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HAMILTON BOULEVARD
SOUTH PLAINFIELD, N. J.

RADIO SERVICE HINTS

Practical Suggestions on Solution of Radio Servicing Problems Encountered in Actual Experience by Servicemen Everywhere

This section, conducted by our servicemen readers, will be a regular feature of the C-D Capacitor, and is intended to provide other servicemen with helpful notes on testing, locating troubles in specific models of sets, repairing them, or any other suggestions to simplify service work.

Cornell-Dubilier will pay $2.00 for each hint published in this section. Notes must be limited to 75 words, or less. Any number of hints may be submitted at one time. Unpublished items will not be returned. Be sure to give your name and mailing address. Send hints to: Editor, C-D Capacitor, Cornell-Dubilier Electric Corp., So. Plainfield, N. J.

Signal Tracing

Those unable to obtain one of the more elaborate signal tracing vacuum-tube voltmeters can easily provide themselves with an adequate substitute simply by renovating a small straight A.C. TRF receiver.

Remove the antenna coil and RF circuit and connect the detector input to a red tip jack and chassis to a black tip jack. The audio input can be connected to another separate red tip jack.

To use, connect the black test lead to the chassis of the set under test. The red test lead prod should be touched to the grid and plate terminals, picking up and checking the signal from antenna to audio stage. The red lead should be inserted in the audio tip jack for checking the signal in the audio stages.—*Helen Lewis, Kalamazoo, Mich.*

Eliminating "Cut-outs"

Receivers which "cut-out" often present service jobs requiring the expenditure of time and labor for which adequate compensation cannot be secured. Condensers are, of course, first suspected, then resistors, tubes, connections, and windings. Yet we can quite often eliminate each of these potential sources of the trouble—and the receiver still intermit.

Frequently, the particularly difficult intermittents can be speedily cured by proper attention to trimmer and padding condensers. Sometimes it is only necessary to remove the adjusting screw and clean and free the mica separator and plates of dust and filings. Most often, however, these capacitors cause "cutting-out" through a leaking mica separator and, in such instances, a new piece of mica will terminate the erratic performance of the receiver.

A signal tracer may be required to accurately locate the offending trimmer instrumentally. Occasionally, the receiver can be made to "cut-out" at will by turning the adjusting screw or by squeezing the plates together by pressing on the top plate with a screwdriver or other tool.—*D. J. Foard, Kalamazoo, Mich.*

Short Circuit Leads

In many models of sets manufactured a year or two ago rubber covered power transformer leads were employed which often caused short circuits as the result of the older type of rubber insulation melting or breaking off after hardening.

Sets will thus be found inoperative, the power transformer will overheat and smoke, or filament of tubes will not light.

To service such jobs, first inspect the leads from the power transformer to tubes. Then separate them, or if necessary, replace the leads with heavier insulated wire.—*Stewart C. Ross, Woodlynne, N. J.*

Bosch Model 48

Very often the addition of a tone control on this as well as various other models of sets will improve the tone to suit a customer's liking.

The writer has had several of the Bosch model 48 sets in his shop and found that by adding a tone control consisting of a 100,000 ohm midget unit with switch and a .02 mfd. 600 volt tubular capacitor, tone quality was considerably improved. The control may be mounted on the panel near the line switch and is connected from the plate of the 27 tube to ground.—*J. M. Gooch, Savannah, Ga.*

Repairing Loose Grid Caps

If a grid cap of a tube comes off when out on a job and no replacement tube of its type is had on hand, here is a method of repairing the tube which the writer found to solve the problem very satisfactorily.

First the cap is thoroughly cleaned to remove all traces of cement and solder with a penknife. Then, holding the cap with pliers, heat it with a soldering iron and partly fill the cap with molten solder.

Invert the tube and place it on the cap in its normal position until the solder hardens. The cap will then remain in place and the tube is ready to be used again.—*Richard Kuba, Detroit, Mich.*

RCA Model U 40

The push button tuning mechanism of this model may be found difficult to operate or fail to function completely. This condition in many cases may be caused by the entire chassis dropping down out of its original position in the cabinet.

To correct this, simply loosen all three mounting screws holding the chassis in place so that the entire chassis can be pushed up again as far as possible and held in position until the three mounting screws are retightened so the chassis will not slip down.—*F. J. Prosser, Cleveland, Ohio.*

Repairing Speaker Fields

Remove tape wrapping and drive a brass pin or nail directly into the coil a few turns at a time, testing with an ohm meter until a complete circuit is found. Solder the new lead to the pin which may be cut off close to the coil. Secure the pin and lead with sealing wax and rewrap the coil with adhesive or friction tape.

Several speakers have been repaired in this manner by the writer and are still holding up over years of service. —*E. H. Gilmore, New Orleans, La.*

Noisy Power Transformers

When open core type power transformers become noisy as the result of loose or fluttering core laminations, they may be repaired as follows:

Loosen the screws which hold the laminations together. Then apply a good grade of insulating varnish directly on the core laminations so that the varnish will soak into the core between spaces of the laminations. Let stand for about an hour until the varnish is almost completely dry and then tighten up the screws as tightly as possible.—*Glen Jochims, Farnhamville, Iowa.*

Preventing Slipping Dial Cords

Here is a very effective way to prevent dial cords from slipping.

First the dial cord is removed from the pulleys and soaked in carbon tetrachloride, a bottle of which every serviceman should carry in his kit for cleaning purposes. While the cord is still moist sprinkle it with some powdered rosin.

If this fails to grip the pulleys properly heat the pulleys with a soldering iron and apply a small amount of the powdered rosin in the grooves of the pulleys in which the cord runs.—*Gilbert Doty, Dayton, Ohio.*

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These advertisements are listed FREE of charge to C-D readers so if there is any thing you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

SALE OR TRADE — Jewell 199 analyzer $15.00. Roller-Smith D.C. milliameter, zero center 0-15 with 0-150 m.a. shunt $4.00. Radio Training Ass'n analyzer $10.00. Want 3/4 h.p. Maytag engine. E. R. Bushman, Canby, Minnesota.

WILL EXCHANGE — Radio News magazines, 8 1940 issues for Radio Craft magazines of any date, or other radio magazines or literature. What have you? Sherman Rice, Route No. 1, Mt. Olivet, Kentucky.

SALE OR SWAP—Universal XX mike with solid polished aluminum stand in A1 shape. Want good used electric phono motor. Herbert H. Eltz, Box 45, R.F.D. No. 1, Juniata, Neb.

WANTED—Scott, National, Hammarlund, or Hallicrafters receiver. Will pay cash, swap or sell the following: 8-tube Hallicrafters receiver, De Forest radio course, RCA and Crosley auto radios, G. E. radio, RCA phono oscillator. Transmitter capacitors and other parts. Oliver F. Klein, 2235 N. 39 St., Milwaukee, Wis.

FOR SALE—Keystone hand operated motion picture projector 16 mm., complete with 400 ft. of film, $8 00, originally cost $15.00 without the film Jos. Willis, 36 N. Washington St., Wilkes Barre, Pa.

FOR SALE — Cornell-Dubilier capacitor analyzer model BF-50 complete with two tubes in A1 condition. Will sell for $18.00 cash. C. E. Middlesworth, 228 North 4th St., Lewisburg, Pa.

WANTED—Amplifier, 15 to 50 watts A.C. or D.C. battery or straight A.C. Would like to trade good 35 mm. standard projector, or will pay cash. Jack Wittman, 1008 Com. Ave., Anacortes, Wash.

WANTED—Rider's service manuals, 1, 2, 3, 5, 8, 9 and 10. Cash for any one or all. Please give details as to condition and lowest price. L. G. Purtee, 4321 Holmes St., Kansas City, Mo.

SALE OR TRADE—New Howard model 436 receiver. Will sell cheap or trade. Wanted Rider's manuals 6, 8, 9, 10 and 11 or any late test equipment. Also have a number of meters for sale. P. D.Q. Radio Service, 109 S. Second St., Rockford, Ill.

WANTED—All-wave test oscillator of any popular make. Must be in good condition. Will pay cash or swap. Jack Levine, 625 Main St., Worcester, Mass.

FOR SALE OR SWAP—Complete 1940 N. R.I. radio training course with all experimental outfits. Will trade for any latest test equipment or Rider's manuals. W. E. Turner, Wetumpka, Ala.

SWAP—A copy of Ghirardi's "Modern Radio Servicing" like new. R.T.I. course in book form in swap for complete used radio course or what have you to offer. John R. Naples, 803 Ford Ave., Youngstown, Ohio.

FOR SALE OR SWAP—Eastman Kodascope 16 mm. motion picture projector with variable A.C.-D.C. motor and 2 extra reels, $25 00 cash. Will swap for radio equipment or books. What have you? Emroy Ivester, General Del., Winston-Salem, N. Carolina.

FOR SALE—Brand new Superior set tester and tube checker, model 1280, $15.00. Used Triplett set analyzer, joint tester and signal generator all in one unit, $15.00. Elmer Showers, Jr., Tannersville, N. Y.

(Continued on page 14)

ANALYZING RADIO NOISES

By the Engineering Department, Cornell-Dubilier Electric Corp.

PART I

OF ALL the problems confronting the serviceman today, none is as intricate and annoying as the elimination of radio noise. It is technically possible, although sometimes impractical, to correct many forms of radio disturbances; this undoubtedly requires considerable technique and analysis.

While in many foreign countries laws have been enacted to insure noise-free radio reception, we have as yet accomplished little in this direction here. For instance, in Europe, it is obligatory for the owner of interfering equipment to apply suitable corrective devices. When a radio listener experiences noisy reception, he simply complains to the branch of the Government set up to handle such matters. Field engineers explore the immediate neighborhood and after locating the offending device compel the owner of the equipment to eliminate this condition at his own expense.

For a number of years, in some countries, it has been unlawful to install or operate an electrical appliance which does cause radio interference. Because, in the United States, few such rigid laws are in existence, our radio interference problem must be solved by private initiative.

When a dealer sells a radio receiver, it is his problem to provide noise-free reception. The customer usually insists upon it and the eventual result is that a serviceman is called upon to identify and correct the source of the trouble.

For servicemen to attack these problems effectively and with the least possible expense, they must have working knowledge of the causes of interference, the electrical devices which cause the disturbance, and the various methods of measuring and rectifying the condition.

The usual tools employed by servicemen are of little use in problems of this nature. While the set analyzer, signal generator, ohmmeters, and similar instruments simplify the correction of receiver faults, they are generally of little help in tracking down the source of a legitimate noise complaint.

Origin of Radio Noise

The fundamental principles of radio transmission involve the setting up of electric waves at the antenna of the broadcast station. These waves are radiated through the atmosphere to the receiving station where they are amplified and detected so that the original audible signal is reproduced. Electrical circuit which sets up any sparking condition also creates radio frequency radiations which travel to the receiving equipment in a much similar manner. Most of these disturbances are relatively of small power as compared with the signal radiated by a broadcast station. The main problem arises in the fact that the noise sources are much closer to the receiving set than the origin of the desired radio signal.

Radio noise may be set up by practically any circuit which causes sparking or arcing. Most electrical motors, oil burners, food mixers, drills and similar devices radiate appreciable noise energy and do feed into the power line a signal which frequently is conducted into many receivers.

This radio frequency energy being untuned usually covers an extremely wide frequency range as compared with the normal broadcast signal. Interference, as applied to radio reception, refers to any disturbance which interrupts or interferes with satisfactory reproduction of the original signal. Although it exists under a wide variety of conditions, it can be classified into four general categories—natural static, inter-station interference, defective operation of some part of the receiver, and that which is set up by man-made devices and electrical systems.

Natural Static

Natural static is caused by clouds becoming electrically charged by the friction between the water vapor and the surrounding air. Considerable electrical potential is set up in this manner. When the potential difference between two banks of charged clouds or between one cloud and the earth becomes sufficiently high it breaks down the insulating dielectric of the intervening air and an electric discharge takes place in the form of a lightning flash. Since the two cloud banks or the one cloud bank and the earth really form two plates of a large capacitor with the intervening air as a dielectric, the discharge is really that of a capacitor and is of an oscillating form. Such discharges produce strong electro-magnetic radiations which are very similar to those of legitimate radio signals, and which reach the receiving system in the same manner. Northern lights, heat lightning, dust storms, rain storms and similar disturbances frequently are the cause of considerable radio noise even at remote distances. No satisfactory method has yet been found to correct the noise conditions caused by natural static. Fortunately, however, these disturbances are not chronically annoying and are more prevalent in extreme and rapid changes of weather conditions which take place only at short intervals throughout the year.

All devices which are recommended to alleviate interference caused by atmospheric conditions, are in every case a form of trick gadget which has little merit. Generally they simply reduce the over-all sensitivity of the receiver and the actual signal to noise level does not improve.

Inter-Station Interference

Although inter-station interference was a serious problem a number of years ago, the high quality of present-day radio receivers plus the Government restrictions regarding the operation of broadcast stations has reduced this to a matter of relatively little importance. Hetrodyning of two broadcast signals is easily identified as a steady or warbling whistle which occurs at only one particular frequency.

Radio Receiver Defects

A wide variety of noises can be caused in a receiver by defective parts, and loose or intermittent circuit connections. Noisy resistors, leaky capacitors, poor contacts in potentiometers and rheostats, high voltage flashover in capacitors, or poor insulation between transformer windings may cause a disturbance much more severe than that originating outside the receiving equipment.

Although the average serviceman frequently encounters many types of defects which cause this trouble, there is no questioning the fact that they are a very tedious problem to identify and eliminate. A visual inspection of the chassis assembly occasionally reveals an apparent mechanical condition of loose connections, dust particles between the tuning capacitor plates, and corroded switch contacts. Severe jarring of the chassis may aggravate these noise conditions without disclosing the cause.

A more or less standard procedure when setting about to service this type of trouble is to check each tube by tapping it several times. Any abrupt changes in the noise condition while this operation is being made can be easily detected and the offending tube replaced with little difficulty.

Potentiometers, rheostats, tuning capacitors and switches and other moving parts will readily disclose the part they contribute to the general noise conditions. Leaky capacitors, and noisy resistors will cause voltage changes, vary the grid bias, and in general are responsible for conditions of oscillation and distortion.

There are no simple rules to follow to correct noisy conditions existing in receivers because any one of the many hundreds of connections and parts may be causing the trouble. In most cases, the defect may be detected only by a process of elimination beginning with the parts which are most apt to be noisy and which are the easiest to check.

"Man-Made" Interference

The so-called "man-made" interference may originate either from the normal functions of an electrical device, or a defect in an electrical system. Two of the devices which are responsible for a very large part of radio noise conditions are commutator type motors and switching circuits, which must, as a part of their operation, create sparking as a result of a rapid change of electrical conditions.

The commutator of a motor is very similar to a multi-circuit switch, which is continuously disconnecting and connecting the current to the various commutator bars. This sudden change in current produces a magnetic field which, in association with the stray capacity, sets up an oscillatory wave. This does not affect the operation of the motor but in effect causes it to act like a small transmitting station emanating waves of various frequencies and magnitudes which find their way into receivers.

In the case of switching circuits, the noise conditions caused are generally less severe than for motors because the frequency of sparking is generally of a much lower rate. However, the intensity of the radio frequency wave created by an ordinary contact switch may be very great as in the case of slow-break thermostats which draw an appreciable arc. As for the cases of motors, just described, the stray capacities and inductance in the circuit cause the spark to be of an oscillatory nature varying in intensity according to the electrical conditions present at the instant of operation.

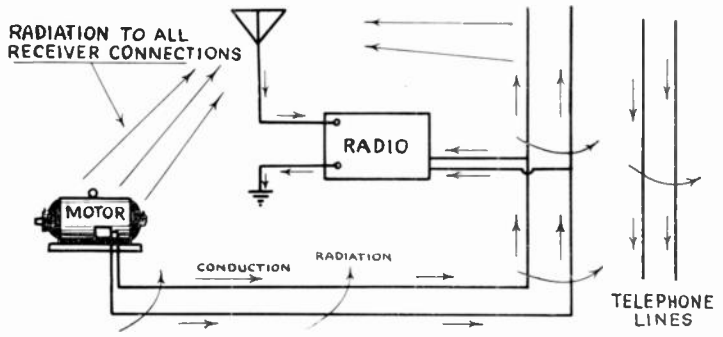

Fig. 1 Noise producing energy finds its way to a radio set by radiation and conduction as indicated above.

Any electrical device which develops a spark as the result of an abrupt change in circuit operation is a source of radio noise. Oil burner ignition transformers, ultra-violet ray machines, and neon signs are also identified as noise producing apparatus.

High voltage transmission systems, insulators, and transformers frequently cause corona and sparking due to leakages and other defects. Such conditions are capable of causing considerable trouble because of the excellent radiation and conduction of noise energy usually associated with such equipment.

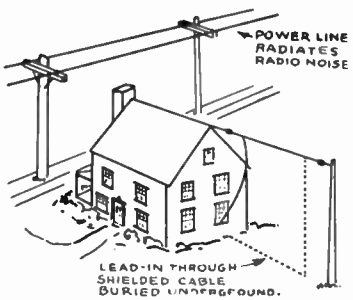

Fig. 2 The antenna should be at right angles to the source of radio noise and erected as high as possible above ground. Dotted lines show optional method for connecting lead-in.

Distribution of Noise Energy

The noise-producing energy finds its way to the radio receiver by direct radiation through the air, direct conduction through power lines, radiation from the power lines and by re-radiation from conductors in the same proximity as shown in Figs. 1 and 2.

Direct radiation, as a rule, cannot extend over an appreciable area from the source of the disturbance. However, due to the great number of electrical devices in use, it is not at all unusual for this method of transference to be of serious consequence. This is especially true for street-cars, automobiles, and trains which pass over a considerable distance and are capable of affecting the receiving systems along the way. Many appliances and industrial equipment in every household or apartment house being so close to the radio sets and associated circuits inevitably affect their operation.

Conducted energy which passes through the power line may be carried over a considerable distance. It is not at all unusual for the ignition discharge of an oil burner to affect the reception as much as a quarter of a mile of its location. By transferring the noise energy from the source along power lines to the immediate vicinity of the receiving equipment, conduction results in a secondary radiation which has a far greater effect than the direct radiation from the electrical equipment.

Radiation from power lines is the most common method of transferring radio noise. Since such a distribution system follows an intricate network in practically all communities, it is very frequently found near the receiving antennas. Although by the time the interference has reached this point, it is very much less in intensity than it was at the start, it is in an ideal condition to cause trouble. Along with the weak broadcast signals, it is induced on the antenna by capacitive and inductive coupling and is amplified and modified to be reproduced as an audible signal.

Re-radiation of interference takes place from telephone lines and metallic structures which have been affected by the conditions existing in the power lines. Telephone equipment placed near the radio receiver will in many cases readily transfer appreciable noise energy to part of this system. Antennas constructed near ungrounded metallic objects are also affected similarly.

(To be continued)

PHONO SERVICING*

WITH close to a million record players of one sort or another in use, the maintenance and improvement of record-reproducing equipment has become more than a mere sideline for the serviceman. Moreover, aside from the possibilities in "doping up" existing equipment to improve response, replacement sales opportunities are larger than one would suspect. The fact is, the average person usually starts out with a cheap unit incapable of doing justice to modern recordings, and soon develops a yen for something better—a new electric turntable, a quality pickup, or possibly a more expensive amplifier and speaker system.

The serviceman should be fully equipped materially and mentally to use to his advantage the slightest complaint a customer may have against his record-reproducing equipment. If faults are explained to the customer, and, further, their presence demonstrated, the customer is very likely to give the serviceman a free hand in deciding what is necessary to provide optimum results.

Material Equipment

As for material equipment, the serviceman should have a compact record player of good quality and known frequency response, to use not only as a check against doubtful pickups, but also as a demonstrator, to show the customer the improvement to be had from a good pickup. The motor and turntable should also be a quality product. If it is reasonably quiet and constant in speed, it, too, will serve to demonstrate the value of good equipment. From such direct comparisons, the serviceman can sell turntables and pickups of the same make as he employs in the "standard" player, and he should stock these units so as to be in a position to make immediate delivery.

The serviceman should also carry a stock of record cleaners, keep one in his kit, and use it before running a test on a customer's record. True, they are inexpensive, and the profit is small, but they have the value of creating good will if the serviceman uses them for the purpose of educating his customers into protecting record surfaces against dust and grit. If the serviceman uses a cleaner, the customer will feel that he also should.

Material equipment should also include a stroboscope disc and neon bulb for checking turntable speed, and a frequency test record for checking response. A stroboscopic test in the home is convincing and pretty conclusive, and may well induce the purchase of a new motor and turntable. A test with a frequency record will show up peaks in the reproducing equipment.

The serviceman should have at least one outstanding modern recording for use when making direct comparisons between pickups and determining the degree of frequency correction required to provide tonal balance. Any of the late Victor Red Seal recordings of the Boston Pops Orchestra are particularly recommended for this purpose. Any pronounced peaks, harmonic distortion, or masking of one group of frequencies by another, will be quite noticeable after a few playings. A recording of this sort will quickly show up a poor pickup, or reveal the quality of a good one.

Mental Equipment

The mental equipment is the knowledge the serviceman has but often fails to use. If it is to be useful, it should be spread around gratis. There's

* By courtesy of "Radio Service-Dealer."

repeat business to be had from it, to say nothing of customer confidence. The specific knowledge can be placed under the heading of "expert advice," and includes the following points that should be stressed when the opportunity presents itself:

(1) By virtue of its abrasive action, dust and grit deposits in record grooves will increase wear and surface noise under the action of the reproducing needle. Hence, do not leave record surfaces exposed. In any event, go over all records occasionally with a cleaner pad.

(2) Do not store records near a radiator in the wintertime, or leave them exposed to strong sunlight. The heat will warp them. A warped record can often be straightened by warming it near a radiator or in sunlight, and placing it under pressure between flat surfaces.

(3) Do not leave records in the holder of an automatic record player; they will warp, particularly in a warm climate.

(4) A warped record will "wow" on the turntable of an automatic record player with drop mechanism, as there will be insufficient surface contact between records to provide constant grip.

(5) A warped record, a record with a rough or chipped rim, or one with off-centered spindle hole, may jam the mechanism of an automatic player, or the record may fail to drop.

(6) Sour music or variation of pitch may be due to, (a) slippage of record on turntable, (b) excessive warpage, (c) variation in speed of turntable, (d) record spiral off-centered with respect to spindle hole.

(7) If "wow" or variation in pitch is due to off-centered recording, it will be reflected in a lateral to-and-fro movement of the pickup arm which is easily seen. The fault may be corrected, though with difficulty, by enlarging the spindle hole with a penknife, in the direction of the maximum outward swing, and placing the record on the turntable with the bulge in the hole bearing against the spindle. This will compensate for the off-centering of the spiral provided the spindle hole is off-centered by the same amount.

(8) There is nothing harder on records than a heavy pickup of the old type. Any pickup with a needle pressure exceeding 3 ounces should be replaced with one of the newer types.

(9) With the exception of the more expensive ones, magnetic pickups are deficient in bass response, whereas crystal pickups overemphasize the bass. Hence, "motor rumble" from the turntable motor is more apparent when a crystal pickup is employed. However, this can be greatly reduced, if not eliminated, from the amplifier input if the bass response of the pickup is attenuated by an alteration of circuit values.

(10) Few popular radio-phonograph combinations produced previous to this year employed frequency correction in the pickup circuit. The quality of reproduction of these combinations can be improved by matching the characteristics of the pickup with those of the amplifier and speaker with which it is employed.

(11) Though it is not always apparent, "pickup chatter" comes from the pickup, not the loudspeaker, but is an annoyance nevertheless. A change of needle type may eliminate it, but the best answer is a record player with a lid that may be closed so that the "off-the-record" noise cannot be radiated into the room.

(12) For those addicted to album music and disliking long breaks occasioned by manual turning, the neatest setup is dual turntables and pickups, with dual volume controls or a fader, and the use of album recordings pressed for automatic record players of the drop or throw-off type. In these pressings, the sequence progresses through one set of sides, then the other.

Servicing

A frequent complaint is phonograph-motor rumble or "growling." This can be very annoying, particularly if the motor-turntable and pickup are a part of the radio rather than separate from it. In consoles having a high degree of cabinet resonance, the condition is further aggravated.

Contrary to popular belief, very little of this rumble is transmitted to the reproducing unit of the pickup via the motorboard and the pickup arm. Modern phonograph motors are floated on rubber and pickup bases are rubber-insulated from the motorboard to prevent mechanical vibrations from reaching the reproducing unit.

Actually, gear noise, etc., is transmitted upwards through the turntable drive shaft, thence laterally from the spindle through the turntable and record. In modern machines, this lateral transmission of mechanical vibration through the record has been substantially reduced by employing a rubber spindle. The felt pad on the turntable also serves to insulate the record from laterally-transmitted vibrations.

Irrespective of these precautions, any lateral vibrations through the record will tend to displace the reproducing needle, the functional movement of which is lateral to begin with. Hence, gear noise, etc., affect the needle in the same manner as the modulated record grooves.

In fairness to the manufacturers of motor-turntables, it should be pointed out that the exceedingly close tolerances required to completely eliminate all vibration in the drive mechanism can be incorporated only in the more expensive units. The high response of crystal pickups in the bass region results in an emphasis of rumble or growl, and in this respect the crystal pickup has brought on a condition seldom encountered when a magnetic pickup is employed.

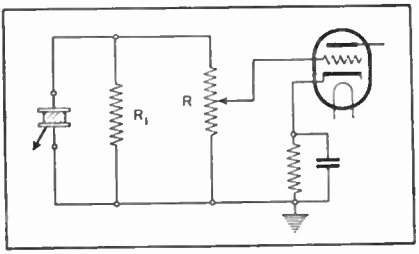

Fig. 1. The shunt resistor, R1, will reduce turntable rumble by attenuating bass response of xtal pickup.

Eliminating Rumble

In the event that the motor-turntable is well designed, and not defective, rumble and growling are most readily eliminated by attenuating the low-frequency response of the crystal pickup. This is accomplished by reducing the value of the load resistance across the pickup, which is usually the volume control. Rather than replace the control with another of lower value, it is far easier, and just as effective, to add a fixed shunt resistor, R1, as shown in Fig. 1. An exact value for this resistor cannot be given, as it is dependent upon the total resistance value of the volume control and the degree of attenuation necessary to eliminate rumble. However, it has been determined that where the volume control, R, has a value of 500,000 ohms, a value of 75,000 ohms for R1 does the trick.

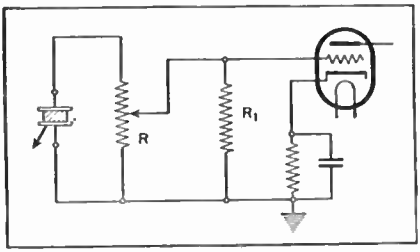

Fig. 2. With this connection, the load resistance alters with a change in the setting of the volume control.

An alternative arrangement is shown in Fig. 2. Here the shunt resistor R1 is connected from grid to ground so that the load resistance alters with a change in the setting of the volume-control arm. It is purely a form of compensated volume control having proportionately greater bass response at low settings and increasingly less bass response as the volume control is increased. The advantage of this arrangement lies in the fact that phonograph motor rumble and growl are usually not noticeable at low volume settings; hence, bass response need not be attenuated in this low-volume region. As the control is advanced, which would ordinarily bring up the rumble, the bass response is progressively reduced.

In cases where rumble is very difficult to eliminate, look for cabinet resonance. The only solution in such an instance is to line the interior of the cabinet with sound-absorbing material, or, where the speaker compartment is separate from the chassis, and no ventilation problems exist, to form an infinite baffle of the speaker compartment.

Pickup Installation

The addition of a record player to a radio receiver is a simple enough procedure, and no diagrams are called for. However, it is important to determine the characteristics of the input circuit of the first amplifier stage before tying in the pickup. So long as the grid of the a-f tube is biased by means of a cathode resistor, the pickup may be tied directly to the grid or the high end of the receiver volume control.

However, if this tube is biased in such a manner that an actual voltage exists on the grid—such as would be the case with a bias cell, with contact-potential bias, or a grid return to a source of negative voltage in the power supply—then it is important that a blocking condenser be inserted (if one is not already in the circuit) to keep the grid voltage off the pickup crystal element. It should be remembered that not only will pressure on a crystal unit develop a voltage, but also a voltage applied to the faces of a crystal will alter its shape. Hence, if the bias voltage for the a-f tube is permitted to appear

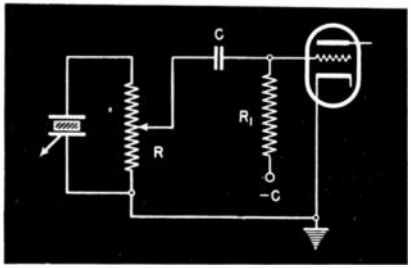

Fig. 3. Where there is an actual bias voltage on the tube grid, it should be isolated from the pickup by a blocking condenser, C.

across the crystal unit, the crystal will be under tension and the pickup needle thrown off its normal vertical axis.

The proper connections when this condition prevails, are shown in Fig. 3. Condenser C should have a capacity of .01 mfd or more.

Correction and Equalization

Few crystal pickups give optimum results if they are merely hitched across the receiver volume control. Aside from the peak at the low end, one or more peaks exist at the high

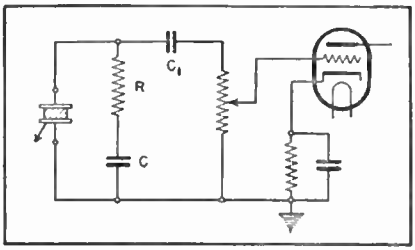

Fig. 4. Circuit for reducing peaks in the upper range of a crystal pickup.

end which give rise to needle hiss and shrillness of tone. An ironing out of these peaks improves reproduction considerably.

As previously mentioned, the peak in the bass region may be reduced by decreasing the value of the load resistance. Peaks in the upper range can be reduced by the addition of a filter, as shown in Fig. 4. Generally speaking, the resistor R determines the degree of bypassing and the condenser C the frequency at which the greatest degree of bypass will occur. Typical values are 100,000 ohms for R and .02 mfd for C. The effect on frequency of condenser C1 is small if its value is .01 mfd or greater, in which case its only role would be that of a blocking condenser. At lower values, however, its reactance to the higher frequencies increases; hence it can be of value in ironing out a secondary peak, if one exists. Normally, this condenser is not required.

So-called equalization can be obtained with the circuit shown in Fig. 5. With proper values for R, R1, and C, substantially flat response over the range of the pickup can be had. The resultant tonal balance provides a marked improvement in the reproduction of the more modern recordings.

Here again, precise values cannot be given as they depend upon the characteristics of the pickup and the amplifier and speaker through which the pickup is operated. R1 (generally the volume control) may be anything from 0.5 to 2 megohms; the higher the value, the greater the bass response. A satisfactory value for C is 100 mfd. The resistor R determines the degree of bypassing around condenser C which presents a high reactance to frequencies in the upper range. Hence, the larger the value of R the greater will be the attenuation of the higher frequencies, and, conversely, the lower its value, the less the attenuation. Values generally used are 0.5, 1, and 2 megohms.

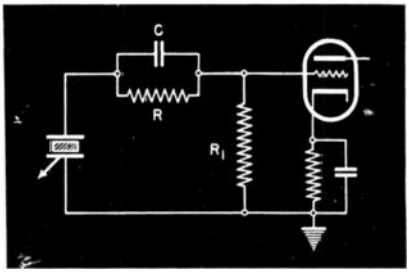

Fig. 5. Crystal pickup circuit containing an equalizer made up of the condenser C and the resistor R. R1 is the load resistor.

This equalizer should not be connected at the output of the pickup, but as near to the grid of the a-f tube as is practical.

Magnetic pickups with inadequate response at the low frequencies, may be jazzed up by means of the arrangement shown in Fig. 6. This is

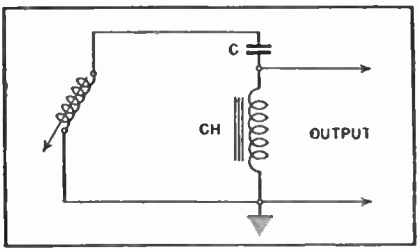

Fig. 6. Increasing bass response of magnetic pickup by means of a resonant circuit composed of a choke, CH, and a condenser C.

a resonant circuit composed of the condenser C and the iron-core choke CH. The bass boost should be in the vicinity of 100 cycles, and for this frequency C should have a value of .02 mfd, and CH a value of 500 henries. These values will be satisfactory for most applications.

THE RADIO TRADING POST

(*Continued from page* 4)

FOR SALE—Triplett 1181E portable lab., $20.00, Superior channel analyzer, $10. Both in perfect condition. Virgil Oliver, 620 N. 20th St., Mattoon, Ill.

FOR SALE OR SWAP—Complete radio-television-sound course by De Forest. Cost $165.00. Make offer. "Principles of Radio" by Henney, "Radio Engineering" by Terman, "Radio Operating Questions and Answers." Want Rider's Manuals 1935 to 1940. Mitchell Vincent, Box 4192, So. Richmond, Va.

FOR SALE—Rider's service manuals Vols. 1, 2, 3, also Rider's auto manual Vol. No. 1. All like new, $15.00 cash for all 4 books. W. J. Cloyd, 103 San Juan, Almosa, Colo.

POSITION WANTED—Young man graduate of R.T.I. desires position as service man. 4 years experience. Edgar Boles, R. 4, Marion, Ill.

POSITION WANTED—Licensed first class radiotelephone operator wants work in broadcast station or other transmitter work. Graduate of National Schools, Los Angeles. Don Reed, Breckenridge, Missouri.

FOR SALE—Rider's auto manuals Nos. 1 and 2. Hickok O.S.-11 all-wave A.F.-I.F. oscillator with input meter. Bogen PM4 A.C. pre-amplifier and mixer—four channels, 6 v. input, 250 v. output Genemotor with filters. Used radios, all kinds. What am I offered. E. Falardeau, 65 State St., Willimansett, Mass.

WANTED—Rider's service manuals. State condition and prices asked. V. E. Rowe, 2100 Lansing Ave., Portsmouth, Va.

FOR SALE- Complete N.R.I. course in radio servicing and merchandising. Make me an offer. H. R. Lauffer, R. D. 3, Box 261A, Greensburg, Pa.

FOR SALE—RCA 5" Kinescope 1802 P4 white phosphor, $20.00. In use only 2 months. S. Malczyuski, 268 Ellis Ave., Irvington, N. J.

TRADE OR SELL—Federal PR-12 recorder complete, 120 watt sound system. CB oscillograph, OMA FM signal generator, CB VTVM. CB universal speaker, Supreme 385 automatic, speakers, mikes, etc., complete description will be furnished. Corbett Radio and Sound Labs., Amboy, Minn.

WANTED—0-300 wattmeter. State price and condition. Oscar S. Marder, 597 Market Street, Kingston, Pa.

FOR SALE — 350 watt autonator, like new, model 1200 Triplett volt ohm milliameter, ABC Unimeter tube tester, 12" Best theatre speaker with field, $9.00. Edward Kertz, Kenosha Police Dept., Kenosha, Wis.

POSITION WANTED — Young man 24, married, wants work servicing radios. Has some experience and necessary equipment to start. Will soon be graduate of N.R.T.I. Leland Johnson, Box 103, Kerkhoven, Minn.

WILL TRADE—Several new Triplett mil. meters, bug and standard key, many new and used amateur transformers, a few assorted crystals, etc. Send for list. Want PM speakers, amplifier and other sound equipment. E. A. Pennington, 2305 West Broadway, Council Bluffs, Iowa.

WANTED—A used record player with crystal pickup, a small amplifier and transmitting key. Must be in good condition. Please state your lowest price. Also want servicing manuals. Bruce Nottingham, Boyer, West Virginia.

FOR SALE—Rider's manuals, vols. 3, 4, 5, 6, 7 and 8 for only $25.00. Also have copy of "Cathode Ray Tube at Work" for $1.50. R. B. Chase, 9 South 16th St., Richmond, Ind.

FOR SALE—Rider's manuals 5, 7, 8, 9, like new, with How it Works books, $30.00. Eastman f 3.5, 16 mm. camera Model B; Projector, Model C, good condition $30.00, or will sell separate $15.00 each. William Georges, 552 W. Liberty St., Cincinnati, Ohio.

FOR SALE — Brand new HRO receiver complete with coils 1550 to 32,000 KC. Will sell at 10% off reg. amateur net. Back copies of Radio Retailing and Radio Today. New G.E. 1941, $19.95, 300 hr. battery portable complete $11.50 f.o.b. Chicago. John Magnus, 404 No. Wells St., Chicago, Ill.

POSITION WANTED—Radio service man, 19, with three years experience, has 1940 tube and set test equipment. Good references. Desires position in any branch of radio servicing. Raymond Buckman, Kearney Add., Nebraska City, Neb.

FOR SALE—Radio-Electric sales and service business, with lot and building, comfortable apartment. Business doing nicely but want to go West. Value $6,500.00. Will sell, swap, lease or make offer for deal. Sherzer Radio & Elec. Co., Cape May Court House, N. J.

THE RADIO TRADING POST

(*Continued from page 14*)

WANTED—Good used Kodak-type camera. Give full details in first letter.—N. A., Post Office Box 814, Plainfield, N. J.

FOR SALE OR TRADE—Meissner 9-tube Traffic Scout, 3 yrs. old, covers 70 meg. to 600 KC., built especially for 10 meters. Prefer local deal so buyer can hear and appreciate set. Isador Gruber, 867 De Kalb Ave., Brooklyn, N. Y.

FOR SALE—P. A. system including S. M. amplifier, Jensen 12" speaker, mike, all necessary cables, $10.00 complete. One demonstrator Kadette Tunemaster, $7.50. Astatic D-104 crystal mike $7.00. Don Taylor, Wellman, Iowa.

FOR SALE—Rider's manuals 1 to 8; several PM speakers; Jackson oscillator, all-wave model; Clough-Brengle oscillator, battery operated; Readrite 710 set tester, closing estate. Box 266, Albia, Iowa.

WANTED—National SW, 3 plug-in coils; tube tester and multi-meters. Have W.E. 205-D transmitting tube to trade. Sam Hect, 10 Fairchild Pl., Irvington, N. J.

FOR SALE—1180 Superior combination multi-meter and tube tester. A complete all-purpose testing laboratory. Good condition. Price $10.00. Matt Halgowski, 311 Wetmore St., Utica, N. Y.

FOR SALE—Gas model aeroplane. Room for radio control. Brown, Jr. motor. Like new. 8 ft. wing, 48" long, 4½" M & M air wheels, mechanical flight timer 10 sec to 5 min. Complete ready to fly $10.00. Harry W. Hess, 25 So. 43 St., Philadelphia, Pa.

SWAP—2 0-100 mill. D.C. Weston 506 meters, 1 0-150 A.C. voltmeter Weston 506, 1 3" Jewell 0-10 A.C. voltmeter, 1 3" Hoyt 0-50-100 mill D.C. meter, 1 Bliley 7025 K.C. crystal in holder, 1 anti-capacity 4 P-DT switch, 2 W.E. relays used in telephone circuits. Want signal generator or tube checker. Walter, Rd. 5, Box 377, Ft. Worth, Texas.

WANTED — Set analyzer of reputable make. Please state make, model and condition of the instrument, also your lowest price. S. Berenblum 417 Greenwich Ave., Greenwich, Conn.

POSITION WANTED—Young man, 27, N. R.I. graduate, two years' experience in radio servicing. Ambitious, desires position in any branch of radio servicing field. Prefer location in Ohio. Ralph Yoder, Sugarcreek, Ohio.

WISE AND OTHERWISE

The colored preacher's term had expired and he was anxious to stay on.

"Brethren," he said, "The time has come fo' youall to elect a pastah fo' anothah yeah. All dose favorin' me will please say 'Aye.'"

He waited a moment and then he said: "Silence gives consent. I'se yo' pastah fo' anothah yeah."

◆

Judge: "Officer, what makes you think this young man was drunk?"

Cop: "Well, your honor, I saw this mug hanging onto a fire alarm box. He dropped a cent in the opening, looked up at the City Hall clock and said, 'Holy Smokes! I've lost ten pounds.'"

◆

Customer: "Could you suggest something suitable for a girl friend's anniversary?"

Clerk: "How about these book ends?"

Customer: "Just the thing! She always reads them before she does the beginnings."

◆

Visitor: "And how old are you, Bobbie?"

Bobbie: "I'm just at the awkward age."

Visitor: "Really? And what do you call the awkward age?"

Bobbie: "I'm too old to cry and too young to swear."

◆

1st Caddy: "My feet burn like the dickens. Do you think a mustard bath would help?"

2nd Caddy: "Sure! There's nothing better than mustard for hot dogs."

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TYPE BR 850

THE high voltage rating of these etched foil "Blue Beavers" makes them ideal capacitors for universal replacement work — eliminating expensive exact duplicates—valuable shopping time—and extensive stocks. Hermetically sealed in insulated aluminum tubes, with patented safety vents, the type BR's are supplied with firmly anchored wire leads. No chassis drilling —no pal nuts or washers needed. Just solder the leads into position and the self-supporting "Blue Beaver" cuts "hook-up" time to a minimum.

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