the TAPE RECORDER

price 2/-

MARCH 1963
VOL.5 NO.2

INCORPORATING "SOUND AND CINE"

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. . . and he'll give you the simple facts, as Mr. Allerhand of City and Essex Tape Recording Centres is doing in the picture above. The simple facts that he'll give you are firstly, much envied mechanics and secondly, electronics, arranged without regard to cost. These combine to produce the long dreamed of ideal in tape recording. See one yourself, though beware—for once you've tried one you'll find non-ownership is quite unjustifiable.

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HI-FI FM TUNER, Model FM-4U

Available in two units which for your convenience are sold separately: Tuning unit (FMT-4U—£2 15s. 0d. incl. P.T.), despatched wired and tested, and I.F. amplifier (FMA-4U—£12 6s.). Printed circuit for I.F. amplifier and ratio detector. Built-in power supply; 7 valves. Tuning range 88-108 Mc/s. (Illustrated bottom right.) Total price **£15.1.0**

HI-FI AM/FM TUNER, Model AFM-1

Also available in two units as above: Tuning heart (AFM-TI—£4 13s. 6d. incl. P.T.) and I.F. amplifier (AFM-AI—£20 13s.). Printed circuit board; 8 valves; consecutive FM limiting and ratio detector. Tuning range FM: 88-108 Mc/s; AM: 16-50, 200-550, 900-2,000m. Switched wide and narrow AM bandwidth. Built-in power supply. Total price. **£25.6.6**

TO ALL MUSIC LOVERS AND HI-FI ENTHUSIASTS

Our wide range does not permit adequate coverage here of all models. A FREE CATALOGUE and full specifications of any particular model will be gladly sent on request without obligation on your part. ASSEMBLED MODELS NOW AVAILABLE, PRICES ON REQUEST.

All prices include free delivery in U.K. Deferred terms available on orders over £10.

Tape Recording and Replay Hi-Fi Amplifiers Models TA-IM (Mono) and TA-IS (Stereo)

For use with most tape decks. Thermometer type recording indicators, press-button speed compensation and input selection. 3-position bias level and printed circuit construction.

TA-IM	£19.2.6
TA-IM and Collaro "STUDIO"	£30.10.0
TA-IM and Truvox D83 ...	£47.2.6
TA-IM and TRUVOX D84 ...	£45.5.0
TA-IS (illustration Centre) ...	£24.10.0
TA-IS and Collaro "STUDIO"	£35.14.0
TA-IS and Truvox D83 ...	£52.6.0
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A WHOLE RANGE OF PACKAGED DEALS (INCLUDING "CONNOISSEUR CRAFTSMAN" TURNTABLE and DECCA ffss PICK-UP) NOW AVAILABLE TO SAVE YOU FURTHER MONEY.

HI-FI EQUIPMENT CABINETS

THE "MALVERN"

A range of over a dozen equipment cabinets is now available to meet the differing needs of enthusiasts. Designed for maximum operating convenience or for where room space is an overriding consideration, this range includes kits accurately machined for ease of assembly and "left in the white" for finish to personal taste, ready assembled cabinets or assembled and fully finished cabinets, and has at least one model to meet your requirements. Why not send for full details? Prices from **£6.19.6** to **£29.8.0.**

"COTSWOLD" HI-FI FREE SUSPENSION SPEAKER SYSTEM

This is an acoustically designed enclosure 26 in. × 23 in. × 14½ in. housing a 12 in. bass speaker with 2 in. speech coil, elliptical middle speaker, together with a pressure unit to cover the full frequency range of 30–20,000 c/s. Capable of doing justice to the finest programme source, its polar distribution makes it ideal for really Hi-Fi Stereo. Delivered complete with speakers, cross-over unit, level control, Tygan grille cloth, etc. All parts precut and drilled for ease of assembly and left "in the white" veneered for finish to personal taste.

COTSWOLD

COTSWOLD MFS SYSTEM

Similar performance to standard "Cotswold" but designed for the smaller room. Size 36 in. high × 16½ in. wide × 14½ in. deep. Either model. **£23 4s. 0d.**

Here are some other easy-to-build Heathkit Models for you:

S-33

NEW DELUXE 6 WATT STEREO AMPLIFIER Model S-33H. A low powered stereo/mono amplifier with the high sensitivity necessary for light-weight ceramic pickups (e.g. Decca Deram) Deluxe version of the S-33 with two tone grey perspex panel. £15 17s. 6d.

HI-FI STEREO 6-WATT AMPLIFIER Model S-33. Attractively styled, completely self-contained. Printed circuit makes it easy to build. Only 0.3% distortion at 2½ W/chal. U/1 output, ganged controls. **£13 7s. 6d.**

MA-5

HI-FI MONAURAL AMPLIFIER Model MA5. An ideal general purpose reasonably priced mono amplifier, 5 watts output at only 0.5% distortion, has inputs for Gram, Radio. Printed circuit board. Size 11" × 6⅝" × 4¾" high. **£10 19s. 6d.**

SSU-1

HI-FI SPEAKER SYSTEM Model SSU-1. This kit is easily assembled. It contains twin speakers and balance control in its direct ducted port reflex cabinet. It is equally suitable for stereo or mono in average room. (Legs 14/6 optional extra.) **£10 17s. 6d.**

HEATHKIT ELECTRONIC WORKSHOP KIT, Model EW-1. This new kit will help your boy to understand electronics, by making at least 20 exciting experiments, including Transistor Radios, Intercom Sets, Burglar Alarm, Electric Eye, etc. **£7 13s. 6d.**

AG-9U

AUDIO SIGNAL GENERATOR Model AG-9U. Delivers up to 10 volts pure sine-wave (less than 0.1% distortion, 20 c/s to 20 kc/s). Decade switch-selected frequencies from 10 to 100,000 c/s. Internal 600 Ohm N/1 load, or external. **£21 9s. 6d.**

MA-12

POWER-AMPLIFIER 12-WATT Model MA.12. Single channel, ideal for stereo conversion. **£11 9s. 6d.**

COLLARO "STUDIO" TAPE DECK. Two tracks. "Wow" and "flutter" not greater than 0.15% at 7½" p.s. Long Term Speed Stability better than 0.5%. **£17 10s. 0d.**

SUGDEN MOTOR UNIT "CONNOISSEUR CRAFTSMAN". Heavy duty motor, operating at 33⅓ and 45 r.p.m. Very heavy 12" turntable. **£16 6s. 6d.**

USC-1

TA-IS

TRUVOX D83

STUDIO

HI-FI STEREO 18-WATT AMPLIFIER Model S-99. Within its power rating, this is the finest stereo amplifier available, regardless of price. U/L push-pull output. Printed circuit construction. **£27 19s. 6d.**

TRANSISTOR INTERCOM. Models XI-1U and XIR-1U. Ideal for office or home. Each Master operates up to five Remotes. 9v battery operated. **XI-1U £10 19s. 6d. XIR-1U £4 7s. 6d.**

STEREO CONTROL UNIT Model USC-1. A de luxe stereo control unit with variable filter, switched rumble filter, printed circuit boards and many other refinements. Operates direct from tape heads. **£19 10s. 0d.**

TRANSISTOR PORTABLE RADIO Model UXR-1. Superbly styled hide case, with golden relief and crystal easy-to-tune dial; this completely self-contained 6-transistor dual-wave set performs brilliantly everywhere, even in a car. Reproduction is exceptionally good. Printed circuit. **£12 11s. 0d.**

SHORTWAVE TRANSISTOR PORTABLE Model RSW-1. Four wave-band seven transistor portable with telescopic and ferrite aerials, slow-motion tuning. Covers Medium, Trawler, and 6-26 Mc/s in four switched bands. Uses printed circuit board and latest circuit technique. Superbly styled leather case. **£19 17s. 6d.**

TRUVOX D83 AND D84 TAPE DECKS. High quality mono/stereo Tape Decks **D83** 2-track for highest-fidelity. **£31 10s. 0d.** **D84** (identical presentation) 4-track for most economical use of tape. **£29 8s. 0d.**

GARRARD AUTO/RECORD PLAYER Model AT-6. A 4-speed stereo/mono unit with manual or fully automatic record selection; adjustable counter-balanced arm. Fitted with Decca Deram ceramic cartridge **£14 6s 1d.** or Ronette 105 mono/stereo cartridge. **£12 11s. 10d.**

GOLDRING-LENCO TRANSCRIPTION RECORD PLAYER Model G.L.58. Fitted with the G.60 pick-up arm and Ronette 105 mono/stereo cartridge, it has infinitely variable speed adjustment between 33⅓ and 80 r.p.m. and four fixed speeds. 3¾ lb. turntable to reduce rumble, "wow" and "flutter". **£17 18s. 11d.**

S-99

RSW-1

UXR-1

GL-58

F.M. TUNER

SOME OTHER HEATHKIT MODELS AVAILABLE

World's largest-selling VALVE VOLTMETER	Model V-7A £13.18.6
G/P OSCILLOSCOPE (5 in. Flat-face screen)	Model O-12U £38.10.0
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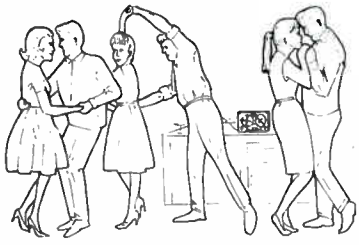

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* FITS CAR POCKET * SIMPLE TO OPERATE
* TAKES SPOOLS OR GARRARD MAGAZINES

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The Garrard Battery Tape Deck opens a new and exciting field for the manufacturer of tape recorders and the home constructor. Highly suitable for use with portable transistorized equipment it weighs only 3 lb. and measures 9″ x 6⅝″ x 1⅝″ above and 2¼″ below top of Motor Board. Two speeds, two tracks—3¾ and 1⅞ i.p.s. it plays for 1 hour 10 mins. per track using a 4″ spool of double-play tape at 1⅞ i.p.s.

Half Track Battery Tape Deck £12 5 0

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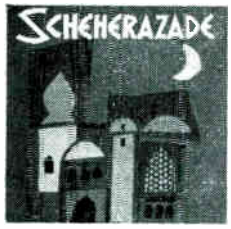
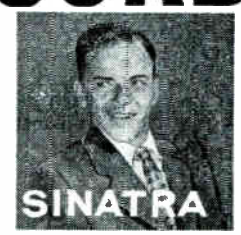


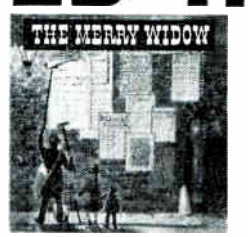
31. Rimsky-Korsakov: Scheherazade. Sir Eugene Goossens conducts the LSO in a breathtaking performance of this rich and exotic masterpiece.
Also on disc: mono/stereo

32. Star cast and orchestra stage all the famous songs: Getting to Know You, Hello Young Lovers, I Whistle a Happy Tune, Shall We Dance, etc.
Also on disc: mono/stereo

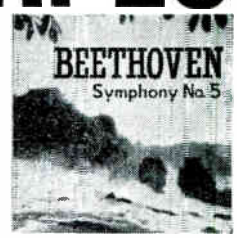
53. These two suites, containing some of Bizet's most thrilling music, are given magnificent performances by the Sinfonia of London under Muir Matheson.
Also on disc: mono/stereo



19. Look Over Your Shoulder, My Lean Baby, White Christmas, Don't Worry About Me, Melody of Love. 12 top numbers sung by the fabulous Sinatra.
Also on disc: mono only



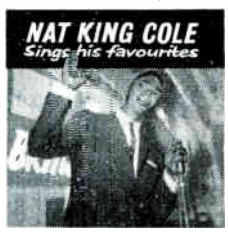
56. All the magic of old Vienna! starring Jacqueline Delman, John Larsen, Linden Singers and Sinfonia of London conducted by John Hollingsworth.
Also on disc: mono/stereo



33. Beethoven 5th. plus Egmont Josef Krips and LSO in a titanic interpretation which matches the tremendous power of this celebrated music.
Also on disc: mono/stereo

30. Ian Carmichael, Joyce Blair, star cast/orchestra. As Long as He Needs Me, Consider Yourself, all the hit numbers from Lionel Bart's great show.
Also on disc: mono/stereo

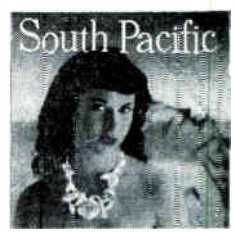
39. Great ballet conductor John Hollingsworth and the Sinfonia of London in a sparklingly fresh interpretation of Tchaikovsky's famous Ballet.
Also on disc: mono/stereo



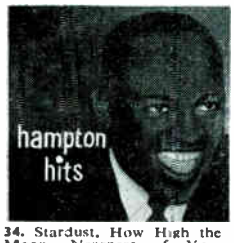
20. Answer Me, Nature Boy, Ruby and the Pearl, these plus 8 more favourites sung especially for you by the unique Nat King Cole.
Also on disc: mono only

40. Superb singing by Bruna Rizzoli and Giuseppe Savio with the chorus of the Teatro Nuovo di Milano and orchestra conducted by Napoleone Annovazzi.
Also on disc: mono only

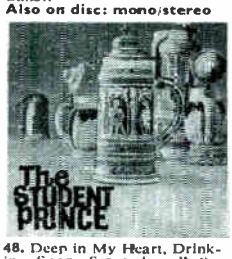
29. Me and My Shadow, Among My Souvenirs, Mean to Me, How About Me . . . the fabulous Judy Garland sings 11 of her greatest songs.
Also on disc: mono only



25. Ian Wallace, Joyce Blair and chorus. Some Enchanted Evening, I'm In Love With a Wonderful Guy, and all the unforgettable songs from this great musical.
Also on disc: mono/stereo



34. Stardust, How High the Moon, Nearness of You, 'Round Midnight, King David —eight numbers by the vibraphone genius, Lionel Hampton
Also on disc: mono/stereo

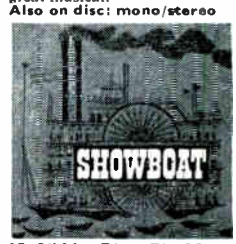


48. Deep in My Heart, Drinking Song, Serenade—all the old favourites fresher than ever with Marion Grimaldi, Linden Singers and Orchestra.
Also on disc: mono/stereo

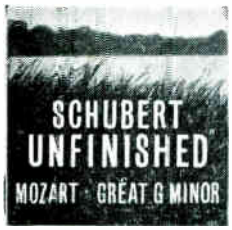
37. Revolutionary Study, Polonaises A and A flat, Fantaisie-Impromptu—12 favourites in all played by the pianist of Dirk Bogarde's 'Song Without End'.
Also on disc: mono only

22. 12th St. Rag, Isle of Capri, Smile, Blue Moon, Bunny Hop Mambo, Satin Doll. 12 top numbers played in characteristic style by the Duke and his band.
Also on disc: mono only

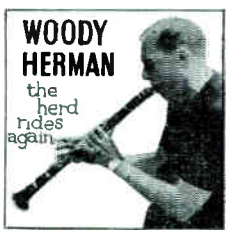
2. Grieg Piano Concerto. Alexander Jenner in an electrifying performance with the Bavarian State Radio Orchestra conducted by Odd Grüner-Hegge.
Also on disc: mono only



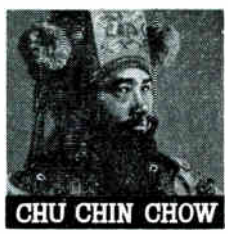
35. Ol' Man River, Bill, Make Believe, many more well-loved numbers from this famous musical memorably sung and played by full star cast.
Also on disc: mono/stereo



44. Leopold Ludwig and LSO combine brilliantly in an exciting 'double': two of the world's greatest symphonies receive vivid new interpretations.
Also on disc: mono/stereo



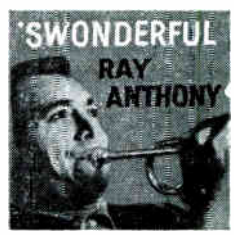
45. Crazy Rhythm, Bijou, I Cover the Waterfront, Northwest Passage, Blowin' Up a Storm, etc The master clarinettist plays 12 numbers in great style.
Also on disc: mono/stereo



38. Hervey Alan, Ian Wallace, Marion Grimaldi and chorus sing the immortal favourites: Cobbler's Song, Robbers' Chorus, Chu Chin Chow, etc.
Also on disc: mono/stereo

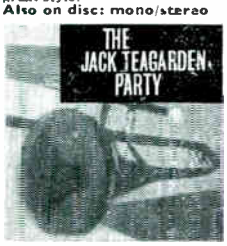
14. Tchaikovsky Symphony No. 5. Sir Malcolm Sargent and LSO combine to give this famous symphony a dramatic and colourful rendering.
Also on disc: mono/stereo

43. Andy Cole, Barbara Leigh, Mike Sammes singers: High Society, Three Coins, Harry Lime, Gigi, The High and the Mighty. 11 top film hits.
Also on disc: mono/stereo

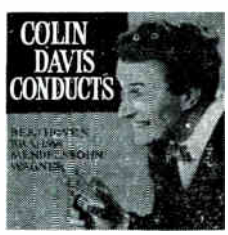


41. Night and Day, King Porter Stomp, Pennies from Heaven, Christopher Columbus, Don't Be That Way, with the top American bandleader/trumpeter.
Also on disc: mono only

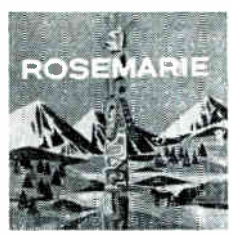
42. Jericho, Swing Low, Shadrak . . . 12 of the best loved Negro Spirituals movingly sung by George Browne, Isabelle Lucas and Linden Singers.
Also on disc: mono/stereo



36. Beale Street Blues, After You've Gone, The Sheik of Araby, My Kind of Love, 12 tremendous hits by one of the world's greatest jazz trombonists.
Also on disc: mono only



49. Beethoven's Fidelio Overture, Brahms' St. Anthony Vars, Mendelssohn's Hebrides, Wagner's Siegfried Idyll. All under Britain's greatest young conductor.
Also on disc: mono/stereo



50. David Hughes, Barbara Leigh, Andy Cole and chorus sing Indian Love Call, Rose Marie, and all the other tunes from Friml's well-loved musical.
Also on disc: mono/stereo

47. Brahms Violin Concerto. Superb playing by Endre Wolf and Sinfonia of London under the baton of Anthony Collins makes this a truly memorable performance.
Also on disc: mono/stereo

46. Elizabeth Larner, Andy Cole, Peter Knight singers. Exciting 'double' featuring highlights from two famous shows by Frederick Loewe and Cole Porter.
Also on disc: mono/stereo

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THE GREATEST BREAKTHROUGH SINCE TAPE RECORDING!

Here is the greatest World Record Club introductory offer ever made . . . a unique offer never before matched by any record club or company anywhere in the world!

EVERY ONE OF WORLD RECORD CLUB'S UNRIVALLED RELEASES AS 12" LPs IS NOW AVAILABLE ON 3¾ ips TAPE!

Now *you* have the opportunity to play any WRC release *on your tape recorder*. Each of these 'tape records' runs at 3¾ ips, mono, on 5" spools and can be played on either 2 or 4 track recorders. New electronic techniques of tape-to-tape transfer give these 3¾ ips WRC pre-recorded tapes a standard of reproduction unattainable previously at less than 7½ ips.

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Choose now, any three of the superb 3¾ ips pre-recorded tapes shown here, for only 10/- each and number them on the attached coupon. (if you wish, of course, you can choose 12" LPs instead. Introductory discs and tapes are both the same price.) Please send no money until *after* you have received, played and approved them. We want you to prove to yourself, before paying, that our tapes are equal to the world's best.

2. THE OPPORTUNITY TO BUILD A UNIQUE TAPE COLLECTION.

The WRC plan offers you an exciting and varied annual repertoire of more than 60 selected tape releases, covering classics, jazz, shows, ballet music, light music and 'pops'. Every one is a superlatively recorded 3¾ ips mono tape (or 12" LP—mono *and* stereo). Tapes are offered to you at the privilege club price of 29/- (12" LPs at 26/6) plus a small charge for post and packing—much less than you would pay elsewhere for recordings of anything like this quality. Your only obligation, as a Club member, is to agree to buy four more tapes (or 12" LPs) over the year. Beyond this, there is no subscription or membership fee.

3. A PLANNED PROGRAMME.

Every World Record Club release is hand-picked by an independent panel of Britain's top musical authorities. The Countess of Harewood, Lord Montagu of Beaulieu, Sir Arthur Bliss, Richard Attenborough, Cyril Ornadel, Ray Ellington, Leon Goossens, Malcolm Arnold, Steve Race, John Hollingsworth, Antony Hopkins—and, as special adviser on tape, Miles Henslow.

4. FREE MONTHLY MAGAZINE.

A monthly magazine, packed with fascinating musical articles, reviews, news and pictures, is issued free to all members.

5. SPECIAL CONCERT PRICE CONCESSIONS.

Many concert halls and theatres throughout the country (including the Royal Festival Hall) allow special concession rates to club members for many performances.

6. FREE BONUS TAPES.

The more you buy, the more you save! After fulfilling the minimum membership obligations, you earn *another* tape of your own choice free for every extra three you buy!

7. EXCLUSIVE EXTRA RELEASES.

In addition to the regular monthly selections, the club offers members exclusive extra tapes at the standard Club price.

World Record Club is unique—the first and greatest Record and Tape Club in Britain, with the largest show catalogue (on tape and mono/stereo disc) *in the world*. No other method of tape—or record-buying offers you so many additional benefits, so much freedom and variety of choice, with no 'high-pressure' selling. And, of course, there are no subscriptions or membership fees of any kind.

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. . . AND IF YOU OWN A STEREO TAPE RECORDER

hear the fantastic reproduction of

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THE NEWEST, TRUEST SOUND ON TAPE TODAY!

Revolutionary new STEREO 21 pre-recorded tapes (7½ ips twin-track) are issued exclusively by World Record Club. But they are offered *without membership commitments of any kind.* The first list of all new STEREO 21 releases is now available. It features *30 superb stereophonic tapes* ranging from *Beethoven's Eroica* with Josef Krips conducting the LSO, to a lavish full-cast production of *Oklahoma.*

As always, WRC prices present unparalleled value—all STEREO 21 releases cost either 50/- or 60/- depending on playing time (up to 50 minutes). STEREO 21 tapes are now obtainable through leading retailers or direct by post from World Record Club. Send for full catalogue now—STEREO 21 *must be heard to be believed!*

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3¾ ips pre-recorded tapes		12" LPs	

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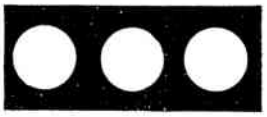
Please send me, without obligation, on 7-day free trial, the three selections indicated. (Your 3 selections must be either *all* tape or *all* disc.) If satisfied, I will pay you 30/- plus 3/- postage, packing and insurance. Only at that stage may you enrol me as a full member of World Record Club, entitled to all the benefits described. My only Obligation as a member would be to agree to purchase 4 more top quality 3¾ ips tapes over a 12-month period at the special club price of 29/- each (or 4 12" LPS at 26/6 each.) If I am not completely satisfied with my 3 selections I will return them to you within 7 days in good condition, and owe you nothing.

Signed _____

this offer applies in Gt. Britain and N. Ireland only.

MY 3-SELECTION 'PACKAGE' COMPRISES

Choice No. 1 Choice No. 2 Choice No. 3



(place tape/disc key numbers only in the circles)

Tick here if stereo 12" LPs are required where available ☐

Mr/Mrs/Miss .....
(BLOCK CAPITALS PLEASE)

ADDRESS .....

.....

.....

STEREO 21 FREE BROCHURE

To WORLD RECORD CLUB (Dept TRR8)
Box 11 PARKBRIDGE HOUSE, RICHMOND, SURREY.

Please send me your free colour brochure, showing the full range of your new STEREO 21 releases.

NAME .....
(BLOCK CAPITALS PLEASE)

ADDRESS .....

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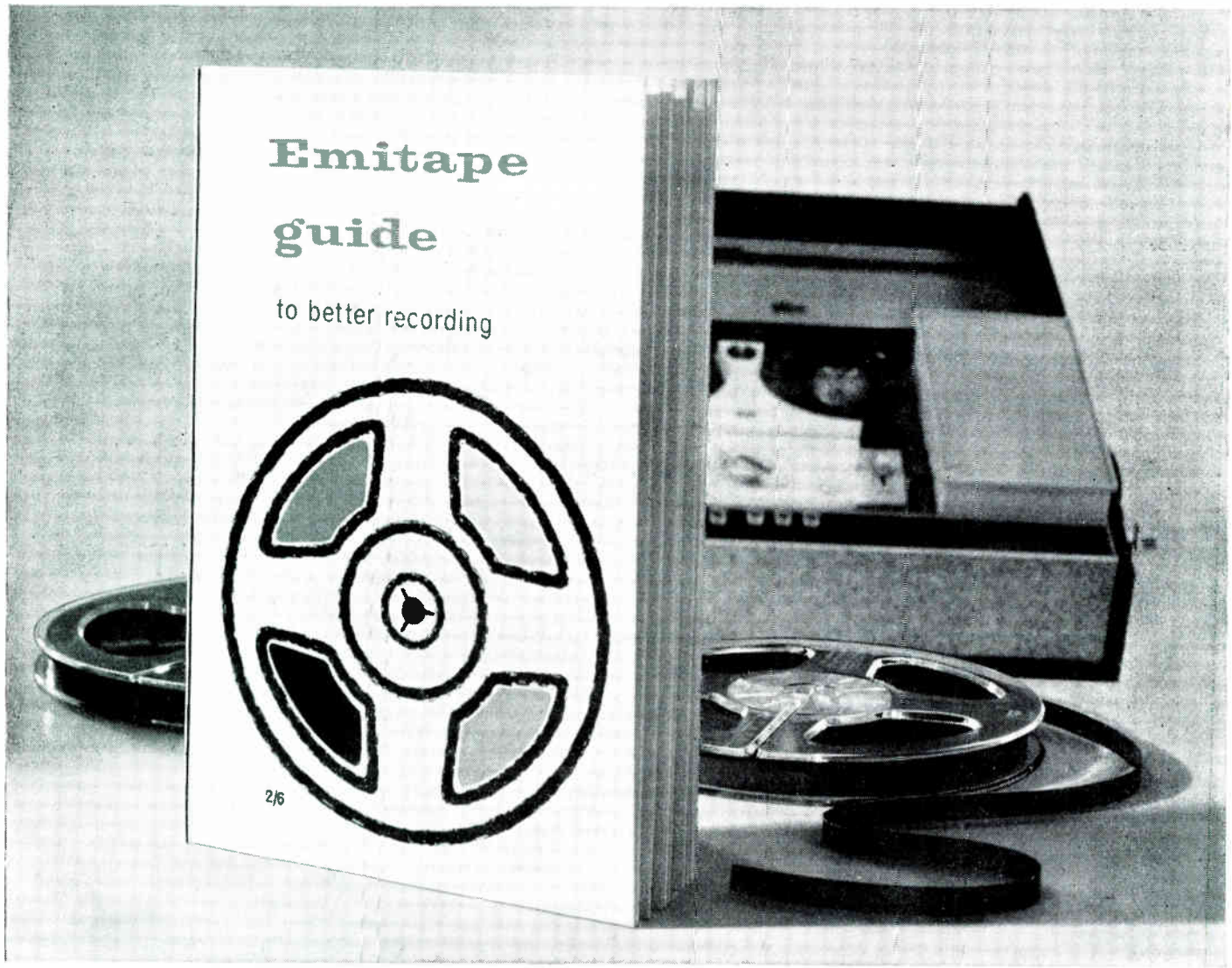
.....

'The Emitape guide to better recording' by John Borwick



'No tape user can afford to be without this book'

PERCY WILSON, TECHNICAL EDITOR OF 'THE GRAMOPHONE'

Emitape shows everyone the way to better recording.

First, Emitape's six highly successful Emiguide tapes told you all about sound—through sound.

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There's no mystery about tape technique when you get Emiguidance. Ask your local dealer for a copy of *The Emitape Guide to Better Recording*. Or write direct to E.M.I. TAPE LIMITED, Department EG, Hayes, Middlesex.

Please send me a copy of *The Emitape Guide to Better Recording*. I enclose a postal order for 2/6.

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Emitape

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E.M.I. TAPE LIMITED · HAYES · MIDDLESEX

the TAPE RECORDER

MARCH - - - - - - - - - - - - - - -1963

VOL. 5 - - - - - - - - - - - - - - - - No. 2

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★

EDITORIAL

SOME of our readers, both of *Hi-Fi News* and *Tape Recorder*, have written to us about a new trouble which they have experienced. It concerns the recording of BBC stereo broadcasts by the FM Multiplex system, and an irritating high-pitched whistle which is found on both stereo tracks on replay. The reason for this is beating of two high frequency signals, one produced by the circuitry of the tape recorder, and the other being an unwanted by-product from the radio receiver. Either, on its own, is inaudible: together, they produce this audible note. In more detail, but still avoiding technical explanations in this column, which is not the place for such subjects, the bias/erase frequency of the average, domestic tape recorder may be anything from 40 to 100 Kc/s, and the stereo output from an FM tuner and Multiplex adapter contains a residual frequency of 38Kc/s. It is the difference of these two frequencies which is heard—whatever that difference frequency may be—because it is automatically but unwantedly recorded when the two pieces of equipment are used together. This trouble was quickly discovered in America when FM Multiplex Stereo was introduced about a year ago, and it was equally quickly pounced upon and cured. The cure is simple, and merely consists of fitting a 38Kc/s filter to the radio tuner, or to the amplifier which follows it. Today, amplifiers are advertised as "fitted with inbuilt 38Kc/s filter", and the fact is used as a selling point. Over here, as and when FM Multiplex stereo broadcasts become regular, and when equipment is made and built in quantity for their reception, the same cure will be applied; but in the meantime the experimenter who wishes to obtain good stereo recordings from the air will know what to do—or what to ask his dealer to do for him.

It was this matter which persuaded us to write this month about the subject of standards. In the above paragraph we mention the bias/erase frequency as being anything from 40 Kc/s to 100 Kc/s in an average selection of domestic tape recorders. This in itself is of no consequence, and if one manufacturer happens to choose a frequency of, say, 50 Kc/s, his product will not be appreciably different, as a result, from the product of the next manufacturer who may happen to have decided to fix his bias frequency at 80 Kc/s. But there is perhaps something significant in the apparent slap-happy, help-yourself attitude, because it is symptomatic of a lot of other apparently standardless procedure which prevails. For good example, take recording characteristics. We know that in America tape records are recorded to the NARTB formula, and that in England and the rest of Europe the CCIR basis is adhered to—in general. This is all perfectly sound—up to a point—when the tape records are made by efficient companies, employing recording apparatus built to these standards. But if good professional equipment is not used, then there is no guarantee at all that the CCIR standard has been achieved, despite the fact that the box and the sales literature says so.

At the moment—so we hear, and so we think we discovered quite by accident—tapes are now being recorded in Europe (7½ i/s tapes, that is) to a new standard which has been talked about for some time. The idea behind the proposed change was to build replay circuitry into tape recorders which would produce almost identical results from American (NARTB) and European (CCIR) recorded tape records. It is a good idea. As those who have played American tapes will know, they sound appreciably "brighter" than English tapes when played on English equipment. Similarly, American users would find English tapes " duller " in sound, in comparison with US tapes, when played on their recorders. The " loss " in either direction, by choosing a middle road characteristic, would not be detectable by normal ears, but the gain in uniformity would be considerable. Fair enough, but why not have a standard and stick to it?

Standards are important in any form of manufacture. The world of audio demands very precise standards. If even minimum standards were fixed for tape recorders—mechanical and electronic—standards to which everyone could at least begin to work, something progressive would surely result. It is not our job to lay down the law. Let the manufacturers get together with the proper Body and sort things out. But, for the sake of two examples, would it be a bad thing to state a maximum temperature that a recorder should reach, lid open, after so many minutes? Would it not be a good thing to know that brakes should stop tape within so many inches?

SUBSCRIPTION RATES

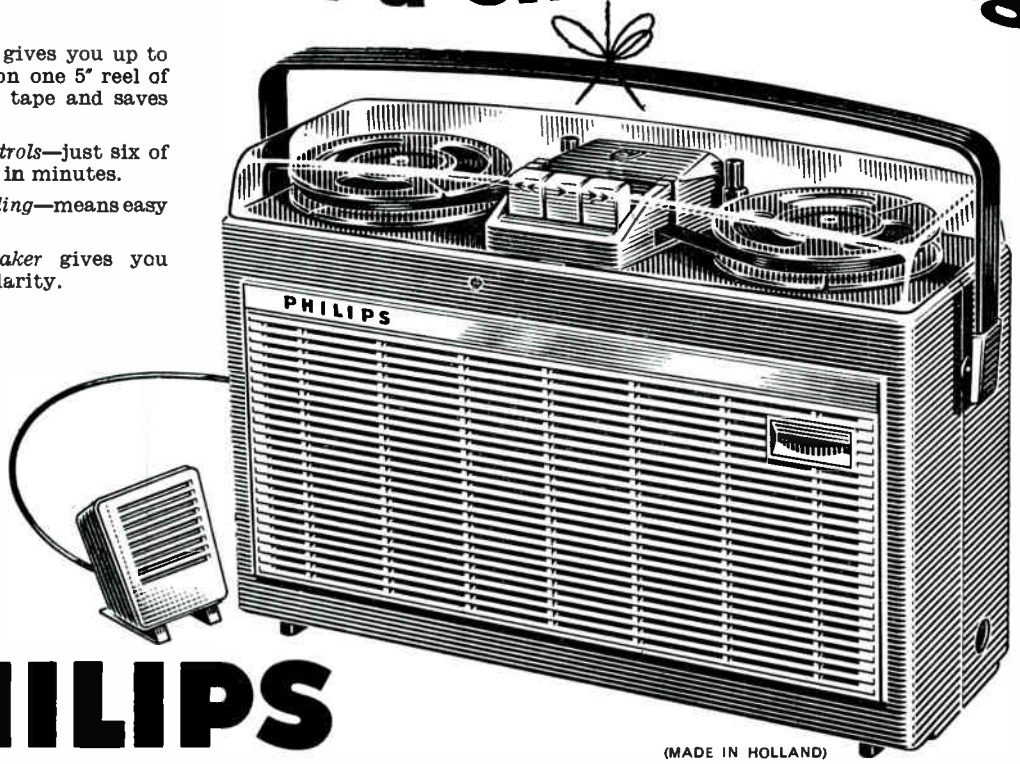
The subscription rate to *The Tape Recorder* is 27/6 per annum (U.S.A. $4.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 30/- (U.S.A. $4.25). The same rates apply to *Hi-Fi News*.

AMAZING FOUR-TRACK
PHILIPS
STARMAKER
MAINS TAPE RECORDER GIVES YOU BIG-MACHINE PERFORMANCE FOR ONLY 27 GUINEAS!

You think you can't afford a top-quality tape recorder? Forgive us, but you're wrong. For just 27 guineas the fabulous Philips Starmaker gives you four-track operation, slim space-saving styling, easy error-proof controls plus an extra-big 6½" loudspeaker. And easy terms are always available. Have your dealer put Philips Starmaker through its glittering paces today.

big sound on a shoe-string

* *Four-track operation* gives you up to **4 HOURS'** recording on one 5" reel of DP tape—saves you tape and saves you cash.
* *Easy, error-proof controls*—just six of them—are mastered in minutes.
* *Slim, space-saving styling*—means easy standing anywhere.
* *Punchy 6½" loudspeaker* gives you extra sound, extra clarity.



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PHILIPS
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PHILIPS ELECTRICAL LTD · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON W.C.2
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NEWS FROM THE WORLD OF TAPE

EMI Equipment on Show at Audio Festival

AT this year's International Audio Festival and Fair to be held at the Hotel Russell, Russell Square, London, from April 18 to 21, the EMI Group of companies will display a full range of professional tape recorders, a new domestic stereo tape recorder with general purpose loudspeaker enclosures, professional loudspeakers and Emitape.

Among professional equipment being shown by EMI Electronics Ltd., will be a studio tape recorder type TR90. Variations of this machine have been supplied to almost all the broadcasting and TV organisations in the United Kingdom and many major networks abroad.

The equipment is in two parts; a mechanical unit and an amplifier unit. They are available in a form suitable for vertical mounting on standard 19 in. racks, or housed together in a console cabinet. In addition, there is available a fully stereophonic version which includes an additional unit containing a second channel, loudspeaker amplifier, power unit and control panel.

Although having the custom built quality of the big machine, tape recorder type RE321, which will also be shown, is a light, easy-to-handle portable machine, much favoured by roving reporters.

Other machines in the professional range to be shown will include the RE301 and TR52/2.

* * *

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M.S.S. MINI-VOICE LETTER

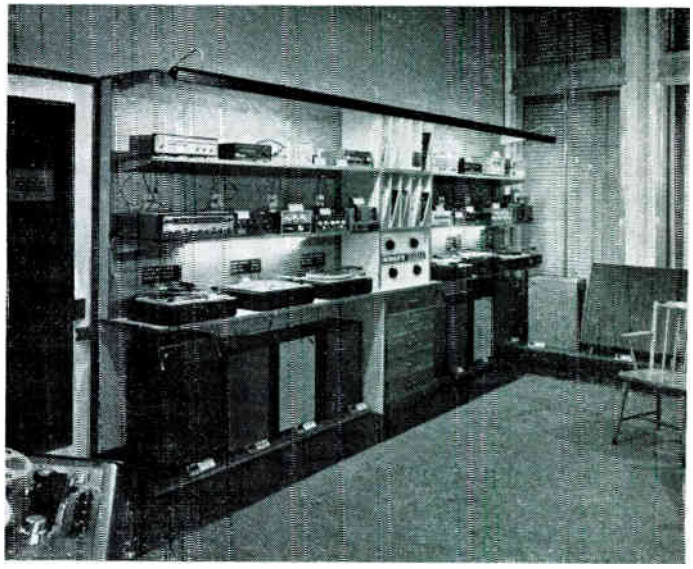
★

M.S.S. RECORDING CO. LTD. have introduced the Mini-Voice Letter. This is identical with the Voice Letter except that it gives ten minutes' playing time at 3¾ i/s instead of twenty minutes. These tapes have been produced specially for those people wishing to send tapes overseas. The cost of the Mini-Voice Letter complete in a box with two envelopes is 2s. 8d. **Manufacturers: M.S.S. Recording Co. Ltd., Poyle Trading Estate, Colnbrook, Slough, Bucks.**

* * *

Two Speeds for Truvox R62

TRUVOX LTD., announce that in response to public demand the R62 Tape Recorder selling at £40 19s. will in future be available with speeds of 7½ and 3¾ i/s.



News From Imhofs

IMHOFS have built yet another hi-fi listening room at their New Oxford Street store. This room has been acoustically treated and sound proofed to enable hi-fi equipment to be selected under the best possible conditions. Here one may sit in air-conditioned comfort in a room of similar size to an average living room and choose the hi-fi system to suit their individual requirements. Each of Imhofs hi-fi listening rooms is equipped with one of their mono/stereo comparators. These are instruments devised and made by Imhofs and are connected to every worthwhile player, tuner, amplifier and speaker so that thousands of alternative combinations may be compared at the click of a dial.

Another unique feature of their latest hi-fi listening room is a tape recorder comparator. As its name implies, this offers a similar facility with tape recorders and allows a number of high fidelity recorders, both mono and stereo, to be heard through the widest possible range of speakers—once again just by the click of a dial.

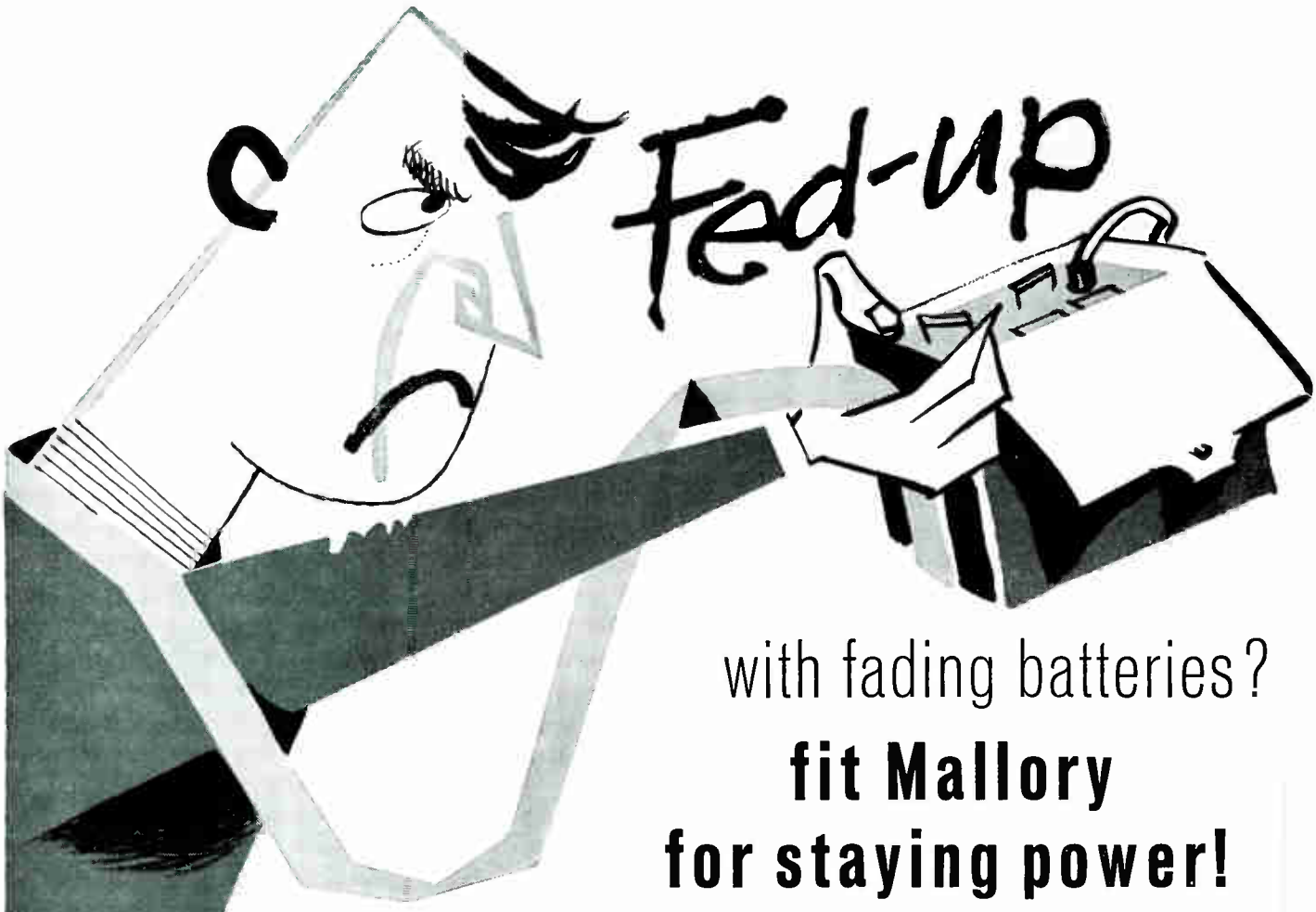
* * *

Construction System by Apton

A REVOLUTIONARY new idea, the Apton Construction System, means that whether the tape or hi-fi enthusiast is a handyman or not, he can design and quickly build strikingly attractive cabinets to house his equipment. The main component of the Apton Construction System is black, satin-finished 1 in. x 1 in. steel angle which may be bought in lengths of up to eight feet.

What laymen find to be an impossible, or at best, a most difficult and tedious task—that of making firm and accurate corners—is dealt with in the system. By means of hidden corner-pieces, 2-way or 3-way, the lengths of angle lock together to form the sound framework of the unit to be built. Panelling and surfacing materials simply slide in or clip to the Apton angle. These materials do not form part of the system. This leaves the individual free to choose these items from the wide range of hardboards, panelling, plywoods, veneered and laminated materials.

With the system come hinges, sliding door tracks, adaptor strips to hold glass, shelf supports, castors and feet—all very easy to fit. The system is not sold in kit form. The individual buys only what he requires to build the unit he wants. All types of furniture can be made with Apton and in addition to the new "How to Build with Apton" booklet and other informatory literature available, Apton regularly issue design sheets giving assembly instructions for standard units. So far these include details of a room divider, a sideboard, trolley, coffee table, bench seating and a bar. Number Four in the series features a hi-fi cabinet. Further information can be obtained from the Manufacturers:—**Apton Ltd., 65 Maygrove Road, London, N.W.6.**



with fading batteries?

fit Mallory for staying power!

Mallory batteries are the most important development in dry cell systems for over eighty years. They are leakproof and fade-free. They give more power for more hours than conventional types — *without* the need for rest periods. And for the first time they enable the discerning portable recorder enthusiast to choose just the right battery for the job.

MALLORY MERCURY BATTERIES
pack power in small spaces for miniature recorders — give them the full hours of service obtained with larger machines.

MALLORY MANGANESE ALKALINE
in standard sizes give *at least* three times the power of conventional types in all battery operated recorders.

The unique properties of Mallory batteries ensure better performance throughout their extended life. Insist on Mallory to eliminate those troubles that occur when normal batteries tire.

MALLORY *for new ideas in batteries*

MALLORY BATTERIES LIMITED CRAWLEY SUSSEX *Crawley 26041*

RCA to Market Language Laboratory Equipment

RCA Great Britain Limited are to market, in the United Kingdom and the Republic of Ireland, the language laboratory equipment manufactured by Cedamel of Paris.

The Cedamel equipment, which is already installed in a number of educational establishments in this country, was developed in conjunction with the French education authorities at St. Cloud, and is in use at the University of Besancon. The equipment is well known to those teachers of modern languages who have been fortunate enough to attend one of the summer courses sponsored by the Ministry of Education in co-operation with the British Institute in Paris.

The basis of the Cedamel equipment is the student twin-track tape recorder, which was specially designed for language laboratory use with robustness, flexibility and ease of operation in mind. The control console and booths are attractively styled with simple layout of controls which can be mastered, by teacher or pupil, in a matter of minutes.

RCA Great Britain Limited, with a service organisation of some 70 field engineers, will survey, install and provide after-sales service from service depots located in Belfast, Birmingham, Cardiff, Dublin, Glasgow, London and Manchester and by service engineers strategically situated to provide country-wide coverage.

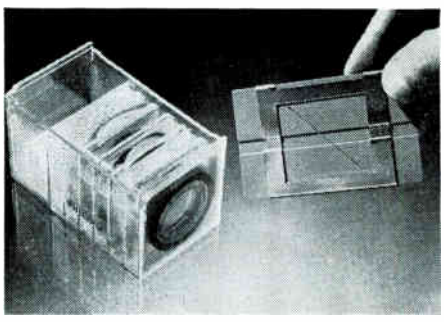
* * *

Dukane Sound/Slide Projector

A NEW, compact and simple to operate American sound slide film projector made its British debut quietly and unobtrusively in a classroom of one of Britain's newest Ten-Pin Bowling operating companies—Fairlanes Bowling Ltd.—last week. Every new Fairlanes £¼m. centre is to have one, and eleven centres are scheduled for 1963.

The equipment, a combination slide/strip projector-cum-record player, provides sound synchronisation for its visual component from 33⅓ r.p.m. 12 in. discs is revolutionary in terms of simplicity. There are five lessons in each of three categories, aimed at teaching would-be ten-pin bowlers, men, women and children, how to play the game. The equipment is made by the Dukane Corporation of St. Charles, Illinois.

* * *



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PHILIPS SPLICING KIT

★

PHILIPS have introduced two new products, a tape splicing kit and triple play tape. Selling at £1 3s., the kit, housed in a clear perspex box, contains reels of red, white, blue and green leader tape, a reel of switch foil for automatic tape stop and a reel of adhesive splicing tape in addition to a cutter and adhesive tape labels. The lid of the box forms the splicing jig.

The triple play tape, marketed in grey colour coded boxes is available in three sizes, 3, 4, and 5 in. The prices and lengths of tape are 3 in. 450 ft. £1 2s., 4 in. 900 ft. £1 19s., 5 in. 1,800 ft. £3 6s. **Manufacturers: Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.**

EMI Tape Recorders for Tannoy's New Studio

A NEW sound studio for additional dubbing and transcribing of tape recently opened in South East London, forming part of the many facilities available from Tannoy Products Ltd. The studio will be equipped with professional tape recorders supplied by EMI Electronics Ltd. Tape-recording equipment will include two twin-track stereophonic TR90 machines, four TR52s and four TR51s.

Increasing demand for verbatim reports of conferences and pre-recorded tapes is the reason for this additional development. A shorthand writer cannot record amusing incidents and applause, the very factors which symbolise the success of a conference.

Use of TR51 and TR52 tape recorders in conjunction with the twin track TR90s gives Tannoy a 16-channel copying system which can be split up, allowing the TR51s and TR52s to be employed for outside recording and the TR90s in the studio for major recording work. This would be impossible when using a conventional copying system, which would also be far more expensive.

Recording a conference enables the organisers to make copy tapes available to interested personnel who were unable to be present. Invited speakers who find it impossible to attend, can pre-record their speeches to be played back at the conference. Reports of conferences, once on tape, can be rushed to broadcasting companies or copied on to other tapes for delivery to delegates, as a permanent record of proceedings.

* * *

Tape Recorder Sales Figures

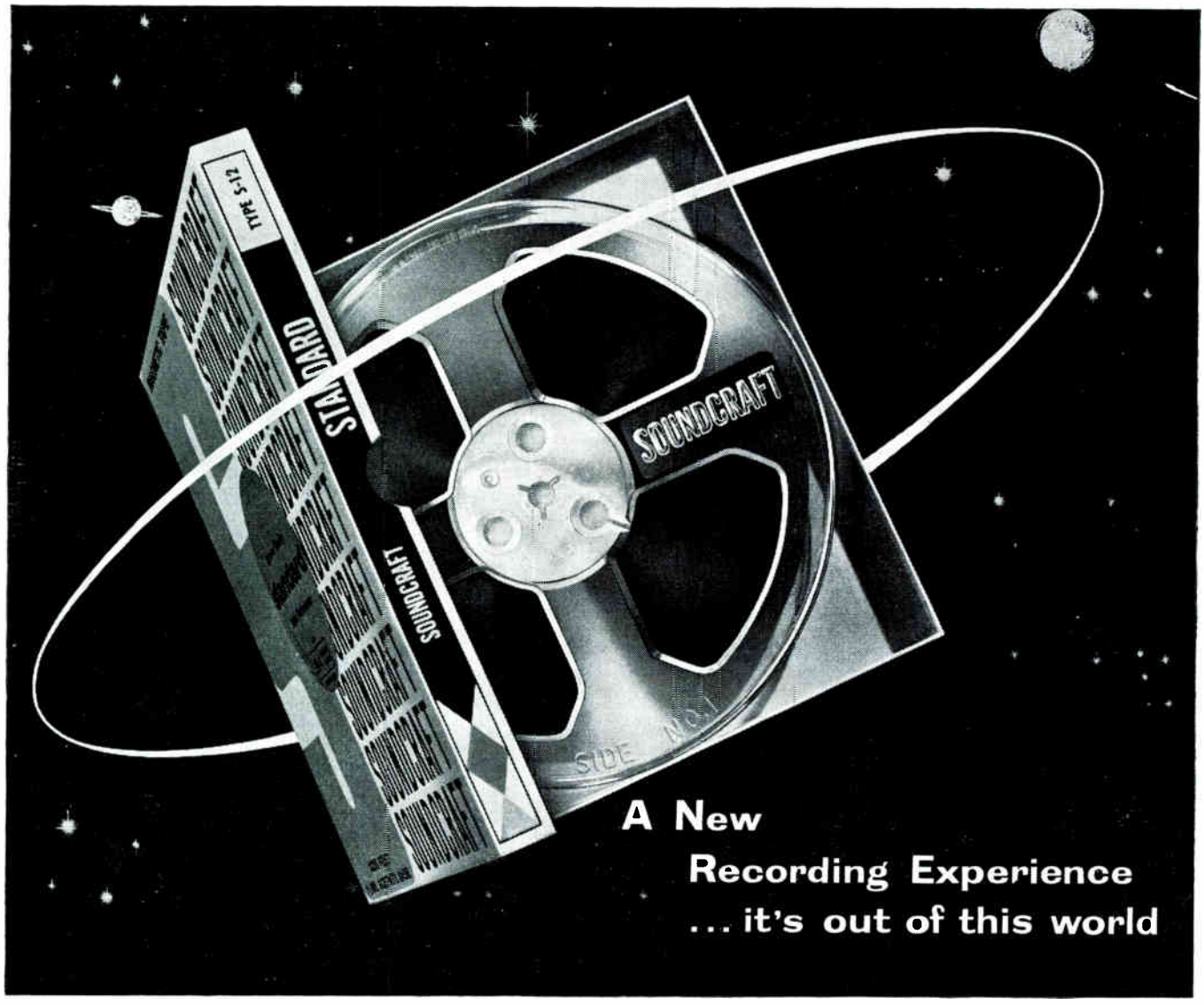
ANNOUNCING their latest sales index figures, covering the last four months of 1962. The Radio Traders' Retailing Association stated that there was a slight increase in the sales of tape recorders over September, October and November, but the most encouraging figures for some time came out for the month of December.

Month	Average Units Sold Per Shop 1962	1961
September	1.9	1.8
October	2.5	1.5
November	2.9	2.4
December	8.4	4.8

* * *

Tape Prices Altered

FROM February 1st, the price of a 4 in. reel of Philips Standard-play tape is 10s. 6d., a reduction of 3s., and a 5¾ in. reel of Philips Double-play tape costs £2 15s. 6d., an increase of 3s.



Soundcraft Tapes are so good that they were chosen by the United States Government for use in their weather satellites, Tyros I and II. Still transmitting back to earth, Tyros II is an ever present reminder of the quality and proved ability of Soundcraft Tape. Soundcraft, also, were awarded Hollywood's coveted Oscar for their work in magnetic oxides. Now, this side of the Atlantic, this superlative tape has been sought after by discerning enthusiasts. Already well known British Tape Recorder manufacturers such as **ELIZABETHAN** and **MAGNAVOX** use and recommend Soundcraft for their machines. To do justice to your recording skill your recorder needs the finest tape. Try New Soundcraft tape this week and know the new recording experience that's *out of this world!*

SOUNDCRAFT . . . the tape that speaks from space

On 3″, 5″, 5¾″ and 7″ 4 spoke reels on DuPont Mylar and Soundcraft tri-acetate. Coloured Mylar Leaders and Trailers. All packs colour coded with timing charts and cellophane sealed for protection.

SOUNDCRAFT MAGNETICS LTD., Haddenham, Bucks. Tel. Haddenham, (Bucks.) 384 & 422-6 (6 lines.) *Manufactured by Reeves Soundcraft Corporction, Connecticut, U.S.A.*

our readers write . . . . .

. . . about the Collaro Studio Deck

From:—N. J. E. Ellis, 61 Greencourt Road, Petts Wood, Orpington, Kent.

Dear Sir:—I was very interested to read of the difficulty experienced by Mr. N. C. B. of Harrow with flutter on his Collaro Studio Deck when the feed spool is nearly empty. I have two of these excellent decks; one was bought shortly after their introduction and the other is a recent acquisition, but both have suffered from this trouble.

I think that the difficulty arises from the fact that although the rotational force exerted by the feed and take-up motors during playing is constant, the actual tension on the tape varies inversely to the effective radius of the spooled tape, so that the tension at the centre of a 3 in. spool, where the radius may be only three-quarters of an inch, is more than four times as great as that at the beginning of a 7 in. spool, where the radius is nearly 3½ in.

For the same reason the speed of rotation of the spools, at any given tape speed, may vary by this same ratio of over four to one. Since the tape speed itself can be varied on this deck by a ratio of four to one, it follows that the full range of speed of spool rotation covers a ratio of over 16 to 1. In these circumstances I think it must be accepted that the feed and take-up tensions, as set by the 2,000 or 2,500 ohm resistor, must be a compromise, and no doubt represents the results of Messrs. Collaro's experience as giving the best results in general, and as avoiding any risk of tape spillage at 7½ i/s.

If Mr. N.C.B. normally uses a speed of 3¾ i/s or 1⅞ i/s it may well be that his tape tension is too high for best results, and he may find the following simple modification of help. The present 2,000 or 2,500 ohm resistor should be removed and in its place fitted a 2,000 ohm 0.1 amp mains dropper resistor of the type which is normally supplied with two movable tapping clips. The outer ends of this resistor should be taken to the black and white wires as at present, one tapping clip should be removed, and to the other should be soldered a wire of a new colour, say brown. This brown wire may be taken to the spare position on the terminal block, and from there a further brown wire should be run to the switch. At the switch the white wire, at present connected to contacts on the start and fast wind wafers, should be wired to the contact on the latter only, and the brown wire connected to the now vacant contact on the start wafer.

As a result of this modification the part of the resistor which is in shunt with the feed motor can be varied, the rest of the resistor being in series with both motors. If the tapping is right at the end of the resistor where the white wire is connected, conditions will be as they were before the modification was carried out. As the tapping is moved from this point the tension of both motors is reduced, but that of the feed motor to a greater extent than that of the take-up motor until, when the tapping is at the other end of the resistor, the feed motor is shorted out, and exerts no tension at all, while the take-up motor has the whole 2,000 ohms in series with it.

I have carried out this modification on both my decks with every satisfaction and find that with tapping clip about half-way along the resistor there seems to be no trace of the flutter referred to. At this setting the tension on the feed spool is so small as hardly to be able to turn it against the resistance of the counter. The price paid is some slowness in take-up at 7½ i/s, but I have not experienced any difficulty through this. With regard to the heating of the motors I can only say that it is normal for these motors to run hot, but provided sufficient ventilation is allowed this should not cause any trouble and is allowed for in design. *Yours faithfully.*

* * *

. . . about two and four track again

From:—C. Braddock, The Tape Recorder Centre (Blackpool), 266 Waterloo Road, Blackpool, Lancs.

Dear Sir:—Being an avid reader of all publications on tape, etc., I read your magazine and the other excellent publication *Hi-Fi News* with great interest and I might add sometimes getting hot under the collar with some of the opinions of "So called Hi-Fi people" such is the case of Mr. Ferguson of Eastbourne, Sussex, in the September *Tape Recorder*.

I have little time to reply to the many letters I consider need answering, but in this case I must reply and trust that it may be published. If Mr. Ferguson considers that Hi-Fi reproduction is limited by the use of 4 track I would like to ask, exactly how much experience he has of excellent 4-track machines, genuine experience and not the "Round Robin" of certain "Hi-Fi" enthusiasts who decry all but what they consider, or have been told themselves, about 4 track. He mentions that he is building a 2-track stereo machine and "Would not consider 4 track" again I ask what experience has he of 4 track?

There are many people today enjoying 4-track recorders by firms of repute, i.e. *Tandberg, Revox*, to name in my humble opinion two of the finest machines available to the public today outside the professional field. As is known and has been proved by Miniflux, the only disadvantage, all other things being equal, i.e. tape transport, tape, etc., of 4 track is the signal/noise ratio, which need only be −3 dB, or just audible on a *perfect* source signal, the latter of which is very rarely available, even with FM.

Also as is widely (although possibly not in Mr. Ferguson's case) known, 4-track stereo has certain advantages over two track, namely crosstalk figures, head alignment, etc., and whether Mr. Ferguson is concerned or not, a great saving in tape costs, when an extensive library is contemplated. I have access to any amount of tape at trade prices, being a retailer in the tape field, but still consider a saving of £2 10s. on each ten-inch spool of tape more than compensates for slightly higher noise level, on most recordings the difference is almost negligible. Tape costs must be a consideration.

Every single tape enthusiast has his opinion, or in many cases as is apparent, the next man's and unless he has wide experience of matters he is talking about, should in my opinion remain silent.

Should he require further proof of 4-track machines giving excellent results I would advise him to contact Messrs. Tandberg, Oslo, and Willie Studer (Revox) of Zurich, also many other people in the know, re 4-track working. It would be interesting to know just what ccts., type of heads, deck, etc., that Mr. Ferguson contemplated using for his "TWO track" but never 4-track stereo. Certain manufacturers of repute have also voiced this opinion, only to confound it later. *Yours faithfully.*

This correspondence is now closed (Editor).

Stuzzi Magnette Portable Recorder

TAPE RECORDER

No. 15 STUZZI MAGNETTE AND STEELMAN TRANSITAPE

IN response to several requests, this article deals with two of the battery models in popular use. There have been a number of queries about battery-operated, transistorised machines, and correspondence indicates that many readers have a mistaken idea that most of these are no better than the "novelties" the Editor spoke about last December. (*See Page* 475, *Vol.* 4, *No.* 11). Even the better-informed majority, well aware of the successful use of "roving recorders", have among them the mistrustful folk who consider transistors to be a "new-fangled mystery" and any battery-operated mechanism as a toy.

If this brings down a storm of protest about my ears, I shall probably deserve it, but confess I am unrepentant. Transistors are nowadays quite dependable, and, in the simple, associated circuitry, capable of doing all that the designer of a portable tape recorder needs. Witness the current trend of Philips machines, whose recent mains-driven models are also fully transistorised.

As for decks; it must be obvious, even to those of us who only have time to read the reviews, that modern machines have less and less "ironmongery". The fully-portable machine can be made adequate for its purpose—which is generally a recording-plus-monitor function, with replay through a more ambitious amplifier and loudspeaker system. There are, admittedly, a number of cheap and rather nasty "portables" about. But the two models to be described have stood the test of time and certainly do not come into that sad category.

Stuzzi Magnette

This is a two-speed, two motor machine, push-button operated, with several special features that merit our attention. Chief among these is the drive system. The relevant circuit is shown

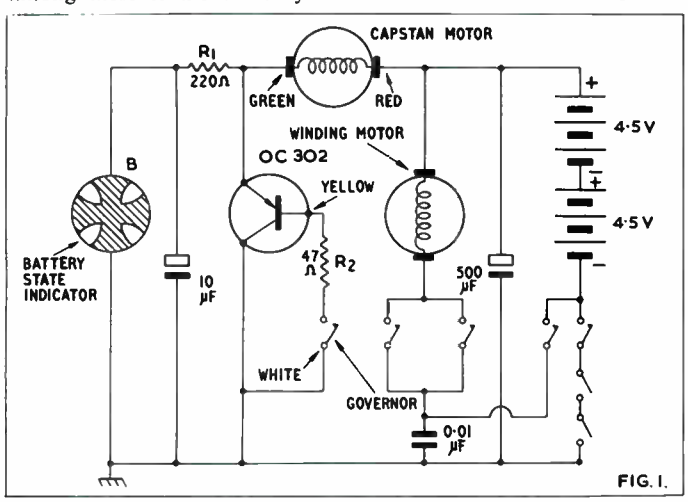


FIG. 1.

in **fig. 1**. Note the two 4.5 volt batteries in series, supplying the motors with 9 volts. The amplifier has a separate power supply, also 9 volts.

A battery state indicator, a simple electro-magnetic device which rotates partially when the voltage applied to the capstan motor is greater than 5 volts, has a series resistor, R_1 in **fig. 1**. If this resistor is correct, there should be a flutter of the indicator at this voltage, and a white series of segments showing steadily for 6 volts or more. The resistor is on the motor board, and should be checked first, if voltages are correct—it may be necessary to reduce this component, from the 330 ohms of most of the later models down to about 220 ohms, or even lower. But beware of increasing motor noise if this reduction is carried too far.

The motor current should be between 30 and 50 mA. If it is greater, check first that there is not an untrue transport drive. The motor is suspended in a cradle, tensioned by two springs which are attached to anchor tags. The pressure of the pulley of the motor against the flywheel should be from 40 to 45 grams when the speed selector is at $3\frac{3}{4}$ i/s. This pressure can be adjusted by movement of the anchor tags or, if necessary, small

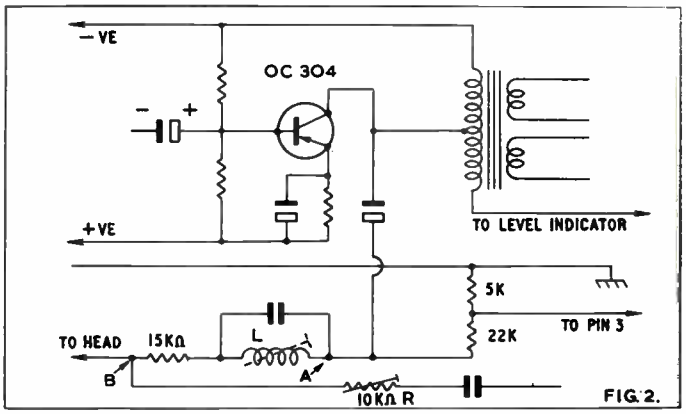


FIG. 2.

alterations to the springs. But ensure that the capstan spindle is true, i.e., at right angles to the front plate, before deciding the motor needs altering. The flywheel cradle has shim washers beneath its three fixing screws. When checking these points, take care not to disturb the self-aligning bearing.

Test Methodically

From the above, it is evident that tests on the machine should be carried out methodically. As has been stated before in these articles, hit-or-miss servicing only leads to greater complications. Sorry to have to reiterate this; but my postbag makes it clear that very often a machine gets the blame for what may have been a minor fault before the attempts at "repair" began!

However, to resume. If the foregoing points are checked, and in order, yet current consumption remains high, or the battery state indicator functions erratically even with good batteries, see that the speed change cradle swivel is springing into place. There is a pulley with a step at the right-hand end of the motor (viewed from beneath), which engages the flywheel lower rim as the motor is moved bodily, its suspension bar riding in the crescent cut-out of the mounting bracket. Action should be quite positive, aided by the springs.

Fine speed regulation is possible by alteration of the regulator screw. A hole in the motor cover reveals a grub-screw which is a setting for the centrifugal regulator. A 45-degree turn clockwise gives approximately a 2 per cent. increase in speed. To check, run through a 375 in. marked length of tape, which should take 100 seconds to traverse, with a plus-or-minus two second tolerance.

When all these things have been checked, the motor current should lie between the limits stated. If it exceeds 55 mA, very likely the motor itself is at fault. Usually, this is evident by a marked increase in motor noise. But there are several

SERVICE

By H. W. HELLYER

modifications that can be made to reduce this annoyance (prevalent on some earlier machines).

Referring again to fig. 1, we see that the special transistor which is part of the motor drive circuit has a resistor R2 between the base connection and the regulator switch. This is a useful addition if your model is without it. Check also that the common earthing is adequate. Earth the regulator cover separately with a length of soldered braid to the nearest point—say the screw holding the front spring on the motor board. Try short-circuiting the noise-cancelling coil and putting a 0.01 microfarad capacitor between the nearest of the lugs and the black lead of the motor wires where it passes under its clip.

Reducing Motor Noise

To reduce motor noise still more, try re-wiring the motor in the following way. First, unsolder the wires from the tag board, leaving them attached to the motor end and taking care not to disturb the lugs. Take away the springs, the front pivot screw and the lifting lever (fitted to later models only) and remove the motor, take it from its outer sleeve, untwist the wires and straighten them. Then, bind the wires to the motor housing at a point near the tags and lay two inches of braid along the housing opposite the screw that holds the governor cover, binding this tightly so that on reassembly, the fixing screw can pierce the braid and make a better earth. Lay the wires in a convergent form so that, without crossing, they emerge together from the other end of the motor housing in their correct sequence (green, white, red, yellow). Bind them securely and reassemble the motor in the sleeve. Next, twist the wires carefully into a plait so that yellow and green are together, red laid over them and white over all three, and refit the screw in the regulator cover. We now have a motor assembly with a twisted length of four cables and a piece of braid emerging at the one end. Reassemble the motor, setting it to the slower speed position, and solder the end of the braid to the tag that carries the front spring.

When resoldering the wires to the tags on the board, measure off the shortest length that will allow a connection without their fouling the flywheel. The colour sequence is: White No. 1. Yellow No. 3, Green No. 4. Red No. 6.

The action of the winding motor is quite obvious, but it should be noted that the fast wind (4 minutes for a three-inch

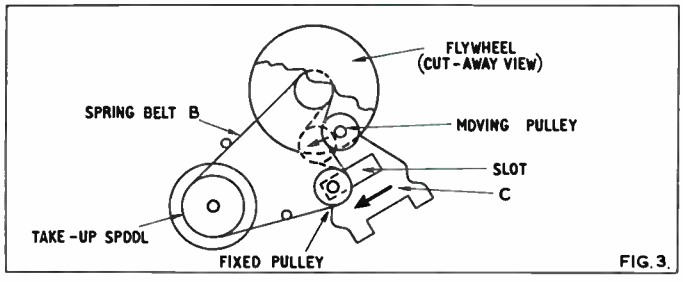


FIG. 3.

spool) depends on the driving axle at each end of the motor engaging its appropriate rubber ring beneath the spool carriers. These axles should be equidistant from the rubbers, and a little judicious bending of the brackets to which the springs are attached may be needed. But note that there is an axial play of 0.08 in. of the Rewind motor, which is quite normal.

Brakes are held "on" by spring tension, being simple rubber pads on a transverse bar. Action of the central control bar holds

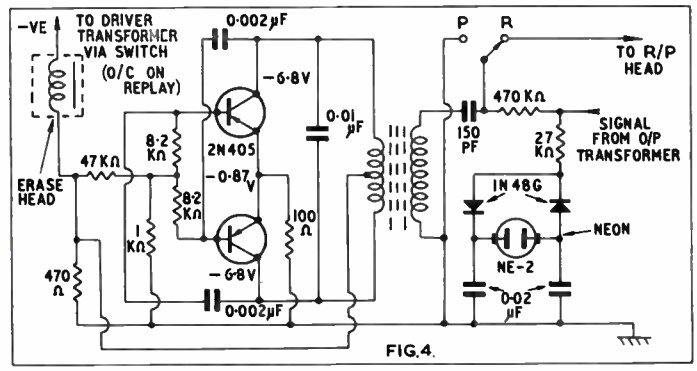


FIG. 4.

them off. Braking is only tight when the Stop button is pressed firmly down.

The pressure roller has an adjustment through an elongated slot, at the axle, and a separate lever is used for the engagement of the pressure pad, with a dual-spring tension that should be checked. The longer of the two springs is fitted to a screw in front of the pressure bar, seating in an elongated slot, allowing a small variation of tension. The pause rod, in an angle-piece adjacent to the take-up wheel and close to the front plate, should lift off from tape pressure no more than a 0.04 in. clearance when the Pause control is operated.

Head adjustment is three-screw, but final setting should be by the rear right screw. The top of the gap shows 0.004 in. above the edge of the tape.

Adjustments

Adjustment should be made while replaying a test tone—4 Kc/s at the 3¾ i/s speed is suggested—and the output can be measured by application of a valve-voltmeter to the yellow and black plugs of the transcription socket, pins 2 and 3. **Fig. 2** shows the output and head circuits with two important test points. The oscillator has a bias suppressor coil, *L*, with an adjustable iron core. Taking a measurement at the same pins. 2 and 3, noted above, with the machine at Record, this core should be adjusted for not more than 80 mV output. Bias voltage can be adjusted by the 10,000 ohm preset resistor *R* so that between 27 and 30 volts is registered at point *B*. A check can be made for final setting, measuring 0.32 volts maximum at the oscillator end of the suppressor coil, point *A*. This gives an erase voltage of 20 to 25 volts—but variations have been noted because of the use of differing heads in later production runs.

If the magic eye fails to light on Record, and a whistling noise is noted on the recording, check the connections of the erase coil, particularly the fine lead-out wires. This fault, accompanied by distortion and weak volume, may also result from a battery with high internal resistance. A general word of warning here—always check battery voltage under working load conditions, and test the current consumption as various functions of the tape recorder are switched in. Check for poor battery terminal connections, corrosion, weak spring contacts, faulty soldering, and finally, in this particular machine, try the inter-stage coupling capacitors. These are miniature electrolytics, 10 microfarad at first and third stages and 25 microfarad to the second stage. The prime suspect for weakness and distortion is the coupling between second and third stages.

If the magic eye lights, but normal recording level does not produce good indication, check that the preset adjustment is correctly set. This should give a two-thirds "length" of light line when a 1 Kc/s signal is fed to pins 1 and 2 (green and black plugs) to give an output of 0.45 v across pins 2 and 3. Under these conditions, the full line shows with the volume control at minimum and the line should disappear entirely when a 0.6 v output is registered.

A modification to adjust the response can be made by altering the value of the 120 ohm resistor labelled *RH*, which is part of the equalisation circuit. Reduce to 95 ohms to increase top-note response and increase to 160 ohms for improved "bottom". Note that the equalisation switch is operated by a rod on the motor casing worked by the speed-change control.

(*Continued on page* 62)

TAPE RECORDER SERVICE—(continued)

Steelman Transitape 2-7111

This is another two-speed machine, of compact design and robust construction. It should not be confused with a much earlier machine in the "Clarion" range which also went under the trade name of "*Transitape*". This one is of American origin, and has some interesting features that we have not met before in this series.

It is powered by thirteen mercury cells, giving an 8 v supply line for the amplifier and 9.4 v for the d.c. motor, which revolves at 3,100-3,300 r.p.m. and has a novel type of governor. This latter acts as a kind of "chopper" rapidly making and breaking the circuit and providing pulses which are stepped up by a transformer and used to light the neon indicator. This gives a "battery state" indication, but also serves to lengthen battery life, for as the power falls, the governor tends to stay closed, reducing consumption. It is worth noting that on some earlier models, the two sections of the battery were switched into series operation to give extra power during Rewind.

The mechanical functions are best explained by reference to **fig. 3.** The motor drives an intermediate wheel via a stepped pulley. This causes the flywheel *F* to rotate, but note that the actual position of engagement of the idler is at right angles to the lower face of the flywheel, and for the faster speed it is at a point one inch from the centre, moving out a quarter-inch for 1⅞ i/s selection. (On some models, a 15 ohms resistor was also shunted by speed switching.) The actual tension is adjustable, the mounting bracket being laterally sprung by three screws, and vertically by a single screw. But note that there must be a 15/32 in. clearance between the end of the motor pulley and the flywheel, to prevent slippage.

Fast Wind and Rewind

Take-up torque is provided by spring belt *B*, with two pulleys and a carrier bracket *C* giving correct tension. The diagram shows the Take-up position, during Record and Replay. For Rewind, the bracket moves outward, releasing the tension, and increasing it by inward movement, as indicated, during Fast Forward winding. A further belt drives the Rewind spool, by the action of another idler contacting the flywheel. This is aided by a yoke spring, released by a stud on the slide bar. The latter item is also used to control the brakes. The flywheel is separately braked on switching to fast wind and the spool brakes are applied between functions. This action is important, and the spring-leaf arms should be checked to ensure good release.

The pressure roller and pads are mounted on a long arm, held away from the heads in the disengaged position, and gravity is used to assist the dropping of a release rod, allowing this arm to lower for Record/Play action. It is thus important that the deck is used vertically, to allow free action of this assembly. The spring at the right-hand side should be checked and the pressure pad adjuster arm, held by a screw inside the main pressure bracket.

Of interest also is the oscillator circuit of this machine. This is illustrated in **fig. 4.** Note that, although bias is provided by a 25-30 Kc/s oscillator, with an adjustable core for fine frequency control, erase is not conventional. The collector current of the two 2N405 transistors is arranged to pass through the erase head, giving d.c. erase, and the negative line is open-circuited during playback. To counteract the effects of d.c. erase, a direct current is also passed through the R/P head, by taking one side of the high impedance winding (1,600 ohms) of the output transformer to the negative line instead of chassis during Record, returning it to chassis during replay by the rear contacts of the switch.

In the same circuit is the neon indicator, which is fed by a full-wave doubler arrangement, consisting of two diodes and two 0.02 mfd ceramic capacitors. This gives peak-to-peak voltages to fire the neon, and has least effect on the audio circuit.

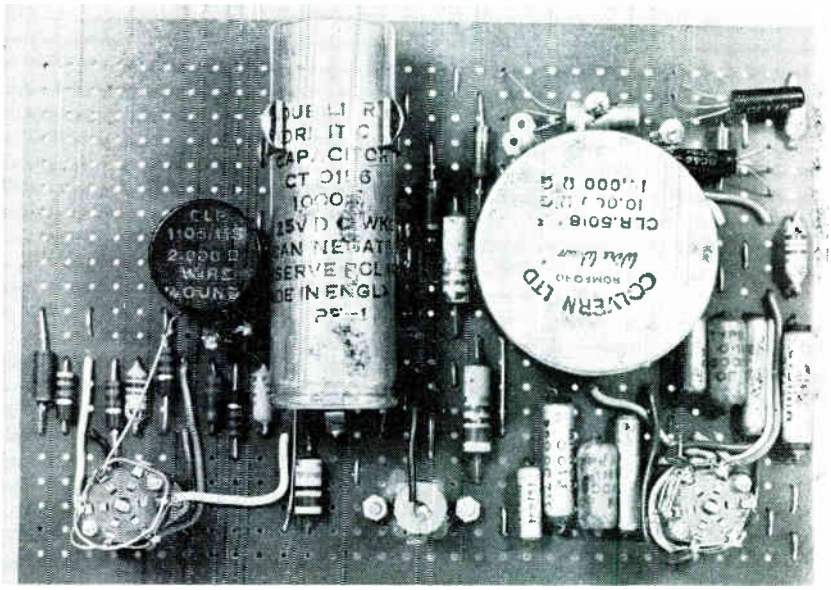
With its 100 mW output from the internal 4-inch loudspeaker, this machine is suitable for a monitor during replay, but facilities for connecting an external loudspeaker enable remarkably good replay response to be obtained.

By A. Bartlett Still

TAPE RECORDER WORKBENCH

No. 44 AUDIO OSCILLATOR

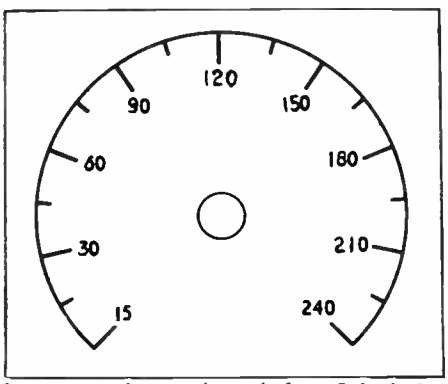
Part 2



LAST month I described and gave the circuit diagram of a transistorised Audio Oscillator that is primarily a Mullard design. With certain exceptions the components are not critical, it will probably be gathered, from my photograph, that my unit was made up largely from components that were readily to hand. It therefore follows that anybody interested in making such an oscillator for themselves need not be too concerned about getting exactly the component referred to in my list, except for the transistors and the thermistor; these, I feel, are critical to the circuit.

It is for pieces of equipment such as this that I personally feel "*Veroboard*" really comes into its own, and so I had no hesitation in choosing it for this piece of test gear. I have in fact used 6½ in. of the standard board 4¾ in. wide, and on this have room for a battery of the hearing aid type.

The layout of components is not critical, and since it will vary with, for instance, capacitors of different sizes, I think there would be little point in my specifying it too closely. Indeed, two of the frequency determining capacitors shown in the photo are 1 mfd 50 VDC electrolytics. If I were building a second unit I would use the larger type I have shown in the parts list. The reason? Electrolytics of this type have a capacity tolerance of −20% to +100%, which would imply that the average capacity is high. This I found to be the case, and I had to choose a pair from several capacitors before I had the correct frequency on the lowest range.



Tubular paper capacitors, on the other hand, are quoted as correct to ±20%, the average presumably being to the nominal capacity, and therefore more likely to give the right frequency range. Such capacitors will be considerably bigger, instead of about 3/16 in. dia. and ¼ in. long, they will be 1 in. dia. and 2¼ in. long. Some of this space can be recovered from the output capacitor. This should have a capacity of 1,000 mfd, and the one I used was 25V working. This measured 1 in. dia. and 3¼ in. long whereas the same capacity, but 12V working, can be obtained ¾ in. dia. and 1¾ in. long.

You may be wondering why such a large value of capacitor should be needed. It is in order that, with a low value of load impedance connected, the "time constant", (Capacity X Resistance). of the circuit shall be long enough to pass the low frequencies without attenuation. In a valve oscillator most circuits would be high impedance, capacitors are correspondingly small, and a cathode follower stage has to be added in order to have the low output impedance that is necessary. With transistors the circuit impedances are already relatively low, and so it is simpler to increase the capacitor value rather than add what would here have to be an emitter follower.

Looking at the photograph again, the three transistors are in the top right-hand corner, above the double-gang frequency setting potentiometer. Below this are the two sets of bridge capacitors and their selector switch. In the centre of the panel is the thermistor, in its glass bulb, and the output capacitor I have already referred to. Over on the left are the output attenuator resistors, together with a switch for the coarse setting and a small potentiometer for fine control.

My second illustration is of a calibration dial that may be readily drawn and is reasonably accurate, sufficiently so for non-professional purposes. Those who may be lucky enough to be able to calibrate against a suitable standard will be able to draw their own scale.

The following is a list of the components required, suitable types being indicated. It is, however, only where I have marked with an asterisk that some other type might give different results.

R1	1.5 Kohm Erie Type 16	C1	1,000 mfd 12V TCC type CE118B
R2	1.2 Kohm ,, ,, ,,	C2	1 mfd 350V TCC type CP91N
R3	100 ohm ,, ,, ,,	C3	0.1 mfd 200V TCC type CP36H
R4	6.8 Kohm ,, ,, ,,	C4	0.01 mfd 200V TCC type CP112H
R6	470 ohm ,, ,, ,,	C5	0.001 mfd 350V TCC type CP110N
R8	6.8 Kohm ,, ,, ,,	C6	As C2
R10	680 ohm ,, ,, ,,	C7	As C3
R12	680 ohm ,, ,, ,,	C8	As C4
R13	2.2 Kohm ,, ,, ,,	C9	As C5
R14	2.2 Kohm ,, ,, ,,	*TR1	transistor Mullard OC45
R15	2.2 Kohm ,, ,, ,,	*TR2	,, ,, OC140
R16	10 Kohm ,, ,, ,,	*TR3	,, ,, OC41
R17	1.8 Kohm ,, ,, ,,	Miniature wafer switches:—	
R18	3.3 Kohm ,, ,, ,,	1 off 2 pole 4 way.	
R19	5.2 Kohm ,, ,, ,,	1 off 2 pole 6 way.	
R20	4.7 Kohm ,, ,, ,,		
R21	2.2 Kohm ,, ,, ,,		

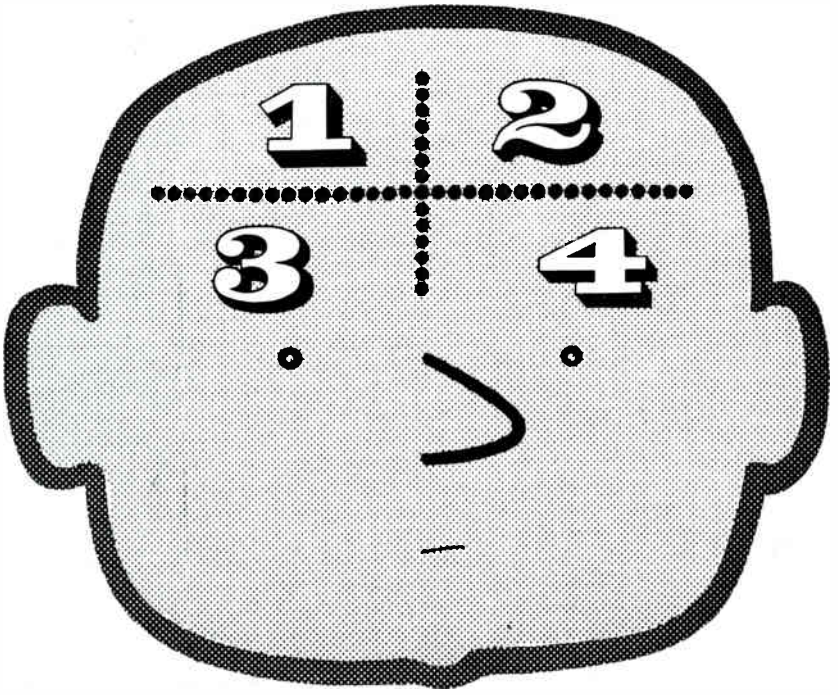
*R5 Thermistor STC type R53

*RV9 + RV11 Potentiometer 10 Kohm + 10 Kohm Colvern type CLR5018/18F Semilog A.

RV22 Potentiometer 2 Kohm Colvern type CLR1106/18F.

Just one final point about the wafer switches. The attenuator switch only needs to be single pole, 5-way, but by using a six position two pole switch, an "off" position can be added. The second pole, with all contacts but the "off" joined together, can be used to switch the battery.

Next month I shall be answering, to the best of my ability, some more readers' problems that may be of general interest.



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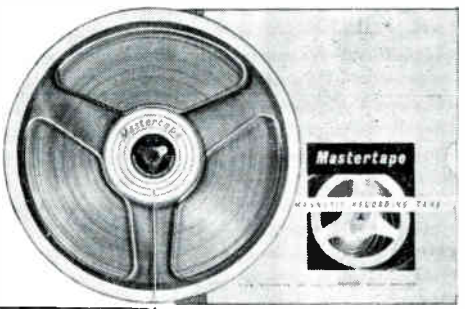

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PART TWO

CONSTRUCTIONAL DETAILS

By A. W. WAYNE*

COMMENCE by fitting the valve-holders, the octal socket, and SK3. To pins 6 and 7 on the octal socket solder two pairs of 22 g. solid covered wires, take one pair forward across the floor of the chassis, solder to pins 4 and 5 on V2 socket, and then wire the heaters of V1V3V4 from V2. V5 and V6 heaters are wired to the other pair, which is taken along the angle of the chassis at the rear. Solder 22 g. T.C. wire from pin 2 to the spigots and continue across to pins 7 and 8 on V2 and V3 valve-holders, and on V4 valve holder, should the output method of **fig. 2** be decided upon, solder, using covered or sleeved wire, pin 6 to pin 1, pin 8 to pin 3, and pins 2 and 7 to the spigot.

Next, solder R14 between pin 3 and pin 5 on the octal socket, as well as about 6 in. of the covered wire to pin 5, and 10 in. to pin 3, bringing the 10 in. wire along the rear apron of the chassis to SK3. Fit SK1 and SK2, the co-axial sockets, to the chassis, using 6BA screws and nuts and serrated washers, first placing under the two inner nuts soldering tags, to which, after the nuts have been thoroughly tightened, a bridge of 16 g. T.C. wire is soldered. This is the only earth point, and care must be taken to ensure really good contact with the chassis.

Fit Potentiometers and Jack Sockets

All chassis fixtures, such as pots, jack-sockets, inductors etc. should now be fitted, and the earth bus between the recording and replay amplifiers soldered into position, as shown in **fig. 6.** This, incidentally, is a composite of **fig. 1** and **fig. 2,** and is basically of the *Ferrograph* amplifier, but with **fig. 1** recording signal inputs. Translation of one circuit to the other will offer little difficulty.

The earth bus, in 18 g. T.C. wire, is run as follows. Join the spigots of V1V2 and V3V4 with lengths of the wire, and join V4 spigot to the soldering tag under SK2. Wire across earthy contacts of VR1VR2, and from VR2 continue the bus to the earthing tags on J1 and J2. At a convenient point between the sockets, wire the bus to the spigot of V2, and the earthy contact of VR1 to the spigot of V4.

Solder Components in Position

The recording amplifier group board is now made up, the layout as shown in **fig. 6** being as convenient as any; but before adding the components. thread 6BA × 1¼ in. screws through holes 1 and 9, securing them with nuts and lock-washers. For the home-constructor, it is easier to solder the components into their places on the board first, and then wire the coupling and cross connections under it, as by proceeding in this rather backwards way while following the circuit carefully, it is almost impossible to go wrong—we hope!

Note that C2 and C6 are below their complementary resistors, and that C11 is under the board. lying from tag 9 front to rear, and that tag 9 rear is connected to tag 8 front. A 10 in. length of covered 22 g. wire is soldered to tag 15 rear, this being the future h.t. supply line to R19 etc. (Care must be taken to ensure that this *is* soldered to tag 15 and not to some point earlier in the h.t. chain, as it is very easy to make a mistake here; and the result of such an error could be hum and L.F. instability in the replay pre-amplifier.) Solder a 6 in. piece of 20 g. covered wire to tag 13 rear, bend it forward under the board, and solder also a 6 in. length of 22 g. covered wire to tag 1 front and bring it rearwards and under; and then solder C7 between pins 2 and 9 on V2 holder, and C4 from pin 9 on V1 holder to the fixed live contact on J1.

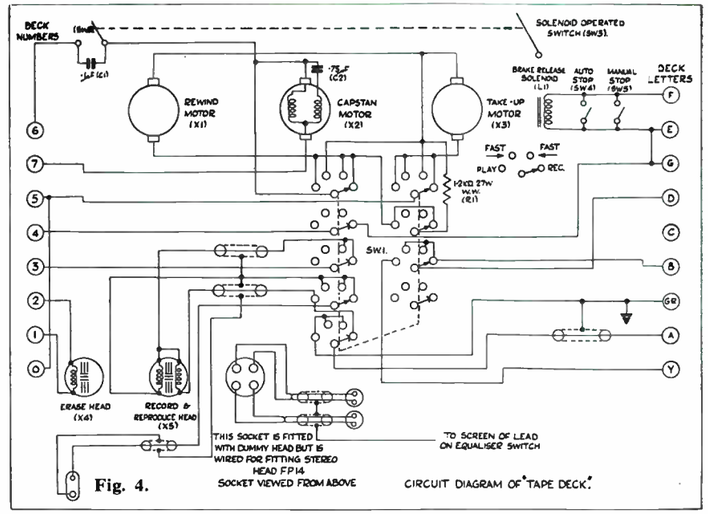

Fig. 4.

Group Board Sub-Assembly

Fix the group board into position on the chassis, using ¼ in. lengths of ⅛ in. i.d. copper or brass tube as spacers between board and deck, and wire the necessary connections between the board and V1 and V2 holders. These connections are quite clearly to be seen in **fig. 6,** as can also the connection between J1 and pin 9 V1 holder, and where the 20 g. wire is soldered to V1 holder spigot. It will be observed also that a covered wire comes from under the lip of the chassis to pin 1 on V2 holder, this being the connection between the slider of VR1 and the grid of V2A. It is in 20 g. wire covered in appropriate sleeving, and is brought up into the lip angle, finally being sharply bent down to the pin. 20 g. wire is chosen for rigidity. The movable live tag on J2 is connected directly across to the top contact on VR1.

Join one of the terminations of L1 to the junction of R10R11, leaving the other termination free for the time being, and solder the wire attached to pin 5 on the octal socket to tag 10 rear on the board. Thread a 4 way power harness through the hole adjacent to the socket, and connect to the pins as follows: l.t. to 6 and 7, h.t. to 3, earth to pin 4; and solder a wire from pin 1 to the nearest convenient chassis point. Solder C3C5 into place, the common earth going to group-board tag 18 rear, and the two live leads to tag 11 and 14 rear. Fix a piece of tag-strip—TS1 in **fig. 6**—in a convenient place, solder C8 from a tag to pin 5 on the octal socket, and the free termination of L1 to the free end of C8. Fix L2 into its place, solder C12 across the live tags, join tag 9 rear to one tag, and pin 2 on the socket to the other.

Oscillator and Meter Box

The oscillator and meter box follow, and hardly warrant detailed instructions. However, one or two hints may not be out of place. Start by making the cross-connections on V5 holder according to **fig. 1,** and then solder the wire from the junction of R3OR31 to pin 8. Fix a piece of tag-strip—TS2 in **fig. 6**—to the chassis, mount R39 on it, and then join one end of this resistor to the free end of R30. From this junction take a lead to tag 1 on SK3, and wire in all the relevant components as indicated in **fig. 6,** taking all earthing terminations to tag 2 on SK3. Make up a 12 in. twisted pair of 22 g. covered wires, join one to the free end of R39, and the other to pin 6 on V5 holder. Pass the pair up through the chassis deck for later connection to the meter, having first provided means of identification as to which wire is what; and then solder a 6 in. length of 20 g. wire to tag 2 on SK3, bringing it out to the left as seen from the underside of the chassis.

Make up a screen of aluminium or tin-plate strip 1¾ in. wide by 6 in. long, bent 1¼ in. from one end to form two sides of a rectangle as in Fig. 6 lower left-hand section. Small pieces of angle—Meccano brackets are ideal—should be screwed to the longer side of the screen so as to provide means of fixing it to the chassis, although, on the commercial amplifier, this is done by the bending of integral lips; but it seems hardly worth while to take this trouble for a one-off. About ⅛ in. below the edge of the screen remote from the fixing clips fix a piece of tag-strip—TS3 in **fig. 6**—extending the full width of the longer side, 12 tags, including anchorage points, being about correct, and on this mount the components as shown. Put the screen aside for the time being, and wire R20, C15, C14, R17, R33, R24, R23, R25, C21, etc., into place, noting that C22, R27, R28, R9, C23, C24 do not show in the illustration.

Fixing the Screen

Offer up the screen to the chassis, and strike off with a scriber the fixing holes as well as a line showing where it will finally lie. Now, bring the 20 g. wire from pin 2 SK3 along and around the line to SK1 and firmly solder it to the tag. If the amplifier is for the *Ferrograph* deck, punch a 1¼ in. hole as indicated, mount the 977 transformer *above* the chassis but with the tags projecting in through the hole, join green and blue tags together and to SK1 solder tag, join the tip of SK1 to the white tag, solder R16 between the red tag and pin 9 on V3 holder, R17 across pins 9 and 2 on this, and R15 between the red and blue tags on the transformer. For decks other than *Ferrograph*, solder R15 between the tip of SK1 and earth, and join R16 from between the tip of the socket and pin 9 of V3 holder.

Fix the screen into position, first ensuring that C16 and R21 are on TS3, underneath R18 and R19, and complete the wiring of the replay box, the 12 in. covered wire from the *record* group-board going to the junction R18R19. If the output circuit of **fig. 2** be used, run the connection between the slider of VR2 in the angle of the lip of the chassis, bringing it down sharply to SK2. For rigidity, it is of 20 g. or 18 g. covered wire, and is the rather fat-looking lead to be seen in **fig. 6** lying across RACA. (The cathode-follower circuit of **fig. 1** is rather easier to arrange, in spite of the extra components.) Finally R34 and R35 are soldered across L4 secondary tags, the drive to the grid of V6 being taken from their junction.

Front Panel Construction

The front panel can now be made up and fixed to the chassis by means of the jack-socket and control nuts; but it is best to mount the meter and switches on it first. The wiring to the panel is very simple, S1A leads being those in **fig. 7** passing by the side of V1 towards the rear of the chassis. S1B and S1C leads go directly down from the switch and along the chassis to a hole above the replay box. The pair of leads from TS2

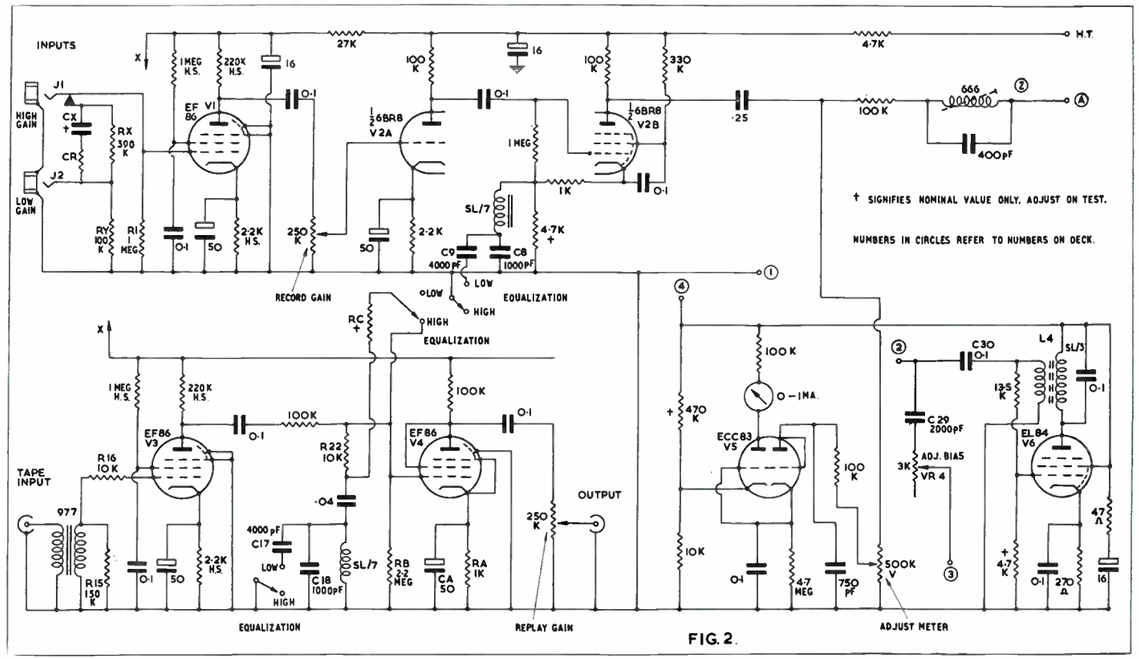

FIG. 2.

Fig. 2: *Circuit diagram and component values for use with the Ferrograph tape deck.*

*Shirley Laboratories Ltd.

(*Continued on page* 68)

BUILDING THE TW/PA4 TAPE AMPLIFIER — *Continued*

are connected with the lead from R39 to + on the meter, the other, going down to anode V5A, being connected to the – terminal.

Note that the absence of a "pause" position on S2 in fig. 8 is intentional, as the *Ferrograph* deck-switching already has the necessary disposition; and that the dashed line between SK1 and SK2 in fig. 7 indicates the position, under the chassis, of the earth link between the sockets. Before proceeding, see appendix.

Final Assembly and Checking

Setting up. It is assumed that a power supply with the necessary 6.3 v. c.t. @ 3 amps and 290-320 v. h.t. @ 50 m.a. is available. After final assembly of the amplifier, check the wiring carefully against the circuit diagram, shake out the odd bits of solder etc., and then, without inserting the valves, switch on and sniff around for smells of burning. If results are negative, switch off, insert valves, and connect SK2, via a co-axial cable, to the input of the main amplifier, which should be adjusted for full output for 1 v. *r.m.s.* in. Check that the valves light up and that h.t. appears at all anodes and screens, cover the replay box with an earthed screen—a piece of tin lid will do—and turn VR2 to maximum.

There should be only a faint "breathing" from the loudspeaker, and if hum is at all obtrusive, suspect (1) the position of the mains transformers and similar radiators in relation to the TW, and/or the h.t. feed to V3 and V4, tracing this to its remote termination. If transformers are not responsible, almost certainly this feed will have been connected to the junction R14C5 and not to R5C3, as, for some unaccountable reason, this first connection appears to exercise a Lorelei sort of fascination, and is almost invariably made by new operatives in the author's own works.

The replay characteristic can now be checked and set, the *E.M.I.* TBT1 tape being the most convenient standard. Connect a VTVM between the top contact of VR2 and earth, and switch it to its 1 volt range. Using band 1 on the tape, align the R/R head azimuth for maximum indication on the meter, not omitting checks on pad pressure and bearing. The next band is the 1,000 c/s reference level, and its reading must be carefully noted.

All the following frequency bands should show the same figure on the meter, but they probably will not, and the first consideration is to a possible peak around the 4,000 c/s–8,000 c/s region, which may reach as high as 10 dB. This peak, if present, will be due mainly to resonance between the inductance and self-capacitance of the head and/or transformer windings, as mentioned previously, and damping of the input, which may have to be quite savage, is the easiest cure. R15, at between 180K and 220K, is correct for most *Ferrograph* and *Bradmatic* decks, but the *Brenell* can need as low as 10K to eliminate its sometimes violent peak. The *Miniflux* head usually gets by with 100K, as does the *Marriot,* but nearly all heads, even if of identical make, vary one from the other, and all that can be done is to experiment. However, it is not necessary at this juncture to clear the peak entirely, as its height is modified to some extent by subsequent adjustments: but it must not be permitted to dominate the proceedings.

The response at the lower frequencies is the next check, and it should be within ± 1½ dB from 45 c/s to 1,000 c/s. The values for R22, RC and C9 are a reasonable commencing combination, but possibly will require to be varied to suit the head

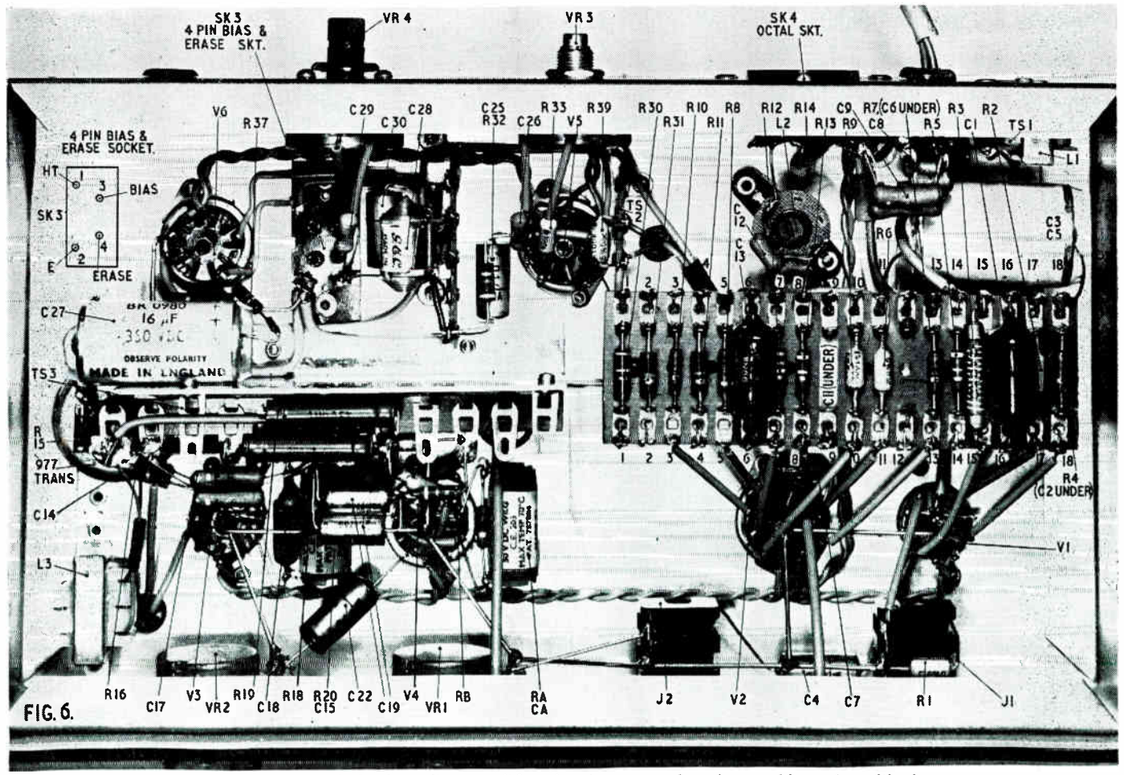

Fig. 6: *Layout of the recording amplifier showing group board assembly and positioning.*

Readers' Problems

★ Readers who encounter snags, or who run into trouble with their tape recording equipment, are invited to write to this editorial office for advice, marking the envelopes "Readers' Problems—Tape". Replies will either be sent direct by post, or published in this column if the subject is of general interest. However, we must emphasise that this advisory service cannot include requests for information about manufacturers' products when such information is obviously obtainable from the makers themselves. It is also essential to keep the queries reasonably short and to the point, and to limit them to one specific subject if at all possible. And, please, in no circumstances confuse such letters with references to other matters which have to be dealt with by other departments in our office.

High Impedance Ribbon Microphones

Dear Sir:—My recorder takes only a hi-Z microphone and when I use an extra long lead (screened, of course) the signal drops considerably. Is there anything I can do to increase the signal to a reasonable level, such as putting it through an amplifier of some kind? If so, could you give me details of a suitable amplifier?

My second problem also concerns microphones. At the moment I have two, one of which is a hi-Z ribbon type. The signal from this microphone is rather weak, even using a normal length cable. This microphone is a dual impedance model and, if I cannot amplify it, would I be better to get the low-Z cable and build a matching transformer?

Finally, how do you tell when your head needs demagnetising? I have the feeling that my recordings are not quite as clear as they once were and I wondered if this could be the trouble. I can borrow an "instant" bulk eraser to demagnetise the head but, if I do the job with the head in position, the erase head will also be demagnetised. Will this have any adverse effects?

Yours faithfully, **J.M., Glasgow.**

Unfortunately one always has to expect a certain amount of difficulty if connecting a high impedance ribbon microphone directly into a tape recorder. The signal level is not high, and hum and noise is likely to be picked up. If the signal can be amplified, as close to the microphone as possible, and then passed down the cable, results can often be considerably improved. If the microphone lead is to be extended this should certainly be done on the low impedance side of any matching device whether it be transformer, amplifier, or both.

The "Workbench" column for July 1962 gave a transistor-operated circuit which included an emitter follower stage and an amplifying stage. These could be used as microphone pre-amplifying devices, the output of the amplifier being connected to the high impedance input of the tape recorder through a condenser of about 0.1 mfd. A low impedance microphone should feed directly into the amplifier while a high impedance version would need the addition of the emitter follower stage. A battery supply of about 3 to 4½ volts would be suitable.

Finally, to answer your query about magnetised heads, these are normally indicated by an increase of background hiss. If your machine has permanent magnet erasing do not take a bulk eraser anywhere near it, but if the more usual type of erase head, fed from the bias oscillator, is used, you need have no fear.

* * *

A Tape Drive Problem

Dear Sir:—I have a Philips Model EL 3585 tape recorder and, after six months' satisfactory performance, I was annoyed to find that the motor was beginning to faulter. Every few seconds it would slow down and then speed up again; all moving parts are oiled according to instruction, and there is no noticeable wear on any parts. Several of my friends possessing similar machines have experienced the same inconsistency in speed. Could you offer any explanation for this fault, and suggest any means of correction?—*Yours faithfully,* **N.M.J., Cardiff.**

The problem of occasional slowing of the tape drive on the Philips EL 3585 can have several causes, most of them cured by slight adjustment. If you refer to my notes on this machine, which appeared on pages 203 and 204 of the June 1962 issue of this magazine, you will see details of these adjustments and a diagram, fig. 3, which helps explain the matter. (If you do not have a copy, I am sure the Back Numbers department will be able to assist you if you would care to drop them a line, including the cost plus return postage.)

In addition to the pressure wheel bracket adjustment, there is an important point that should be checked. The clutch drive wheel should make constant good contact to the flywheel, and a stop bracket which is adjacent to the drive spindle should have a clearance of about a half millimetre from the insert hub during Record/Play. This bracket will be recognised by the line of holes along its lower edge: a slight bend with the aid of a pair of electrician's pliers should do the trick.

Apart from this, and the adjustments mentioned formerly, there is the matter of motor regulation. Beneath the motor itself there is a bracket, with a grub screw setting for speed regulation. Make sure this it not loosened. Check also the spring that applies tension to the bracket on the side of the motor housing, providing regular pulley pressure to the flywheel.

* * *

Tape Slip

Dear Sir:—With reference to the article "Tape Recorder Service" in the December issue, I would be grateful if you would let me have your opinion on a modification I am thinking of carrying out to the deck of my Brenell Mk. V 'M' recorder.

I often use this machine with 5 in. reels at 15 i/s, and find in these conditions tape slip occurs at the beginning of the reel. This I have found is due to the take-up motor running at full power, and this produces too much torque with these small reels. There is no fault in the pinch wheel pressure. In theory it seems that it would be a simple matter to disconnect the 10 watt 500 ohm resistor from its connection to the speed change switch and connect it to a small toggle switch which could possibly be mounted in the left-hand corner of the deck adjacent to the rewind switch. The resistor could then be switched in and out of circuit independent of the speed change switch.

—Yours faithfully, **G.E.W., Ruddington.**

The problem you are experiencing, sluggish drive or excessive take-up on the 15 i/s position of the Brenell Mk. V 'M' tape recorder, when using 5 in. spools, is, as you correctly deduce, too much power to the right-hand motor. It is a problem we have had to face, even with the larger spools, at the commencement of a recording.

I have not actually tried your device of fitting a toggle switch to re-insert the 500 ohm resistor in series with the take-up motor but have simply disconnected the existing switch connection to leave the resistor in, and have found that there is still adequate take-up torque.

However, while you are undertaking a modification, it may be of some benefit to try alternative values of resistance in this position for 15 i/s. I would suggest a 250 ohm, 10 watt resistor in series with a 250 ohm 5 watt wire-wound potentiometer, adjusting the latter until a suitable value is found. These potentiometers are linear, and with careful mounting it may be possible thus to determine the angle of rotation and make a fairly accurate assessment of the resistance in circuit for overall even take-up.

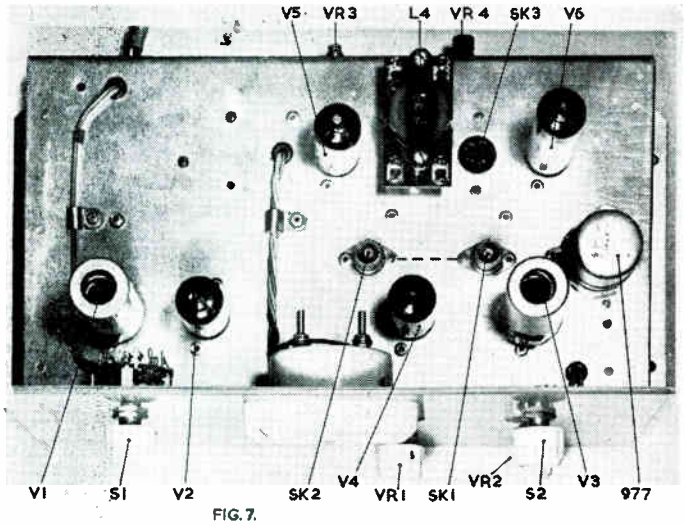

FIG. 7.

in use. As given, they are correct for the average *Ferrograph* head, but if 45 c/s–60 c/s is noticeably deficient, reduce the value of RC. The procedure here is to bring the response at 1,000 c/s down to that at 60 c/s, the lower frequencies representing the maximum gain available under the required conditions; and the TBT1 is most useful from this point of view, as the 40 c/s and 60 c/s bands follow immediately after the 1,000 c/s reference band. and shunting of the tape is reduced to the minimum.

Some juggling with C19 may be necessary, too, as is sometimes quite a lot of patience. For guidance, the *Brenell* heads will probably need 10K and 0.03 mfd. the Bradmatic 8.2K and 0.02 mfd, and the *Miniflux* 8.2K and 0.04 mfd. C.C.I.R. 100 μs recommendations notwithstanding. these are representative true figures for a level response from a standard test tape. and are the fruit of long experience and unimaginable exasperation. (For further reading on this important subject, it would be difficult to suggest anything better than Tutchings' interesting and informative article in the April 1962 issue of *The Tape Recorder*, where his exposition of the usual fallacies is masterly.)

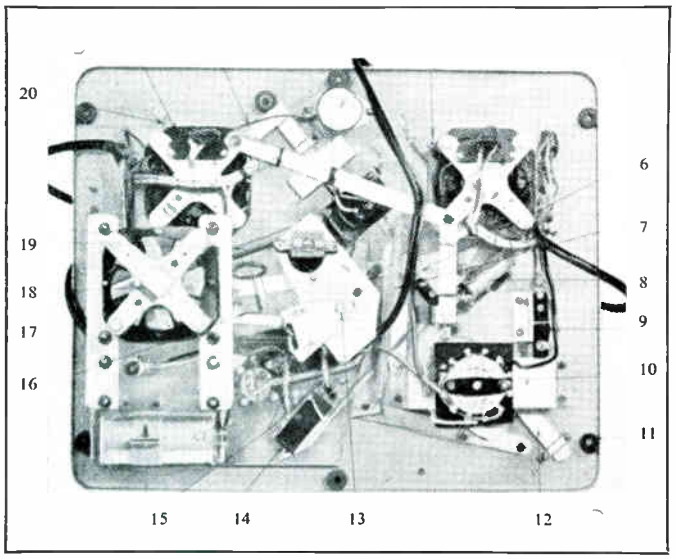

Fig. 3: *Underside of the Ferrograph 4S Deck, showing: 1. Take up motor. 2. Flexible drive cable. 3. Hold in solenoid. 4. Turns counter. 5. Rewind motor. 6 and 7. Holding springs. 8. Motor switch. 9. Manual stop switch. 10. Main selector switch. 11. Grommets. 12. Main starting bar. 13. Speed change and equaliser switch. 14. Auto stop switch. 15 Pressure arm springs. 16. Idler wheel carrier springs. 17. Idler wheels. 18. Capstan motor. 19. Hold in spring. 20. Brake springs. (Photograph, and* **Fig. 4** *on page 67 by courtesy of Wright and Weaire Ltd.)*

Components List

Resistors

R1	1 meg	
2	1 meg*	
3	220k*	
4	2.2k	
5	27k	
6	100k	
7	2.2k	
8	1 meg	
9	100k	
10	1k	
11	10k+	
12	330k	
13	100k	
14	4.7k + 2 watt	
15	10k +	
16	10k	
17	1 meg	
18	220k*	
19	1 meg*	
20	2.2k*	
21	100k	
22	10k	
23	2 meg	
24	10k	
25	2.2k	
26	220k	
27	1 meg	
28	1k 1 watt	
29	47k 1 watt	
30	470k +	
31	10k	
32	4.7 meg	
33	100k	
34	13.5k = 2 × 27k +	
35	4.7k +	
36	270Ω 2 watt	
37	47Ω	
38	22k	

* = hi-stab
\+ = adjust on test
All ½ watt except where stated

Capacitors

C1	.1 mfd
2	50 mfd 25 v.w.
3	16 mfd 350 v.w.*
4	.1 mfd
5	16 mfd 350 v.w.*
6	50 mfd 25 v.w.
7	.01 mfd
8	1000 pf
9	3000 pf
10	50 pf
11	.25 mfd
12	400-500 pf
13	.1 mfd
14	.1 mfd
15	50 mfd 25 v.w.
16	.1 mfd
17	3000 pf
18	1000 pf
19	.04 mfd +
20	.1 mfd
21	50 mfd 25 v.w.
22	.1 mfd
23	4 mfd
24	.01 mfd
25	.1 mfd
26	750 pf
27	16 mfd 350 v.w.
28	10,000 pf
29	1,000 pf
30	.01 mfd

* = composite unit
\+ = adjust on test
All paper conds 400 v.w.
All pfs. 10% or better

1	EF86 Mullard
2	6BR8 Brimar
3	EF86 Mullard
4	ECC83 Mullard (see text)
5	ECC83 Mullard
6	EL84 Mullard

Sundries

SK1, SK2	Belling-Lee co-axial
SK3	Carr-Fastner or similar
S1 3 p 2 way	A.B. Metals
L1 and L3	Shirley Labs. type SL/7
L2	W. & W. type 666
L4	W. & W. type 726
M1	Shirley type 9, Sifam type M
J1, J2	Igranic P72
Chassis and Front Panel	Shirley Laboratories Ltd.
Valve-holders	McMurdo
VR1 250k log A.B. Metals	
VR2 250k log A.B. Metals	
VR3 500k lin. A.B. Metals	
VR4 30k w.w. pre-set A.B. Metals	(But see text and Fig. 2).

Where to get the parts

Most of the parts are obtainable from the majority of dealers, but following on the experiences in regard to the large number of enquiries regarding kits for the TWA 1515D amplifier, *Shirley Laboratories* have made arrangements with the following suppliers, who are prepared to stock either full kits or individual items. They are:

(1) **The Wayne Acoustic Laboratories,** 7 Longfellow Road, Worthing, Sussex.

(2) **Home Radio Ltd.,** 187 London Road. Mitcham. Surrey.

(3) **The Photo Centre,** Keymer Parade, Burgess Hill. Sussex.

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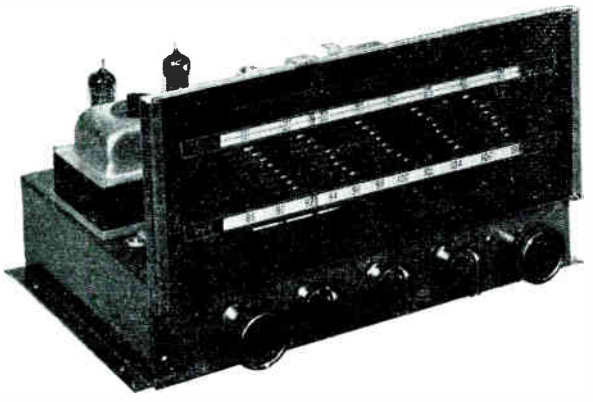

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Brenell Mk. V Model M	88 gns.	*Telefunken 98 ½/¼ Tr.St.	95 gns.
*Brenell Mk. V	64 gns.	Truvox 60 2 or 4 Tr.	39 gns.
Brenell 3 star	58 gns.	Truvox Series 80/2 Tr.	55 gns.
Cossor 4 Tr. 1602	38 gns.	Truvox Series 80/4 Tr.	59 gns.
Cossor 4 Tr. 1601	59 gns.	Truvox R7	82 gns.
Cossor 1603 4 Tr.	28 gns.	Uher Universal	83 gns.
Elizabethan 200	22 gns.	*Vortexion WVA	£93.13.0
Elizabethan 2230	32 gns.	*Vortexion WVB	£110.3.0
Ferguson 3200	26 gns.	*Vortexion C Stereo	£148.10.0
Ferguson 3202 2 sp. 4 Tr.	33 gns.	*Vortexion CBL Stereo	£160
*Ferrograph 5AN	85 gns.	Wyndsor International	69 gns.
*Ferrograph 422 or 424	110 gns.	**BATTERY PORTABLES**	
*Ferrograph 4A N	81 gns.	Cossor 1620	25 gns.
*Ferrograph 4AN/S	88 gns.	Grundig Memorette	55 gns.
Fidelity Minor	22 gns.	Philips Portable	24 gns.
Grundig TK14	35 gns.	Loewe Opta 412 (Mains/Battery/Car)	47 gns.
Grundig TK23 4 Tr.	45 gns.	Butoba	66 gns.
Grundig TK40 4 Tr.	75 gns.	Clarion Phonotrix	39 gns.
Grundig TK41 2 Tr.	75 gns.	Fi-Cord 202	66 gns.
Loewe Opta 404 2 sp. 4 Tr.	53 gns.	Stella	25 gns.
Loewe Opta 403	45 gns.	Stuzzi Memo-Cord	25 gns.
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Philips 4 Tr. 3542	59 gns.	Mains Power Pack for Philips or Stella	£5.0.0
Philips 3514 4 Tr.	27 gns.	Grundig Mains Power Pack	8 gns.
*Reflectograph 'A' ¼ Tr.	105 gns.	**TRUVOX DECKS WITH PRE-AMPS**	
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*Simon SP5	93 gns.	PD 85—Professional 4 Tr.	£52.10.0
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Sony 521 Stereo	124 gns.		
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Stella 4 Tr. 459	62 gns.		
Stella 456	28 gns.		
Stuzzi 4 Tr. Junior	26 gns.		
*Tandberg Series VI Stereo ¼ or ¼ Track	110 gns.		
*Tandberg Mono, 3B	76 gns.		
*Telefunken 85 De Luxe	83 gns.		

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Simon 'Cadenza' Ribbon	£10.10.0
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SOUND AND CINE

PART THREE—PLACING SOUND EFFECTS

IN my last two articles of *Sound and Cine* I dealt with, first, the making up of sound effects at home with all sorts of domestic equipment and what have you and, next. the sources of available recorded effects on disc and on tape. Now, I think we ought to consider the means available of transferring these required effects to spot positions on the master soundtrack.

Using a suitable disc, with the entry points marked with a grease pencil, even a complicated synchronisation system may be attempted with just a turntable and one tape recorder loop-coupled to an 8 mm projector. Various means of screen synching may be used from the pilot number track, where the tape is marked visually with cue points at each physical entry, to actually screening the film and placing the effects spontaneously as each appropriate visual comes up. Levels may be superimposed at subsequent dubbing sessions using the same sync system until a quite complicated master soundtrack has been assembled. It all requires, however, a considerable amount of work, patience and dexterity on the part of the turntable operator and his assistant.

Superimposing

Some people find. too, that their efforts at superimposing seldom come off satisfactorily however much they try to effect a clean recording. The trebles invariably vanish and all they finish up with is a muffled recording. The greatest fault, I find. with the single tape recorder system is that although sounds can be added at a later date, once a track is assembled on a single tape track it is impossible to alter any level afterwards if the balance is found to be incorrect. Although it is possible to remove sections of the track (even one half inch can be removed with a magnet). to fade in or out at certain points after the superimposition has been made, or even to remove single words or even a single syllable (1/15th of a second at 7½ i/s represents one half inch of tape) any erasure will automatically effect any other sound level existing at that point.

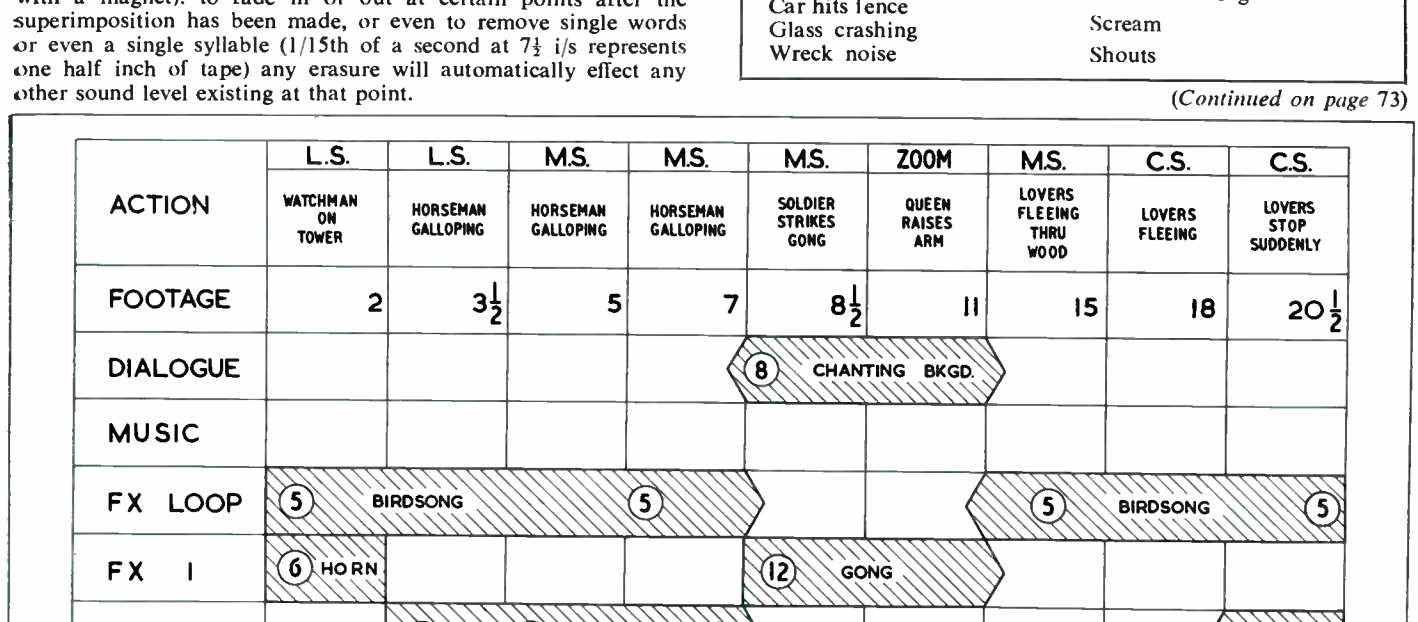
The position may be eased considerably, however, by the use of one of the new recorders such as the fully stereophonic Grundig TK46. This machine has separate erase, recording and playback heads as well as separate recording and playback amplifiers, thus permitting recording techniques previously only possible with the use of more than one tape recorder and mixer units. With the TK46. a second recording may be made in synchronisation with an earlier one, and while listening to the playback from the first track a second recording may be placed on the second track. Both recordings can then be played back together, or the operation repeated, thus adding more and more levels to the previous recording.

Echoes can be introduced on either track, the delay being governed to the tape recorder speed. The intensity of echo is controlled by an internal feedback control. Monitoring can be effected with or without the equivalent time-delay. Superimposition is possible without erasing the previous recording, and output levels from both channels can be controlled independently or, after the correct balance has been obtained, together with one button.

For a simple example of how the four-track recorder may be used to overlay spot effects let us take the car crash.

Effects "A"	Effects "B"
Normal engine noise	Passing traffic
Gear changing etc.	Passing traffic
Engine noise	Motor horn
Tyre skid	Shout
Tyre skid	Wood breaking
Engine noise	Scream
Car hits fence	Shouts
Glass crashing	
Wreck noise	

(*Continued on page* 73)



Section of dubbing chart from "The Magic Ring" 16 mm colour film.

SOUND AND CINE — continued

Effects "A" is the subjective track and is our foreground and will be recorded at a high perspective level. Effects "B" is partly shot-background and middle distance and should be recorded at a lower gain to "A" so that the aural perspective is realistic. If we are using the pilot track system, e.g. we have cue-marked the tape against the visuals and we are using the tape recorder on its own without running the projector and each part of the whole sound effect is cued in the same way, we know exactly where to place each part of the whole effect. Of course, it may be better to divide the soundtrack up so that dialogue and music are kept together on one track and the effects are kept together on the other track. With a single recorder this will require superimposition, so record the distance track first and place the foreground track on last of all. With dialogue and music the music should be the first to be recorded.

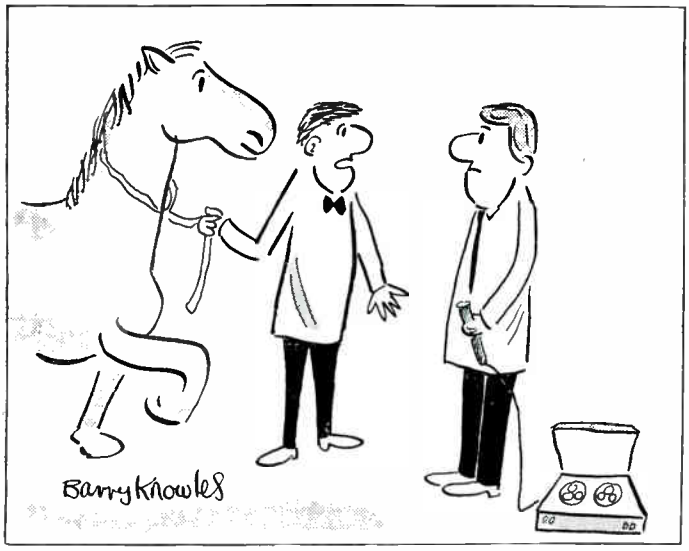
Using two four-track recorders

It should not be impossible for the owner of one four-track recorder to borrow another machine of the same type and two of these machines will give, to the amateur, something comparable to the professional dubbing studio bench normally equipped to handle four separate tracks in sync. By keeping dialogue, music and all effects tracks separate throughout all the early stages, complete control of volume and tone may be exercised until the final dubbing session when the master soundtrack is compiled with music and dialogue on the one track and all effects on the other track.

The stage missing, of course, is the professional studio bench facility of being able to adjust any one of the four tracks to any one of the other tracks by simply lifting the sprocketed film off the synchroniser and placing it some few sprockets in either direction. But this can be managed, not simply of course, on our system providing you are prepared to devote some time and patience to it.

Let us begin with our new two by four-track system by taking as an example the section of the dubbing chart from Herman Wuyts' "The Magic Ring". This scene deals with the flight of the two young lovers from the Queen's palace. The watchman on a far tower gives another warning. The horseman approaches them through the woods. We cut back to the palace and the Queen's chamber where the glowing gong is struck suddenly by a soldier. From a full zoom-in to the Queen we cut to the lovers struggling through the undergrowth. They stop suddenly as they hear the approaching hooves.

The whole system depends on establishing one track in complete sync. with the visuals and placing the other tracks in their proper relationship thereafter. We must assume that the synchronisation system, whether using strobes, loop-coupler, sprocketed-tape timer or a measuring unit such as the *Synchrodek*, is fairly tight so that when the establishing track is laid sync can be picked up at any point with the visuals. Quite obviously, it is not desirable to have to keep on re-running the picture, and when we have this first track just right we can dispense with the visuals until the whole master tape is needed to be checked.



"Why can't you use coconut shells like anybody else?"

The Simplest Method

The simplest way to begin is by making up the cue-spot pilot track where each sound entry point is marked visually on the tape with a number (I go into this quite fully in my book "Sound and Cine for Beginners"). Taking our dubbing chart example, we cue-spot tape "A", and, having re-run the tape against visuals for sync, we place our dialogue on track-one and our music on track-two. Here, in our example, there is no music entry shown but it does exist to quite some extent on other sections (I found it impossible to find a short section of thirty seconds' duration showing entries for all six tracks).

Both tracks are then played back together to check balance before transferring them to track-one on tape "B" on the other machine (the ringed numbers on the dubbing chart indicate volume levels determined beforehand). The FX loop of bird song is faded down at the end of shot 4 and faded up into shot 7 on track-one of tape "A". FX 1 is placed on track-two of tape "A". These two tracks are then transferred to track-two on tape "B". Both tapes, of course, will have start marks and will have to be started in sync. During the transfer, tape "B" can be monitored so that each time the number spot comes up on tape "A" the appropriate section of music and dialogue is heard in sync. If the sync is out then manual adjustment of tape "B" can be effected there and then. The master tape in this system is always tape "A" and is the guide at all times.

Compiling the Master Tape

The remaining FX 2 and 3 tracks are then placed in sync on tracks one and two on tape "A". Both machines are then rewound to start marks and played back together to test the total effect by ear. The whole effect being satisfactory we now transfer FX 2 and 3 to a new tape "C" (it may be equally well to use tracks 3 and 4 on tape "A" for storing the sound if there is a shortage of tape, but, in any case, if perforated tape is the medium then a third tape must be employed).

We now begin compiling the master soundtrack. The music and dialogue track on tape "B" is now transferred to tape "A" track-one. This is taken off the machine and stored. Tape "C" is then transferred to track-one on tape "B" which will now have all the effects on the two tracks. Tape "A" is then replaced and the two tracks on tape "B" are then placed on track-two of tape "A". This tape now contains all six original soundtracks on the tracks one and two.

This sounds very involved and indeed it is but we must remember that we are using equipment that is not designed for our specific purpose. By this method we are at least able to exercise a great deal of control of volume and tone and, if we are prepared to take the system even further by running the visuals against each track before each transfer, a very high degree of synchronisation. We have, too, effected a highly complicated track laying procedure without recourse to superimposition.

Next Month

In the next issue of *Sound and Cine* I hope to describe further methods of placing spot effects, bringing in more advanced equipment.

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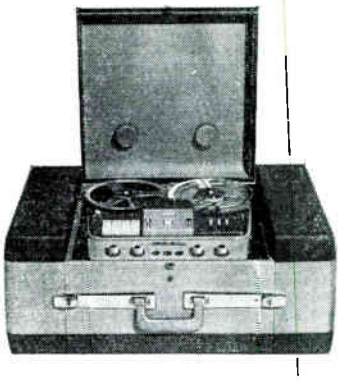

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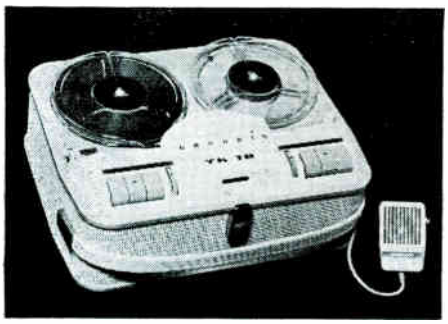
TAPE, RECORDERS & ACCESSORIES

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.



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GRUNDIG TK18 TWO-TRACK RECORDER

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THE TK18 recorder is a fully automatic machine which does not require manual recording level adjustment. Fitted with the "Magic Ear" which contains a unique memory system, this machine retains the correct recording level so that the full dynamic range of music or speech is reproduced without distortion. The memory system provides different storage durations for radio and microphone recording to meet the requirements of speech recordings in rooms which are not acoustically prepared.

The recording signal after the frequency correction network is sampled, is fed to a two stage control amplifier, rectified and fed as a control signal into the first two stages of the recording amplifier. This ensures that the correct frequency response is maintained at all times with no increase in harmonic distortion whatsoever. To prevent an increase in background noise and hum under no signal conditions, the "Magic Ear" will operate only after a very low signal input level has been exceeded.

The specification quotes a frequency response: 40-12.000 c/s +3 −5 dB. Tape Speed 3¾ i/s. The maximum spool size is 5¾ in. providing a playing time of 1 hour per track using long play tape. Other details are signal to noise ratio: Better than 50 dB. Wow or flutter: Less than ± 0.2 per cent. Inputs: Microphone Radio/Gram P.U. Outputs: High Impedance Low Impedance. Output Power: 2.5 watts. Dimensions: 14¾ × 11½ × 6¾ ins. Weight: Approximately 20 lb. Price £40 19s. complete with microphone and tape. **Manufacturers: Grundig (Great Britain) Ltd., Newlands Park, Sydenham, London, S.E.26.**

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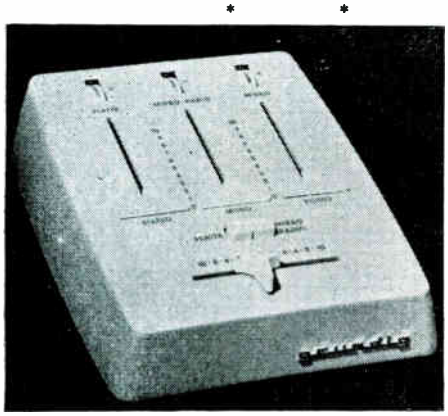

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GRUNDIG STEREO MIXER

★

ALTHOUGH the description of this accessory indicates that it is intended for stereophonic operation, the Mixer type 608 is in fact an instrument that can be used for monophonic working. It is now the only mixer unit offered for sale by Grundig (Great Britain) Ltd.,

Fully transistorised and fed from two batteries type PP3 (or equivalent), the Stereo Mixer 608 is immediately ready for use after switching on. It is fitted with connecting sockets for two microphones (left-hand channel and right-hand channel), a further monophonic microphone, for the connection of a radio receiver and a stereophonic gramophone pickup. A monophonic/stereophonic output socket is also provided.

Studio type linear fading controls are fitted, permitting exact adjustments of levels and fading operations. Inputs from a monophonic microphone or a radio receiver connected to the appropriate socket can be mixed with a stereo programme and with the aid of a "Directional Control" these monophonic inputs may be mixed with either the left or right-hand channels, or combined with both channels.

The frequency response of the mixer unit is substantially flat between 30 and 20,000 c/s. The unit weighs 3 pounds 12 ounces and measures 9½ × 8 × 3 in. The price is £18 18s. **Manufacturers: Grundig (Great Britain) Ltd., Newlands Park, Sydenham, London, S.E.26.**

* * *

★

COSSOR CR 1605 FOUR-TRACK FOUR-SPEED RECORDER

★

A NEW four-track, four-speed tape recorder has been introduced by Cossor to replace the successful model CR1601. Designated model CR1605, the new machine has many advances over its predecessor, notably the all-transistor amplifier and the fourth speed. A newly designed deck-layout has also been used for this machine with clear labelling of all the controls.

The newly introduced speed of 15/16 i/s is particularly suitable for speech recording, over four hours' recording can be made on a 3 in. reel of D.P. tape.

Housed in a wooden cabinet covered in washable two-tone brown and beige P.V.C., the new machine, by using transistors instead of valves, weighs only 26 lb. The use of transistors also ends warm-up time and gives the instrument long-term reliability.

A parallel track facility has been incorporated for simultaneous playback of two separately recorded tracks. In addition there are facilities for mixing microphone with radio or gramophone inputs, and for monitoring through headphones and internal loudspeaker while recording.

Rotary controls are provided for volume, tone and microphone and radio input levels, with push-buttons for record, pause, play, stop and fast wind and rewind. Inset symmetrically placed switches operate track and speed selection. The modulation level indicator is of the moving coil meter type.

The price of this new machine, together with a moving coil microphone, screened connection lead, 7 in. reel of long play tape and empty take-up spool, is £65 2s. **Manufacturers: Cossor Radio and Television Ltd., 233 Tottenham Court Road, London, W.1.**

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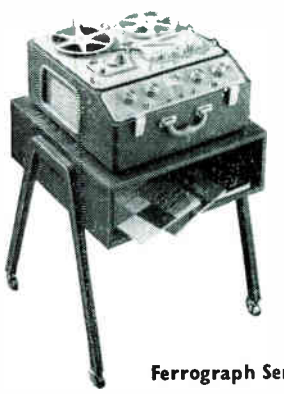

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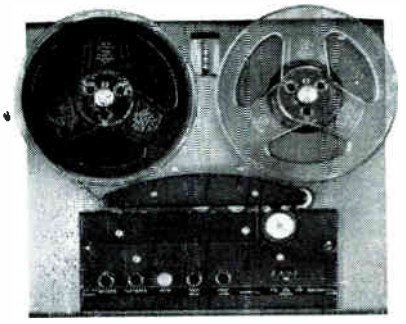

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PLANET
U1/15
THREE SPEED
TAPE DECK

★

Manufacturer's Specification: Heads: Three-head two-track system fitted to standard deck. High impedance record and playback coupled with special triple-field erase head all of Miniflux type. Any other combination of heads can be fitted upon request. **Tape speeds:** 15 i/s, 7½ i/s and 3¾ i/s. **Reels:** 7 in. max. **Rewind:** Tight even stacking. 90 secs. 1,200 ft. **Tape position:** Four digit counter. **Obtainable frequency response:** 15 i/s 30-22,000 c/s, 7½ i/s 30-18,000 c/s, 3¾ i/s 30-15,000 c/s. **Wow and Flutter:** 0.06% R.M.S. at 15 i/s, 0.08% R.M.S. at 7½ i/s and 0.12% R.M.S. at 3¾ i/s. **Speed:** plus or minus 0.2%. **Motor:** Papst Hysteresis Synchronous. **Auto Stop:** By Solenoid (6-12 V. A.C. or D.C.) operates by metal foil on tape and removes all idler and pinch reel pressures. **Power:** 200-250 volts A.C. 50 c/s. 32 Watts. 100-145 volts A.C., 50 or 60 c/s to order. **Tape pressure system:** Stainless steel pins wrap tape across face of head (reduces wear to minimum). **Balanced drag:** Wow and flutter same at beginning and end of tape. **Clutch:** Variable speed magnetic. Smooth take up. No uncontrolled spinning of free spool. **Extra heads:** Space for fourth head. Can be supplied complete with mounting plate and tape pin plate at small extra cost. **Head to amp. connections:** Via co-axial sockets below deck. **Controls:** Press button. Record with interlock to prevent accidental erasure. Playback. Stop. Fast Rewind. Fast Forward. all with interlock. Pause control with lock. **Dimensions:** Top mask 14 in. x 12¼ in. Bottom plate 11½ in. x 10¾ in. Depth between mask and bottom plate 2 in.; motor protrudes a further 2¼ in. **Weight:** 12½ lb. **Price:** £44 10s. **Manufactured by Planet Projects Ltd., Goodman Works, Belvue Road, Northolt, Middlesex.**

THIS is not so much a review as a report on the testing of one of the new *Planet U1* 15 tape decks with the *Stern STP-1* stereophonic tape pre-amplifier. The Planet deck was fitted with Miniflux heads: a VLF4 double quarter track ferrite erase head and a VKH4 quarter track R/P head. The pre-amplifier was built by News Editor Alan Lovell to the exact assembly data and diagrams given in the Stern Kit book. All the suggested modifications for Miniflux heads were incorporated. A quick listening test confirmed that no major errors had been made in the wiring, and the complete outfit was packed and sent to me for detailed technical tests.

The one hundred mile journey from Waterloo to Christchurch proved a very effective vibration and bump test. The wiring and assembly had passed the test very well, the pre-amplifier worked perfectly.

Wow and Flutter

A 3 Kc/s tone was recorded at the three speeds of 15 i/s, 7½ i/s and 3¾ i/s and the rock-steady flutter bridge meter readings proved that the tape deck had not suffered any damage.

The fluttergram pen recordings of **fig. 1** show that short term speed variations are very small indeed, with total *rms* wow and flutter readings of 0.05 per cent. at 15 i/s, 0.06 per cent. at 7½ i/s. and 0.1 per cent. at 3¾ i/s. At the lowest speed a slight capstan wow can be seen on the pen traces; it could just be heard on a steady tone but could not be detected on music recordings at all.

It is interesting to compare the fluttergrams with those of the U1 deck reviewed in June 1962. The total integrated *rms* readings are almost identical, but the traces look appreciably smoother. This indicates that cyclical speed variations due to the motor, stepped pulley and idler wheel have been reduced to vanishing point; the very slight capstan effect can be picked out more clearly as the rotation frequency has been halved for any given speed by doubling the diameter of the capstan.

Let me emphasise once again that this detailed analysis of the last remaining trace of wow is of academic interest only and is in the nature of a progress report on the continued development and detail improvement forecast in my review of the original U1 deck.

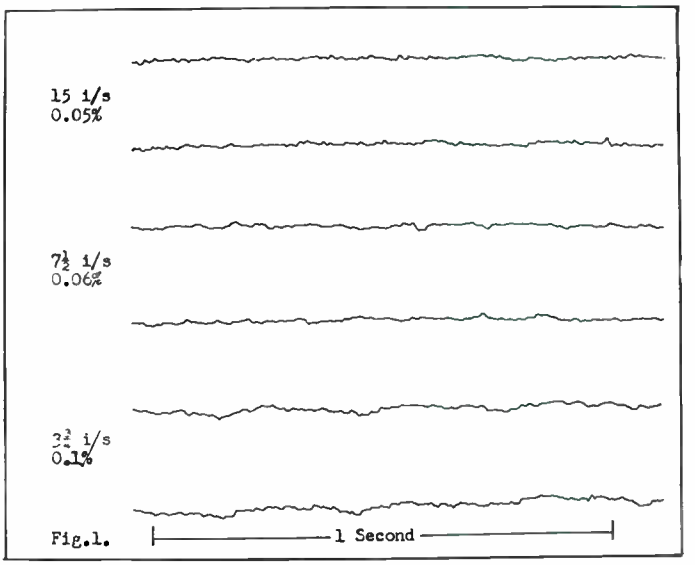

Fig.1.

Play Only Responses

The deck was next loaded with pure tone test tapes recorded with surface induction characteristics of 35, 100 and 200 micro-seconds to check the combined head and pre-amplifier responses at the three speeds of 15, 7½ and 3¾ i/s. The pre-amplifier output on each tape was in the order of 0.15 V. and the responses are shown in **fig. 2.**

There is a small wavelength head contour effect (see my article in April 1962 issue) which causes a series of small bumps and dips which move down in frequency as the tape speed is reduced, but the playback responses are within plus or minus 2 dB over most of the frequency range at each speed.

Noise and hum could be reduced to 40 dB below test tape level (1.5 millivolts at pre-amplifier output) by *very* careful orientation of the power unit with respect to the pre-amp and deck; but such critical placement indicated that there was a certain amount of hum cancellation taking place between valve hum and hum picked up on the heads from the power transformer. Such cancellation could change markedly with small variations of mains voltage or harmonic content and should not be relied upon for serious work.

The leads to the power unit were extended so that it could be placed well "out of sight" of the deck and pre-amplifier and the hum was then 32 dB below test tape level. Later

(*Continued on page* 79)

recording tests confirmed that a peak level of 12 dB above test tape level could be recorded without waveform distortion, so that the basic dynamic range between maximum signal and hum is 44 dB, and, using some cancellation, it could be improved to better than 50 dB. I would suggest that careful selection of input (EF86) valves, or the fitting of a heater "hum bucking" potentiometer, would give an improvement of at least 6 dB in the signal hum ratio in the "non-critical" layout.

Even under the worst conditions the playback response can be said to be very satisfactory, and listening tests on a wide range power amplifier and speaker, using a selection of pre-recorded tapes, gave excellent results.

Record Play Tests

Previous experiences in testing kit pre-amplifiers with separate decks (May and June 1961 issues) led me to expect trouble at this stage and my worst fears were confirmed. Recordings sounded

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STERN STP1 STEREO TAPE PRE-AMPLIFIER

★

thin and rather shrill and slightly distorted unless the recording level was kept well below half scale on the record level meter.

As usual, my first move was to check the bias voltage across the record heads. It was less than 30 volts and the Miniflux specification for this head called for 50 volts. The voltage across the parallel erase heads was also low at 9 volts instead of the specified 12-14 volts.

The mains tapping on the power unit transformer was altered to give an exact 300 volts on the main H.T. line, but this did not appreciably alter the bias voltage. A new ECC82 was substituted for the bias oscillator valve—still no change. The 390 ohm damping resistor across the secondary of the bias oscillator coil was removed and this brought the erase head voltage up to 12 volts, but the bias voltage was still low at about 40 volts. Attention was next directed to the bias feed condensers C18 which were the specified 47 pf. Increasing them to 100 pf raised the bias voltage to 50 volts and further recording tests showed a vast improvement in quality and recorded level. Test

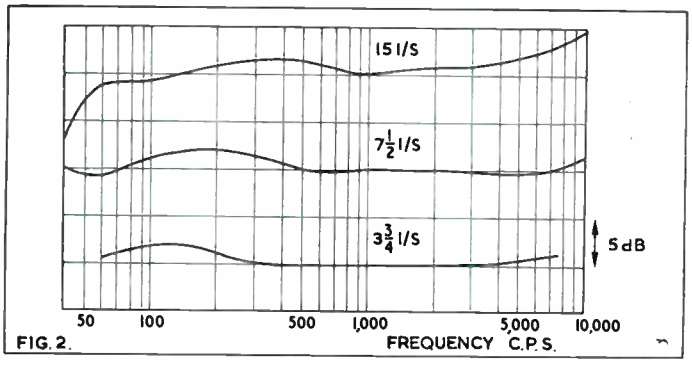

FIG. 2.

tape level was recorded at a scale reading of 2 on the record level meter and peak recording level (plus 12 dB on test tape level) was recorded at a meter reading of 6. At this reading, waveform distortion was small but increased appreciably when the meter reading was raised to 8.

It was now considered that the bias was a good compromise value for the three tape speeds and frequency runs were recorded and plotted to give the curves shown in **fig. 3**. These responses show the same peaks and dips as **fig. 2** together with a small fall in bass response. The fall in recorded level above 5 Kc/s

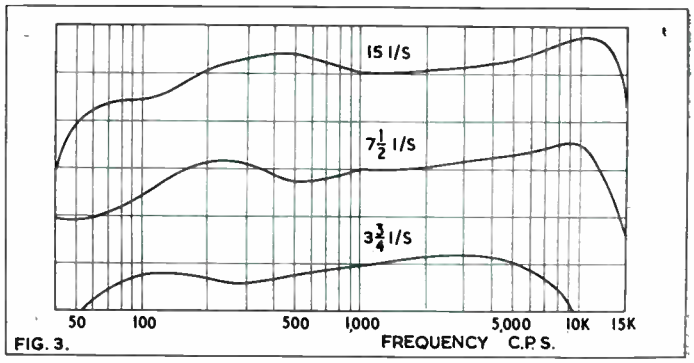

FIG. 3.

at 3¾ i/s confirms that the bias was indeed about right for the tape speeds provided by this deck—a little high for 3¾ i/s—a little low for 15 i/s—and just right for 7½ i/s. For a lower speed deck 40 volts bias would probably be all right. The response on the lower track was next tested and found to be almost identical to that of the upper track.

Erase on both tracks was complete and the recorded noise was within 1 dB of that of bulk erased tape. At one point the recorded noise came up by several dBs and this was found to be due to magnetised heads. The heads were degaussed and the noise disappeared. The usual cause of such magnetisation is switching transients caused by operating the Record-Play switch with the gain control fully advanced. However, subsequent operation of the controls at all settings did not cause any further trouble and it was concluded that experimental circuit changes with the H.T. on may have caused the voltage surges which magnetised the heads.

Comment

These tests demonstrate once again that playback equalisation can be designed to suit a given head and tape speed with a fair certainty of obtaining good results, but that the recording process is much more difficult, due mainly to bias and erase problems which can only be solved by a certain amount of experience in dealing with such problems and by the use of elaborate and expensive test gear. I would suggest that all recorder kits should be fitted with a pre-set control of some kind so that the bias can be varied by known amounts, and playback listening tests used to select the best recordings. If such a control is fitted, more than adequate bias should be available on the highest settings to overcome the effects of long leads, weak oscillator or off standard heads. A three or four position switch is the ideal as the bias levels can be repeated with precision. A variable resistance is the next best as the angular position of the control gives some indication of the bias level. A compressor type of variable condenser is better than nothing, but the capacity, and bias, will not repeat on each angular setting of the control due to hysteresis effects, and it is difficult to duplicate results without meter monitoring of the actual bias voltage across the head. A fixed C is ideal if *all* tolerances are tightly held, but bitter experience has shown that high frequency bias is the most unpredictable of all recording variables and, even when all parts of a recorder are under the control of a single manufacturer, it is extremely difficult to use fixed components in the critical bias feed circuits.

A. Tutchings.

(Constructor's Note)—Stern Radio, specialists in constructional kits, have again produced a worthy addition to their range of tape pre-amplifiers. The latest is the STP1 tape record/replay stereo pre-amplifier. This unit, taken from stock, was checked through for parts before construction commenced, and everything down to the last washer was supplied. The price is £22 (kit) £28 assembled.

The instruction manual divided the building of the pre-amplifier into five sections, giving point-to-point drawing and a complete circuit diagram.

All the condensers and resistors are mounted on tag strip giving the constructor an opportunity of producing a really neat layout. Providing each stage is fully checked, before moving on to the next, there is no reason why anyone with the ability to

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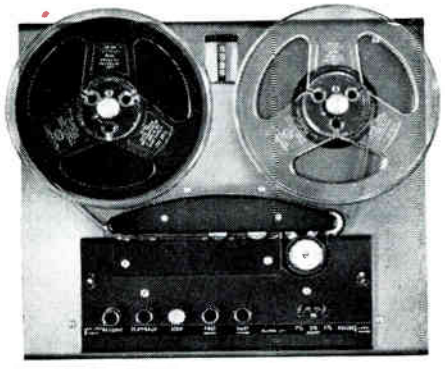

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EQUIPMENT REVIEWED — *continued*

produce a well-soldered joint should not be capable of building this pre-amplifier.

Depending on the type of deck selected the enthusiast can now build a piece of equipment, capable of stereo recording for as little as £39. A stereo power amplifier will be required together with speakers, but many readers will already be using this equipment. However, for those contemplating stereo, the same company produces the Mullard 10/10 power amplifier and the dual control stereo pre-amplifier which is constructed to take the inputs from the STP1.

Manufacturer's Comment

We are unable to understand the necessity to increase the bias feed capacitors to 100pF, the investigations completed in our laboratories and which are now commonly and successfully employed, establishes that a capacitor of 47 to 68pF achieves correct operating conditions for VKH 4 and VLF 4 Miniflux heads. Other factors such as type of lead and length could contribute to low HF bias measurements, but before commenting further we would prefer to examine the STP1 unit in conjunction with the Planet deck used for the purpose of this article.

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Bethnal Green: R. Gentle, 24 Hyde Road, London, N.1.

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Clacton: J. Heavens, "Oak Bungalow," Jaywick Lane, Clacton-on-Sea, Essex.

Kettering: M. F. York, 31 Green Lane, Kettering, Northants.

Medway: K. G. Whyborn, 7 Wellington Road, Gillingham, Kent.

* * *

New Clubs

A TAPE Recording Section has been formed at the **South Reach County Boys' Club**, Manor Road, Erith, Kent. It has been designed to interest those in the 14 to 21 age group. Any adults interested in assisting this club should contact the Warden, Mr. F. Brett, at the above address.

* * *

THE first meeting of the **Hoylake and District Tape Recording Society** was held on February 6th. Anyone living in the area wishing to join this club should contact *Mr. L. Wright, T.W. and Guy Warbrick, 128-130 Market Street, Hoylake, Cheshire.*

* * *

THE **St. Andrews Tape Recording Club** has recently been formed and meetings are held fortnightly in the Torch Club, South Street, St. Andrews. Further particulars may be obtained by contacting *S. M. Fitzgerald, 109 North Street, St. Andrews, Fife.*

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BUILDING ROUND THE HARTING DECK
POSTSCRIPT

By A. G. WATLING

SINCE the publication of the three articles on the construction of this recorder, I have had some interesting correspondence with people working on similar lines. The following points are important enough to pass on.

Oscillator (Fig. 4 in part 2)

Our old friend Mr. R. Williamson points out that the H.T. for the oscillator circuit, switched on by the microswitch under the "record" button, puts a charged capacitor (C4B) straight across an uncharged one (C4A). The resulting surge is, in his experience, enough to damage the microswitch contacts and even weld them. The surge can be reduced by fitting a 100 ohm resistor in the "C" lead from the microswitch and is a worthwhile insurance.

Motor Noise

The brief remarks in the opening article on noise from the deck referred to proper alignment of the motor grommets. These are very soft rubber, and if the deck has been standing on edge in store for some while the weight of the motor often cuts into these or displaces them. They should be checked before wiring begins. Check that the idler pulleys are correctly at right angles to the flywheel surface and drive spindle, otherwise they may "hunt" up and down and cause vibration.

Another cause of intermittent noise is the smaller idler pulley which bears against the main drive belt on "rewind". This should clear the belt altogether on "playback" or it will rotate at high speed on its stub axle and give an annoying rattle. The mechanical decoupling of the whole deck from the chassis and cabinet is best done again with rubber grommets—the fatter, the better. Where the chassis is to fit into a static cabinet it can be laid on plastic foam to minimise the transference of vibration. An empty reel sitting on the deck when the motor is running will often "buzz" alarmingly, but this is avoided by having the motor switch on the speed change shaft mentioned in Part 2 (fig. 5).

Microphone input

This works well with a cheap crystal insert and no trouble was found in getting sufficient gain with a reasonably low hum. For those with a better quality microphone who want a higher sensitivity input at minimum cost, a transistor stage can be added on the lines of the "High gain pre-amplifier" which appears in the Mullard book: "Reference Manual of Transistor Circuits". Using an OC 70 and + 250 volt supply this will provide a low impedance input without the expense of a transformer. Coupling this to the existing microphone stage, one can omit the 1.5 megohm series resistor, reduce the 3.3 megohm grid resistor to 100 K and bypass the cathode resistor with a 50 mf electrolytic. While not as quiet as a suitably designed valve stage, it is very economical and hum-free.

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All advertisements for the April issue must arrive not later than March 4th.

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(*Continued on page* 86)

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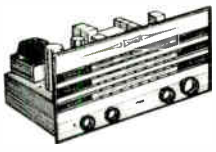

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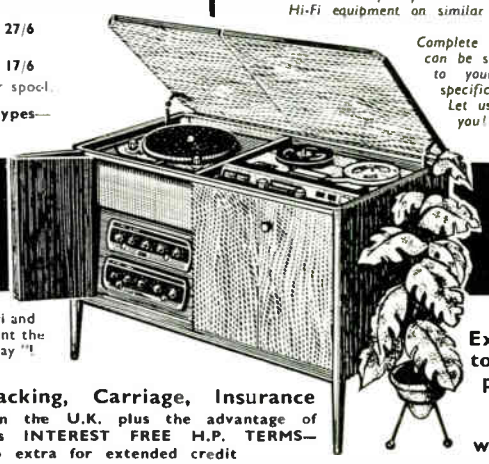

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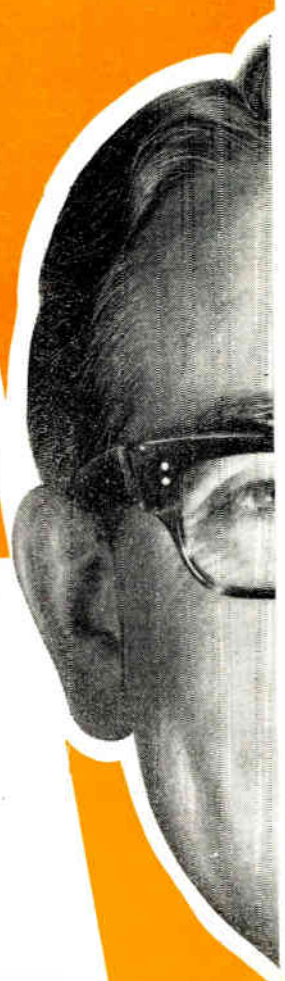

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