

the TAPE RECORDER

PRICE 1/6

AUGUST 1960
Vol. 2 No. 7

INCORPORATING "SOUND AND CINE"



IN THIS NUMBER

- Special survey of all current microphones
- Field Trial of the Butoba battery portable
- New Tape-Cassettes for the Blind
- Making a delayed action time switch—final assembly
- Tape Recorder Workbench
- Teaching Tape—a feature for beginners
- Readers' Problems
- Equipment Reviewed

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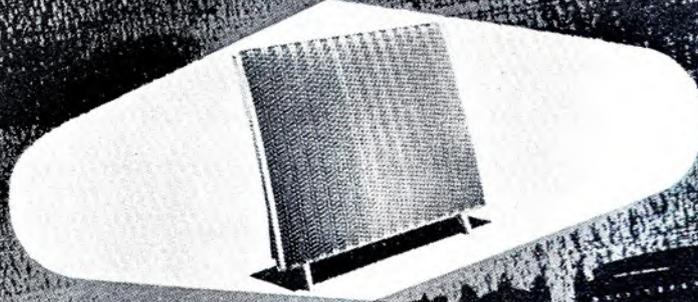
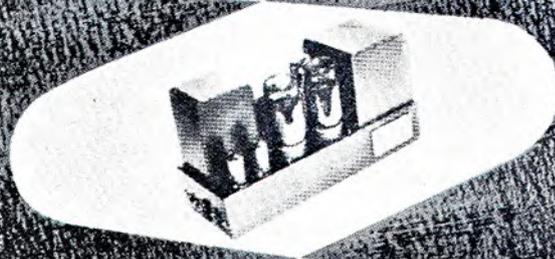
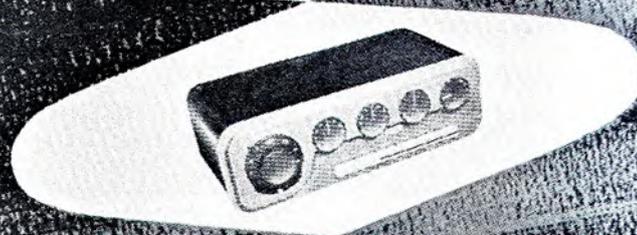
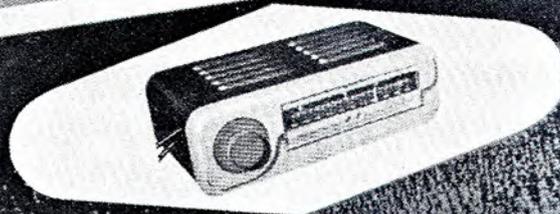
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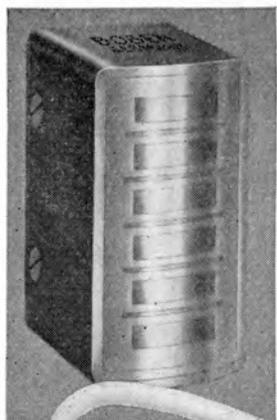
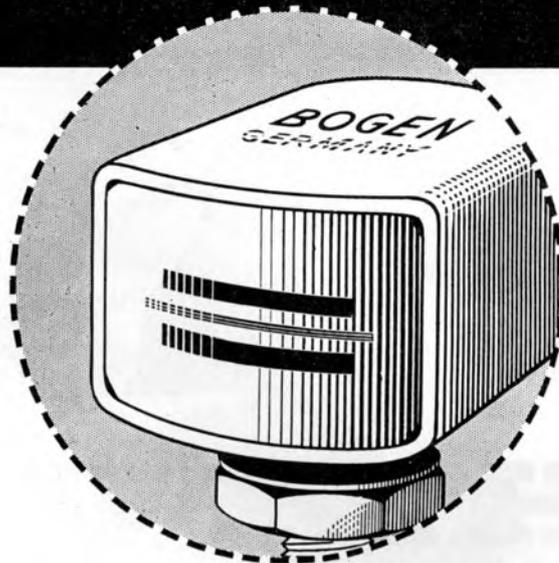
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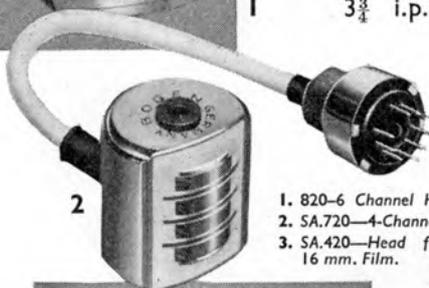
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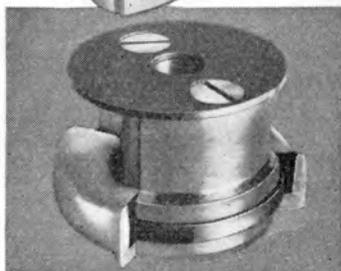
often associated with twice or four times that speed.* That is why it pays to see that the recorder you buy is fitted with Bogen Heads in the same way that you want to know what type of lens is fitted to the camera you buy. With **BOGEN** you are assured of the three most important essentials in tape recorders—finest possible recording and reproduction, long working life, dependability. Bogen heads are also available separately through good stockists for those wishing to fit Bogen to existing equipment.

*These are the same as the heads used by some commercial producers of pre-recorded stereo tapes.



2

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MEMBER OF THE
 AUDIT BUREAU
 OF CIRCULATIONS

EDITORIAL

AT the head of this column this month is a monogram which will mean very little to some of our readers, but which represents a great deal to all our friends in the world of Circulation and Advertising. It is the monogram of the Audit Bureau of Circulations, which is regarded as a symbol of integrity whenever a publisher's figures of "net sales" are quoted. We are pleased to be able to announce that we have become members of this Bureau, both for *The Tape Recorder* and for its sister journal *Hi-Fi News*, and that our officially audited circulation figures for these two journals will be published in due course.

However, it is because we feel that ABC membership is of greater interest to all readers than may at first be apparent, that we have set aside this column to the subject. On the face of it, any circulation figure claimed by a publisher means nothing to the casual reader of the magazine concerned—except that some readers may well be dazzled by an announcement to the effect that X,000 copies are sold. The basic use of an ABC circulation figure is a guarantee to an advertiser that the quoted figure is a genuine one; and that is precisely why so many journals are pleased to announce their membership, though behind the symbol of the ABC lies considerably more than mere figures.

From the publisher's point of view, the audited figure of his net sales must be a barometer of his success, or otherwise, in his endeavours to provide what his readers want to read. If the periodically published figures show an increase, then he may be satisfied that he is on the right lines: if on the other hand they show a decrease then he will be well advised to find out what is wrong, where he is failing, and why—and to take active measures to put things to rights! And it is on this count that the ABC symbol can mean a very great deal to all readers, because it is indirectly a very good measure for them, too, that their interests are well studied in every way.

A journal which deals in any way with the reviewing of goods must be exceptionally jealous of its integrity. It must consider the trust of its readers before anything, and it must always be scrupulously fair to its supporters. We, of *Hi-Fi News* and *The Tape Recorder*, are very conscious of the fact that we are a long way from perfect! We have, in homely terms, dropped many a clanger, and we shall doubtless drop many more, given the opportunity; but we will never consciously depart from the truth in editorial content, any more than we will knowingly expose our readers to anything that is of bad value in our advertising pages. This is our guarantee of value to readers and advertisers alike. And the finest method of ensuring a neat toeing of the line is surely the creation of a good, visible line to toe. It is therefore with a fair mixture of pleasure and anticipation that we publish this ABC symbol, because it is not only an outward and visible sign of integrity to all concerned, but it will serve a useful purpose by keeping us on our toes!

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COVER PICTURE

BATTERY portable recorders have one feature which is not often mentioned—they are perfectly safe to operate anywhere, and put in the hands (or even the paws) of any member of the family. The idyllic scene on this month's cover could hardly have been so carefree if a mains recorder was in use, however securely earthed. As anyone will confirm who has tried the experiment, young children take as naturally to tape recording as kittens do to chasing balls of wool—or microphone leads.

NEXT MONTH

WITH another Earls Court Radio Show looming up again next month, we shall be taking stock in a bumper issue of the exhibitors' plans for demonstrating tape equipment. In addition there will be two special articles of particular interest to home construction enthusiasts.

We plan too to give a fully detailed report on the new Fi-Cord 101 pocket notebook recorder, of which preliminary notes will be found on page 327 this month. I. W. Jarman contributes another in the *Teaching Tape* series for beginners, based on his recent broadcasts on Network Three, and there will be all the regular features—*Equipment Reviewed*, *Tape Recorder Workbench*, *Readers' Problems*, *Details of New Products*, and *Club News*.



On Sale August 22nd

SUBSCRIPTION RATES

The subscription rate to *The Tape Recorder* is 21/- per annum (U.S.A. \$3.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription+Index, 24/- (U.S.A. \$3.25).



SOUND SENSE . . .

Obviously the quality of reproduction obtainable from your recording equipment depends basically on the input received from the microphone. Hence the wisdom of using a microphone of the highest sensitivity and response. The fact that STC microphones are used by the B.B.C. is sufficient recommendation.

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TEACHING TAPE

A SPECIAL SERIES FOR BEGINNERS

By I. W. JARMAN

PART THREE—THE AMPLIFIER SYSTEM

IN the previous article, I dealt with the functions of the various controls on the tape deck of a recorder, the motor drive systems, braking and such extras as the pause control and the revolution counter. The other components of a tape recorder deal with the amplification of signal fed into it, the adding of high frequency bias and the frequency correction necessary to ensure a good quality recording.

In the case of tape recorders employing unit construction (such as the type used in the BBC programme "Sound") and having the tape deck, and amplifier as separate units, the amplifier panel will normally include the following controls:

1. *Gain Control*—this is a variable control which allows adjustment of volume on both recording and playback.

2. *An amplifier function switch*—switchable to Record, Replay or Amplifier with a visual (coloured lamp) indication as to which function has been selected. With most domestic recorders the output valve of the amplifier is bi-functional, i.e. when switched to Record this valve becomes part of the oscillator which supplies Erase current for "wiping" the tape and also the bias signal which, when added to the amplified input signal, reduces both the background noise and distortion. Very slight overbiasing (to the extent of reducing the recorded signal by only 1 dB) will normally improve the signal to noise ratio in the order of 3 dB. But care should be taken to avoid overdoing it, since overbiasing by too much causes a falling off of the high frequency response.

Oscillator valve "doubles" as amplifier

When the amplifier is switched to Replay, the valve used as oscillator in Recording assumes the rôle of an output (power) stage, feeding sufficient level to operate the loudspeaker (internal or external).

The Amplifier position of the switch makes it possible to use the amplifier independently of the recorder, e.g. as a means of amplifying the output from a gramophone pick-up or for public address purposes. When using this facility for public address announcements, it is usually necessary to use an external speaker and to cut the loudspeaker in the recorder to prevent any risk of feedback caused by using the microphone too close to it.

3. *Tone control*—this control, which is operative only on playback, usually affects the high frequency response only, and the setting of it is a matter of personal choice. Should the recorder possess two tone controls, they will be labelled "Bass" and "Treble," in other words, both the high and low frequency response can be adjusted by varying these controls.

4. *Frequency correction switch*—this switch is used in conjunction with the speed selector switch and the various positions of it will be marked with the speeds, i.e. $3\frac{1}{2}$, $7\frac{1}{2}$ and 15 i/s. It is obvious from this that the amount of frequency correction required depends on the speed of the tape across the heads. It is introduced on both recording and reproduction—in the case of the low frequencies there is a slight boost when recording to compensate losses on replay and in the case of the high frequencies, which are more difficult to record and replay than the low, substantial correction is introduced on both recording and replay. These losses occur mainly in the record and replay heads and are inherent in the system.

Nowadays, on a great number of domestic recorders, the selection of speed and the required frequency correction is accomplished by the operation of a single switch marked "speed

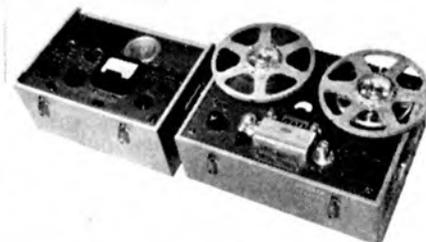
selection" or by depressing keys marked with the appropriate speeds.

5. *Recording level indicator*—Also on the amplifier control panel will be some means of visual checking of the recording level. It could be a meter or, far more likely, a magic eye level indicator.

In the case of a meter, the movement of the needle across a scale will indicate the level of the sound to be recorded and in the case of a magic eye the level is indicated by the movement of the petals. In order to keep the signal to noise ratio

The amplifier section of some tape recorders, including that used in the author's broadcasts, may be purchased as a separate unit.

The Levers-Rich E 121P (right) occupies two separate carrying cases.



at a maximum, the recording level should be as high as possible without distortion occurring. This point will usually be reached when the petals of the magic eye are just short of overlapping. The level should, of course, be adjusted so that this point is reached on the loudest sounds.

6. *Input sockets*—two input sockets are provided:

(a) *Microphone socket* which is normally a high impedance input (of the order of several thousand ohms) to take a high impedance microphone, e.g. crystal type. If a low impedance microphone is to be connected to such a socket then a matching transformer will be required to match the impedance of the microphone to that of the recorder.

(b) *Radio/Gram socket*—this has been provided with a suitable electrical pad across it to reduce the input level from a radio or gramophone which, being quite high, would, if not suitably attenuated, introduce distortion.

The input sockets are usually so arranged that they cannot be used simultaneously and plugging into the microphone socket will automatically disconnect the radiogram socket.

7. *Output sockets*—there is at least one output socket and this is labelled Extension Loudspeaker—by plugging into this socket the output of the amplifier is automatically disconnected from the internal speaker and connected to the extension. Other sockets which may be provided are for installations in which inputs from radio and gramophone and an output from the pre-amplifier stage for feeding an external power amplifier, are permanently connected.

Monitoring

In addition, some machines are fitted with a socket which is labelled "Monitor", at which point the signal can be checked by plugging in headphones (usually high impedance) or by using an external amplifier and loudspeaker. It can also be used on playback as an input for a hi-fi amplifier system.

Whatever the controls provided, on buying a recorder you should, before attempting any serious recording, spend some time experimenting. Then, having mastered the controls to your satisfaction, you can turn to the problems of recording from a microphone. I shall be dealing with these, paying particular attention to microphone balance, in my next article.

HERE AND THERE AND EVERYWHERE

Putting the Talyllyn Railway on tape

The Talyllyn Railway, first opened in 1866 and now preserved by the Talyllyn Railway Preservation Society, is to be immortalised on a 12 in. 33 $\frac{1}{3}$ rpm record now being prepared by Bill Hartley Productions Ltd. for the well-known distributor of specialised actuality records, Sound Stories.

This unique Sound Story of a typical trip on the 2ft. 3 in. track running through 6 $\frac{1}{4}$ miles of Cardigan Bay to Abergynolwyn, with technicalities, description and sounds of rolling stock on the reverse side is to be sold at 37s. 6d.

Not only will the record be made available by the Society to its members and as a souvenir of their trip to passengers, but more widely through distribution outlets of Sound Stories in the United Kingdom, America and other countries, the story behind the fight to preserve this precious British heritage of steam will be told to an international audience. For the special interest of Welsh folk overseas the recordings will capture the sounds of Welsh voices, birds, sheep and even a Welsh harpist!

Bill Hartley will be commentator, Bernard Coaling, F.I.P.A. will direct and edit. Recording will be in the skilful hands of Gordon Thomson, B.Comm., M.A.P.R.S. The three-man team, following a preliminary reconnaissance, will make their Fi-cord recordings over three days.

E.M.I. equipment in Studio 5

THE major share of equipment supplied for recording, replay and monitoring for the new £1,000,000 Associated-Rediffusion Studio 5 at Wembley was supplied by E.M.I. All equipment was built to Associated-Rediffusion's specification and made up in special cabinets. The basic recording unit was the EMI TR 90 of which 11 were supplied. There were also disc replay consoles in special cabinets.

Tape Recorder used in Courtroom

A MINIATURE piano, a record player and the chanter from a set of bagpipes were used in the High Court, London, to illustrate evidence in a music copyright action. It was claimed that Miss Vera Lynn's song "*Travelling Home*" infringed the copyright in "*Westering Home*" composed by Sir Hugh Robertson who died in 1952.

At the request of Mr. Justice Cross, who said he could not read the music and it might be some assistance if he could hear it, a record player and a miniature piano were brought into court.

An articulated solicitors clerk played on the piano the melody of "*Westering Home*", and the chanter from a set of bagpipes was played by former Scots Guards pipe-major Mr. James Blair



"The Old Lady" of Talyllyn with (L. to R.) Bernard Coaling F.I.P.A., Herbert Jones, engine driver, Bill Hartley, Gordon Millar Thomson, recordist. (see first story).

HERE AND THERE AND EVERYWHERE

Robertson. Mr. Justice Cross gave judgment for the defendants, with costs. He held that the plaintiffs had failed to establish that Sir Hugh Robertson had actually composed the verse section.

Teletape open a new branch

WE recently accepted an invitation from Tele-Tape (59a, Edgware Road, London, W.2.) to inspect their entirely new-style shop a few doors along at No. 33, Edgware Road. In reconstructing and decorating the new premises, the opportunity was taken to call in a consultant designer, and build in the complex wiring necessary to instal a comprehensive tape recorder comparator, and Tape Record Bar.

The heart of the comparator is a multi-way switch, by means of which any of the score or so of tape recorders on display (each with its individual mains socket and jackplug) may be listened to through its own loudspeaker or any one of half a dozen extension loudspeakers. The usefulness of this arrangement for straight sales was obvious, and we learnt too that many customers expressly ask for demonstrations of particular recorder/loudspeaker combinations, perhaps through the recommendations of a friend.

The Tape Record Bar is, as far as we know, the first of its kind in this country. A number of Ferrograph playback machines are fitted (safely behind the counter) and customers can "listen before buying" just as in a gramophone record store. The listening is done in two of the open-domed booths frequently seen in record shops, or, if the shop is quiet, through the high fidelity speakers on the comparator aforementioned. Sales generally of pre-recorded tapes have not been excessive in this country so far, but it is encouraging to see such a well-equipped and original shop devoted to making the buying of tape records an enjoyable and at the same time efficient process.

Tricorder makes a hit in Nottingham

Nottingham Tape Recorders Ltd., recently organised a public demonstration and lecture at the Welbeck Hotel. There was a terrific response, over 200 people packing the hall to listen to Mr. K. Short of Recording Devices Ltd., and when question time came, they were reluctant to let Mr. Short go. For forty-five minutes they fired questions at him, displaying a keen and lively interest in his demonstration of the Stuzzi Magnette and Tricorder. Mr. Short played music at 15/16 i/s on the Tricorder and showed its use with a slide projector. Automatically, the machine changed the slides, spoke the commentary, and provided the background music.

New Fi-Cord pocket recorder

JUST as we go to press, we have been inspecting the new Fi-Cord 101 pocket recorder. We shall be giving fuller details of this machine and its particularly versatile range of accessories in next month's issue, but can safely predict a great future for it. The transistorised recorder itself measures only $6\frac{3}{8} \times 3\frac{1}{4} \times 1\frac{1}{8}$ in., and has a built-in microphone with the alternative of a lapel microphone which is worn in button-hole fashion.

Either of these microphones may be employed for the dual function of private listening—at low volume—or there is a desk stand which gives immediate loudspeaker facilities. A transcriber unit is available, similar in appearance to the desk stand, with associated foot control and stethophones for typing. A neat volume control is fitted on the stethoset itself. Standard double-play $\frac{1}{4}$ -in. tape is used on easy-load spools, giving 15 minutes on each track. Price of basic recorder, £55 13s. Look out for a full report next month, or write to Fi-Cord International, 40a Dover Street, London, W.1.



This unusual picture of Stirling Moss—taken some time prior to his recent accident, from which we are glad to hear he is making a good recovery—shows him astride a scooter! He is being interviewed by Derrick Scott-Jobe (with the Fi-Cord) after riding in the N.S.U. Economy Run.

Apologies to Lustraphone

WE find that in our account of the music balance sessions organised by Miss Daphne Oram at the recent Rose Bruford Tape Recording Course (Page 222, June issue) we specified the wrong microphone type. These were three Lustraphone model VR/53 Studio Ribbon microphones, and they were in fact used in conjunction with a Lustraphone model MU/77 Transistorised Mixer Unit.

We apologise to Lustraphone for this error, particularly in view of the fact that it was their generosity in lending the equipment which helped Miss Oram to put on such an interesting demonstration. It has also been pointed out to us that the music demonstration was at the Burnt Oak Lane Primary School, and the children were supplied by Hurstmere Secondary School.



Open air meeting of the South Bank Tape Recording Club? No, worse luck, but London's South Bank seemed as good as any to eat a few sandwiches and listen to the Teppaz "Transit" battery-operated 4-speed record player. A wide range of Teppaz disc and tape equipment is now available in this country.



Recording "The Voice of a City" (See story below) was very much a team effort. Co-operating on the editing of the three miles of tape we see (from left to right) G. M. Thomson, B. Coaling, and M. I. S. Redman.

The Voice of a City

THREE miles of magnetic tape. Three weeks of recording editing and dubbing, on locations ranging from the Lord Mayor's Parlour to Stoke-on-Trent North Signal box, have finally been cut to make a fascinating thirty minute sound documentary of Stoke-on-Trent in the Golden Jubilee Year of its Federation.

With the voice of popular newscaster and television commentator Bill Hartley linking the sound sequences and interviews, this programme presents a broad cross section of the City, at work and play, and introduces the voices of masters and men whose visions and skill have brought international fame to North Staffordshire. Men and women of the older generation, students of Technological Colleges, people in every walk of life have contributed to this Sound Picture which is to be "Ambassador Extraordinary" for the North Staffordshire Chamber of Commerce.

The Voice of a City opens dramatically with the words from Handel's Messiah "Surely" sung by the Ceramic City Choir. It

moves through a montage of sound, including interviews with men and women talking about their work with various firms in the City. But the last word . . . spoken in the broadest dialect yet recorded, comes from "Albert" who says he has been "firing this kiln for donkeys years" . . . and sums it all up with . . . "They've cosst mea and I've cosst em back weyer owreyte 'ere".

So the working day ends and the trains leaving Stoke station take the workers home, and the listeners on to a rehearsal of the choir, to bring this sound picture to a grand finale. It is now legend that at the end of the session, over a mile of tape had been recorded. In the days that followed Gordon Thomson, the chief recordist edited and dubbed the master copies and this left four hours material. The gigantic task of editing, cutting and levelling took nearly a week and then began the even greater task of assembling the multi track master.

Three Ferrograph recording desks were used linked together with a mixing panel. Sound effects were added, mispronounced and misplaced words were altered and deleted. Finally the first master, a multi coloured mixture of tape, indication marks, leader, and splices were ready.

The first complete multi track ran for nearly forty minutes, and the whole process of editing began again. This is the most delicate process, for the whole success of the production depends on this stage. Here the programme is given its pace, the light and shade of sound that makes for good listening. It is a great tribute to Gordon Thomson that without losing a single vital word, the final master ran for just thirty minutes four seconds.

The first two prints of the tape are being presented to The Lord Mayor of Stoke-on-Trent, Alderman H. Clowes, O.B.E. One for the City Archives and one for him to present to two young American research workers from Keele University, to take back to the States with them as a permanent memento of their College life in North Staffordshire. The recording is an invitation to visit the City for the Jubilee Celebrations and to see what is made there and how it is made. It is aimed particularly at the Commonwealth and the United States of America where they hope friends will gain from it a fresh picture of the City.

Also it is hoped that it will create new friends and tempt them to visit a place whose name already graces their tables.



AUGUST NUMBER

★

Contents include:

- Building the TWA/1515 Stereo Tape Amplifier
- Understanding Hi-Fi
- How to Balance your Stereo
- Tap > Heads and Transistors
- Equipment and Record Reviews

★

NOW ON SALE

HOW OTHERS USE TAPE

Blind Bulletin

WHAT Goes on Here, a thirty minute tape recording produced by Mr. W. Gillings—a name familiar to readers through his activities with the Ilford Club—is likely to develop into a national sound magazine for the Blind. Entitled *Blind Bulletin*, a tape recording lasting one hour will be available every month, on subscription, to blind groups and individuals throughout the country. This will contain news of activities by blind people over a much wider field, reporting on new developments in blind welfare and including actuality material gathered from many sources.

* * *

Hospital Broadcasting Service

THE Hospital Broadcasting Service which has been in operation for over five years, providing free programmes to Hospitals throughout the country wishes to announce that it has severed all connections with the British Recording Club. Hospitals and Club members already receiving tapes under this scheme should in future send all correspondence and tapes to the Secretary, A. J. Lovell, 63, Aintree Crescent, Barkingside, Ilford, Essex.

* * *

Stolen Machine

ON the night of June 15th/16th, thieves broke into the Rex Cinema, London Road, Norbury, London, and stole a Grundig T.K.35 Serial No. 502761840 together with cigarettes, money, and an Ekco V.H.F. Radio Serial No. 58065. If any reader is offered these items would they please contact Norbury Police Station, London Road, Norbury, S.W.16, as Mr. P. J. Cordier has offered a £20 reward for information.

* * *

Thieves strike again

A clean sweep of the entire tape recorder stock of the newly-opened Sheen Tape Recorder Centre Ltd., 8, Station Parade, Sheen Lane, London, S.W.14, was made on the night of the 6th July. Although the premises were bolted and barred, and lighted all night, the following machines were removed:—Stuzzi Magnostette, 14402; Grundig TK24, 39290; Brenell 3 Star, 6975; Wyndson Victor, 21722 and 21724; Simon Minstrelle Table Model 371 and Portable 5166; Mannequin, 3865; Elpico, 56758; and G.B.C. Clarion, 15565. You will be doing a public service if you can assist the police to locate any of these stolen machines.

BOOK REVIEW

Magnetic Recording: Wire and Tape—by M. L. Quartermain. 72 pages, illustrated, 4s. 6d. Norman Price (Publishers) Ltd.

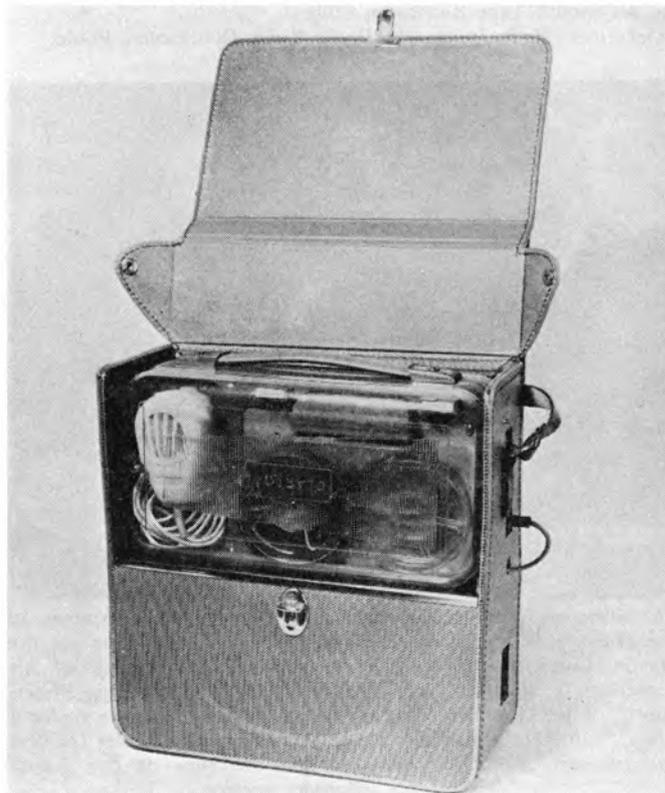
We wonder if there is any tape recording enthusiast who has not come across this excellent little book, which has been reprinted many times since its first appearance (as long ago as 1952). It takes a much more practical line than the majority of today's small books, and it is assumed that the reader will wish to construct all the parts of his magnetic recording equipment. Useful amplifier circuits are built up in stages, and there are pages devoted to head construction and even the building of a complete deck assembly. To crowd all this information, plus some simply explained general theory, into 72 pages has necessitated a fair degree of compression, but we are glad to take this opportunity of adding our congratulations to the many which the author must have received since this book's first appearance.

J.N.B.



Collecting autographs on a Clarion

NORMA LONGPER believes in collecting her autographs on tape! At the recent Teenage Fair she used her Clarion to record many famous people, including Michael Cox (top photo) whose disc of "Angela Jones" is well up in the Hit Parade. We gave details last month of the new Clarion "Twinsset" device, which for an extra 8 guineas supplies a neat leather shoulder-strap case incorporating a special playback amplifier and loudspeaker. A close up photograph of the Clarion and "Twinsset" combination is given below.



NEWS AND PICTURES FROM THE CLUBS

DURING the last few weeks members of the **Ulster Tape Recording Society** have moved into their new premises at 44, Dublin Road, Belfast. Meetings are held every Thursday evening at 8 p.m. The decorations and modifications of their new H/Q. have been carefully considered and a sound-proofed control annexe is now nearing completion. An observation window enables the operator to view the main room and microphones are cabled from there to the annexe in which a variety of equipment is contained. The end walls of the main room have been modified to reduce reverberation during recordings.

They are of course very proud of their new studio and would like to hear from any club in Great Britain with a private, non-professional recording room.

Mr. Parrington of Walter Instruments Ltd., continues to visit local tape clubs, the most recent being the **West Middlesex Tape Recording Club**. The latest equipment was demonstrated including the Mains/Battery portable first shown at this year's Audio Fair. At the next meeting members had the opportunity of seeing the famous film "The Magic Tape" presented by Mr. Wilson on behalf of the B.A.S.F. organisation.

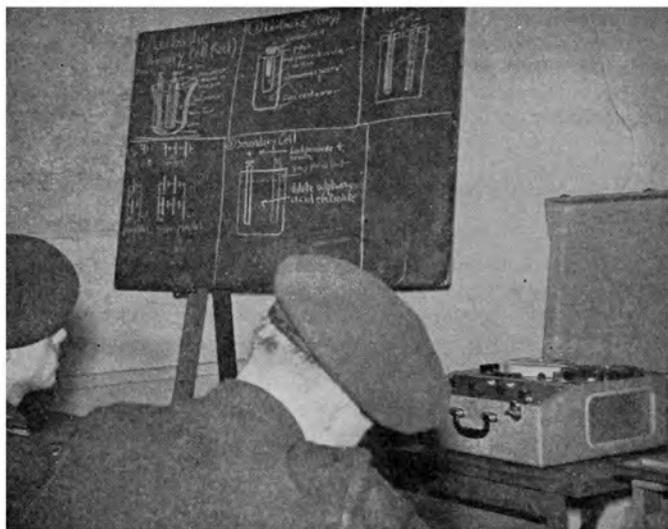
Secretary: H. E. Saunders, 20, Nightingale Road, Hampton, Middlesex.

Club members of the **Bournemouth and Poole Tape Recording Club** recently enjoyed a visit to the BBC Studio at Southampton to study the editing of a tape recorded programme. Later they were given the opportunity of using the E.M.I. L2/TA and then hear the result played back on the larger equipment. In the near future the club hope to visit the I.T.V. Studio at Southampton and the Weymouth Tape Recording Club.

Secretary: H. R. Jones, 442, Poole Road, Branksome, Poole.



The town of Ilford (Essex) made an overwhelming response to the Mayor's World Refugee Fund appeal, and here we see the Mayor, Councillor Harold Root, making a recording of his expression of thanks for inclusion in Ilford's "Talking Newspaper" What Goes On Here, which is presented weekly to local Blind Clubs. On either side of the mayor are Mr. Walter Gillings and his son Ronald, originators and directors of this Sound Features voluntary service.



Tape recorder lectures

THE above photograph, showing a section of a classroom in the Headquarters building of No. 1083 (Hayes) Squadron of the Air Training Corps, was sent to us by Flying Officer S. Wells, Adjutant and Training Officer. Cadets are seen receiving a technical lecture from a Brenell Mark IV tape recorder. Pre-recorded lectures on many subjects in the Syllabus of Training are used in conjunction with the instructional staff, and to supplement an instructor when one is not available for a particular subject or lecture. This type of training does not take the place of the "live" instructor, but is used to augment the instructional staff, and to provide extra instruction aid. When an instructor is absent due to illness or leave, it is possible to select his lecture from the Tape Library and to give the Cadets their normal lessons in that instructor's style and voice. F/O Wells introduced recorded lectures to the A.T.C. in 1948, but these were on disc and by no means as convenient as tape.

Five members of the **Rugby Amateur Tape Recording Society** accepted the invitation by the **Coventry Tape Recording Society** to visit them on their Club night. On arrival members were welcomed by the Chairman, Mr. R. Penfold, and other members of the Coventry Club. After the normal business of the meeting had been concluded, Mr. Penfold read a report on the subject of "print through" and apparently independent experiments had shown that "print through" on double play tape is a very live problem and actually does exist contrary to the claims of the manufacturers. The Chairman then introduced Mr. Worman of R.E.S. (Coventry) Ltd., who had brought 12 machines for demonstration. After a brief introduction, members were allowed to examine the recorders and this was followed by "Question Time".

Secretary: M. F. Brown, 219, Clifton Road, Rugby.

The **Nottingham Co-operative Amateur Tape Recording Society** heard the behind-the-scenes story of the recent Tape Recording Course held at the Rose Bruford Training College, Kent. Two members who attended the Course produced a ten minute feature tape on their visit to the London Planetarium. The meeting closed with a discussion on programme production. Future meetings

NEWS AND PICTURES FROM THE CLUBS

include Outside Broadcast Night (4 August) Assembling a news-reel from O.B. recordings (18 August). 1 September. First Birthday of the Nottingham Club.

Secretary: N. D. Littlewood, 129, Standhill Road, Carlton Hill, Nottingham.

The committee of the **Swindon Club** have got their heads together and between them have thought up a really lively programme for the coming season. The club has been fortunate in gaining permission to record some local talented amateurs. Members of the Club are invited to tell the committee just what they want to be included in future club nights.

The **Crawley & Sussex Tape Recording Club** recently recorded speeches given at a luncheon in honour of Sir Thomas Bennett, Chairman of Crawley Development Corporation. This was so successful that they were invited to record the opening ceremony of the new Civil Defence Headquarters in Crawley by His Grace, the Duke of Norfolk. Finally they were given official permission to cover the Crawley Carnival on Whit Monday. Two sites were used for recording, and with the co-operation of the Civil Defence they had a two way radio link with one of their members actually in the procession. Club meetings are held on the first and third Monday of every month at the Southgate Community Hut, Crawley. New members with or without equipment are welcome.

Secretary: R. C. Watson, 32, Southgate Drive, Crawley, Sussex.

It appears that clubs are being formed throughout the world, the latest is the **Hi-Fi Society of South Africa**. Members are interested in contests and tape recording activities. Any club or person should contact the *Secretary:* A. E. Peach, P.O. Box 11326, Johannesburg, South Africa.

A Club has been formed recently in the county of Gloucestershire called the **Cotswold Tape Recording Society**. Already thirty members hold regular meetings once a fortnight in the club rooms of the Cheltenham Science Fiction Circle, 30, London Road, Cheltenham. An extensive programme of club activities is being planned including visits to local manufacturers of tape recording and hi-fi equipment. A warm welcome is extended to all enthusiasts and further details can be obtained from the *Club Secretary:* K. G. Tomes, 41, Barnwood Road, Gloucester.

Anyone in the West Suffolk area wishing to join the newly formed club should contact Mr. P. J. Blades (*Secretary*) **West Suffolk Tape Recording Club**, c/o Eastronics, 68-69, St. John's Street, Bury St. Edmunds, Suffolk.

The **Wakefield and D.T.R.C.** had a very interesting and instructive evening on the 4th July, when Mr. Wilson of B.A.S.F. Tape, gave a talk on the history of magnetic recording tape. The Academy Award winning film "The Magic Tape" was also shown. The A.G.M. was also held on the same evening; the membership now totals 27. The Club announces the following changes in their Committee: Chairman, Mr. C. H. Wood; Secretary, Mr. I. Chidwick (remains), and Treasurer, Mr. M. Storey. Owing to lack of support from local traders the open day planned for Saturday, July 16th, had to be postponed. But they hope to hold one later in the Autumn, so would any national firms interested please write to the Hon. Press Secretary, Mr. G. B. Lardner, Holmfirth House, Bradford Road, East Ardsley, Nr. Wakefield, Yorks.



Co-operating in local events—particularly those which aid deserving charities—can be one of the most rewarding extramural activities of a flourishing tape recorder club. The above photograph was sent to us by The Walthamstow and District Tape Recorder Society, and shows the exhibition van which members prepared for a recent carnival.

Notice to all Club Secretaries

Will Club Secretaries please note that Club meeting dates after the 20th of each month must be sent to the editor by the 25th of the previous month. Many Clubs supply us with the dates of meetings, but by the time the magazine is printed they have already been held and no future dates are given.



designed by Stanley Kelly

NEW RANGE OF MICROPHONES



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price 25/-

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The M8 is a ribbon microphone of exceptional merit, with a frequency response of 35-13,000c/s ± 3 dB and yet selling for only £8 15s. 0d. This microphone has its own inbuilt transformer and the source impedance is 30 ohms, 12 ft. of screened cable is supplied, other lengths can be fitted on request. Alternative models with source impedance of up to 57 K ohms are available.

We also manufacture the popular M7 moving coil microphone, this sells for £6 5s. 0d. and has frequency response of 35-9,000 c/s ± 3 dB. The source impedance is 20 ohms.

Desk, table and floor stands are available for all models.

Write for complete details

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For Styling, Performance and Workmanship

The best of Both Worlds

Cadenza Ribbon MICROPHONE ➔

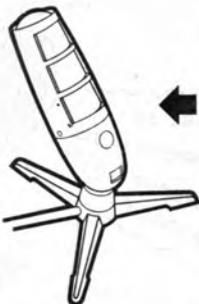
A worthy link in the chain between live sound and perfect recording, the Cadenza ribbon microphone has been designed to give performance to studio standards whilst remaining in the medium price range.

The unique arrangement of ribbon and magnets gives an output which is flat to within close limits over the wide range

from 50 c.p.s. to 12,000 c.p.s. Patent No. 810064.

Cadenza dual impedance microphone head only in presentation case, 8½ gns.

Cadenza dual impedance microphone, with tripod desk stand, connected 11 ft. of cable. Complete in presentation case, 10 gns.



← *Cadenza Crystal* MICROPHONE

Top crystal performance, robust and handy, these qualities and the low price make this an ideal second microphone or an excellent partner to any tape recorder. Complete with tripod desk stand, hinged to allow adjustment of microphone head angle, 3½ gns.

Simon Equipment Limited

46-50 George Street, London W1. Telephone: WELbeck 2371



Readers' Problems

"Torch" microphones

Dear Sir: I have noticed that a number of the newer microphones are shaped something like an electric torch, with the "business" end about 1 in. in diameter, whereas the more conventional types resemble a clock or pocket watch with the grille on one face. What are the advantages of these two varieties, and which would you recommend for outdoor recording?

Yours faithfully, F. S., Durham.

Early microphones were necessarily bulky, since the emphasis was on obtaining maximum sensitivity through the use of large diaphragms, magnets, etc. Improved materials and techniques in manufacture have made possible a great saving in size and weight, so that a complete microphone could now be built into a wrist watch. An incidental benefit obtained from these smaller and lighter microphones is that the quality of reproduction and the angular response will often be much improved.

All pressure-operated microphones (i.e. most crystal, condenser and moving coil types) are nominally omni-directional. In other words they respond equally to sounds from all directions; but they fail to do this at high frequencies as soon as the wavelength of the sounds approaches the dimensions of the microphone itself. Now 3 in. and 1 in. correspond to the wavelength in air of sounds at 4.5 Kc/s and 12.5 Kc/s respectively, and so a 1 in. microphone has a more even angular response than one measuring 3 in. across.

In practical terms, this means that there is likely to be a noticeable variation in the reproduced quality from the larger microphones depending on whether we speak directly to the diaphragm, or speak across it—sharpest sibilance on the axis, softer quality at oblique angles. With the smaller microphones there is practically no difference—provided the frontal size of the microphone case is also kept down to 1 in. or thereabouts.

It was this last factor which led to the introduction of "pencil", "torch", "stick" and other slim microphones. These are very easy to handle, and are inconspicuous—e.g. in theatre and television work. Which of the two varieties you choose for outdoor recording will depend entirely on the circumstances. For hand operation these new stick microphones are perhaps best.

Transformer ratios

Dear Sir:—I am a newcomer to tape-recording and would be grateful if you would explain one point about microphones. I notice that the input impedance of most recorders at the mic input is 500,000 to 1,000,000 ohms. I have a Reslo ribbon microphone 30 ohms impedance with the Wearite transformer which

I understand has a ratio of about 100:1. Surely this gives a mismatch; in theory would you not require a ratio in the region of 30,000:1 to bring it up to near 1,000,000?

I should be most grateful if you would clear up this matter for me. I feel sure there must be something wrong in my deductions, but I am not sure where.

Yours faithfully, J.D.B., Lauder.

The apparent error in your calculations is due to the exact meaning placed on the term ratio in this context. When a transformer is quoted as having a certain ratio, 2:1, for example, this means that the number of turns of wire forming the primary and secondary windings are in the ratio of 2:1.

When a certain AC voltage is applied to the primary, the action of the alternating rise and collapse of the magnetic field surrounding the winding is an equivalent linkage with each turn in the secondary. The result of this is the generation (in an ideal 2:1 transformer) of a voltage in the secondary equal to twice that in the primary. So a step up transformer increase voltage in exact proportion to the turns ratio. But we get nothing for nothing (and remember that the total power is unaltered, i.e. voltage x current) and so, although the voltage has been doubled, the current is halved.

Now applying Ohm's Law (or what tatters of it we can remember from school days) we see that the impedance (which equals voltage ÷ current) will have been quadrupled. In other words the ratio of impedances which a transformer may be used to match is equal to the square of the turns ratio. Taking your example of a 30 ohm microphone, and a 100:1 transformer, the correct loading for the secondary would be $30 \times 100^2 = 300,000$ ohms.

* * *

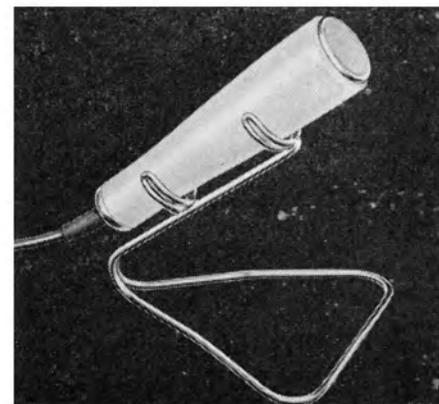
Making tape recordings visible

Dear Sir:—I have heard that there is a special material for making video tape recordings visible. At this helps in editing I should like to know if it works equally well for sound recordings.

Yours faithfully, M.C., Liverpool.

It is quite correct that the pulses recorded on a Videotape are made visible during the editing of TV programmes, so that the operator can cut and join the tape in such a way as to preserve the exact frame continuity. A solution containing carbonyl iron is applied before making the cut, and the adherence of the iron particles to the heavily modulated sections of tape is found to make the editing pulses easily identifiable.

We have never heard of this technique being applied to audio tapes, however, and feel that editing "by ear" is probably the best method.



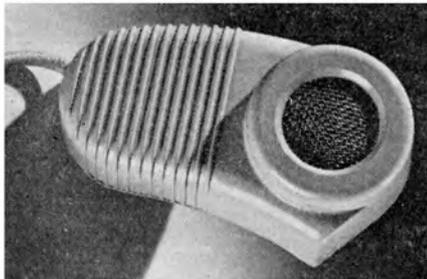
Three popular microphones which illustrate the contrast in styles referred to in the first letter on this page. Reading from left to right they are the Grampian DP4 moving coil, the Lustraphone DL66 moving coil, and the Acos Mic 39-1 crystal.

ALL KINDS OF MICROPHONES

A COMPLETE GUIDE TO TODAY'S RANGE OF TYPES



Telefunken D19B moving coil



Vivox B52 moving coil



Shure 55s small Unidyne



S.T. & C. 4038 ribbon



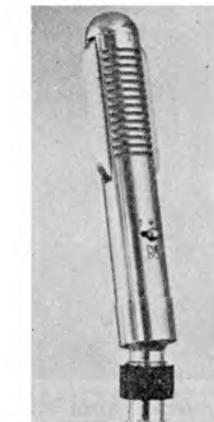
Reslo CR Ribbon



S.T. & C. 4104 Lip



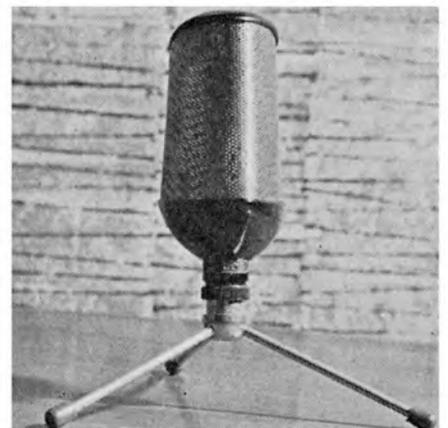
Tannoy MC/424/S



B. & O. BM3 Ribbon



Collaro Crystal



Acos Stereo Mic. 44

TO follow last month's survey of tape recorder accessories, we have drawn up a table of available microphones. You are likely to go shopping for a microphone for any one of a number of reasons—perhaps you have a new recorder with no "included" microphone, or you have decided to add a second string in the shape of a superior quality type, or one with different directional properties. In any event, it pays to know something of the technical terminology used in the manufacturer's specification, and we give here a brief guide to the items listed in the tabulated columns. The information is as supplied by the manufacturers concerned.

Type

The electrical types of microphone are crystal (there is one ceramic listed), condenser, moving coil, and ribbon. Crystal microphones are usually offered as the accessory included with domestic recorders. They have the advantages of cheapness, high voltage output and robustness, and are light in weight. To set against this, however, is their somewhat limited frequency response, and the fact that a short cable is usually necessary.

Condenser microphones are listed by only two manufacturers, and whereas the Grundig types have characteristics similar to the crystal microphones, the AKG condenser microphone is clearly in the professional class, having a built-in valve amplifier and facilities for giving delayed switching to 9 directivity patterns.

Moving coil microphones are perhaps the most versatile. They will stand up to all sorts of conditions, and can generally be run out on long leads 100 feet or more. They are not particularly expensive, and, in the best examples, have a high standard of quality. Ribbon microphones are a little less sensitive than moving coils—which they resemble electrically—and are unsuitable for outdoor work due to the extreme lightness of the ribbon element. They are acknowledged favourites for most kinds of music recordings, however, due to their smooth response to a wide range of frequencies, and their directional properties.

Frequency Range

This refers to the microphone's ability to reproduce sounds at low and high frequencies, and should in practice be qualified by a reference to the level limits within which the response is maintained—e.g. 50–10,000 c/s ± 5 dB. This figure is invariably quoted in the full specifications of the better grade microphones, but is omitted with cheaper microphones. For example, one of the

ALL KINDS OF MICROPHONES

A COMPLETE GUIDE TO TODAY'S RANGE OF TYPES

continued from previous page...



Schumann-Merula Crystals

crystal microphones listed specifies a frequency range of 20–16,000 c/s, but this is ± 15 dB! However, it would be a mistake to pay overmuch attention to frequency response alone in choosing a microphone—as in choosing a recorder—and 100–8,000 c/s is perfectly satisfactory for speech, or for use with the cheaper machines.

Impedance

Three basic internal impedances are met in microphones, and it is important from the point of view of quality and volume that the microphone should be connected to a similarly rated input socket on the recorder. The three impedances are roughly referred to as high, line, and low, and these are nominally around 50,000, 300, and 30 ohms. Crystal and condenser microphones are high

impedance types. Two important implications of this are (a) the cable length cannot be increased beyond 6 or 8 feet without loss in volume, (b) the recorder input impedance cannot be reduced below a specific value—of the order of a few megohms—without deterioration of the bass response.

Moving coil and ribbon microphones are low impedance types and may be connected to quite long lengths of lead. They are often constructed with a built-in step up transformer to increase their versatility by presenting a high and/or line impedance additional to the inherent low impedance. They will then match any type of recorder input socket.

MAKER	MODEL	TYPE	FREQUENCY RANGE (c/s)	IMPEDANCE (Ohms)	SENSITIVITY	DIRECTIVITY PATTERN	PRICE	REMARKS
A.K.G. ... (Politechna London)	D9	Moving coil	80–10,000	200 and 50K		Omni	£4 19s.	Includes collapsible stand and 5 ft. cable.
" ...	D11	Moving coil	80–12,000	200 or 50K		Cardioid	£5 6s. or £5 12s.	Includes screw on stand and 5 ft. cable.
" ...	D19	Moving coil	40–16,000	200 or 50K		Cardioid	£19 10s. or £22	Bass cut switch.
" ...	D88 (Stereo)	Moving coil	80–15,000	200 or 50K	–75 or –52 dB	Dual cardioid	£17 10s. or £19 10s.	Suitable for stereo and mono.
" ...	D12	Moving coil	40–12,000	60 or to order	–77 dB	Cardioid	£34	Front to back ratio 15 dB.
" ...	C12	Condenser	30–15,000	50 and 250	–60 dB	Choice of 9	£185	Includes power unit and 9-position selector.
Bang & Olufsen ...	BM3	Ribbon	20–14,000	50		Figure of Eight	£14 10s.	Bass cut switch.
" ...	BM4	Ribbon	20–14,000	50, 250 and 40K		Figure of Eight	£16	Bass cut switch.
" ...	Stereo assembly	Ribbon	20–14,000	50, 250 and 40K		Figure of Eight	£36 10s. or £39 10s.	Comprising 2 x BM3 or 2 x BM4 plus baffle.
B. & K. Laboratories	4131	Condenser	20–20,000	Cathode Follower	–46 dB	Omni	—	Designed for free field measurements.
" ...	4133	Condenser	20–40,000	Cathode Follower	–57 dB	Omni	—	½" diameter, for free field measurements.
Collaro ...	Studio	Crystal	50–10,000	REC. 5 Meg		Omni	£2 5s.	Includes jack plug, 6 ft. cable.
Cosmocord ...	Acos MIC 39	Crystal	40–15,000	REC. 4.7 Meg	–60 dB	Omni	£3 3s.	8 ft. cable.
" ...	Acos MIC 40	Ceramic	30–6,000	2.5 Meg	–60 dB	Omni	£2	
" ...	Acos MIC 45	Crystal	30–6,000	2.5 Meg	–50 dB	Omni	£2	
" ...	Acos MIC44 (stereo)	Crystal	50–6,000	2.5 Meg	–62 dB	Figure of Eight	£6	
Elizabethan ...	Elizabethan	Ribbon	50–12,000	50K	–56 dB	Figure of Eight	£7 17s. 6d.	Built-in transformer.
Film Industries ...	M7	Moving coil	60–9,000	20		Omni	£6 5s.	
" ...	M8	Ribbon	35–13,000	30		Figure of Eight	£8 15s.	Other impedances available up to 57K.
Fortiphone ...	M1	Moving Coil	—	2,200		Omni	£1 15s.	Hand mic.
G.E.C. ...	BCS2372	Ribbon	50–14,000	30 and 300	–90 dB	Figure of Eight	£19 19s.	Built-in line transformer.
" ...	BCS2378	Ribbon	50–8,000	30		Figure of Eight	£10 5s.	Includes on/off switch, transformer and cable.
" ...	BCS2384	Moving coil	200–10,000	25–30		Omni	£8 18s. 6d.	
Gramplan ...	DP4/H	Moving coil	50–15,000	25	–86 dB	Omni	£7 11s.	
" ...				600	–70 dB	Omni	£8 11s.	
" ...				50K	–52 dB	Omni	£8 11s.	
Grundig ...	GCM.3	Condenser	—	—	—	Omni	£6 6s.	
" ...	GDM.111	Moving coil	—	—	—	Omni	£8 8s.	
Lee Products (G.B.)	Elpico M.403A	Crystal	40–7,000	REC. 1 Meg	–52 dB	Omni	£7 7s.	Including floor stand. Other versions available.
" ...	Elpico M.401V	Crystal	40–7,000	REC. 1 Meg	–52 dB	Omni	£4 14s. 6d.	Including on/off switch and table stand.
" ...	Elpico M.416	Ribbon	30–13,000	15–30	—	Figure of Eight	£7 15s.	On/off switch. Stands available.
" ...	Elpico M.63	Moving coil	—	15–30 or high	—	Omni	£8 8s.	
Lustraphone ...	LX55	Crystal	30–8,000	High		Omni	£2 10s.	9 ft. cable.
" ...	Lustrette LD/61	Moving coil	70–12,000	High line and low		Omni	£3 7s. 6d.	Transformer when required.
" ...	Master C51	Moving coil	50–8,000	High, line and low		Omni	£5 5s.	
" ...	Master C48	Moving coil	50–8,000	20		Omni	£5 15s. 6d.	Built-in transformer.
" ...	Master C48S	Moving coil	50–8,000	20		Omni	£6 6s.	
" ...	Pencil LVF/H59	Moving coil	150–14,000	High, line and low		Omni	£7 7s.	On/off Switch.
" ...	Tubular TH59/SB	Moving coil	150–14,000	High, line and low		Omni	£8 18s. 6d.	Built-in transformer; hand type.
" ...	Full-vision LFF/59	Moving coil	150–14,000	High, line and low		Omni	£8 18s. 6d.	Built-in transformer; hand type.
" ...	Lavalier LV/59	Moving coil	150–14,000	High, line and low		Omni	£8 18s. 6d.	Neck halter type.
" ...	Chest DI59/BS	Moving coil	150–14,000	High, line and low		Omni	£11 11s.	With chest harness.
" ...	LD/66	Moving coil	70–12,000	Low	–88 dB	Omni	£4 2s. 6d.	
" ...				Line	–75 dB	Omni	£4 12s. 6d.	
" ...				High	–52 dB	Omni	£4 12s. 6d.	
" ...	Studio VR/53	Ribbon	Flat to 14,000	High, line and low		Figure of Eight	£9 19s. 6d.	Built-in transformer, 6 ft. cable.
" ...	Ribbonette VR/64	Ribbon	Flat to 13,000	High, line and low		Figure of Eight	£7 17s. 6d.	Built-in transformer, 6 ft. cable.
" ...	Stereomic VR/65	Dual ribbon	50–13,000	20 and 300	–90 dB	Figure of Eight	£31 10s.	Built-in transformer, 6 ft. cable.



**MINIATURE
RIBBON
MICROPHONES**

by

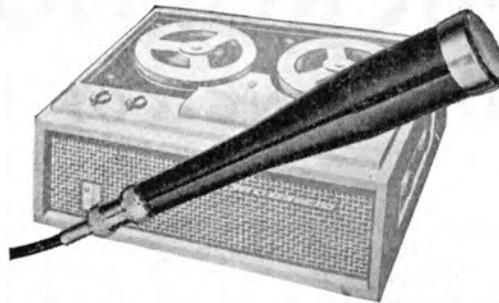
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Grampian DP4



**brings out
the best
in any
recorder**

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The DP4 is equally suitable for Public Address, Broadcasting, Call Systems, etc.

Output Levels.—DP4/L low impedance—25 ohms 86 dB below 1 volt/dyne/cm. DP4/M medium impedance—600 ohms 70 dB below 1 volt/dyne/cm. DP4/H high impedance—50,000 ohms 52 dB below 1 volt/dyne/cm.

Retail Price.—DP4/L complete with connector and 18 ft. screened lead £7 11 0
(Medium or High Impedance models £1 0 0 extra)

A complete range of stands, swivel holders, etc., is available also. A matching Unit (Type C7) can be supplied for adapting the microphone for a Recorder having a different input impedance, or when a long lead is required. ... Retail Price £3 5 0

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23 Hanworth Trading Estate, Feltham, Middlesex

Feltham 2657



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AND RIBBON MICROPHONES**

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**A MODEL FOR
EVERY REQUIREMENT**

- ▶ "LUSTRETTE" DYNAMIC — popular replacement for crystal types.
- ▶ "FULL VISION" DYNAMIC—Pencil slim high quality dynamic for hand or stand use.
- ▶ "RIBBONETTE"—High sensitivity ribbon for recording.
- ▶ LV/53 STUDIO RIBBON — Studio microphone for professional requirements.
- ▶ "STEREOMIC"—Twin ribbon vertically mounted microphone for stereo and mono.

LUSTRAPHONE MICROPHONES ARE AVAILABLE IN ALL GENERALLY REQUIRED IMPEDANCES

LUSTRAPHONE MICROPHONES are completely British and have behind them the advantages of very many years of continuous experience in microphone design and development. You will see and hear them again and again in TV, broadcast and theatrical use. Often you will find the recording that sounds better, the transmission that is clearer owes its quality to LUSTRAPHONE. These microphones are finely designed in appearance, too, combining modern line with elegance that will not quickly outdate. For whatever purpose you require a microphone (particularly with tape recorders) there's a LUSTRAPHONE model for it ranging from the ever-popular "Lustrette" dynamic at 67s. 6d. to twin ribbon stereo assemblies for highest professional requirements. LUSTRAPHONE MICROPHONES are sold by leading stockists. Full descriptive literature on request.



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recorder users**

LUSTRAPHONE LD/66 DYNAMIC MICROPHONE with substantially flat response from 70–12,000 c/s. In all impedances for connecting direct to all types of recorders. For hand use. With stirrup support for table use, or stand-mounting swivel. 6 ft. cable. Case in cream colour polystyrene. **82/6**
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Sensitivity

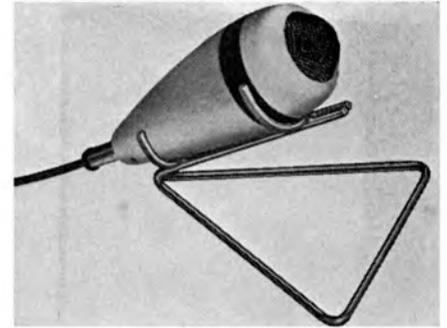
The efficiency with which a microphone converts a given amount of sound energy into electrical power (or pressure into voltage) is referred to as its sensitivity. The standard of sound pressure in the present table is 1 dyne per square centimetre, and the level is quoted in decibels (dB) below 1 volt. Thus -60 dB corresponds to 1 millivolt, and -52 dB represents twice the sensitivity of -58 dB. It will be seen from the tables that low impedance microphones have much lower quoted sensitivities than the high impedance types, but the process of transforming up to high impedance—either by a built-in transformer or one included in the recorder—produces a simultaneous step up in voltage, so that the differences are less than might appear at first glance.

Directivity Pattern

The majority of microphones have an omnidirectional response, i.e. they are activated more or less equally by sounds arriving from all angles. It is necessary to qualify this statement slightly for microphones whose diaphragm measures more than about 1 inch in diameter, since there is then a loss of high frequencies at angles away from the axis. The next most common directivity pattern is the figure of eight. This indicates that the microphone has its maximum response to sounds arriving on the front and back axis, and is insensitive to sounds arriving at the side. Ribbon microphones are generally bi-directional in this way, and allow one to discriminate against unwanted or over-enthusiastic sources of sound



Acos Mic. 45



T.S.L. MX 3 Crystal

to produce a good overall balance. A cardioid (heart-shaped) pattern means that sounds are picked up efficiently over a wide frontal angle, but not from the rear.

Price

Finally, as a guide to prospective purchasers, we suggest that a reasonable balance should be maintained between the amount of money expended on the microphone and the tape recorder itself. A ceiling figure of 20% is perhaps fair. This would mean spending up to £5 on a microphone for a £25 recorder, up to £15 for a £75 machine, and so on.

MAKER	MODEL	TYPE	FREQUENCY RANGE (c/s)	IMPEDANCE (Ohms)	SENSITIVITY	DIRECTIVITY	PRICE	REMARKS
Lustraphone—cont.								
"	Lapel LP/62	Moving coil	Flat to 6,000	30 and 1,000		Omni	£3 7s. 6d.	6 ft. cable.
"	Velodyne VC/52/TH5B	Moving coil	See remarks	25 or to order		Omni	£8 18s. 6d.	Noise cancelling: Response rising to 1,700 c/s, flat to 3,500 c/s, then falling. Impedance switch.
Philips	EL6011/10	Moving coil	100-10,000	50 and 25,000	-76 and -50 dB	Omni	£10	
"	EL6012	Moving coil	100-10,000	50 or 25,000	-76 or -50 dB	Omni	£17	
"	EL6021	Moving coil	60-15,000	50, 500 and 10,000	-56, -69 and -78 dB	Omni	£14	On/off switch.
"	EL6031	Moving coil	70-15,000	50 and 25,000	-84 and -58 dB	Hypercardioid	£19	
"	EL6040	Moving coil	60-20,000	50, 500 and 25,000	-88, -78 and -61 dB	Omni	£27	
R.C.A.	Varacoust 6203C	Ribbon	60-10,000	50, 250, 600		Figure of Eight		
"	6204C	Ribbon	60-10,000	40K		Figure of Eight		
Resound	DP	Moving coil	—	30, 600, or High	—	Omni-Cardioid	£8 15s.	
"	RB	Ribbon	—	30, 600, and High	—	Figure of Eight	£8 15s.	
"	CR	Ribbon	—	30, 600 and High	—	Cardioid	£8 15s.	
Romagna	HMC/1	Crystal	80-8,000	— 2,000p	-54 dB	Omni	£1 5s.	
"	HMM/1	Moving coil	60-10,000	10K	-60 dB	Omni	£1 19s. 6d.	
"	HMR/1	Ribbon	35-12,000	10K	-60 dB	Figure of Eight	£2 19s. 6d.	
Schumann-Merula	MKS.1	Crystal	—	REC. 3-5 Meg	-48 dB	Omni	£2 5s. 6d.	
"	MKS.3	Crystal	—	REC. 3-5 Meg	-46 dB	Omni	—	
"	MKT.2	Crystal	—	REC. 3-5 Meg	-52 dB	Omni	—	
"	MDT.2	Moving coil	—	200	-72 dB	Cardioid	—	
"	MDS.5	Moving coil	—	200	-72 dB	Cardioid	—	
Sennheiser (Tellux Ltd.)	MD31	Moving coil	50-12,000	200	-70 dB	Omni	£22 1s.	"Invisible" tubular type.
"	MD403	Moving coil	50-12,000	200 or 45,000	-75 or -55 dB	Cardioid	£7 7s.	—
"	MDS3	Moving coil	to 9,000	200	-75 dB	Omni	£5 5s.	—
"	MD42	Moving coil	200-10,000	200	—	Cardioid	£10 10s.	Noise cancelling type. Built-in switched transformer.
Shure	555 small Unidyne	Moving coil	50-15,000	50, 250 and high	-57 dB	Omni	—	Price with stand and 11ft. cable, £10 10s.
Simon	Cadenza	Ribbon	50-12,000	30 and 80K	-93 and 58 dB	Figure of Eight	£8 18s. 6d.	
"	Cadenza	Crystal	30-8,000	REC. 1-10 Meg	-47 dB	Omni	£3 13s. 6d.	
S. T. & C.	4021	Moving coil	30-15,000	30	-80 dB	Omni	£21	Spherical case.
"	4032	Moving coil	30-10,000	30	-78 dB	Omni	£18	Windshield available.
"	4033	Ribbon and moving coil	30-10,000	50	-80 dB	Choice of 3	£46 10s.	Switch omni, figure of eight, or cardioid, front to back ratio 15 - 20 dB.
"	4035	Moving coil	30-10,000	30	-78 dB	Omni	£18 10s.	
"	4037	Moving coil	30-10,000	30	-84 dB	Omni	£20	Pencil type.
"	4038	Ribbon	30-15,000	30	-85 dB	Figure of Eight	£38 10s.	
"	4104	Ribbon	70-10,000	30	-92 dB	See remarks	£75	Noise cancelling "lip" commentator's type.
"	4105	Moving coil	60-10,000	30	-82 dB	Cardioid	£20	Front to back ratio 15 - 20 dB.
Super-Electronics	SE.101	Crystal	30-12,000	REC. 1 Meg.	-60 dB	Omni	£1 15s.	With moving coil insert, £3.
"	Diana	Crystal	—	—	—	Omni	£3 3s.	With moving coil insert, £4 4s.
Tannoy	MR/425/S	Ribbon	60-7,000	600	-76 dB	Figure of Eight	£17	On/off switch.
"	MC/424/S	Moving coil	30-12,000	600	-76 dB	Omni	£21	On/off switch.
"	MC/423/FS	Moving coil	45-10,000	600	-81 dB	Omni	—	Tube type.
Tape Recorders (Electronics)	Sound M1	Crystal	20-16,000	REC. 1-5 Meg		Omni	£2 15s.	Hand type: 8 ft. cable.
"	Sound M2	Moving coil	—	80K		Omni	£5 12s. 6d.	Built-in transformer: 8 ft. cable.
Telefunken (Welmecc)	C.14	Condenser	—	—	—	Omni	£4 4s.	
"	D.11B	Moving coil	—	—	—	Cardioid	£8 8s.	Speech/music/telephone switch.
T.S.L.	M1	Moving coil	60-13,000	200 and 50K	-72 and 52 dB	Omni	£4 4s.	Built-in transformer.
"	S2 (Stereo)	Moving coil	50-15,000	200 and 50K	-75 and 52 dB	Dual Cardioid	£19 19s.	Built-in transformer.
"	MX3	Crystal	50-13,000	0.5 to 5 Meg	-52 dB	Omni	£2 5s.	With stand and lead.
Trix	G 7871	Moving coil	50-8,000	30		Omni	£7 10s.	Other versions available.
"	G 7822	Ribbon	50-10,000	30		Figure of Eight	£12 10s.	
Vitavox	B50	Moving coil	60-8,000	25	-85 dB	Omni	£6 10s.	6 ft. cable.
"	B51	Crystal	60-8,000	1 Meg	-50 dB	Omni	£5 10s.	6 ft. cable.
"	B52	Moving coil	60-8,000	600 and 100K	-85 dB	Omni	£7 10s.	Built-in transformer: 6 ft. cable.
"	Type A	Moving coil	60-8,000	25	-82 dB	Omni	£9 9s.	
Walter Instruments	Walter	Crystal	—	—	—	Omni	£2 12s. 6d.	

TAPE CASSETTES FOR THE BLIND

TALKING BOOK DISCS GOING — TAPES COMING IN



● These pictures, which the R.N.I.B. kindly permitted our photographer to take specially for this feature, represent the first news of an important chapter in the advance of magnetic recording. We give below a hint of some of the work behind the scenes before such an ambitious project could be launched.

in terms of needs, and it rules out any possibilities of newer readers obtaining advantages that should go first to those who have "made do" with the older system. It also fits neatly into the gradual plan of change-over, because as new blind readers join the library they will receive reconditioned disc players that have been exchanged for new tape players; and, as the output of Tape Books and Tape Players gains momentum, corresponding to a fall in new titles on disc, so the period of waiting for the new system will decrease in proportion to the number of new tape books.

Result of several years' work

NEWS of the greatest importance for blind readers has just been officially announced by the Royal National Institute for the Blind and St. Dunstan's. It is the news of an entirely new form of Talking Book service—tapes instead of discs. It is hoped that the first issue of the new tape players will begin in the late Summer or early Autumn of this year, and that the whole change-over from discs to tape cassettes may be completed within about five years. In order to ensure that the distribution of the new Talking Books shall take place on a scrupulously fair basis, they will go first to well established blind readers who have already read their way through the existing disc catalogue.

This latter point is indeed one of the most ingenious elements of the whole plan, for it automatically adjusts priorities

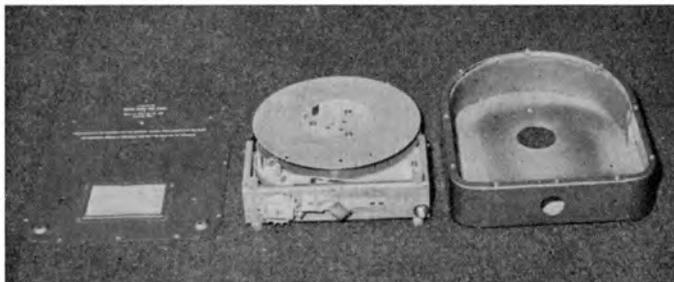
The tape cassette, which is the heart of the new talking books, has been developed entirely by the technical staff of the R.N.I.B. & St. Dunstan's, and is the result of several years of work and experiment. It is massively strong, so as to withstand the roughest handling that it might receive in postal transit. It is completely self-contained, with in-built replay head. It employs 18 recorded tracks, with a simple push-button change from track to track. It plays for a maximum of 20 hours. It is already being made in large quantities by a British manufacturing company which has long specialised in the production of rugged, reliable tape equipment for educational establishments.

Also being made by the same company are the playing desks. These, too, are the work of the same team of designers. They are beautifully simple. Two moulded shoulders on the deck accept the rounded edge of the cassette; and when this contact is made, the cassette is merely lowered into position, where it automatically engages with the dogged driving spindle which projects upwards through the deck. A stop/start lever is located at the front left-hand edge of the deck. On the front end of the desk are (1) a socket for headphones, (2) a speaker grille, (3) a volume control and (4) a pre-set tone control.

The cassettes are reversible. A label on the top-side announces the title in writing and in braille. When the cassette is in position, and when the "start" lever is moved, the title, copyright notices, etc., are announced and followed by the words "Track One begins immediately". At the end of the track



View of the playing desk, with cassette removed.



The cassette's case is massively strong, and has a bolt-on lid.

TAPE CASSETTES FOR THE BLIND

TALKING BOOK DISCS GOING — TAPES COMING IN

there is a further announcement which instructs the reader to lift the cassette and reverse it, and to press the button located on the front of the cassette. This re-positions the in-built replay head for track 2, and so on. A recorded 2 Kc/s note at the end of each track automatically switches off the motors.

Half-inch tape

Half-inch tape is used, and there is no fixed tape speed, as in terms of speeds known to users of domestic tape recorders. The recording is non-linear in terms of speed. The driving spindle revolves at 15 r.p.m. Therefore, as the diameter of the spooled tape increases, so does the tape speed increase; but as the process of replay is merely a repetition of recording conditions, pitch naturally remains constant.

So much for the details of the system. The accompanying photographs and captions will provide a better description than many more unnecessary words. There are no "fast re-winds" or other complications. If the reader wishes to go back over a section of a story, it is only necessary to lift and reverse the cassette, and without any button pressing. Another cassette reversal will then provide the replay.

The system on which it is proposed to make the new tape players available to blind readers is a straightforward hire plan—£2 per year. This would be the final cost, for the tape cassette library service will be free. As will be appreciated, such a charge is purely nominal, in view of the tremendous outlay involved;

There are already some 6,500 blind readers who now use the disc service. The Talking Book library has, currently, about 700 titles, and some of the more popular of these titles are represented by up to 100 copies—with many discs to each book. Last year the turnover of discs exceeded 2,000,000!

Time-saving

One of the less obvious advantages of the change-over from disc to tape will be the relative freedom of choice in deciding upon the number of copies to be made, and also the saving in time of production. With discs it can take up to 18 months, from the reading and the recording, to the finished copies on the library shelves. With tape the time is reduced to the same number of days. Another very important advantage is, of course, the well-appreciated facility of erasure and re-use of material, with its tremendous saving in cost. As a title goes out of popularity, cassettes can be erased, and placed on the "dubbing" machine for a new title to be recorded on them. Finally, there are very few books which cannot be accommodated in the 20-hour capacity of the cassettes. Such works as *The Forsyth Saga*, *Ben Hur*, or *Gone with the Wind*, would no doubt spill over into a second cassette, but even so there is no comparison between this eventuality and the number of parcels of discs that would be needed to accommodate such works!

Three modern and well-appointed recording studios have just been completed in the Institute's Great Portland Street premises in London, and it is here that readers will come to record the master tapes. These readers include many well-known voices from the BBC, and also those of famous actors and

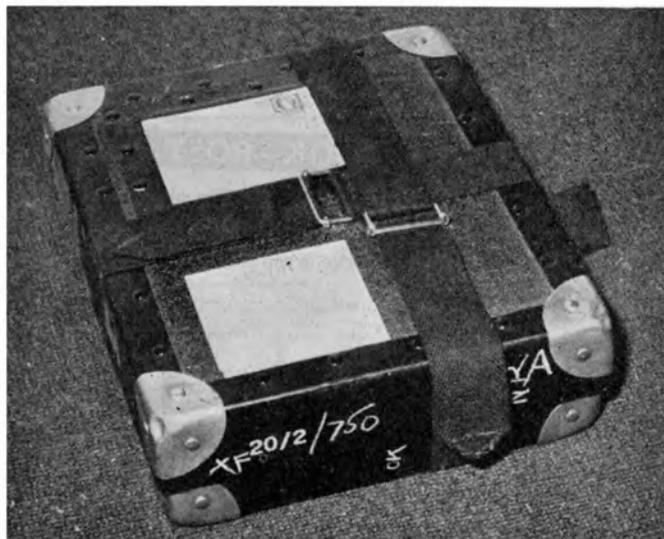


For all its strength, the new cassette is easily handled, and boxed for posting. (see foot of page).

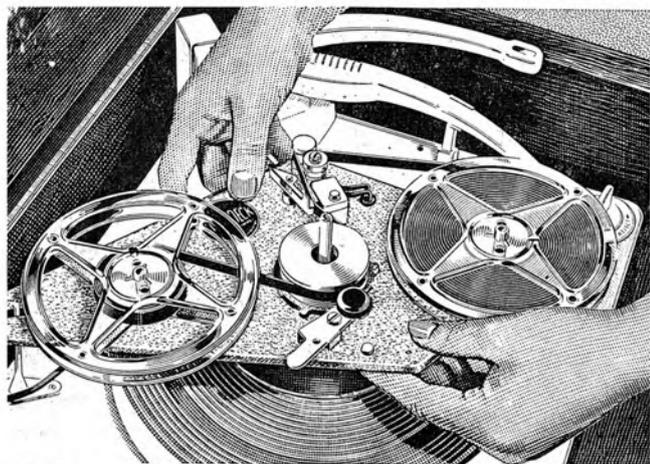
actresses. A newly created Tape Store, with rows upon rows of metal shelves, has already an interesting nucleus of master tapes in one corner. Adjoining it is the high-speed dubbing room, where the master tape is copied simultaneously on to twelve 18-track cassettes.

Dubbing procedure

At the moment, since standard $\frac{1}{4}$ -inch tape is used for the master recording, and since other attendant complications, such as instruction announcements have to be considered, the 18 tracks are dubbed one at a time. However, as the demand grows, and as the technical staff gain a better appreciation



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Ready to record. Complete with 600ft. of twin-track tape extra.

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Gramdeck is completely new . . . a revolutionary invention that instantly turns your gramophone into a tape-recorder and back into a gramophone at will! You simply slip it on to your turntable and you are ready to record direct from radio or microphone . . . the voices of your family . . . radio programmes . . . your favourite music—and you can instantly play it back through your own gramophone or radio with *Lifelike Fidelity*. The amazing Gramdeck brings full tape recording and playing facilities to every gramophone owner, at little extra cost.

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This wonderful new invention means that any gramophone owner can now add superbly good tape-recording facilities to existing equipment at a fraction of the usual cost. Full details, photos, specifications, Easy Terms, etc., are given in the Gramdeck Book. Send for your copy today—FREE and entirely without obligation.

PRaise FROM THE PRESS

"Real hi-fi results . . . reproduction excellent."—Radio & T/V Retailers' Review "Provides the same recording and playback quality as many high priced tape recorders."—Radio Review. Results better than those obtainable from many tape recorders in the £50-£60 price range."—Amateur Stage. "Better than many so-called hi-fi recorders."—Amateur Cine World.

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I would like to know how to turn my gramophone into a first-class tape-recorder . . . please send me the Gramdeck Book—FREE and without obligation. (Write if you prefer not to cut page.)

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ADDRESS

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GRAMOPHONE TAPE RECORDER

(Dept. TA/812), 29, WRIGHT'S LANE, LONDON, W.8.

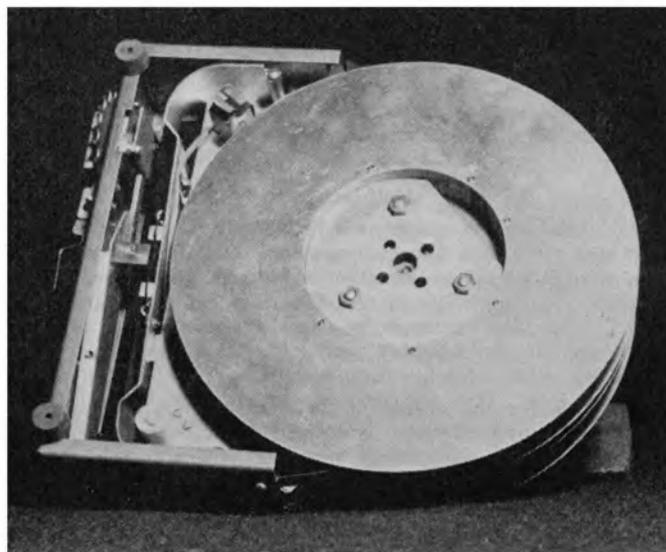
GRAMDECK TURNS A TURNTABLE INTO A TAPE-RECORDER

TAPE FOR THE BLIND—(continued)

of those demands, it is possible that equipment for simultaneous 18-track dubbing may be evolved. All the existing equipment for copying and processing has been made, adapted or modified by the same team of keen engineers who have worked upon the development of cassettes and players.

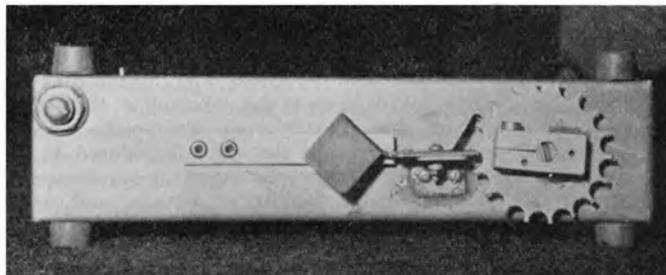
Many new titles

The change-over from discs to tapes had already begun, in effect, some months before the first new tape cassettes came into being; and the very first results of the change-over were



All together 20 hours of material are stored on a single cassette. The head (centre left) can be selected to scan any one of the 18 tracks. The push-button selector trips the spring-loaded head carriage once on each depression (see lower photograph).

advantageous to the growing list of blind readers. Last year, for instance, a total of 75 new book titles were added to the library catalogue, on discs. This coming year the total of new recorded titles has been increased to 100; and of this total 35 are to be on discs as well as tapes. Next year the balance will be further tilted until, as already mentioned, the final change-over to tape cassettes can be achieved—it is hoped—about five years. It is certainly a big and very exciting development,



Close-up of the track selection mechanism.

and we know that all our readers will share our pleasure in the thought of what it will eventually mean to those without sight.

In the past, invaluable help has been given by members of the Radio Society of Great Britain and of the British Sound Recording Association, who have voluntarily given their assistance in the installation of new machines and in helping blind readers in the use of these machines. It is hoped that this generous help will continue, and indeed grow, as the new scheme develops and expands.

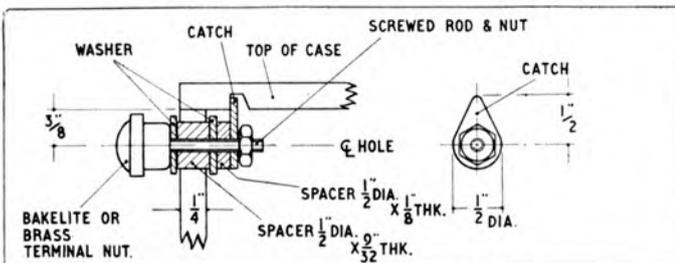
By R. E. STEELE

DELAYED ACTION TIME SWITCH

PART 2—BUILDING AND SETTING UP

THE door should be a close fit in the back of the case, to prevent the ingress of dust to the clockwork, etc. Four steel pins were driven in the bottom of the door to locate the door, and also allow it to be removed easily. Care should be taken when fitting these pins to avoid splitting the thin edge. After driving home the pins (leaving $\frac{1}{4}$ in. projecting), they are pressed down into the bottom of the case to mark the position for drilling the locating holes. When drilling these holes in the case, the drill should be slightly turned outwards to give a slight lead when placing the back in position.

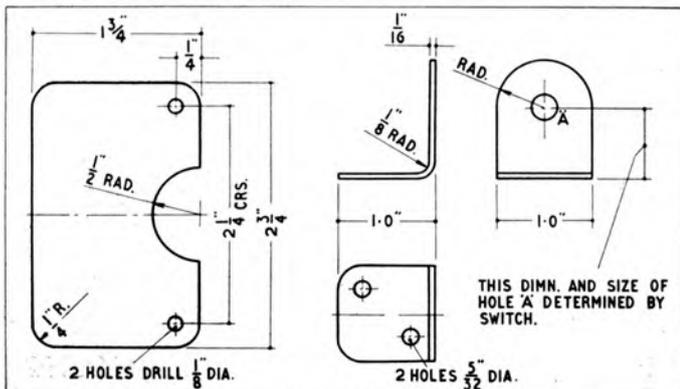
The latch for the door was made up from a screw-on terminal with a short length of rod screwed into it. A catch was cut from 16 SWG aluminium to the dimension given, and the whole assembled as shown. A small chip will have to be removed



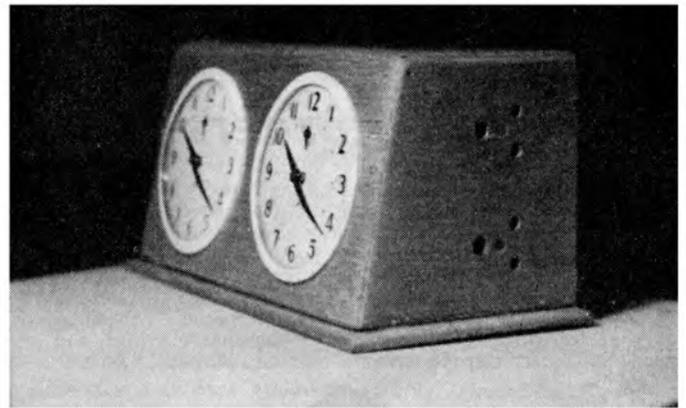
Detail of the door catch, made from a radio terminal.

from the top of the inside of the case to receive the end of the catch. The best way to mark this is to place the back in position and turn the knob until the catch marks the top.

A little preparation to the clocks is necessary before they can be fitted. To enable the clocks to enter the holes cut in the case, the metal feet have to be removed. To effect this without causing damage to the clocks, drill out the two rivets on the under-side, the foot will then pull away easily. Two carrier plates for the micro-switches are made from aluminium sheet as shown. These are then bolted temporarily on to the clocks, using the nuts on the clock case. The micro-switches are then positioned on the plates so that the end of the alarm winding key presses the button of the micro-switch when the alarm is



Micro-switch mounting plate (left) and rotary switch bracket.



The completed unit, details of which were given last month. This side view shows the position of the output sockets.

released. Two fixing holes are marked on the plates by marking through the holes in the micro-switch.

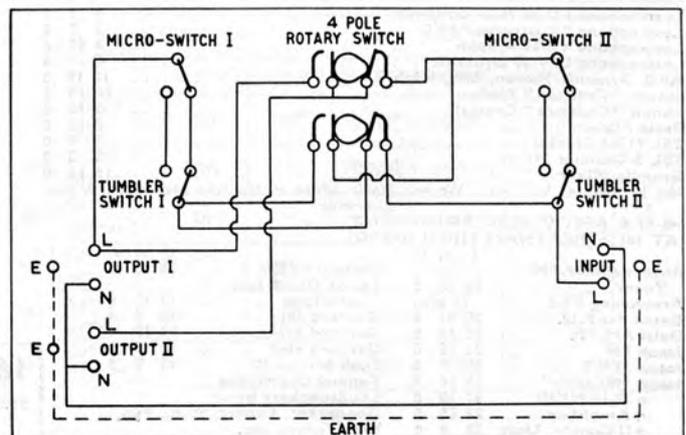
By this time the case should be able to be handled again and prepared to accept the electrical equipment. The edges shown are given a $\frac{1}{4}$ in. radius and the whole case cleaned up with sandpaper. Two switch blocks for the tumbler switches are made from $2\frac{1}{2}$ in. \times $\frac{1}{4}$ in. wood, and given a $\frac{1}{4}$ in. radius all round and sanded off.

To allow the switches to sit flat on the blocks, recesses are cut on the top side and in line with the wire entrances in the switches. The blocks can then be temporarily screwed on to the switches, and this assembly then screwed into the main case. All holes in the case for screws should be drilled and countersunk to take the screwheads, and drilled with a smaller size drill than the screw in the mating part. This will avoid splitting—especially if hardwood is used.

An "L" shaped bracket is made to mount the rotary switch, since this was intended for panel mounting. This is detailed, but the size of the hole for the switch and the height to the centre of the hole have been omitted, as these will vary according to the switch used. This bracket is fixed into the case by two 4 BA countersunk bolts. The two clocks can now be fitted into the case. It will be necessary to relieve the case at points marked "X". This, is to permit the entrance of the alarm stop button.

In order to allow the rim on the front of the clocks to fit flush with the front of the case, the holes may have to be filed slightly tapered. If the fitting of the clocks is carried out carefully, they should be able to be pressed in tight without any further means of attachment. A more positive way would be to make a strap to bolt onto the back of the clocks and screwed into the front panel.

This leaves only the sockets to be fitted. The input socket is simply pushed into the hole cut in the side, and fixed with



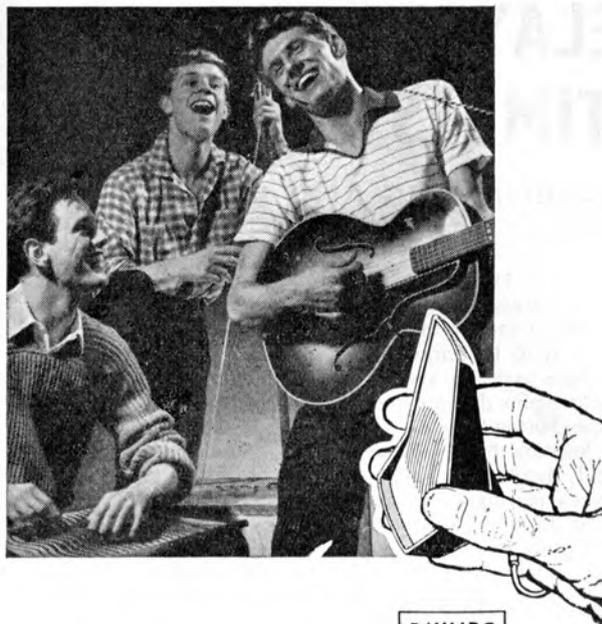
Key diagram to the wiring of the complete unit.

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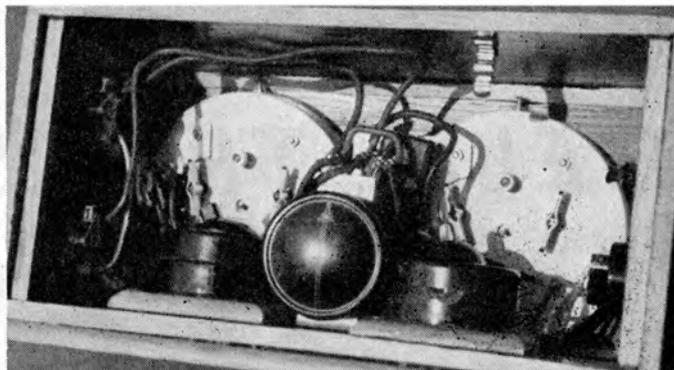
TIME SWITCH—(continued)

two round-head screws. The covers of the two output sockets are removed and discarded, as only the actual sockets are required. These are placed on the outside of the case, and the holes for the socket pins are marked through on to the wooden case, and drilled to the size of the pins. The sockets are then fixed into the case from the inside using woodscrews. These screws must be long enough to pass through the thickness of the socket base and into the case. To locate the sockets whilst fixing in position, a 3-pin plug was pushed through the holes in the case, and the sockets placed over the projecting pins.

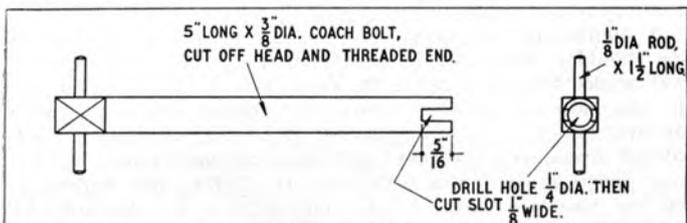
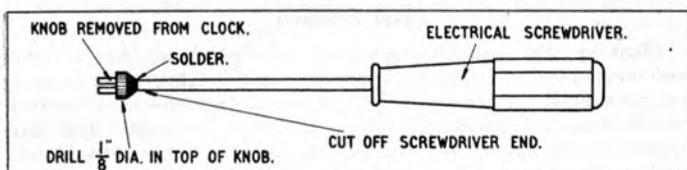
Wiring

The unit is now ready for wiring. All soldered connections are carried out more easily if the component is removed from the case. For this reason, the carrier plates holding the micro-switches are left out after fitting the clocks. When wiring these components out of the case, ensure that enough loose wire is left on each connection so that it can be bent up out of the way of the winding keys.

The tumbler switches should be so arranged that, when in the OFF position, the toggles both point to the right (looking in from the back), or the setting chart will not be correct. When all the components are back in the case and all connections completed, the wires should be bent up and around the outside of the clocks. This can be seen in the photograph



Rear view with back removed, showing switches and wiring.



Extension hands setting key (top), and extension winding key.

looking into the back of the unit. The connection to the mains is made up from the 3-pin plug, the male 3-pin socket and one yard of flex.

The unit is now ready for test. The unit should be tested with low voltage first, in case any mistake has been made in the circuit. Connect a battery into the input sockets and a lamp into output 1. Arrange the switches as for setting (1); the lamp should be dead. With the aid of a small screwdriver, lightly touch the button of micro I and the lamp should light. Keeping micro I button pressed on, touch micro II and the lamp should go out. If this is successful, the switches should be set in all the other combinations, and the unit tested to ensure that the correct operation is performed.

When the unit has been tested successfully on low voltage it should be tested on the mains, but, first a word of warning! Never attempt to set or wind the clocks when the unit is connected to the mains, as all the bare connections may be live—according to the setting. Also never leave the unit in operation without the back in position as unwary fingers or paws may receive a nasty shock.

It will be found that the keys to the clocks and the buttons to wind the alarm are a little difficult to operate due to their recessed position. This can be made an easy task by making two extension keys as described below, also see diagrams.

The key for the hands was made from a small electrical screwdriver and one of the original knobs from the clocks. Cut the end of the screwdriver off to leave a round portion. Drill the top of the button $\frac{1}{8}$ in. deep with a slightly larger

drill than the screwdriver shank, insert the end of the screwdriver in the hole, and solder together.

The key for the winding mechanism was made from a $\frac{1}{8}$ in. dia. \times 5 in. long coach bolt, and a piece of $\frac{1}{8}$ in. dia. rod. Cut off the head and the threaded end on the bolt, and drill a $\frac{7}{64}$ in. dia. hole through square left under the head. Cut a piece of $\frac{1}{8}$ in. dia. rod $1\frac{1}{2}$ in. long, and file a slow taper along half of its length until it can be driven into the bolt with an equal amount showing at each end. The slot in the other end of the key is made by first drilling with a $\frac{1}{4}$ in. dia. drill $\frac{1}{2}$ in. deep, and then cutting a slot wide enough to pass over the flats of the key on the clock. To give a finished appearance, file off all sharp corners, polish with emery cloth, and then apply a coat of paint to prevent from rusting. The keys are retained in the case by two "Terry" clips.

The panels for the wiring key and the operation and setting chart were made from black glossy plastic: Cut the panels so that they will fit on the inside of the door. First lightly mark on the lines and printing with a sharp pointer, and then scratch the lines in permanently after checking. All connections on the wiring keys are denoted by a small circle, which is cut in the panel with the aid of a drill. To make the lines stand out, and clearly visible, polish the panels with Brasso. When this dries out it goes white and remains in the grooves, after polishing the surface of the panels. Stick the panels to the inside of the door with secotone or similar adhesive.

A word or two about the setting of the alarm clocks will help to give accurate setting. If the alarm pointer is set by turning the button attached directly to the alarm setting hand, the results are not very accurate. To make the alarm go off accurately (never more than plus or minus $\frac{1}{2}$ minute error), turn the two clock hands—with the centre button—anti-clockwise until they show the same time as the alarm setting hand, carry on winding and the alarm will be picked up and turned with the centre hands. These should be turned to precisely the time required to operate and then wound on to the correct time (this time in a clockwise direction).

		OPERATION			SETTING	
		CLOCK I	CLOCK II	MICRO I	MICRO II	SWITCHES
(1)	OUTPUT I	ON	OFF	OPEN	OPEN	
	OUTPUT II	ON	OFF	OPEN	OPEN	
(2)	OUTPUT I	ON	—	OPEN	CLOSED	
	OUTPUT II	ON	—	OPEN	CLOSED	
(3)	OUTPUT I	OFF	—	OPEN	CLOSED	
	OUTPUT II	OFF	—	OPEN	CLOSED	
(4)	OUTPUT I	ON	—	OPEN	OPEN	
	OUTPUT II	—	OFF	OPEN	OPEN	
(5)	OUTPUT I	ON	—	OPEN	OPEN	
	OUTPUT II	—	ON	OPEN	OPEN	
(6)	OUTPUT I	OFF	—	OPEN	OPEN	
	OUTPUT II	—	OFF	OPEN	OPEN	

Chart showing the switch positions for all operations.

FIELD TRIALS OF BATTERY PORTABLES

A SERIES OF REPORTS AND TESTS — No. 8 THE BUTOBA

THE Butoba looks so good, is so cleverly designed for the job in hand, and performs so well, that the reviewer has had to be very firm with himself to keep his superlatives within bounds. In the course of carrying out these *Field Trials* it has been possible to draw up a list of "Things to be looked for in a battery portable recorder", and the Butoba scores high on every point.

Taking the question of appearance first—which is more important than one might suppose, since we subconsciously assess a machine's functional as well as appearance design on a first inspection—the Butoba is shaped something like a lady's handbag, and is coloured in two tones of cream and light brown. The clip-on plastic carrying handle is adjustable for shoulder or hand-carrying, and a perspex cover snaps over the tape deck section, leaving the controls fully accessible.

The controls

These are grouped on a recessed sloping panel, whose angle makes a good compromise for the operation of the recorder in a horizontal or vertical position. Unlike some recorders, the Butoba was found to perform satisfactorily at any angle, though undue movement during recording or playback is, of course, best avoided. The spools are held on their spindles by flat springs, and the best playback performance is obtained

with the machine standing upright, since the loudspeaker is mounted on the base of the case. When the recorder is laid flat, the 5 operating buttons fall under the hand in piano key fashion, and are, in order, Record, Fast Rewind, Off, Fast Forward, and Replay. There is a Quickstart slide lever just above the Record key, which resets to the "hold" position both on recording and playback. The usual safety button is fitted alongside the Record Key and is intended to prevent accidental erasure. For "Straight Through" amplification, or Public Address, the Record and Replay keys are pressed simultaneously.

Level indicator

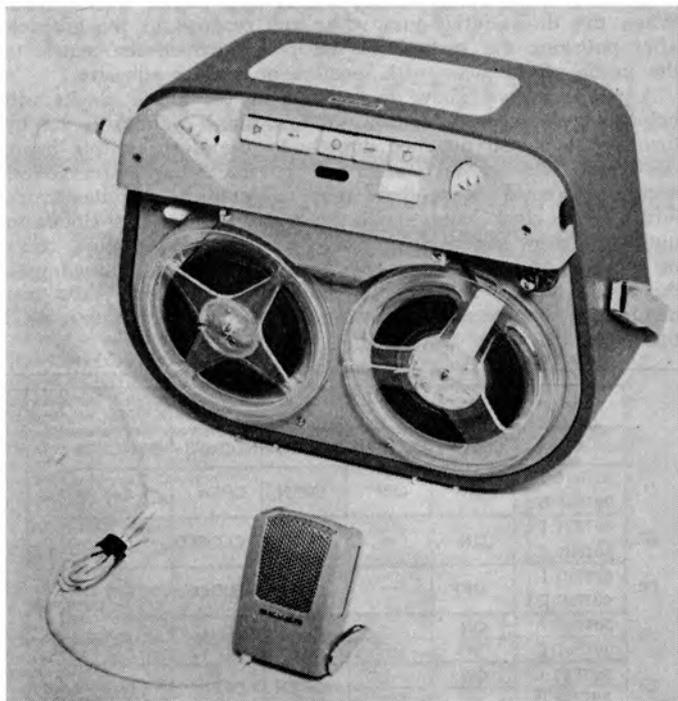
Flanking the control keys are two edge-wise knobs, the volume control (left) and the tone control (right). The former operates both on recording and playback, but the tone control is effective on playback only (the usual practice). The bar type level indicator is situated immediately above the keys, and is also part of the sloping panel, so that it is visible in any operating position.

A number of recordings were made "on the move", using the shoulder strap, and it was found that very little practice was needed before operating the keys by feel became automatic. It was not too easy to verify the volume control's setting by eye, but it is more important, of course, to maintain the correct magic eye readings, and an occasional glance at this was found to be quite sufficient. At 12 lbs., the Butoba is by no means a featherweight, but there must obviously be an irreducible minimum if a certain standard of robustness, speed consistency, and playback quality are to be achieved. The reproduction of speech was found to be as faithful to the original as that of any portable machine so far tested. It was perfectly easy to receive the impression that the recorded voice was "the real thing", the present writer being himself caught out by the family in this way.

Background listening

A series of photographic and other chores being required in the workshop, the writer loaded the Butoba with a varied selection of music, (recorded from radio and gramophone) and was supplied with a pleasant background of sound infinitely more satisfying than random listening to the radio. The Butoba's larger than usual (5-inch) spools gave 2×1 hour's playing with double play tape. This was at the higher speed of 3½ i/s, which was chosen to give the better frequency response. However, it was later found that 1½ i/s was perfectly satisfactory for this kind of background listening to music, and the portability of the machine allowed its being positioned near one's working area so that a low volume setting was all that was necessary. The unusually high power rating of the amplifier 1.2 watts, does mean, however, that very high volumes are possible from the 7×4 in. elliptical speaker—a feature which was admirably demonstrated to the writer at the London Audio Fair, with a resultant influx of visitors to the demonstration room!

The speed selection lever is on the deck plate, and acts by moving the appropriate diameter of the stepped roller into line with a rubber tyre on the flywheel shaft. At rest, in the 3½ i/s condition, the roller is in contact with the



This view of the Butoba shows the sloping control panel with its row of push buttons and the flanking tone and volume controls. Just above the 5 in. spools can be seen the speed change lever (left), and the clock type position indicator. The bar type magic eye is centrally positioned just below the off button.

FIELD TRIALS OF BATTERY PORTABLES

A SERIES OF REPORTS AND TESTS —

No. 8 THE BUTOBA

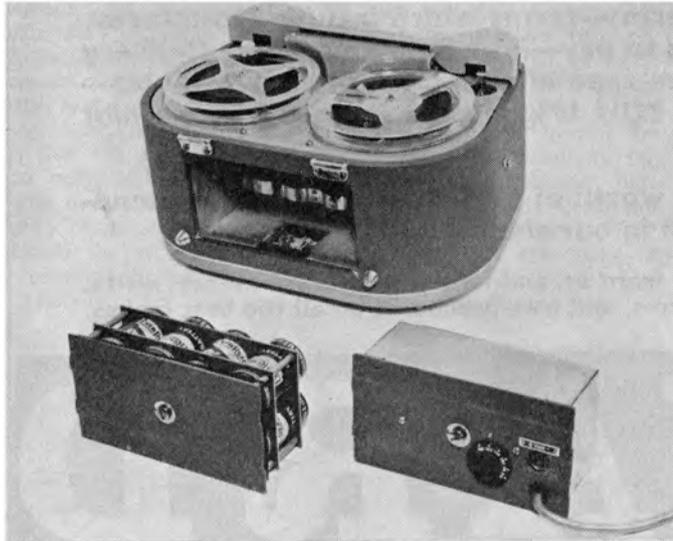
Recordings were made with the Butoba in a number of locations including The Trinity College of Music (right). Anthony Lindsay is seen playing a Dolmetsch harpsicord in the Bridge Memorial Library. Music students are generally agreed that a tape recorder can be an extremely useful aid in learning to play an instrument.



tyre, and it is therefore recommended to leave the switch in the $1\frac{1}{2}$ i/s position when the machine is not in use. There is a separate motor for fast wind and rewind. This is centrally positioned, and swivels to either side in such a way that it bears on a rubber outer ring on the left or right spool turntable, whichever is appropriate. A full 5-in. spool took approximately $2\frac{1}{2}$ mins. to rewind. The clock-type position indicator, with "hour" and "minute" hands was found to be particularly easy to read and re-set.

Alternative power supplies

Power is normally supplied by 8 standard U2 1.5 volt cells, which are slipped into a special holder magazine. Removing



In the rear compartment is situated the power supply housing, and the photograph shows the alternative systems. On the left is the magazine of eight torch cells, and on the right is the mains power unit through which it is also possible to employ a 6 volt car battery.

this magazine is a simple matter of turning a coin-slot screw, and the alternative mains-operated power unit fits into the same compartment. It is possible too to operate the recorder from a 6-volt car battery—via the power unit—by connection of a suitable cable.

As we have said, the reproduction through the Butoba's own loudspeaker was of as high a standard as we have come across in these Field Trials to date, and it was hardly sur-

prising that, when replaying through high fidelity equipment, this good impression was reinforced either by running a lead from the recorder's 100mV pre-amplifier output socket, or transferring the tapes to a semi-professional machine.

As a point of interest, after the above photograph was taken a number of trial recordings were made and it was discovered that the best musical balance was obtained with the microphone resting on a cushion on the floor immediately under the instrument. Recordings made as in the photograph were marred by a continuous thumping sound due to the mechanics of the instrument. It was found best at the same time to keep the recorder itself away from direct contact with the harpsicord.

Useful literature

Along with the instructive leaflet there is a full circuit diagram—when will British manufacturers adopt this sensible practice?—and a spare set of fuses. We were also given the Servicing Booklet, which has most comprehensive, illustrated dismantling and fault-finding instructions to assist maintenance engineers. All together, inspite of its fairly high price, there can be little doubt that the Butoba will create a lively interest amongst recording enthusiasts, and is technically in advance of most of its rivals.

Technical Specification

Battery Complement: $8 \times 1.5v$ U2 cells, or similar. **Battery Life:** 20-40 hours. Two Motors. **Transistors:** 0C603, 0C75, 0C71, 0C76, $2 \times 0C74$, plus 2 diodes. **Level Indicator:** DM71 magic line. **Tape Speeds:** $3\frac{1}{2}$ and $1\frac{1}{2}$ i/s. **Frequency Response:** 50-13,000 c/s at $3\frac{1}{2}$ i/s; 60-5,000 c/s at $1\frac{1}{2}$ i/s. **Signal to Noise Ratio:** 40 dB. **Recording Sense:** Top track left to right. **Inputs:** Microphone 200 ohms, 200 microvolts; Radio 100 Kilohms, 100mV. **Output:** 200 ohms, approx. 100mV. **Loudspeaker:** 7×4 in. elliptical, amplifier power 1.2 watts. **Maximum Spool Size:** 5 in. **Fast Forward and Rewind:** approximately $2\frac{1}{2}$ mins. **Position Indicator:** clock type. Straight-through Amplifier facility. Tone control. **Dimensions:** $12 \times 9\frac{1}{4} \times 6$ in. **Weight:** 12 lbs. including batteries. **Price:** £72 9s. including tape. Microphone 7gns. Other accessories include, Mains and Car Battery Converter, Zip Carrying Case, Telephone Adapter.

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Practical suggestions for the tape handyman _____ by A. Bartlett Still

No. 14 – AVOIDING OVERLOAD DISTORTION

WHATEVER may be the rather exacting requirements of a true interpretation of the term "High Fidelity", it is nevertheless true that the average person's ear, without an immediate and direct comparison, will tolerate considerable deterioration from those standards. In one respect, however, there is a fairly sharp dividing line beyond which even the most tolerant listener will complain. I am referring to distortion such as can be introduced so easily into a recording by overloading. With a proper understanding of the manner in which such distortion occurs, it can be just as easily avoided every time.

Recording distortion in a tape recorder is almost entirely third harmonic. This means that if a 1 Kc/s pure sine wave signal were recorded, any distortion would mean the introduction of a 3 Kc/s signal in addition to the fundamental. The magnitude of the distortion signal in relation to the total is then expressed as a percentage to give the level of (say) 5%. Experience has, I think, shown that if the distortion level of a 1 Kc/s signal is gradually increased, the average person will notice the change in the sound at between 5% and 7%. For domestic machines, therefore, the maximum allowable distortion is usually taken to be 5%, while equipment for professional usage will have a top level of 2%.

How distortion occurs

How is this distortion caused, and why should it be third harmonic? Let us consider the way in which the signal is applied to the tape. In fig. 1, the dotted line A, e, A₁, e₁, represents the hysteresis loop of the material, the way in which the Flux density B, in a positive or negative direction, follows the magnetising force H, but lagging behind it. If it is considered that this loop is produced by the HF bias current in the recording head, whose frequency, experts agree, should be at least four times the highest audio, then it will be seen that for audio frequencies the path is substantially the mean path, or the full line A, O, A₁. Over the straight part of this line, equally spaced as it is about the Origin, we are able to carry out linear, or distortionless recording.

Should the signal level be increased, so that the peaks of the recorded signal extend into the curved portion of the characteristic, then the signal waveform gets flattened at its

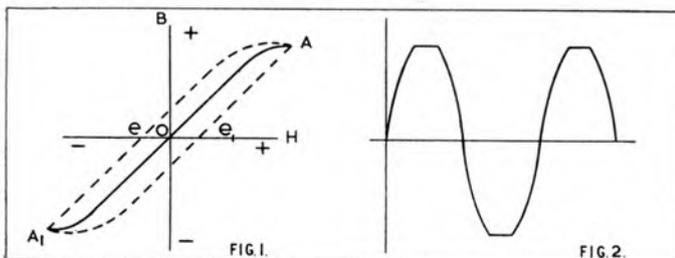
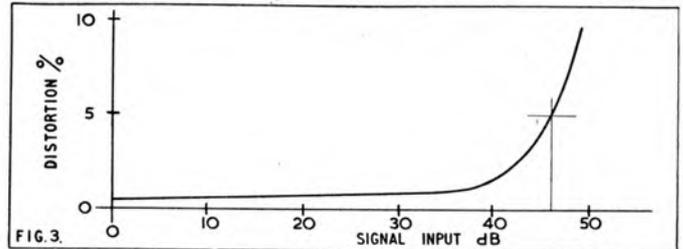


Fig. 1: Showing the straight part of the curve A₁O A traversed by the audio signal; and Fig. 2: the effect of overloading.

peaks, as shown in fig. 2. While the flattening effect is symmetrical, the odd order of harmonics only will be introduced, with the third predominating. If, due to a poor bias waveform, the linear portion of the curve were displaced up or down, the distortion on positive and negative half cycles would be unequal, introducing second and other even order harmonics. In practice, since distortion is to be avoided if possible anyway, a poor bias waveform would be noticed, not by a change

in the distortion, but by the introduction of a much higher level of tape noise.

How do we avoid distortion? As will perhaps have been gathered, the onset of distortion to any degree in a recording is quite sharp and defined. Fig. 3, plotted from a typical domestic machine that was set for a maximum distortion of 5 per cent, at a signal/noise ratio of 46 dB, shows the increase of distortion with an increase of recorded signal level and indicates the sharp increase of distortion that we would expect once a certain level has been reached. The point at



which the "magic eye" closes, to indicate 5 per cent, is shown. It will be seen that, once this point has been reached, the onset of serious distortion will accompany any great increase in signal level.

On better quality machines the sensitivity of the magic eye, or other indicator, is made adjustable. It can then be preset on test so that the correct indication is given. Unfortunately this is not always the case and a fixed circuit is used, whose design gives the right answer. Component tolerances being what they are, however, variations of the signal level indication can occur, and these, added perhaps to the fact that different tapes have different distortion levels, can easily produce small lateral changes on fig. 3 that mean quite a lot in terms of distortion level. It should be pointed out that the error can be just as easily on the right side as otherwise, but if the full signal capability is not being used, the greatest signal/noise ratio is not being achieved.

What to do about it

What can we do about it? On any individual machine it is inadvisable to alter the magic eye circuit without the use of a proper distortion factor meter, and they are few and far between. What I do suggest is that a simple experiment, if properly carried out, will tell you what the magic eye looks like at a noticeable distortion level, allowing you to use as much of the curve of fig. 3 as possible. I have referred previously, when talking about wow and flutter, to the use of the BBC tuning signal of 1 Kc/s for checking purposes, and I again suggest it be used. On a length of good tape, of the type you normally use, make a series of short recordings of this signal. The first should be some way below full modulation, so as to ensure that it is not distorted and gives you a good idea of what it should sound like. The second will be really the first of the test, and should be a little way only below full modulation. For the next increase the level slightly, and so on. Try to have three or four short recordings either side of "magic eye closed" and equally spaced in terms of magic eye indication.

On playback, assuming you have gone far enough, you should be able to hear the onset of distortion, and recall the appearance of the magic eye for that particular recording. Your conclusion should be either to let well alone or to work with the magic eye more open (or closed) than you did before. Remember that you can always do the same test again, and nothing is being altered in the machine, but you will learn a little more about getting the best recordings, the sort you want.

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By James Moir

REVIEWING TAPE RECORDERS

PART FIVE _____ WOW AND FLUTTER



The E.M.I. TR52 was reviewed in May, and found to have very low wow and flutter figures.

THE changes of tape speed that take place in a machine are of three types, all of which produce different results. The speed of the tape may not be the intended speed of, say, $7\frac{1}{2}$ i/s, but may be something fairly close, such as 7.3 or 7.7 i/s. If this speed is maintained in service, it is of no consequence when used as a recorder/replayer for there is no significant change in the electrical characteristics of a tape system for differences in mean speed of as much as 10–15%.

Where the machine is used to replay tapes recorded on another machine a deviation in mean speed of 1% or 2% may annoy a critical listener, for the pitch of all the instruments is shifted by exactly the same amount as the speed on replay differs from the speed on record.

Long term speed changes

The speed may change slightly as the machine warms up, unless a synchronous motor is used to provide the drive. When such changes do occur they are usually small, and take place slowly over a period of some hours. They are referred to as "drifts" and are generally not very serious to a domestic user,

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though they may be a nuisance to a broadcasting organisation that requires split-second timing of programme.

Wow and flutter, the third form of trouble, is generally much more annoying than either incorrect mean speed or a slow drift in speed so it justifies a more detailed discussion. Wow and flutter is the generic description given to the cyclic changes in pitch that result from the cyclic variation in the speed of the tape or disc past the point at which the signal is impressed on, or taken off the medium. Absolute constancy of speed from instant to instant seems impossible of attainment in any mechanical drive system, and the most we can hope to achieve is to reduce the speed variations below the point at which the results are audible.

This is extremely difficult, particularly when the designer must keep cost firmly in mind. If single tones are used, the human hearing system will detect a cyclic change in pitch of less than 0.01% when the test tones are presented to the listener in a typical living room. Fortunately for the designer of sound recorders the hearing system is much less sensitive when speech or music is used for the tests, but even so the cyclic changes in speed must be kept down to something in the region of 0.1% if criticism is to be avoided. Where the programme has to be re-recorded or re-re-recorded as happens in practically all sound films, the speed constancy must be better than about 0.03–0.05%.

The subjective result of these cyclic changes in speed is difficult to convey in words. If the rate at which the speed changes is below about 10 c/s, piano tones, the chimes of bells, gongs or clocks have a "wavy" characteristic indicated perhaps by some of the other terms often used to describe the effects, "wavering", "watering", "bubbling", "dithering". When the cyclic changes take place at frequencies much above about 20 c/s, the subjective effect is very different and in some ways much more objectionable. Soprano singers sound cracked, hoarse and harsh while the brass instruments, particularly the trumpet sound as though they were being played while partly filled with water.

An example

It should be particularly noted that the frequencies mentioned are not the frequencies of notes being played, they are the frequencies at which the disturbances occur. This may be better understood if a simple cause of wow and flutter is described.

Tape passes through a tape recorder at a mean speed (say $7\frac{1}{2}$ i/s) determined by the diameter of the capstan and its rotational speed. Thus a capstan having a radius of 0.2 in.

will need to rotate at $\frac{7.5}{2\pi \times 0.2}$ revs per second to ensure the desired tape speed of 7.5 i/s. The speed at any instant is determined by the radius from the point at which the tape makes contact to the effective centre of rotation of the capstan. If the capstan is bent, badly turned or has an accumulation of dirt on its surface etc., the effective radius will vary as the capstan rotates and the instantaneous speed of the tape will also vary.

There are many other causes of wow and flutter too numerous to mention, drive pulleys eccentric, lumpy belts, lumpy pinch rollers, inaccurately cut gears, tape intermittently touching the



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REVIEWING TAPE RECORDERS—(continued)

edge of a spool, or the spool touchings the deck etc., all of which result in a once-per-revolution change in instantaneous speed.

Wow and flutter values are rarely constant throughout the run of a spool of tape, change in the tape tension producing changes in flutter that may be as much as two to one between start and finish of a spool. Changes in tape thickness as between "standard", "long play" and "extra play" result in variation in flutter unless precautions are taken in the design of the tape transport system, but refinements of this kind are generally too costly to include in domestic machines. Flutter, i.e. speed variation taking place with a frequency above about 20 c/s, are generally due to oscillation in the tape as it runs over the head assembly.

Equivalent to frequency modulation

However caused, and whether wow or flutter, the objective effects of these cyclic changes of tape speed are always the same, the frequency of any recorded signal is caused to rise and fall above the true mean value. Thus any recorded signal is frequency modulated in exactly the same way as the BBC modulate the carrier of any of their VHF/FM stations. The result of frequency modulating a carrier frequency in this way has been the subject of much thorough mathematical investigation. If the frequency f_c of a carrier is cyclically changed π times per second, it results in the production of a number of side band frequencies spaced from the carrier frequency at $+n$, $-n$, $+2n$, $-2n$, $+3n$, $-3n$, etc. cycles per second, the number and amplitude of these side frequencies being a function of the amount by which the carrier frequency is changed.

For any tape recorder in tolerable working order only the first two or three sidebands will be generated by wow-producing defect and thus the objective results are very similar to those produced by amplitude modulation of the type produced by variable contact between head and tape.

There have been several attempts to establish a relation between wow frequencies and subjective "objectionableness" but no consistent relation has emerged. Wow frequencies in the region of 5-7 c/s appear to be the most objectionable, very slow, wows of 1-2 c/s being much less annoying. However, there is no doubt that the annoyance produced by a given amount of wow is greatly dependant upon the kind of programme material being reproduced.

Typical figures

The performance that can be achieved in respect of wow and flutter is largely a function of the size and price of the machine. A value of 0.05% is excellent, but a performance of this order is the prerogative of professional machines. Values between 0.1% and 0.15% are very good while 0.2% to 0.3% is tolerable, but likely to cause annoyance to a critical listener. Where the machine is intended for the reproduction of speech only, wow and flutter figures as high as 1% may be acceptable. Performance almost invariably falls away as the tape speed is reduced, and in fact the acceptability of a low tape speed is determined more by wow and flutter than by any restriction of frequency range imposed by lowering the tape speed.

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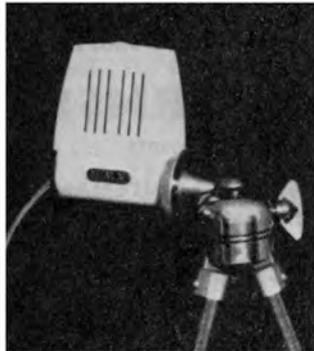
our readers write

. . . about mounting the Acos Mic. 40

From:—K. G. Leach, 116 Gledholt Bank, Huddersfield, Yorks.

Dear Sir:—The microphone supplied with several of the popular tape recorders is the Acos Mic. 40, an inexpensive microphone retailing at 35s. The writer found that in use this microphone was fairly easily upset due to its lightness. Any enthusiast with a mechanical bent would find it easy to make the modifications detailed below resulting in a microphone of greater utility and, we hope, attractive appearance.

Being an amateur photographer the writer first considered fitting the microphone to a camera tripod. This was easily accomplished by threading the hole opposite that through which



Two handy methods of mounting the microphone

the lead enters. The standard thread on English tripods is $\frac{1}{4}$ in. Whitworth (20 t.p.i.), and it will be found that the hole left by the makers is exactly the right size for threading to this standard. The first photograph shows the microphone attached to the ball and socket head of the tripod by means of this threaded hole. Once such a means of fastening the microphone is obtained then another step is to fit a heavy base for standing on a table. The bracket is made from brass or aluminium strip $1\frac{1}{4}$ in. wide which is bent in a vice and bored in the appropriate places.

The hole through which the microphone is clamped to the bracket is bored first and will need to be large enough to allow a $\frac{1}{4}$ in. bolt to go through to hold the mic. and with this in position the bracket is marked for the hole which will hold it to the base. This will need to be central beneath the microphone, and should be $\frac{3}{16}$ in. in diameter for threading with the same thread ($\frac{1}{4}$ in. Whitworth) as was used on the microphone. The base made by the writer is of brass with a central brass bolt to which the bracket screws. The underside of this base is lined with thick flannel to give a non-scratch surface. Such a base might equally well have been made from wood in the absence of any means of turning metal. Finishing off the stand depends on the materials used. Brass and aluminium are best buffed and polished, but wood or steel will look better if painted. In this we must leave each constructor to work out his own salvation.

Yours faithfully,

. . . about magnetic film and a Ferrograph

From:—Fergie Meek, 18 Stenhouse Avenue, Edinburgh.

Dear Sir:—I am an apprentice projectionist and a purchaser of your magazine since the first issue. I am a Tape Recorder enthusiast and I have managed to save and purchase a Ferrograph 4 A, I enjoy reading over the various electronic circuits that appear each month in your magazine and they are also helpful to me in my work with the amplifiers in the cinema.

It may be of interest to you, a little experiment I tried the other week. We received in the projection-room a copy of a film in which the leader of one of the prints was clear film with a magnetic sound track on it. I cut this track off for about

14 feet or so, and threaded it through the record head of my Ferrograph, and then plugged in my VHF Radio and set the recorder going at Record. I was astonished on trying it at Playback that I had recorded the music of the VHF, and it had come through very well, especially so as sound on film is recorded at a very much greater strength than my recorder could possibly do. I thought it was quite an interesting discovery, as film magnetic-track will probably be made in quite a different way to the usual magnetic-tape. Yours sincerely,

* * *

. . . about taking up cine

From:—H. T. Hunnisett, 33 Mill Lane, Northfield, Birmingham, 31.

Dear Sir:—Your contributor's summary on the above subject, in the June issue, was a very praiseworthy effort except for one glaring omission. He made no mention whatever of the intermediate gauge which combines many of the advantages of 8 mm and 16 mm, i.e. 9.5 mm.

For picture quality there is very little to choose between 9.5 mm and 16 mm, the frame area being only a little less than 16 mm and about $3\frac{1}{2}$ times as great as 8 mm. This is achieved by allowing the picture to occupy almost the entire width of the film, and placing the sprocket holes in the centre, between each frame. The frame pitch is the same as 16 mm.

Good second-hand equipment can be obtained more cheaply than on either of the other gauges. Cameras range from £6 10s.—my own cost me £9 10s. with standard and telephoto lenses—and projectors from about the same. I paid £7 10s. for my 100 watt model. New cameras range from £17 17s. and new projectors from £14 14s. but there is not the bewildering choice which 8 mm offers. In point of fact there are about five types of cameras, with a wide choice of lenses, and about ten types of projector—which is quite enough for most people. Running costs for black-and-white are considerably less than 16 mm. For example 100 ft., with a running time of 4 mins. 10 secs. would cost from 29s. to 38s. 4d. according to the type of emulsion. Colour is only slightly cheaper than 16 mm. There is a choice of three types of black-and-white film and two types of colour film.

If any reader cares to get into touch with me, preferably on tape ($3\frac{1}{2}$ or $7\frac{1}{2}$), I shall be only too pleased to go into greater detail on any outstanding points.

Yours cinetapely.

* * *

. . . about loose ends

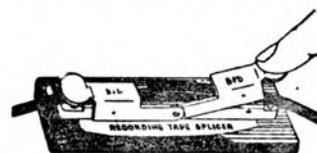
From:—B. L. Hensman, 347 Fell Lane, Keighley.

Dear Sir:—I have just hit on an idea which may be of interest to other readers of your magazine. I find that the loose end

(Continued on page 353)

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READERS' LETTERS—(continued)

of tape on a full reel tends to unwind in storage. I have tried sticky tape, but after being used a few times it no longer holds.

My idea is to use a rubber band to hold the tape, not around the reel, since this slips between tape and reel, but across the diameter of the reel. To stop it from slipping I file four small notches on the edges of the reel exactly opposite each other, using a triangular file, and smooth off the edges carefully. If these are made small a rubber band can be slipped over the reel and it will be just tight enough to hold the tape end without damaging the edges of the tape. I have never needed to use a deeper notch, but the same principle could be applied to a reel from which tape has been removed by cutting a deeper slot with a small fine saw. *Yours faithfully.*

... about 17/8 i/s conversion

From:—R. W. Griffin, Redenham Hall, Burstow, Surrey.

Dear Sir:—I was most interested to read in your July number, Volume 2, No. 6., the correspondence from Frank Ely of Leeds, whose comments you quote as an answer to John A. Bell, Esq., of the S.S. "Serbistan." This all sounds so delightfully simple that I feel I ought to point out that it is in fact not quite so easy.

I had the same idea, with the additional thought of changing the playback/record heads for continental heads of a narrower gap width. I put this proposition to Messrs. Collaro Ltd. who replied as follows:—"In reply to your main point, we are sorry to advise that it is not possible to fit alternative heads with a narrower gap than those which are normally supplied with our Mk. IV Tape Transcriber. Furthermore, we maintain that this model was designed for operation at 3½, 7½ and 15 i/s, and although we are well aware that some makers claim that the Mk. IV Deck can be converted for 1½, 3½ and 7½ i/s, our Technical Department remain unconvinced that the Deck can function satisfactorily. It is therefore much regretted we cannot help you."

I feel that this is worth mentioning, so that anyone who contemplates taking the step which Mr. F. Ely has taken, should not be gravely disappointed with the results, after having made the modification. *Yours faithfully.*

Mr. A. Tutchings is putting one of the proprietary conversion stepped pulleys through its paces, and we shall publish his findings next month (Editor.)

... about "idling"

From:—M. R. Ratcliffe, 76 Harton Grange Road, Bradford, 7.

Dear Sir:—I notice that "Motek" now attach a small cellophane label warning users that, when not in use, the deck should be switched to one of the two "parking" positions indicated by a dot.

I noticed this at once, but apparently dealers do not!—at least I saw one in a Bradford window firmly switched to the 7½ i/s speed thus ensuring the maximum of "wow" for the subsequent purchaser! *Yours sincerely.*

... about a Tape Club in Singapore

From:—R. S. Hellyer, c/o R.N.A.D., R.M. Base, Singapore.

Dear Sir:—Whilst tape-recorders are a daily topic of general conversation here in Singapore, it would be true I believe to say that *The Tape Recorder* is not yet included in the popular range of magazines. However, judging by the number of people now borrowing my copy, sales will be increasing soon (some are only just realising the existence of the magazine).

Also it would appear strange that here, where tape recorders

are so popular, that no "club" exists at the moment, and I wonder if you have any helpful advice on the formation of such a club, and some idea of "beginner activities" practised, until we see what technical brain interest we can co-opt. Any help would be very much appreciated. *Yours sincerely.*

What about it Club Secretaries? (Ed.)

... a home built parabola

From:—J. H. Adams, 15 King Charles Road, Surbiton, Surrey.

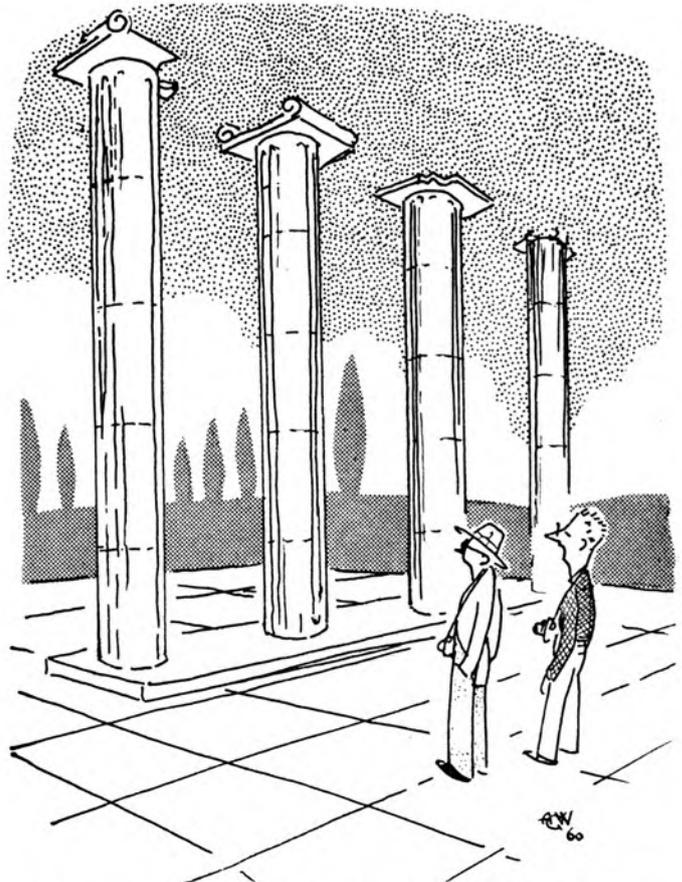
Dear Sir:—First may I say thank you for a first-class magazine and all the help it has given me. I am (with many of your readers), making the parabolic reflector described in your magazine. I anticipated having trouble getting a reflector bowl rolled to shape, and decided to make the bowl of fibre glass, so far I have made all the parts for the mike to fasten to the bowl and also the mould for the bowl itself.

I made the mould from stiff cardboard glued together and faced it with plaster to get a smooth finish, and then I scraped the contour to the correct shape using a female pattern to check the contour. When I have finished my reflector and it proves satisfactory I hope to make some more for friends (cost permitting, so far the cost will be around £3 for the reflector).

If you would like to pass this method on to readers who may enquire about the metal cone it may help them, as one mould should make quite a few reflectors, before it deteriorates, also a fibre glass reflector should not need the rubber damping behind it. The fibre glass and/or instructions can be got from Holts Products, Vulcan Way, New Addington, Surrey—a postcard to them will get the instruction leaflets and price list. Well, Sir, I hope this method solves the problem of R.V.A., Chesham.

Yours sincerely.

P.S.—I am a sheet metal worker by trade and couldn't get a reflector rolled (legally).



"Those boys certainly went for stereo in a big way . . ."

TAPE, RECORDERS & ACCESSORIES

FIRST DETAILS OF NEW PRODUCTS

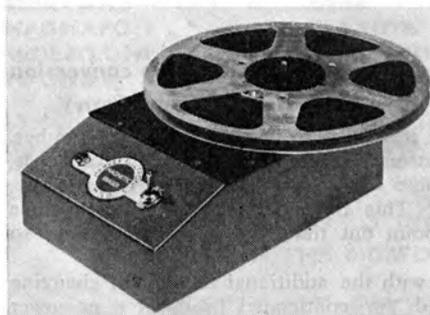
● We remind our readers that notices of equipment listed and illustrated in this monthly feature are in no sense reviews. When figures, specifications and diagrams are published, these data are extractions from manufacturers' lists. When samples of this equipment are submitted for test, they are passed to our technical contributors, whose reports are published in a separate section.



★
**THE NEW
 CAROUSEL
 "RADIOTAPE"
 CONSOLE
 RECORDER**
 ★

WITH the emphasis on home entertainment, this new recorder is housed in a free-standing veneered walnut cabinet, and has provision for the fitting of a VHF/FM tuner with plug-in connectors. The Radiotape costs 39 guineas, and the tuner 20 guineas Tax Paid. The recorder takes 7-inch spools, has 3 motors, and operates at $1\frac{1}{2}$, $3\frac{1}{2}$, and $7\frac{1}{2}$ i/s. The claimed frequency response at $7\frac{1}{2}$ i/s is 50-18,000 c/s ± 3 dB, and there are separate bass and treble controls. A useful feature is that the signal may be monitored at a volume level controlled independently from that being recorded. The cabinet measures $22\frac{1}{2} \times 25 \times 15$ ins., and the detachable legs are 14 ins. Made in England by Stereosound Productions Ltd., Capital Works, 12-14 Wakefield Road, Brighouse, Yorks.

the Fujiya is also announced, $1\frac{1}{2}$ and $3\frac{1}{2}$ i/s or $3\frac{1}{2}$ and $7\frac{1}{2}$ i/s, to retail at £25 4s. Write to the above address for further information.



★
**HARVEY
 ELECTRONICS
 BULK ERASER
 TYPE 104**
 ★

A FULL range of bulk erasers is manufactured by Harvey Electronics Ltd., Farnborough Road, Farnborough, Hants. The model illustrated above operates from any standard AC supply, and accommodates any size spool up to 12 ins. The price is £14 5s., and up to 1 in. tape may be used. The smallest unit supplied takes 5 in. spools, and costs £6 5s. Ask for leaflet No. 109.

★
**NEW
 HALF-TRACK
 MINIATURE
 RECORDER
 FROM JAPAN**
 ★

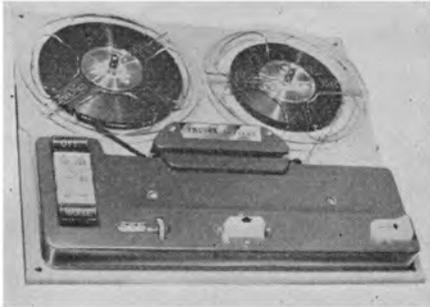


IMPORTED by Nortons, 14 Shudehill, Manchester, 4, and retailing at the unusually low price of £24 3s., the Fujiya portable recorder originates in Japan. The price includes a microphone, monitoring lead, and headphone. The conventional half-track system is employed, and the tape speed is $3\frac{1}{2}$ i/s, giving a frequency response of 200-6,000 c/s. There is a pause control, and 5 inch spools. The dimensions are only $10\frac{1}{2} \times 5\frac{1}{2} \times 4\frac{1}{2}$ in., and the weight 8 lb. A two-speed version of

★
**WALTER
 INSTRUMENTS
 ANNOUNCE
 THE NEW
 404 PORTABLE
 RECORDER**
 ★



THE latest mains portable from Walter Instruments is the 404, priced at 42 guineas including crystal microphone tape, radio/gram lead, and plugs. The exclusive Walter joystick control is again featured, and is child's play to operate. Although the overall dimensions are only $16\frac{1}{2} \times 12\frac{1}{2} \times 8\frac{1}{2}$ in., there is provision for 7-inch spools, position indicator, and magic eye level indicator. Other useful facilities are the pause control, storage for two 7-in. spools, record safety button, tone control, "straight through" amplification, and 3 watts output. Drive is incorporated for the Walter Cine Synchroniser Attachment, and the two operating speeds are $3\frac{1}{2}$ and $7\frac{1}{2}$ i/s. The manufacturers are Walter Instruments Ltd., Garth Road, Morden, Surrey.



★
**THE TRUVOX
 MARK 6
 TWO-SPEED
 TAPE DECK**
 ★

THIS is a two speed half track instrument accepting up to 7 in. reels and tracks to American and British standards. The attainable frequency response is 30/17,000 c/s at 7½ i/s and 30/9,000 at 3¾ i/s. Total wow and flutter at 7½ i/s is 0.2% rms and at 3¾ i/s not more than 0.3% rms with a speed variation of less than 1%. Three motors of B.T.H. manufacture are fitted and giving a fast spooling of 1,200 feet in less than one minute. The capstan motor carries a fan and drives a large fly-wheel. Speed change may be effected with the Deck either stationary or in motion. The Deck has electric braking and auto-parking brakes; pause control which can be locked "on"; "Hublocs" securing reels which are standard on all Truvox Tape Decks. The reels are rigidly locked preventing chatter.

The record/replay head is of new design and has a 0.00025 in. Gap. It is of high impedance and suitable for direct connection to an amplifier without a matching transformer. The Bias requirements are approximately 1.5 mA at 120 volts, but the new Erase head requires approximately 10-15 mA at 150 volts. The record/play head is arranged with a positive single screw adjustment for Azimuth. All Truvox Magnetic Tape Recording Heads are of the stacked lamination type and are potted. Faces are lapped to tape contour.

The models which are available include Monaural Deck fitted with half track Record/Replay head and half track Erase head, but the tag panels are wired for later fitting of Stereo head. Stereo Tape Deck fitted with Stacked half track Record/Replay head and half track Erase head. Export model is fitted with Stacked half track Stereo Record/Replay head and full track Erase head. Panel size is 14¼ in. × 13 in. front to back, and the weight is approximately 13½ lbs. These Tape Decks are finished in two tone beige/mushroom.



★
**GRUNDIG
 STENORETTE
 TYPE "M"**
 ★

A new version of the Stenorette Dictating Machine—the Stenorette "M"—is just announced by **Grundig (Great Britain) Limited**. Similar in appearance to the Stenorette "T" the new machine is so designed that it is virtually foolproof in operation, and incorporates a number of improvements. The microphone, the GDM 515, has a special recording button in addition to the stop/start and backspace button to ensure that accidental erasure is impossible during transcription when ear-phones are used. Backspace facilities are flexible so that the dictator is able to backspace as little or as often as he wishes without fear of partial erasure.

Apart from the microphone and earclip, the S.E.4., which have new type plugs to prevent damage to connecting leads, all accessories are interchangeable with those of the Stenorette "T". The price, including basic accessories remains the same at 61½ guineas.

More news from T.S.L.

TECHNICAL Suppliers Ltd. have just purchased the entire stock of Telefunken record/replay heads **Type F402A**. This two-track head has an inductance of 1 henry at 1,000 c/s, and a 0.00014 inch gap. The bias current is approximately 1mA, and the frequency range is 30-20,000 c/s. The price, including instructions for adapting the recorder, is £2 2s.

T.S.L. have also added two interesting microphones to their range. The **model M1** is a dual-impedance moving coil unit, and an ingenious method has been adopted to facilitate matching to the high or low impedance input of the recorder. This is via a 3-pin plug, which can be inserted in two ways to give immediate matching at 200 ohms or 50,000 ohms. The brown and cream plastic case measures 3¼ × 2 × 1¾ ins., and incorporates a fold-away table rest. Price £4 4s.

The **model S2** is a stereo microphone comprising a pair of moving coil elements built into a gilt, perforated case. The frequency range is quoted as 80-15,000 c/s flat, and the output impedance is 200 ohms per section. A twin line transformer is available stepping up the impedance to 50,000 ohms per section. The low impedance version costs £18 7s. 6d; the model with transformer, £19 19s. A telescopic stand, extending from 16 in. to 5 ft., is available, price £5 5s. Table stand £1 11s. 6d. Enquiries to **Technical Suppliers Ltd., Hudson House, 63 Goldhawk Road, London, W.12.**

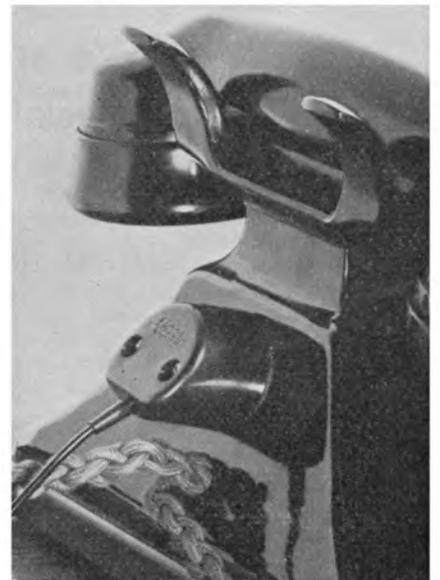
★
**GRUNDIG TK24
 4-TRACK
 RECORDER**
 ★



WE gave details of this latest Grundig recorder on page 274, last month. Briefly the TK24 is the first four-track machine from this manufacturer, and it operates at 3¾ i/s. The price of 62 guineas includes microphone, tape, radio lead, and tape cleaning felt. A Monitor Amplifier, MA1, is available as an extra, and costs 4½ guineas. A unique feature is the track selector which enables one and two, or three and four, to be selected, or else the simultaneous reproduction of tracks one and three, or two and four. Write to **Grundig Ltd., 39/41 New Oxford Street, London, W.1.**, for further details.

★
**ACOS
 TELEPHONE
 ADAPTOR**
 ★

OUR survey of tape recorder accessories last month included a number of telephone adaptors. The Acos model was first shown at the Audio Fair, and we have just heard that it is now in full production. This adaptor is easily fixed to any G.P.O. or intercom. telephone by the rubber suction pad, so that two-way conversation may be recorded or amplified. The manufacturers are **Cosmocord Ltd., Waltham Cross, Herts.**



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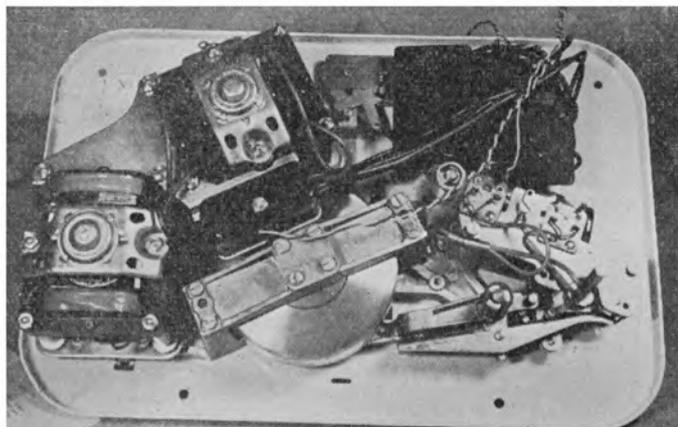
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EQUIPMENT REVIEWED



Garrard Magazine Loading Deck

Manufacturer's Specification: Tape speed: $3\frac{1}{2}$ i/s. One motor. Spool size: 4-in. or special magazine. Frequency Range: to 10,000 c/s. Wow and Flutter: 0.2%. Size: $12\frac{1}{4} \times 8 \times 3\frac{1}{4}$ ins. Price: £15 7s. 3d.

Manufactured by Garrard Engineering & Manufacturing Co. Ltd., Newcastle Street, Swindon, Wilts.

THE magazine is the main feature of this deck, and I can testify that it is an almost foolproof way of handling tape. I let a four-year-old child load, reverse, and reload a magazine several times without even a hint of trouble. I shudder to think of the shambles which would have resulted had I asked the same child to operate an orthodox two reel recorder, particularly if double play tape had been used as in the Garrard magazine.

The deck on to which the magazine fits looks deceptively simple, but this simplicity hides a multitude of very elegant design details. All the main parts are supported by heavy die castings which ensure accurate alignment of capstan shaft, pressure roller, and heads, so that the tape runs true without the help of normal tape guides. Two rod members between the heads provide the necessary guidance, and at any instant only an infinitesimally small point at one edge or the other of the tape is in contact with a guide. Despite this it proved almost impossible to force the tape out of vertical or azimuth alignment, even with loose reels or a tape loop. This means that any small imperfections in the seating of the magazine on the deck will not cause top loss due to azimuth misalignment, or level loss due to track misplacement. The spring-loaded projections on the reel turntables, which feel for the reel slots, and seem to work every time, are also worth mentioning.

It is always difficult, when reviewing a unit such as this, to know whether the deck submitted is representative of production samples, but in this case I was lucky enough to have two complete recorders awaiting test which also incorporated the

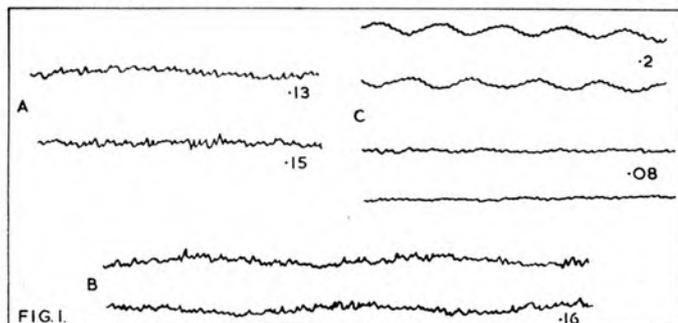


FIG. 1.

Garrard deck. The three decks all behaved well as regards tape handling, but there were some small differences in wow and flutter content, and head output, which gave an indication of the production spread of these parameters.

Wow and Flutter

Fig. 1A shows a fluttergram of deck A; the RMS readings averaged 0.14% over long periods of time, and stopping and starting the machine, or altering the phasing of the tape relative to the capstan and pinch roller, did not cause any change in reading. This indicates that there is no cyclical speed variation which can add or cancel on playback.

Fig. 1B shows the cumulative wow and flutter on machine B, this was the worst reading obtainable, and shows evidence of a two cycle per second variation in speed which proved to be due to a slightly eccentric pressure roller. In the cancelled condition the reading was 0.13%, and over long periods of playback the flutter bridge readings varied slowly between 0.13% and 0.16%. The main speed variation on decks A and B is a slight 50 c/s flutter; this is due to the pulsating torque of the motor as the armature moves from pole to pole which is not completely filtered by the flywheel inertia.

Fig. 1C indicates very low flutter on deck C, but a slightly eccentric or bent capstan causes a sinusoidal variation of speed which provides another very effective demonstration of the cancelling and adding of recorded and playback wow which results in extreme readings of 0.08% and 0.2%, with a mean reading, over long periods, of 0.15%.

These tests confirm the manufacturer's specification of total wow and flutter less than 0.2%, the average reading being 0.15%.

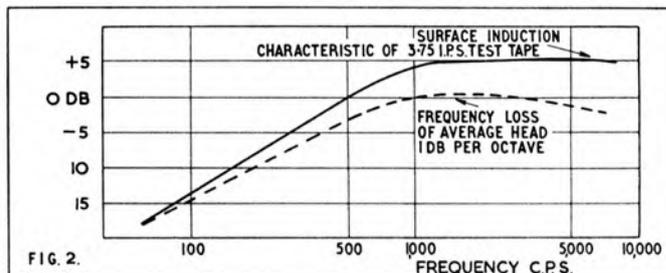


FIG. 2.

—but underline the fact that higher and lower figures may be obtained when a tape is recorded and played on the same machine, due to interference between recorded and playback wow.

Playback responses

A $3\frac{1}{2}$ i/s C.C.I.R. test tape, with a surface induction characteristic of 200 micro-seconds, and a level 12 dB below peak recording level, was played on each deck and the head output measured on a valve voltmeter. The voltage outputs and frequency responses at low and middle frequencies were almost identical on the three heads, but the high note responses showed a spread of about 5 dB at $7\frac{1}{2}$ Kc/s.

Fig. 2 shows the RMS alternating flux, or surface induction of the test tape, and this response should be obtained from a perfect head with no eddy current or iron losses, and with an infinitely narrow gap. In practice no head is perfect, and almost all heads have eddy current, or iron losses, which depend on the thickness of the mu-metal laminations used in their manufacture. These particular heads have a frequency loss of approximately 1 dB per octave over the useful frequency range, and if such a loss is applied to the perfect response of Fig. 2 a close approximation to the response of the best head is obtained.

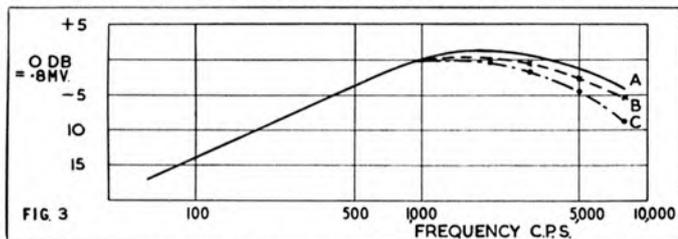
Head A response is very close to the frequency loss curve, with an added loss of $1\frac{1}{2}$ dB at $7\frac{1}{2}$ Kc/s; this is a measure of

EQUIPMENT REVIEWED—(continued)

gap loss, and corresponds very closely to the response which should be obtained from a gap of 0.00025 in.

Head B shows a more normal gap loss of about 3 dB, and probably represents a good average response for this type of head. Head C is a lower limit sample with a loss of 6½ dB relative to a perfect gap, and a loss of 5 dB relative to the best head tested. The effective gap would appear to be nearer 0.0005 in. than the specified 0.00025 in.

The playback amplifier response should therefore be the inverse of the curves of Fig. 2, rising 5 dB per octave below



1 Kc/s, and rising 5 to 10 dB at 8 Kc/s to compensate for gap losses.

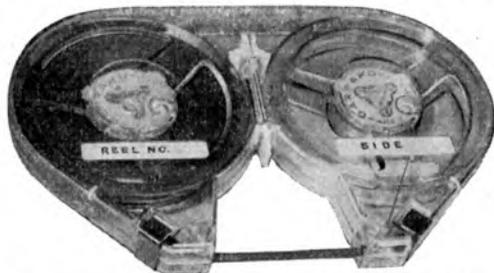
Record bias and equalisation

At the fixed speed of 3¼ i/s there seems little point in using a bias and erase frequency higher than 40 Kc/s, as losses in the heads increase rapidly beyond this frequency. At this frequency I found that 15 volts across the erase head gave almost complete erasure, and 30 volts RMS was the optimum bias for recording. At higher frequencies the voltages will be correspondingly increased due to the rising impedance and losses of the heads, i.e. at 60 Kc/s erase and bias voltages will be 22 and 45 volts respectively.

To record a CCIR characteristic, the signal current through the head should remain constant from low frequencies up to 1 Kc/s and then rise 1 dB at 2 Kc/s, 5 dB at 5 Kc/s, and 10 dB at 8 Kc/s. A level 12 dB below peak recording level will be recorded with a signal current of 30 micro-amps, and peak recording level at 0.12mA.

Summary

I like this little deck very much. It should form the basis of a series of very simple domestic and portable recorders. As mentioned in an earlier review I would have liked the fast



The unique magazines eliminate threading of the tape.

spooling facility on the supply reel rather than on the take up one, but this would have involved a slipping clutch take up of some kind which may well have spoiled the excellent wow and flutter performance of the deck.

I understand from the manufacturer that a clock type tape measuring device is now available which can be placed on the take up reel when recording or spooling to measure the exact position and extent of any recording. I also find that spare magazines, loaded with double play tape, can be obtained at a price comparable to a 12 in. LP record, so that a library of one hour recordings may be made and stored, bookcase fashion, so that even the most unskilled operator can load and play a chosen programme. This facility, and the availability of the spare magazines is not, I feel, sufficiently advertised by the manufacturers of the deck, or by the makers of the many excellent recorders which use it.

A. Tutchings

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The rate is 6d. per word, with a minimum charge of 7s. 6d. Box numbers may be used for an extra charge of 1s. 6d. The trade rate is 9d. per word, plus 2s. for a box number, conditions on application.

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All advertisements for the September issue must arrive not later than August 2.

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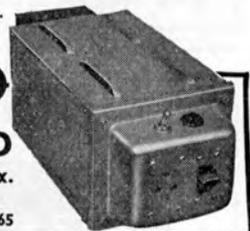
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Miscellaneous

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Tape Recorder need repairing? Let the specialists do it for you at an economical price. Essex Tape Recorder Centres, 2, Maryland Station, Stratford, E.15. MAR 5879.

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Tapes? Transfer? Consult Sound News for better rates. See above.

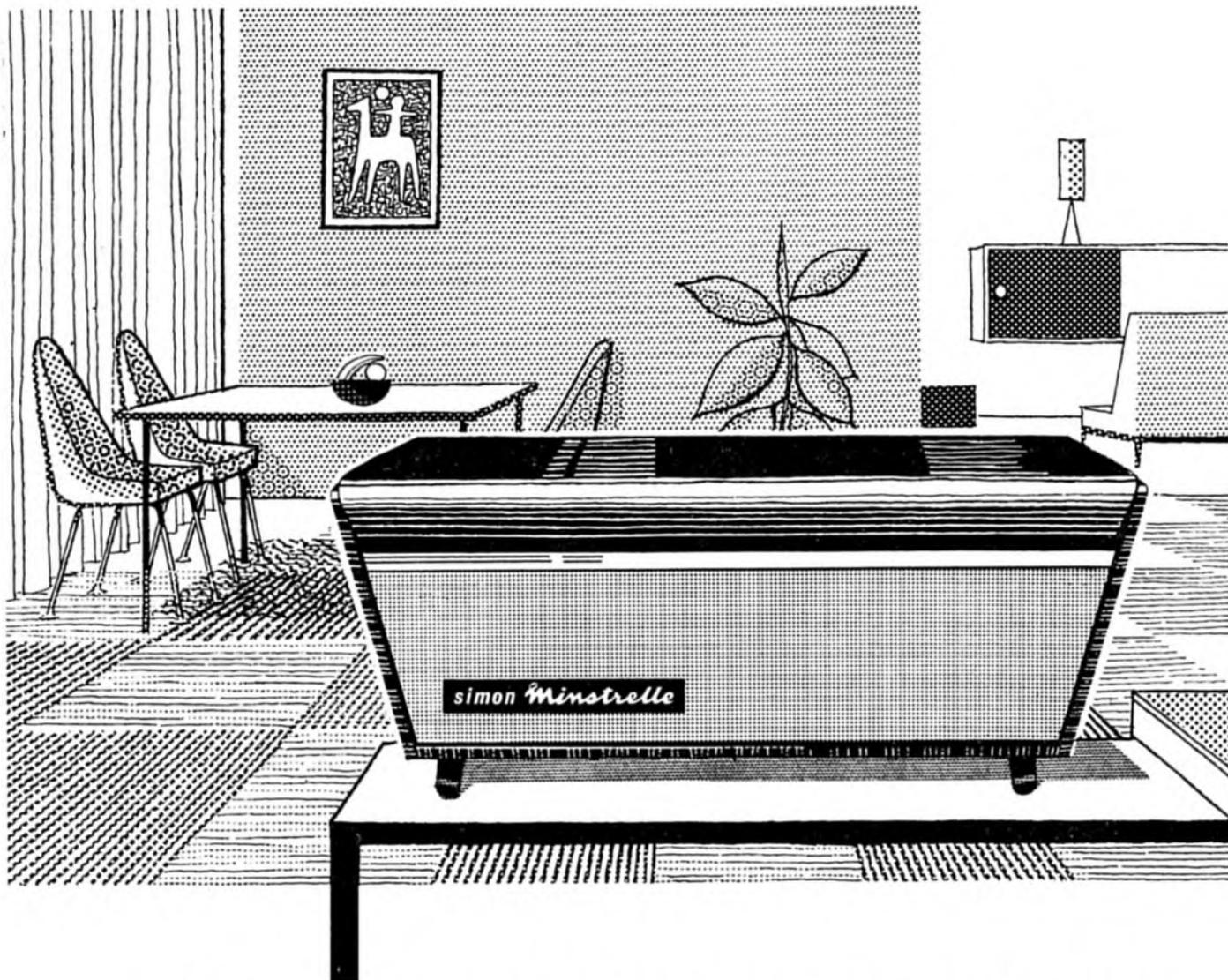
Tape Recorder repairs, all makes, also trade servicing—Telefunken service agents. Tape Recorder Centre (Halifax), 17, Rawson Street, Halifax 66832.

Wanted

TK20 or similar good Grundig wanted. F. Riddle, 113, Church Road, Northolt, Middx. Viking 4734.

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