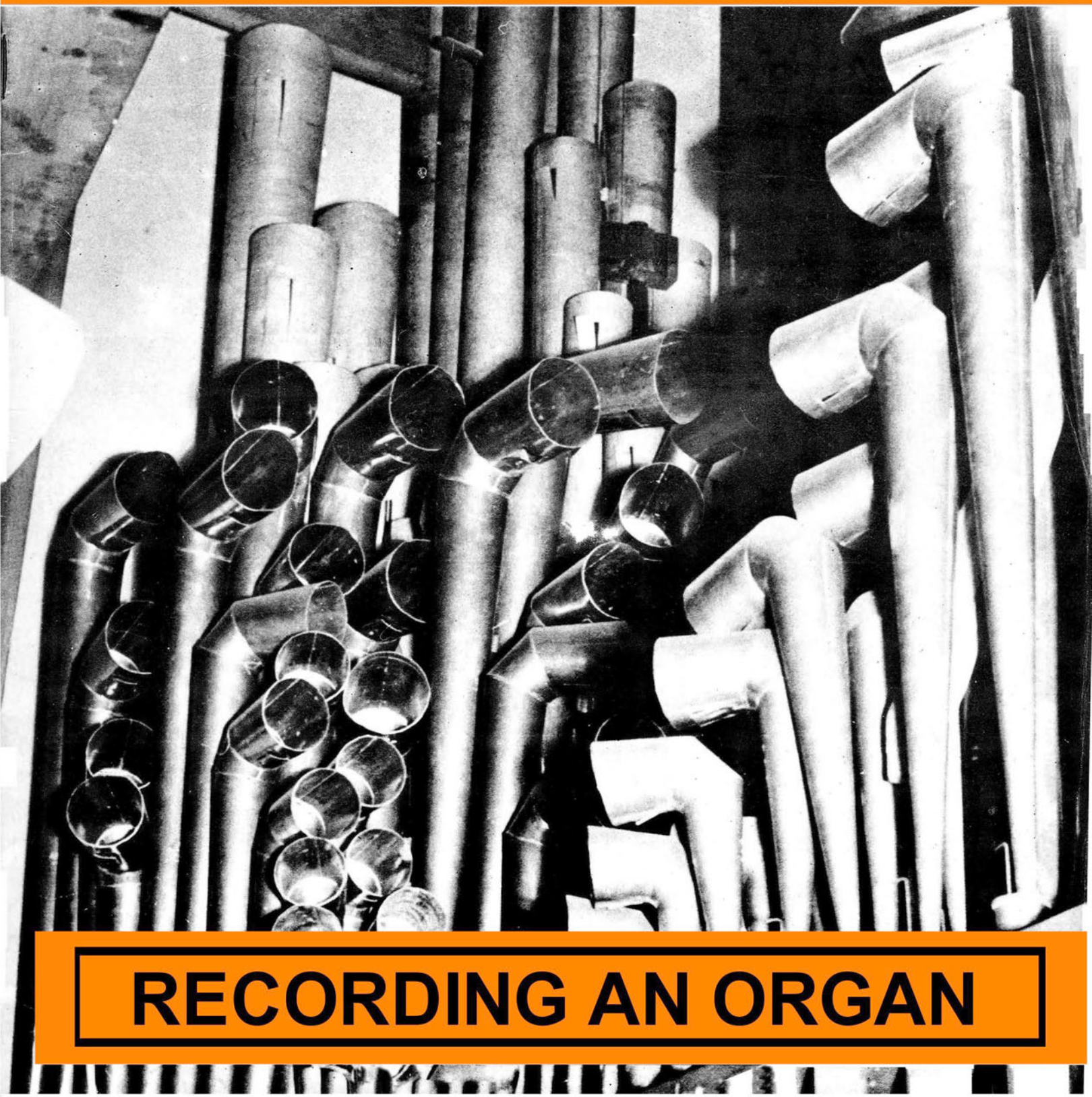
the TAPE RECORDER

PRICE 2/-

JANUARY 1964
Vol 5. No. 12

INCORPORATING "SOUND AND CINE"



RECORDING AN ORGAN

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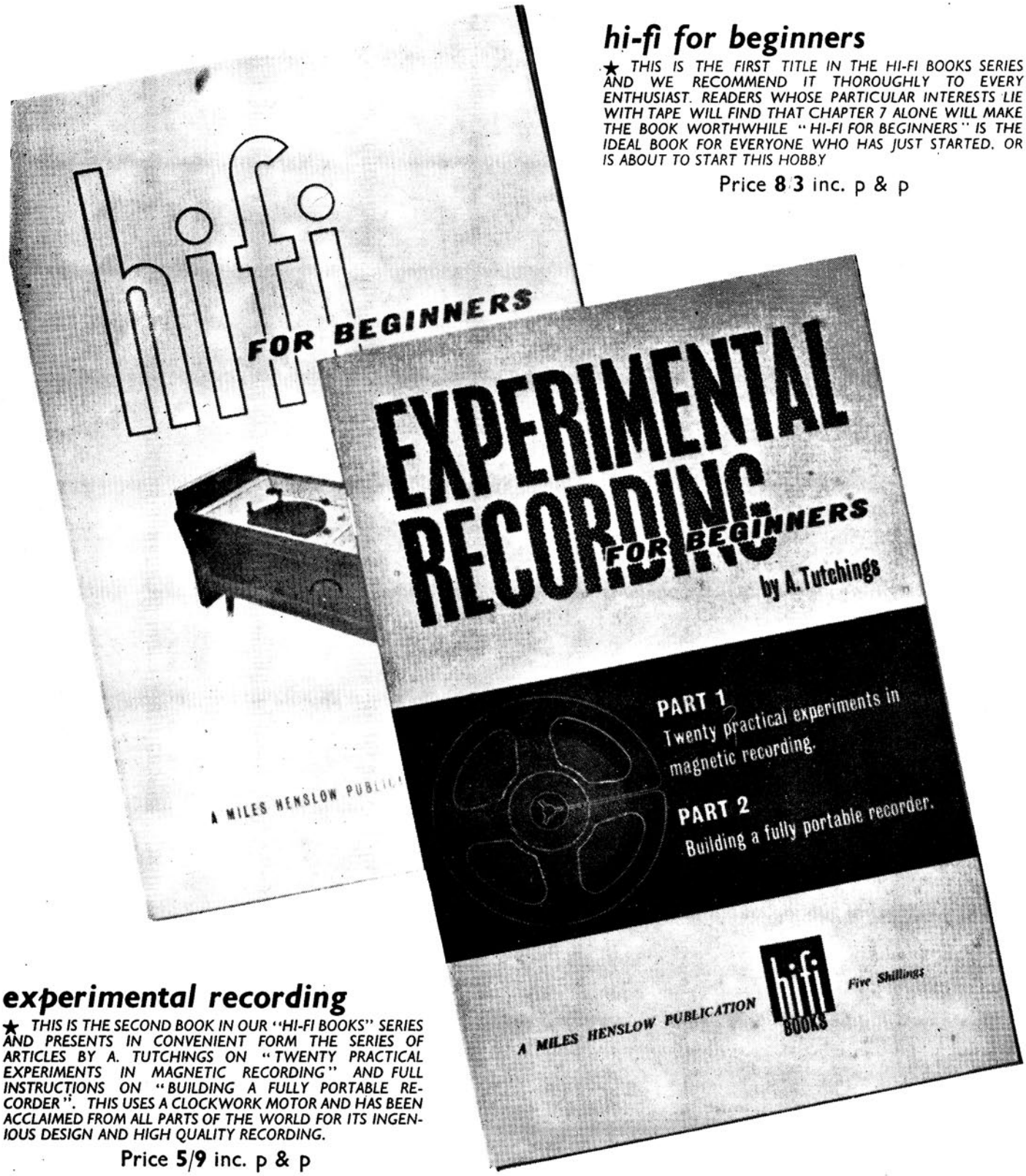

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MA-5

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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. £13 12s. 1d.

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S-99

RSW-1

UXR-1

GL-58

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Each 59 gns. (U.K. only)

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These handsome self powered tape units, in superb Afrormosia plinths, polyester finished, provide an ideal means of adding tape to the existing Hi-Fidelity system at a very economical price. They can be used with any amplifier at present available and be operated horizontally, vertically or any angle between.

To enable purchasers to make their own personal choice of microphone and tape, we do not supply these items with any tape unit.

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ANY 3 PRE-RECORDED TAPES

89 The one and only Dakota Staton sings If I Love Again, On Green Dolphin Street, Pick Yourself Up, Meet Me at No Special Place, etc.

54 Tchaikovsky's last and greatest symphony, is here given a splendidly moving rendering by the Sinfonia of London conducted by Muir Mathieson.
Also in stereo.

58 The fabulous dynamic Duke Ellington himself in eight great numbers including Stomping at the Savoy, In the Mood and Honeysuckle Rose.

14 Tchaikovsky Symphony No. 5. Sir Malcolm Sargent and LSO combine to give this famous symphony a dramatic and colourful rendering.
Also in ster

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 in stereo.

74 Superb Sarah Vaughan in ten great numbers. If I Loved You, Saturday, It's Delovely, You'll find me There, etc. Every one a hit.

76 Unforgettable Art Tatum in person plays Tenderly, Body and Soul, Without a Song, Begin the Beguine - 12 superb numbers from the greatest-ever jazz pianist.

11 Dvorak Symphony No. 5 - From The New World. Leopold Ludwig conducts the London Symphony Orchestra in a dramatic and moving performance.
Also in stereo.

69 The exquisite playing of the Virtuoso Ensemble matches the beauty of Schubert's celebrated Trout Quintet, which contains some of his most famous melodies.

66 Lily of Laguna, Milord, Come Prima, Dance Everyone Dance, and 14 more played in characteristic manner by the Les Baxter Orchestra.

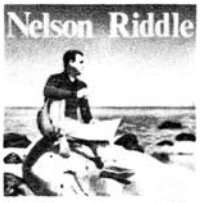
44 Leopold Ludwig and LSO combine brilliantly in an exciting 'double': two of the world's greatest symphonies receive vivid new interpretations.
Also in stereo.

72 The magnificent Platters bring you Sixteen Tons, My Dream, Mystery of You, You'll Never, Never Know, One in a Million – 10 superb numbers.

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

85 Beethoven's Emperor Concerto. A virtuoso performance by Yuri Boukoff with L'Orchestre des Concerts de Colonne under Pierre Dervaux.
Also in stereo.

53 These two suites, containing some of Bizet's most thrilling music are given magnificent performances by the Sinfonia of London under Muir Mathieson.
Also in stereo.



71 The smooth sound of the Nelson Riddle Orchestra in Touch of Your Lips, Body and Soul, The Tender Touch, As you Desire Me—11 favourites in all.

2 Grieg Piano Concerto. Alexander Jenner in an electrifying performance with the Bavarian State Radio Orchestra conducted by Odd Gruner-Hegge.

1 Tchaikovsky Swan Lake. John Hollingsworth conducts the Sinfonia of London in a great performance of this well-loved ballet music.
Also in stereo.

70 The Archduke Trio. Beethoven's inspiring masterpiece here receives a truly outstanding performance from the Loveridge - Martin - Hooton Trio.

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 in 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.
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77 In the Mood, Bugle-Call Rag, Chattanooga Choo-Choo, Serenade in Blue 9 original tracks by the immortal Glenn Miller and his band.

49 Beethoven Fidelio Overture, Brahms St. Anthony variations, Mendelssohn Hebrides Overture, Wagner Siegfried Idyll. Superb interpretations.
Also in stereo.

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

65 Our Love is Here to Stay, The Nearness of You, Guilty, and nine more great hits, all with America's top vocal group, the fabulous Four Freshmen.

91 Barbara Leigh with all-star cast and orchestra sing It's Never Too Late, I Could Be Happy With You, We Said We Wouldn't Look Back, 12 in all.
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63 Cuban Carnival, Yesterdays, Blues in My Heart, and eight more great numbers played by George Shearing with vocals by Dakota Staton.

6 Kismet. Full cast production. Brand new arrangements. Star artists sing Stranger in Paradise, Baubles, Bangles Beads, This is my Beloved, etc.
Tape.

81 Some of Chopin's loveliest melodies magnificently played by world-famous pianist Fou Ts'ong—The Four Ballades, Nocturne in F Sharp Major, etc.

13 Gershwin's Rhapsody in Blue and American in Paris. Pittsburgh Symphony Orchestra conducted by William Steinberg. Jesus Maria Sanroma, piano.
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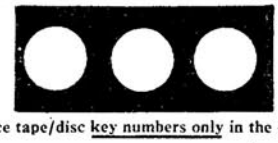

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EDITORIAL

ONCE more we notice with a bump that "Number 12" has appeared at the head of this page, and that another Volume is at an end; and because we are acutely aware that we have caused quite a few of our faithful readers more than a little trouble during the past year, we wish to take up part of this space, before we go any further, with a most sincere apology. Many of us will probably remember, painfully, the schoolmaster's words—"*this hurts me more than it does you*"—and certainly those who have not actually been at the receiving end when the words were uttered will appreciate their significance. They are in every way applicable to our own feelings when, (to use a horrible modern phrase) due to circumstances beyond our control, copies of this magazine have gone out to our readers, and have reached them in a condition that made us blush with shame when we knew about it. There are times when it seems that nothing more could go wrong with plans, and we have several times thought that we had reached and passed that point during 1963, only to find an odd and overlooked Gremlin with a spanner in its hand. Perhaps there is no such thing as that final straw . . .

For 1964, therefore, we hope that we can bring you much in the *Tape Recorder* that will more than make up for our shortcomings in the past year; and if we do not entirely succeed, you may be sure that it will not be through lack of effort. Editorially, we hope that we are on the right lines, and that our decision to include more features for do-it-yourself constructors will be pleasing to the majority. Many readers have told us that we devote too much space to articles dealing with service, repairs, etc., and that we should concentrate more upon less technical matters. On the other hand, from readers who are specially interested in the "insides" of recorders (and they include a large proportion of our dealer and service readership), we are told that these articles are just what are needed, and that we can leave out much of the "froth". There is of course only one answer to that, and it is to make sure that there is a good proportion of both types of material in nearly every number. Since we established our *Tape Records Reviewed* feature as a regular item some months ago, instead of treating it as a hit-and-miss item every so often, it appears to have found considerable favour; and as releases of tapes are stepped up, so do we hope to be able to give it even more space. Stereo is another subject for which more information is demanded, but the fact remains that most of our readers have mono equipment only, and until such time as stereo is really "with us"—and we repeat our belief that this will come about rapidly when the BBC begin regular stereo broadcasts—the accent must remain predominantly upon mono topics.

Among features which have earned almost as much criticism as praise for their inclusion have been (for example) those on the technical side of tape, notably the series on "drop-outs", by Graham Balmain. We defend these not merely because we like them, but because we know that they are proving of great interest to a large number of readers. What we hope to do is to tackle the subject in a parallel but more down-to-earth way for non-technical readers during the coming year. Rather like listening to music through good, hi-fi equipment, when one begins to be really critical for the first time, it is a knowledge of what to look out for, and of what faults to recognise, that enables the tape recorder owner to improve his results; and troubles with tape, and with the tape transport system, are the most frequent causes of disappointing recordings. At first, when a tape recorder comes into use in a home—and no matter if it is only used for occasional amusement—most of the recordings sound good—or at least passably good. But it is almost certain that many of these recordings would not sound nearly so satisfactory if played back a year later and compared with more recent tapes. Though it is often thought that the recorder "has gone downhill", the fact is that the faults are only recently apparent. The ear was deaf to them before. And so it is that experience makes the user demand more from his machine in other ways—and for this reason we hope to bring readers more articles from experienced writers who know the subject. We do indeed appreciate the feelings of readers—particularly those who are complete newcomers to tape recorders—when they write to tell us that they are not interested in knowing what goes on inside a recorder, and that all they want to know is how to use it and what to do with it. We have that thought in mind, and intend to cover it, too, but there seems to be little doubt that, in most cases, when the novelty wears thin, and when the recorder has been lived with for a while, most people want to know a little more about it. And we hope to be able to help. We wish all our readers, once more, a very happy and successful 1964.

SUBSCRIPTION RATES

The Subscription rate to *The Tape Recorder* is 30s. per annum (within the British Isles) and 32s. 6d. per annum overseas (U.S.A. $4.50). This includes a free copy of the annual index. The same rates apply to *Hi-Fi News*.

The Tape Recorder, 99 Mortimer Street, London, W.1

JANUARY - - - - - - - - - - 1964
VOL. 5 - - - - - - - - - - - - - - - - No. 12

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Contents

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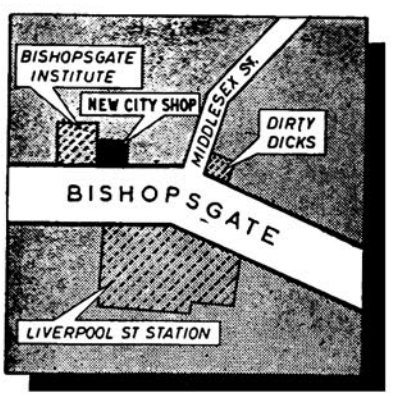

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NEWS FROM THE WORLD OF TAPE

BBC Install Philips Recorders

TWO hundred Philips *EL3566* tape recorders are being supplied to the BBC by *Peto Scott Electrical Instruments*.

Over 180 full-track mono machines have already been installed in sound studios and, in addition, a number of twin-track versions are to be used in television studios and outside-broadcast vans. The second track is used for cueing purposes.

The recorders have two speeds, 7½ and 15 i/s, the appropriate equalisation circuits being selected automatically. The overall characteristics of the *EL3566* are as follows.

Frequency range: (7½ i/s) 60 c/s to 8 Kc/s ± 2 dB. (15 i/s) 60 c/s to 10 Kc/s ± 2 dB. Wow and flutter (peak to peak): 0·2% and 0·15%

Portable version of the Philips EL3566 professional recorder

respectively. These figures are maintained even when badly wound tapes are used, due to pneumatically damped smoothing rollers.

An important feature for broadcasting work is the rapidity with which the recorder can be started and stopped. The rated speeds are attained within half a second, and the quoted flutter conditions established within two seconds. Light pressure on the stop button applies the brakes moderately, and when the button is fully depressed the tape stops instantly. Constancy of tape speed from beginning to end of the reel is an important factor in the timing of programmes; a total speed deviation of less than 0·25% can be attained.

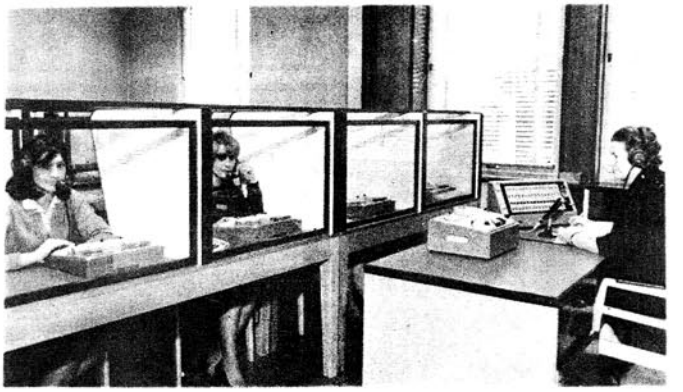
The recorder is driven by three motors. A Papst capstan motor with an outside rotor serves as a flywheel, while two torque motors provide drives for take-up and fast-rewind. When rewinding, the tape is lifted automatically from the heads.

The recorders and amplifiers have been supplied to the BBC in unit form, with separate decks and amplifiers suitable for rack mounting, or in wooden cabinets with accommodation for storing cables and accessories.

* * *

Victoria Language Laboratory

WE make no apology for returning once more to a subject that has received considerable publicity in the last few issues of this magazine as, there can be no doubt, we are witnessing a revolution in educational techniques. Hitherto, the laboratories described have been



somewhat expensive "streamlined" units costing several thousand pounds.

The underlying theme in the design and application of the "Victoria", recently instituted at the City of London College has been economy. Using standard, though nevertheless good quality, equipment based around the Magnavox (Collaro) Studio deck, the complete teaching system with twelve booths cost less than £1,200. Transistor amplifiers are used throughout, eliminating warm-up time and damage to valves caused by continual switching on and off. No distracting modulation indicators have been included, the recording level having been pre-set at a reasonable level. Facilities have been provided for recording educational radio programmes from a Philips FM/AM receiver and language-discs from a Garrard turntable.

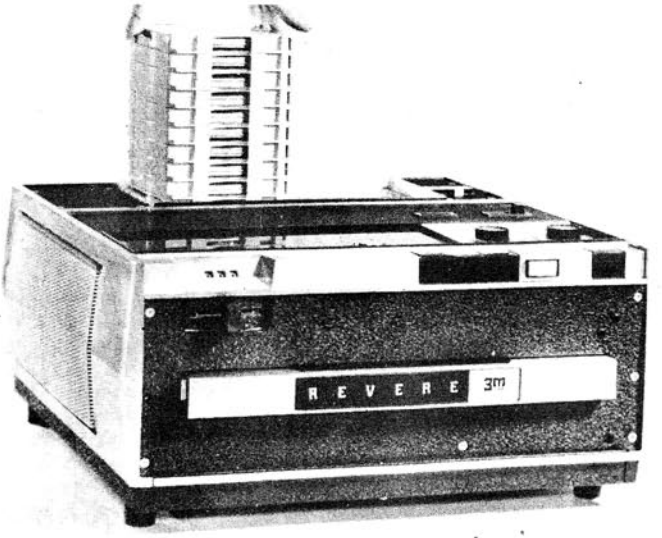
A small, well-insulated, recording room has been set aside to enable the instructor to make her own language-tapes or modify existing ones. This work is carried out on a twin-channel Telefunken.

* * *

Revere Tape Player

THE following news item is guaranteed to agitate all readers who are, in principle, against commercially pre-recorded tapes. Truly, the *Revere* stereo tape-player can claim to be a competitor to the gramophone. Of American origin, it is designed to play-back tapes (and to record them if necessary) on special single-spool cassettes. These cassettes can be loaded on to the machine in much the same way as discs are placed on a record-changer.

Using special tape, ¼ in. wide, running at a speed of 1⅞ i/s, a playing time of 48 minutes can be had from a single cassette. Loaded



with a maximum of twenty cassettes the machine will play in stereo, unattended, for over eight hours. It is claimed that the quality of these tapes at 1⅞ i/s is as good as, if not better than, many modern machines playing at 7½ i/s.

Although the idea behind it is not new, similar machines have been available in the U.S. for several years, the *Revere* is said to be the simplest recorder ever made. Less dexterity is required to operate it than is needed for a record-changer. By making tape this simple to use, the designers hope that it will attract potential buyers who are put-off by the apparent complexity of most present-day recorders.

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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.

The Raw Material

Dear Sir, I believe that recording tapes are made, mainly, from three basic materials, of which those with a polyester base are the best for high-quality recording. There are many standard makes of tape on the market, and also many advertisements for cheap unbranded tapes. The trouble is, how does one differentiate?

Tape drop-out is one of the most prevalent defects a recording enthusiast has to overcome; do any of the standard makes guarantee their tapes not to have this defect, and are they prepared to exchange faulty tapes after purchase? What is the chance of getting tapes suffering from drop-out?

I would like to use double- or triple-play tapes but understand that there has been trouble over print-through when thin tapes are stored for fairly long periods. I am now told that this difficulty has been overcome, your comments would be appreciated.

Yours faithfully, **G. A. V. S., London.**

Your problem is an interesting one which would appear to confuse many readers. There are three main base materials from which recording tape is made. They are polyester, poly-vinyl-chloride (PVC), and acetate. Of these, polyester is the most durable and is used on many modern extra-play tapes. It is known by several commercial names, such as Mylar and Melinex.

While polyester and PVC are less likely to leave oxide deposits on the recording heads, many professional studios and broadcasting stations use acetate because of the brittle nature of that substance which renders it less likely to stretch in the event of a mishap during playback or fast-winding. This is not, however, to say that it is in any way stronger than the other two; as many readers will know, acetate has a bad habit of snapping if mishandled.

Tape drop-out is, unfortunately, far too common on all three kinds of tape. Several of the quite well-known brands suffer very badly from it, while on others, including many of the so-called "cheap" tapes, the effect is quite negligible.

Due to considerable advances in the nature of the oxide structure, print-through is nothing like as prevalent as it used to be, even on the thinnest of tapes.

* * *

Hiss on Playback

Dear Sir, I have a Grundig TK20 and would appreciate your advice on overcoming the following problem. When switched to play-back, the gain control being at normal volume, a loud hiss and considerable amount of hum are present. This occurs even without tape on the recorder. I have cleaned and defluxed the heads with little or no improvement.

Yours faithfully, **P. A. N., West Bromwich.**

The loud hiss and hum you are experiencing on your Grundig TK20 could be due to poor contacts of the Record/Play relay. This is a popular (or, more accurately, unpopular) fault with service engineers.

You can check the first stage by short-circuiting the middle contact of the volume control to chassis (which is the same as turning it to minimum). If the hiss clears, the fault is in the first stage. To prove the first stage, look for the contact trio of the Microphone button and note the common tag. Short this to chassis when switched to playback and if the fault clears, either your relay or head is at fault. This is where the fun begins!

Your head could be magnetised, but if you have carried out normal defluxing, I would certainly suspect the relay. You will find this adjacent to the sound channel or head plate, and it is easily identified by the transparent plastic cover. Remove this (one screw and a strip of adhesive tape) very carefully, and clean the contacts with a good switchcleaner, such as "Electrolube". Many of the proprietary switchcleaners leave a carbon deposit which does this kind of contact no good at all. Remember to let the switchcleaner evaporate completely before switching on again, or you'll suffer from switch-burn on one of the contacts which carries current.

I hardly like to advise you to attempt adjustment of contacts as this is an extremely delicate job, and, once bent, the contact springs are extremely difficult to re-position. It is essential that good contact is made in a high impedance, low signal level circuit—the least resistance serves to convey noise. With the machine switched to Play, try gently touching the contacts with a plastic knitting needle, or even a match, and note if the noise stops.

* * *

Inaccurate Digit Counter

Dear Sir, I own a Philips EL3541 tape recorder, the digital tape counter of which has become very inaccurate. A length of tape that registers, say, 0 - 100 turns digits, when put through the machine at normal recording speed would show around 75 when fast-wound. I gather this is due to the band slipping from the left spool carrier. Have you any suggestion for remedying this?

Yours faithfully, **A. I. P., Hounslow.**

You are indeed correct in assuming that the difference in play and fast rewind notation on the digital tape position indicator of the Philips EL3541 is caused by a slipping rubber drive band on the left-hand spool.

I would not suggest a makeshift cure in this case, as the band itself is so cheap. Replacement is the correct cure, but you might try a little French Chalk on the rubber if it has not worn too badly. If the plastic band is used, it is possible to shorten it by cutting and rejoining, using the heat treatment, i.e., the ends applied to and slid off the blade of a knife which has been heated. The trick is to melt the plastic just enough to form a weld, but not so much as to cause a bulky joint. As there is very little tension on this belt, the joint holds quite well. In fact, I have managed to join other belts, clutch drive, etc., in emergency, by this method.

* * *

Impedance Matching

Dear Sir, I have a Gramdeck tape recorder which works perfectly when connected, through its associated pre-amp, to the pick-up and extension speakers sockets of my radio. I recently bought an Armstrong Stereo 55 tuner-amplifier which has proper tape connections. For some reason the Gramdeck will not record from these sockets although it does replay through the amplifier. I would be obliged if you can throw some light on this problem.

Yours faithfully, **G. S., Bath.**

The trouble you are experiencing in coupling your Stereo tuner amp to the Gramdeck Tape Deck attachment seems to be due to mismatching. When the Gramdeck is connected to a normal radio, recording from radio is via the ext L.S. socket, at low impedance, which is correct for position 3 of the Gramdeck pre-amplifier selector switch. The pick-up connection to the radio allows the output stage of the latter to be used as an amplifier. To couple to the Armstrong, the P.U. output from the Gramdeck pre-amp should go to the Tape Input socket of the Stereo amp, and the input to the Gramdeck will either have to be stepped down via a transformer from the Armstrong Tape output or taken, as before, from extension loudspeaker to maintain the low impedance.

HUM AND NOISE IN TAPE RECORDERS

Part 2—COMPLETING THE PLAYBACK CHANNEL

By GRAHAM BALMAIN

THE first part of this article suggested how the home constructor should put a tape recorder together in order to prevent excessive hum. The reader who has taken the covers off a commercial machine may well have thought: "What a load of rubbish!"—the thought being directed at me if he liked the machine and at it if he did not. To be less obscure, many commercial recorders work very well in spite of being constructed in what is apparently the worst possible way: steel bars and chassis earth points all over the place, it seems.

Remember that commercial recorders have undergone months of laboratory development to determine just what the makers can get away with and still produce a sound to justify the price. You too can do this, and probably learn many surprising things in the process, but it is not worth doing unless you aim to sell hundreds a month. It is far better—if you ever want to finish the thing, that is—to start out with a form of construction likely to be successful straight away.

Last month's **fig. 3**, reproduced here for convenience, has one or two features which need explaining. Returning the screen—and suppressor—grids to earth wiring rather than to the cathode flouts the text book rules but results in less hum and noise, because the return currents do not then develop a voltage across the small, but finite, reactance of the cathode capacitor. It has no other adverse effects provided both screen-grid and cathode are adequately by-passed. The valve's own internal electrostatic screen (pins 2 and 7 on an EF86) is connected to chassis as usual.

The values of the two by-pass capacitors are greater than those often suggested, for the same reason, although they cannot be much increased for the screen-grid because of the physical size involved and for the cathode because of a rise in noise to be explained in a moment.

Finally the "humdinger", the 50 ohm wire-wound potentiometer across the 6·3V supply, helps to counteract the effect of electrical unbalance in the valve heater by offsetting the "centre-tap" of its supply as necessary. In practice it can only do this for one hum frequency, and the adjustment for the lowest *measured* level (usually of the 50 c/s fundamental) will not generally be the same as that for the lowest *audible* level (due to hum harmonics).

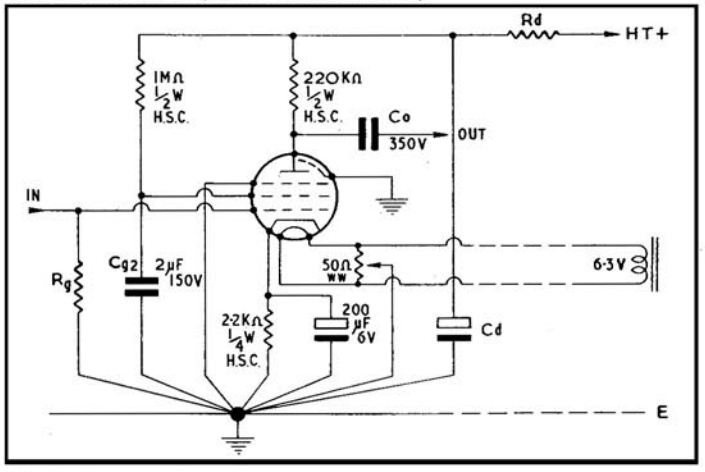


Fig. 3. *Circuit of low-noise EF86 input stage. Note that grids 2 and 3 are returned to earth, not to cathode. Co and Cg_2 must be paper or good metallised paper, metal-cased. The 50 ohm WW pot is adjusted for minimum hum under working conditions. Values of Co, Cd and Rd depend on overall circuit arrangements.*

If a really low hum level is wanted, a DC heater supply is far more satisfactory and, considering the total cost of a recorder, quite inexpensive. **Fig. 5** shows two arrangements, of which the (b) version is usually preferable, although the other can be tried first without losing anything.

It is wise to supply the second valve also with DC, which these units will do. In playback amplifiers the input pentode is usually followed by a double-triode whose hum level is considerably higher, so that the contribution of each to the final result may be of the same order. There is then little point in allowing the second stage to carry on where the first left off. One well-known machine, in which the equaliser network follows the input stage, actually has DC heating for the *second* valve and not the first, because the input stage hum is reduced by the network to below the level of that arising in the following stage.

Wide-band random noise in a pre-amplifier stage has two main sources. One is the valve itself. The causes are of no direct interest

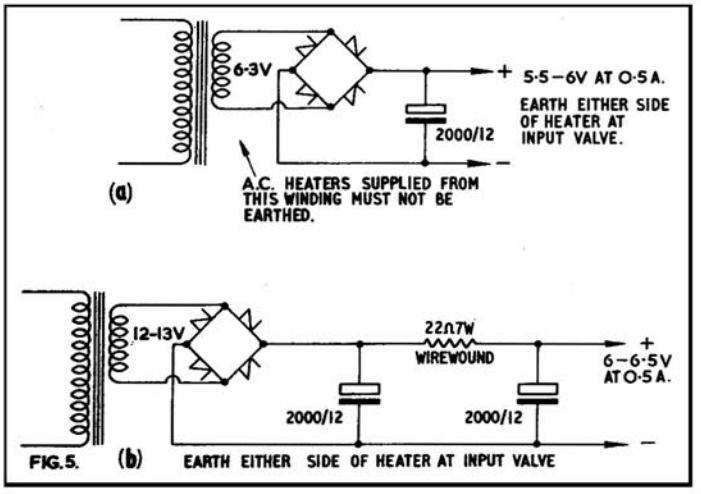


Fig. 5. *DC Heater Units, to supply pre-amplifier pentode and following double-triode. Diodes can be any 0·3A silicon junction rectifiers (TV supply type)*

here; P. Tharma's article in *Wireless World*, September 1963, summarises them and gives figures for the EF86 valve (and the AC107 transistor). But DC working conditions can be chosen which give the lowest value consistent with reliability and general convenience for pre-amplifier work; for example those of **fig. 3**, which are widely used in tape recorders.

The other source is the components associated with the valve. Fundamentally, any component possessing DC resistance (i.e. any practical inductor or capacitor as well as resistors) will produce some noise, but for our purposes the significant offenders are resistors or inductors in the grid circuit, and electrolytic capacitors or current-carrying resistors elsewhere.

For this reason high-stability carbon resistors should always be used in early stages; they produce much less excess noise when carrying DC than ordinary solid carbon resistors do, and even where there is no DC they may still show an advantage. All four resistors in **fig. 3** which have a direct circuit function (Rd is not included here) will produce appreciable noise: the anode, screen-grid and cathode resistors because they carry DC; Rg merely because it is there, although a playback head (of much lower DC resistance) connected to the input would itself determine the input noise at a much lower level.

True enough, both screen and cathode resistors are by-passed, but the by-pass capacitances are not infinite and their reactances at low frequencies still allow an appreciable amount of resistor noise to be amplified by the valve. The noise from the anode resistor is merely added to the output, of course.

As noted above, the screen-grid capacitor cannot be much increased because of the physical size involved, although doing so does produce a noticeable improvement in this particular circuit. An electrolytic capacitor cannot be used here since its high DC leakage produces much noise on its own account and also drops the screen voltage. On the other hand, an electrolytic *has* to be used in the cathode, and its value is a compromise between its own noise level and that of the cathode resistor. 200 mfd is usually about right, although up to 500 mfd may be satisfactory with a really high-quality unit. The decoupling capacitor Cd should also be borne in mind as a possible cause of noise,

and Rd as well if it is large and Cd small, but these components should normally give no trouble.

Looking forward a moment to **fig. 7** will give us one or two more points for low-noise design. This is a complete pre-amplifier block with negative feedback applied in an unusual way. **Fig. 6 (a)** shows the more usual cathode injection arrangement, which suffers from the disadvantage of having DC flowing through the non-by-passed feedback injection resistor Rf to cause excess noise. In **fig. 6 (b)** only the leakage current through Ck passes through Rf, and as the latter is usually small there is no appreciable addition to the total noise.

However, aside from the noise broblem, the **fig. 69** arrangement sometimes causes low-frequency instability ("motor-boating"), but it can often be stopped by connecting as in **fig. 6 (b)**. If that is unsuccessful, one is forced back to the conventional arrangement of **fig. 6 (a)**, but even here there is another possibility: making Rf a wirewound resistor, which shows no excess noise.

In the first part of this article I warned against using wirewound resistors in low-level stages because of the risk of hum pick-up, but with care they can help. The resistor must be physically as small as possible and will have to be tried *in situ*, in the orientation for minimum pick-up, to check that any induced hum is not in fact higher in level than the noise one is trying to reduce. Note that Rk in **fig. 7** is wirewound anyway; this also improves the circuit noise noticeably.

While you are experimenting along these lines it is essential to short the grid of the input stage to earth *at the grid*, so that you are certain of measuring and listening to the amplifier noise only. But the final aim is to have the background noise of a properly-erased tape clearly audible above the amplifier hum and noise (or at least amongst it), and you should stop to check this occasionally during your experiments. Monitored after the equaliser, the amplifier background should consist mainly of hum if AC heating is used and of roughly equal hum and noise with DC—some hum will always creep in somewhere. Amplifier noise should sound smooth and fairly low-pitched.

After achieving the right conditions with a short on the input grid, taking it off will usually be rather like opening the flood gates because of the hum picked up in the playback head circuit, especially with the mechanism running. With luck this hum will still be comparable with the background noise of the tape itself and thus quite inaudible under ordinary listening conditions. However, anything much above this must be reduced somewhere or all the previous work will have been pointless.

First find the place where most pick-up occurs by shorting the head lead at any available point (e.g. input socket, switch contacts,

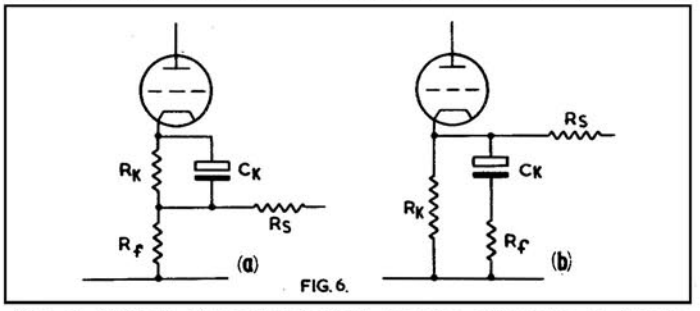


Fig. 6. *Methods of negative feedback injection, alternative to that in fig. 7. (a) may be noisier than (b) because in it DC flows through Rf*

tag strips, etc.) working back from the amplifier input right up to the head itself. A small amount of hum, increasing slightly as you move towards the head in this way, will usually be heard from pick-up in the cabling, but even with a short right across the head tags this should be much less than the full value. If not, replace cabling as required according to the suggestions given in Part One of this article and re-route if necessary to avoid stray fields from motors or the mains transformer. A lead passing through a hole in a steel plate is always a danger-point; it should definitely be run some other way if that section of the cabling is suspect. Another is an intermediate connection on open tags, usually allowing electrostatic pick-up and often curable with a small shield of thin brass, earthed nearby.

Excessive hum pick-up in the head itself can be due to: unbalanced windings, which cannot be detected easily unless the centre-tap is brought out on a tag; to insufficient screening for the situation, which is the most likely; or to a leak between the winding and the case, which is not a case of pick-up at all but an earth loop.

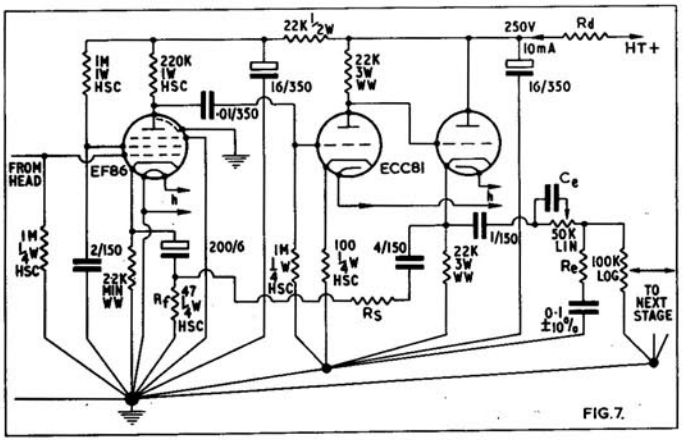


Fig. 7. *Low-noise pre-amplifier block followed by basic series playback equiliser. Heater pairs (h) connect to 6V DC supply. Rs=22-100 K, 1W HSC, according to gain requirements. Adjust Rd to give 250V DC where shown. Ce is approx. ·001 mfd for 15 i/s or ·002 for 7½ i/s. 50K pot gives HF compensation for head losses. Re=300 ohm ± 10% for 7½ i/s, gives LF compensation with 0·1 mfd*

Hum due to this last will remain wherever the circuit is shorted but will disappear when the head is disconnected.

The screening can round the head should be examined for cracks at joins and so on, although most heads now have one-piece drawn cans. If there is a frontal screen, check that it fits closely to the projections on the front of the head when the mechanism is set to run. If there is none, fitting one will usually help greatly.

At this stage the mains transformer will have to be oriented, if possible, for minimum hum pick-up, and after that any low-level signal transformers. It may also be possible to reduce hum pick-up by choosing a favourable combination of mains connections to the motors (the mains transformers should be connected only as shown on the tag plate). Should the head apparently need extra screening in spite of all this, it is wise to contact its manufacturer; there are so many styles of head in use that one cannot give rules for fitting extra screens, and anyway such a head could have an internal fault.

One last point to watch, at all times, is that you *are* genuinely reducing the hum level and not merely tending to cancel it by injecting more hum in anti-phase. This is sometimes used as a "hum-reducing" technique, but it is unreliable and usually works only for one frequency and one set of conditions; a valve replaced or some small adjustment somewhere may upset the whole thing. When the final satisfactory condition is reached, any readjustment at all (e.g. of humdinger, transformer orientation, position of head screen) should increase the hum. If you find, for example, that lifting the frontal screen off the head slightly *reduces* hum, then you haven't finished yet.

Readers who are building high-quality recorders may be interested in the pre-amplifier block shown in **fig. 7**, which I developed for some test equipment. Provided the whole recorder is constructed and laid-out properly, this should allow you a signal-to-amplifier-background ratio of some 70 dB, using a high-impedance ½-track playback head at 7½ i/s, and a signal-to-tape-noise ratio of well over 60 dB. The heaters can be supplied from the unit shown in **fig. 5 (b)**. No comments on its use are necessary, except that it is *not* amenable to feedback equalisation techniques, and that the gain can be adjusted (to cope with different types of heads) by altering the series feedback resistor Rs. The full-modulation output level from the cathode-follower should thus be kept in the region of 3-10V.

Incidentally, this same basic block, without particular precautions against hum and noise, can be used as a line-output stage following the series equaliser and gain control and also as a recording output stage.

The series feedback resistor Rs must be a high-stability type, since this is a gain-controlling element whose noise will be amplified; a 3W wire-wound type can also be used here if required. The 4 mfd feedback capacitor must be a good paper or metallised-paper unit, not an electrolytic, for the same reason. On the other hand the 22 K resistors in the second and third stages need not have been wirewound but for the power rating required. These two stages are in fact remarkably quiet as a whole, and add nothing measurable (or even audible) to the total noise output from the block.

by Richard Golding

SOUND AND CINE

FILM cutting, in itself, may well be a comparatively new art form but its principles date back far beyond 1887 when Edison first invented motion pictures. Indeed, from the time of the Ancient Greek theatre onwards producers of Drama have pruned scenes, reshuffled scenes and experimented in all sorts of ways to create atmosphere and pace and to give an extra meaning to the original script. Even recently, at Stratford-upon-Avon, we have witnessed this process at work in Peter Hall's highly successful *War of the Roses* trilogy, where the power of the political and human meaning of Shakespeare's original plan has been sharpened both by clever adaptation and compression of scenes and dialogue.

A Close Shot from "Sortilegio" (see Italian Amateur Film Shows). girl here is blissfully unaware of what she is about to witness in the following few minutes

With film, adaptation is the producer's work: the editor is more concerned with compression. As with the well-made play, the well-made film will contain a number of scenes or incidents cut together in such a fashion that the story will flow smoothly from start to finish. In most cases the scenes, or sequences of scenes, will show action that has been compressed into a shorter space of time than it actually took to happen in real life. In some scenes, perhaps, the time element will be stretched in order to analyse actions or motives, or to show parallel action going on elsewhere. Rarely, except perhaps in the case of the documentary, will the film show a complete record of an action in the actual time that it took to happen.

Each scene will be made up from a number of individual shots, carefully chosen and skillfully cut together. In a scene lasting, say, four minutes, the number of separate shots may be anything from ten to fifty according to the pace at which that particular part of the story is to be told. The editor's first concern is with distance for it is by using great variation of the medium shot (the normal length of the scene from the audience) with the long and close shot that he is able to apply his story-telling technique.

Di. erent Shot Techniques

It is usual to begin a sequence by introducing the character or by establishing the locale with a *Long Shot*. Shots are generally defined in terms of the size of the human figure and a long shot would show the complete human figure occupying about one-third or a little less of the height of the frame. Beginners have to guard against the tendency to make this shot far too short especially when there are details or special characteristics to be taken in and absorbed by the audience. When the film pace is fairly slow this shot may be immediately followed by a *Medium Long Shot*. The human figure here will occupy almost the entire height of the screen and if this shot is not meant to tell anything specific about the character its duration could be quite short.

The *Medium Shot* is of much more importance to the editor for it enables him to tell us something about the character or what he is doing. In the picture the actor will be shown from the thighs upwards in an immediate setting of about 6 ft. by 4 ft. A Two-Shot Medium Close-Up brings the camera position a fraction nearer to the scene for the framing of two actors.

The *Close Shot* is used to show the head and shoulders of the subject or closer detail of the scene in an area of about 3 ft. by 2 ft. The *Big Close-Up* will pick out special detail of the scene or will show the face or a portion of the face.

Pace of the story may be determined in two ways. The combination in which the shots are arranged is one; the actual length of the individual shot is the other. Shots of short duration speed up the action. Shots of longer length slow it down. Straightforward story telling is achieved quite naturally by beginning with a long shot, following this with a medium shot of slightly shorter length and then by cutting to a close shot of even shorter duration still. The simple LS-MS-CS formula is a stock one and for a fairly slow-paced scene where interest or suspense is to be increased slightly with each shot a BCU may be added before cutting to the next LS.

Although a shot lasting only six frames, say, is appreciable when screened a shot of this length should never be used unless for a special effect. I would suggest that the minimum time for any shot should not be less than three seconds, especially a BCU, for this is a shot which must have a great impact and is the shot which really gives us greater insight into personal reactions. Three-second close-ups intercut with five-second long and medium shots can build up suspense very quickly indeed. Great variation of shots creates flurry and excitement and by using a formula such as LS-CS-MLS-BCU-MS-CS, etc., a very fast pace in cutting can be achieved.

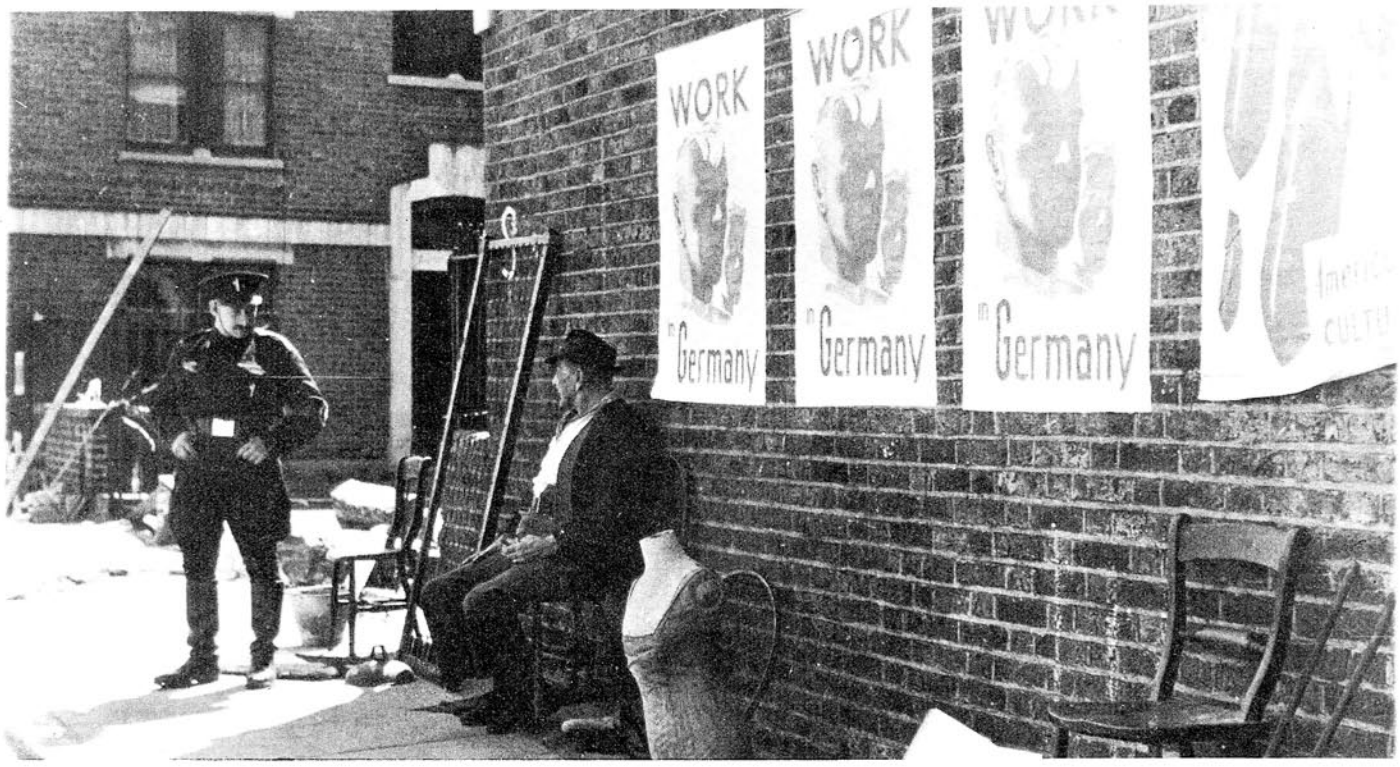
The purpose of each shot is to add to the flow of action and everything superfluous or even distracting must be discarded. A change in camera angle must never be distracting, but it often is when the camera operator has gone for effect and forgotten about continuity. Most amateur shots are taken at eye-level when hand held or between eye and waist-level when using a tripod. When these shots are projected they appear quite normal. On the other hand, if all the shots are taken from floor-level then some explanation must be given to justify this seemingly unnatural position. If the opening shots make it clear that the audience is seeing life through the eyes of a pet dog or cat then this curious low angle of view would probably be accepted.

When cutting an angled shot into a succession of eye-level shots moderation is important for the dramatic angle is easily overdone. The extreme high-angle shot will give a feeling of loneliness, distance or isolation. With the camera slightly above eye-level the character will appear smaller than life and slightly undignified. The low-angle camera

A high-angled Medium Shot (the angle does bring more of the body into the frame) from Jonathan Imgrams' "The Picture"—Ten Best winner in 1960. The character here is getting dispirited as she fails to find a buyer for the painting

makes the characters larger, menacing, more dramatic but also increases the feeling of movement. The truly dramatic shot is the express train taken from floor-level for as the carriages thunder overhead so is the power and movement emphasised by the low-angle.

As with picture editing, so must sound editing emphasise the mood of the film and nothing else. There should be no distracting clicks



A typical Long Shot from perhaps the most famous amateur film of all time—Kevin Brownlow's "It Happened Here". A slightly low-angled tripod shot to emphasise the "Work in Germany" posters

on the track indicating poor switching technique in dubbing, the music should be cross-faded in such a fashion that the audience is unaware of any transition point, narration levels should be even throughout, and noise (as distinct from room sound) should be non-existent. Where sound is used in perspective the depth must be definate and able to be related to its source.

The pace of the edited visuals will determine the pace of the commentary. Where the picture cutting has been slick the narration will have to be cut to its bare bones, and laid fairly early too. Where the pace is extra fast the narration may well have to start six frames or even less after the first visuals of a new scene in order to keep up the overall pace. Conversely, a whole second may be allowed before introducing a commentary for a new scene when the pace of the visuals is fairly leisurely. Where the subject changes completely and there is a new scene the narration should finish just before the old scene ends and when there is a mix of picture (lap dissolve) the narration should never continue through the mix.

Points to observe when laying dialogue are as follows. Medium shots are best kept for run of the mill dialogue, cutting to a single close shot for the important sentence or important reaction. A reaction shot of a person listening to another person speaking can be cut in during the middle of a sentence but, generally, it is better to cut to and from the speakers in the short pause between sentences. To speed up the pace, cut immediately at the end of a sentence but do try, at all times, to show the next speaker just before he starts his sentence. To slow down the pace, the shot of a speaker can be held for a split-second after he has finished his sentence. When showing an interruption the voice of the person interrupting should come a fraction before you show his picture.

Mickey Mousing

When there is an absolute necessity for an exact relationship between music and effects and picture, the technique used for their orchestration in the documentary film is known as "Mickey Mousing". This is the reverse procedure to the synchronisation of the cartoon, for the sound is matched afterwards to the visuals. With the cartoon, of course, the sound-track is recorded first and the visuals are then shot to an exact timing taken from the track. Vivid examples of documentary sound orchestration of this type include Disney's *Vanishing Prairie* where each giant clash of the mountain rams' horns is counterpointed by an equal giant clash from the *Anvil Chorus* sound-track, and Haanstra's brilliant *Glass* where each glassblower's action is accented by a trumpet blare. The visuals here contain over 260 separate cuts, some of which are of only six frames each, and indicate very tight control indeed over the sound editing.

There is a tendency to overplay this technique, which is best kept to short sequences of live action where a brief musical phrase, edited to a brief action (falling notes for falling object, etc.) will give it immediate emphasis.

Synchronisation for "Mickey Mousing" should never be more than two frames out as this will most certainly show up and, although the time and trouble needed would warrant the use of 16 mm. and a track-reader, I have successfully experimented doing this on 8 mm. with a *Synchrodek* and sprocketed tape. As to 16 mm., I am indebted to Albert Noble, producer of the Ten Best winner—*Red Type*, for this variation on the usual track-reading procedure. "Recently," he told me, "I had to read a 16 mm. optical track consisting of a skylark's song for a short animated cartoon I was making. The sequence showed two small white feathers dancing in sync with the song.

"Anyone who has heard the sound of this bird will appreciate how difficult it was to read the track by running it through the projector soundhead. I could not hear all the rhythms and themes of the song when the track was pulled over the head by hand and, because of the rapidity of the bird's voice, it was impossible to mark the frames with a grease pencil when run at normal speed. I solved the problem in the following way.

"I scratched the sound-track work print at every six frames. I then ran this through the projector and transferred back to tape at 15 i/s. This tape was then read with a spare tape head and marked visually at each click (or every six frames). Now I was able to analyse the song at half and quarter speeds, and also to pull the tape through by hand if required, and in this way each note and set of notes were able to be written down to the camera instruction charts."

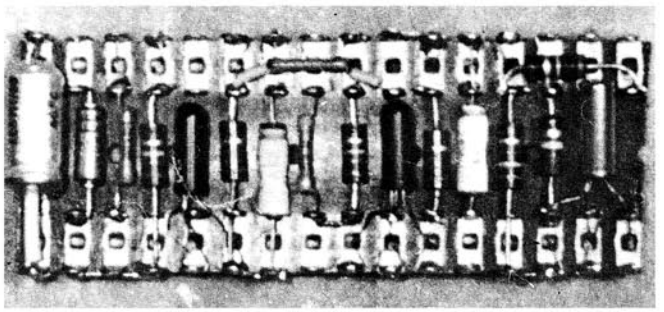
Italian Amateur Film Show

I have been able to arrange for a complete 90-minute programme of Italian prize-winning films to be sent over for screening to some Cine-clubs in Great Britain. The films include such "greats" as *Sortilegio* and *Marco del Mare* and will be shown on the following dates: **January 18th** and **19th** at the Grasshopper Group, 35 Endell Street, London, W.C.2. **January 24th** at Bristol Cine Society, Hon. Secretary, D. E. Stevens, Esq., 31 Wellington Hill, Horfield, Bristol 7. **February 4th** at Newcastle & District A.C.S., Hon. Secretary, George Cummin, Esq., 143 Bayswater Road, Newcastle 2. Details of time, place and how to get tickets available from the respective addresses. I shall probably be in attendance during both the Grasshopper Group shows should any reader wish to meet me.

By R. R. SLANEY

USING A THIRD TAPE HEAD

MODIFYING RECORDERS WITH MAGNAVOX (COLLARO) STUDIO DECKS



ALTHOUGH the modifications described in this article were made in the first instance to a Wyndsor Victor recorder, I see no reason why they could not be applied equally well to other machines equipped with the Collaro (now called Magnavox) *Studio* deck.

The modifications make use of the provision for fitting a third head to the *Studio* deck. This I have done, and at the flick of a switch I can use the extra head either for headphone monitoring (via a built-in transistor amplifier) of material going on to the tape, or as an echo device which, when used at various tape speeds and recording levels, will give a variety of echo effects.

The former is a decided advantage when the mic. input is being used and loudspeaker monitoring is not possible because of acoustic feedback. In the same way, the mixing of two inputs or more, if you have a mixer, can be monitored and the balance adjusted without guess-work. For some, an even greater advantage will be that superimposing can be carried out with complete accuracy, for both the material already recorded and that being superimposed can be heard in the headphones.

Another modification which, though simple, I have found to be of enormous benefit, is separate switching for the main amplifier and the deck. This enables one to run a tape through the machine and listen to it through the headphones without so much as a milliwatt being consumed by the main amplifier.

A further advantage is that, for the final positioning of editing marks, the transport mechanism can also be switched off and the tape "see-sawed" round the extra head without the spool carriers spinning their heads off, or having to be held down by some form of half-nelson!

If the foregoing appeals to economy-minded readers, then they will also be pleased to learn that the amplifier runs on a 1·5V cell, and will draw something between 2 and 5 mA, depending on the transistors used.

Aluminium Control Panel

I mounted the controls for all these facilities on an 18 SWG polished aluminium panel, 6½ x 2$\frac{1}{10}$ in., let flush into the right-hand side of my recorder case (**fig. 1**). The controls are in this order from front to back: (1) Echo/Monitor switch (S1); (2) Transistor amplifier on/off switch (S2); (3) Main amplifier on/off switch (S3); (4) Output socket for headphones; (5) Transistor amplifier volume control; and (6) Superimpose switch (S4). However, readers can juggle these controls about as they find convenient.

All the following notes and construction details relate to the Victor recorder and must be adapted as necessary for other machines using the *Studio* deck.

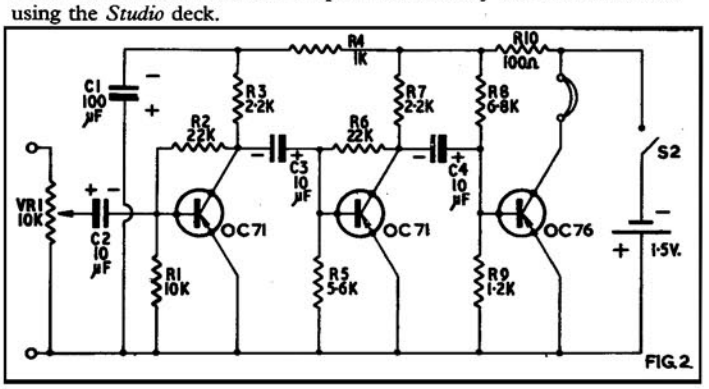


FIG. 2.

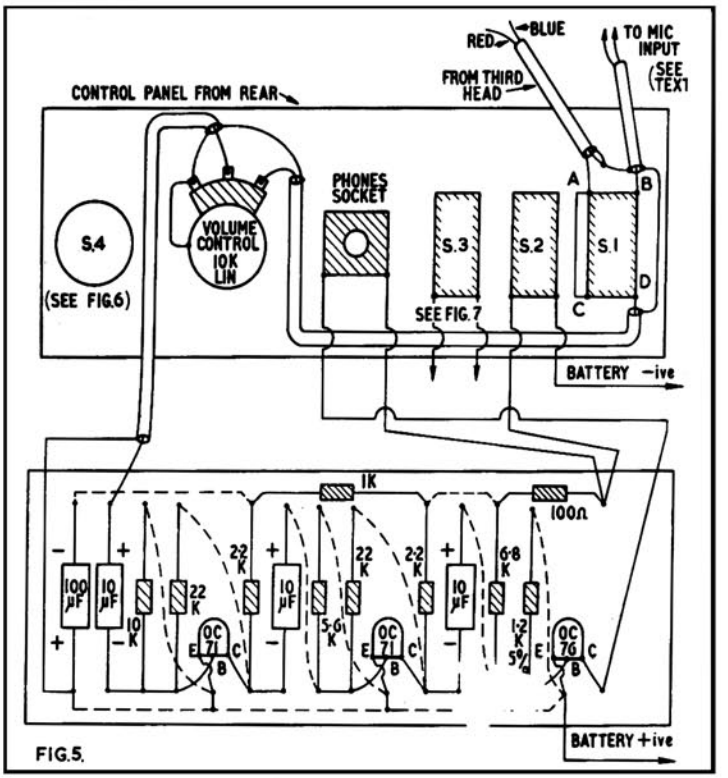


FIG. 5.

The first—and simplest—job is to fit the third head, which is, of course, a standard *Studio* record/replay head. Next, it is probably best to construct the three-stage transistor amplifier (see **fig. 2**). This gives ample headphone volume, and the only component value which is anything like critical is R9. On the prototype a 5 K pot. was used, which was adjusted to give the greatest volume consistent with the lowest current consumption, and the resultant setting measured on an ohm-meter. The 1·2 K shown represents a compromise; with the OC 71—OC 71—OC 76 complement, the consumption was under 4 mA. This value for R9 also gave satisfactory results when tried with a range of different transistors.

For those readers who wish to use other types, a 5 K miniature preset pot. should be used instead of R9 and adjusted accordingly. The pot. can then either be left soldered permanently into the circuit or the setting measured on an ohm-meter and a resistor of the required value made up.

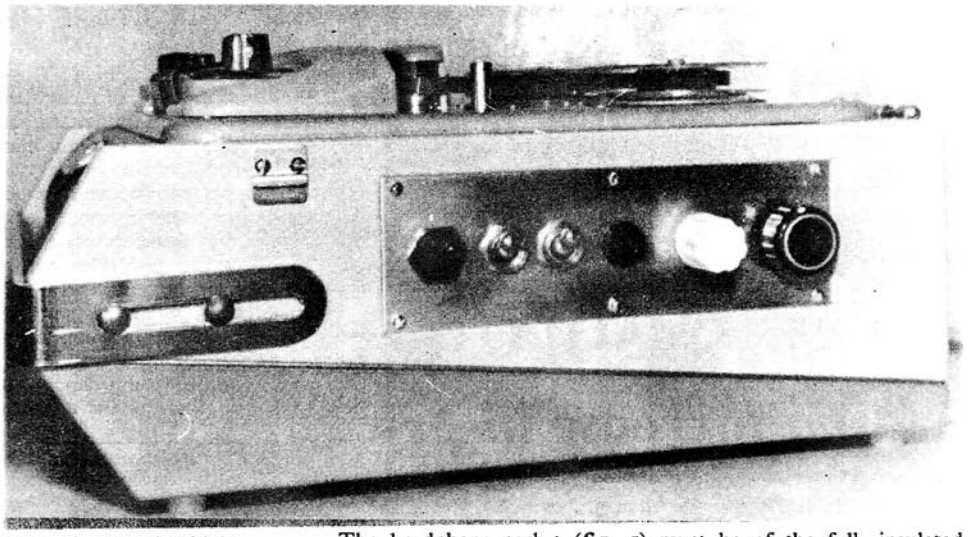
Experiments showed that almost any audio transistors can be used, and in fact, the amplifier worked very well with three cheap "red spot" transistors. Results not far below those possible with OC 71—OC 71—OC 76 were obtained using two "red spots" and an OC 71 as output stage.

Building the Amplifier

The amplifier can be built on a standard 16-way flat tag board measuring 4 x 1½ in. (see **figs. 3 and 5**). It is best to leave the transistors until last. They can be mounted in holders or soldered directly, the usual precautions being taken against overheating.

On completion the amplifier should be tested outside the recorder by making temporary connections, using screened wire to the third

USING A THIRD TAPE HEAD



head and unscreened to the phones and battery. A tape should be played back through the phones and the third head roughly aligned by ear for maximum signal. Some hum may be noticeable. This will be due to the long leads employed for the temporary connections.

Cutting the Cabinet

The next step is to cut a hole in the side of the recorder case to take the control panel. This does not take as much courage as one would imagine, and a very neat finish can be obtained in the following manner. From the measurements given in **fig. 4a** it will be seen that the hole is a $\frac{1}{4}$ in. smaller all round than the control panel, so that the panel can be bolted to the recorder case at the overlap.

The plastic covering of the case is carefully eased back from the edges of the hole, the panel held in position and the wood marked. Sufficient layers of the plywood of which the case is made are then removed so that the panel fits flush with the side of the case.

The panel should now be drilled to take the six 6BA fixing screws, switches, etc. The plastic covering is pressed down again so that it goes *under* the panel, which should now be bolted in position, thus firmly clamping the plastic covering (**fig. 1**).

It will be necessary to remove some of the thin ply forming the spool "pocket" inside the case to make room for the panel controls.

The various connections are as shown in **figs. 5-7**, and the following notes may be helpful. All screened wires in **fig. 5** should be kept as short as possible. It is important that the control panel is earthed. This is achieved via the transistor amplifier volume control (VR1), which should make good electrical contact with the panel, and the screening which reaches chassis earth at the mic. socket of the recorder.

The screened lead from S1 to the recorder mic. socket is connected as follows. The braiding is soldered to the earthed contact behind the socket, and the core is soldered to the other contact. Then, when the recorder is switched to "record" and S1 to "echo", the output from the third head is fed into the grid of the first valve of the recorder.

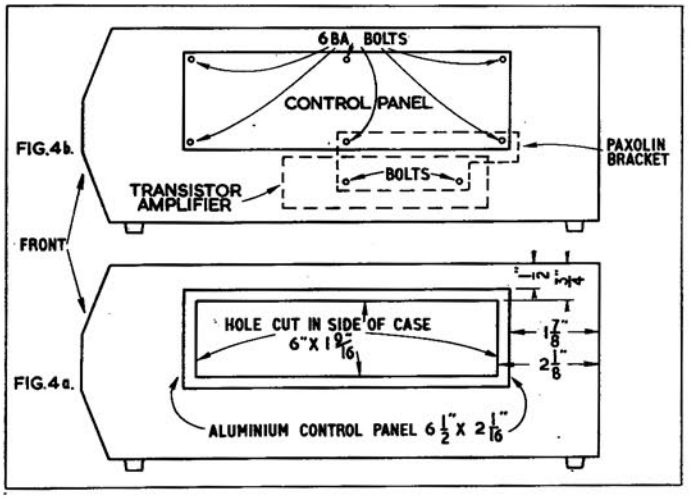


FIG.4b.
FIG.4a.

The headphone socket (**fig. 5**) must be of the fully-insulated type, otherwise the battery will be short-circuited through the control panel.

The battery in my recorder is mounted in a Terry spring clip at the rear of the case. Two copper strips are used as battery contacts, and the battery wires are soldered to these so that the battery can be easily changed when necessary.

It is very important that the correct battery polarity is observed, and I suggest that the positive and negative contacts should be clearly marked.

Fig. 6 shows the superimposing circuit. Switch S4 is inserted in one of the two leads between the erase head and the HF bias and erase oscillator. When S4 is in the "superimpose" position, the erase current is diverted to a 600 ohm, 5W dummy load resistor.

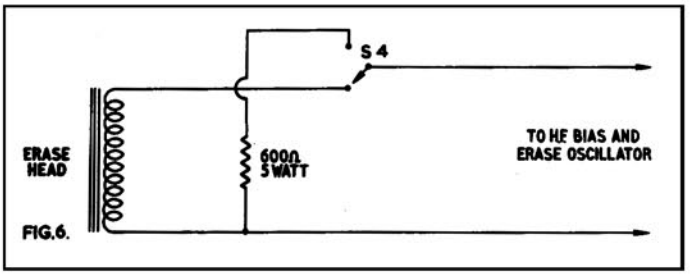


FIG.6.

In my recorder, the leads from the erase head are soldered to the upper tag-strip on the output transformer. This is the best point at which to make the switch connections.

Connecting-Up

For the mounting of the 600 ohm dummy load resistor, I made an insulated clip which was bolted, with a distance-piece to hold it clear, to the lower tag-strip on the output transformer. Check that superimpose is working before proceeding.

Switch S3 (**fig. 7**) is wired into one of the leads between the recorder mains on/off switch and the power unit. As the leads to S3 will be carrying AC they should be twisted together to minimise hum radiation. When this connection has been checked, the transistor amplifier should be wired to the control panel as shown in **fig. 5**.

The amplifier is mounted inside the recorder case, immediately below the lower edge of the control panel and parallel to it (**fig. 4b**). In my recorder I mounted the amplifier in this position by means of a flat paxolin plate, bolted to the back of the amplifier tag strip and shaped so that it can be attached to two of the 6BA control panel bolts as indicated.

To finish off, I dropped into the top of the spool "pocket" (where the controls are now located) a strip of pegboard to keep out little (or even big) fingers. This is supported on two small plywood blocks glued to either end of the slot so that the pegboard strip fits flush with the top of the recorder case.

The third head should now be carefully aligned, and in the absence of proper test instruments this can be done by adjusting for maximum treble brilliance when replaying a previously recorded signal via the

THIRD TAPE HEAD—*Cont.*

monitor amplifier. This method ensures that the azimuth alignment of the original record/replay head and the new head are identical.

Incidentally, the third head requires no pressure pad. I experimented with a home-made pad and found that this made no difference that I could detect. Many months of use with various types of tape have shown that this holds good provided that the tape itself is not physically distorted, i.e. "cupped". I have only experienced one example of this, which was a portion of an oldish acetate-based tape. As would be expected, there was some loss of output due to the tape not making intimate contact with the head.

For those wishing to fit a pressure-pad, one is available from the manufacturers and fitting is an extremely simple matter, provision already being made for it in the existing pad assembly.

Low impedance headphones are needed for use with the monitor amplifier. I use a lightweight pair of a type which is obtainable on

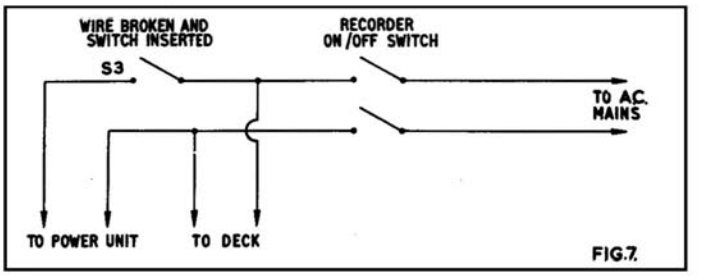


FIG.7.

the surplus market. Their measured DC resistance is 10 ohms. I rewired these with a good length of lightweight flex, breaking this about a foot from the 'phones' end and inserting a miniature flex connector. Thus, when wearing the phones, I can unplug myself from the recorder without having to carry around a couple of yards of wire.

Adding the Echo

The monitor/echo switch (S1) is the only control which perhaps requires any explanation regarding its use. It will be seen (**fig. 5**), that the switch is in the "echo" position when contacts A and B are closed, and in the "monitor" position when C and D are closed. When the recorder is being used in the normal way, S1 should be left in the "monitor" position with, of course, the battery switch (S2) off.

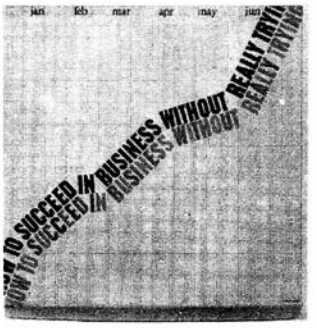
The procedure for adding echo to a pre-recorded tape is quite simple. With the recorder switched to "record", S1 and S4 are respectively switched to "echo" and "superimpose". Because the mic. input circuit is short-circuited when the socket is not in use, a screened jack-plug must be inserted in the mic. socket when using the "echo" facility, and a spare plug should be reserved for this purpose.

The recorded material on the tape is scanned by the third head and fed back into the main amplifier. There it is amplified and re-recorded on the tape in the normal way by the record/playback head. Except, of course, that it follows the original material by the distance between the rec/playback head and the third head, and thus appears as an "echo".

The volume of the echo in relation to the original material on the tape is controlled by the recording level control on the recorder when the echo is being added. It is worthwhile experimenting with different recording levels, and record and playback speeds, for many interesting effects can be produced. Before adding echo to a tape, some experiments should be made to get the effect required, and the recording level noted.

I should like to make it clear that Messrs. Wyndsor are in no way associated with the modifications described in this article and that they cannot therefore be expected to answer any queries regarding them.

TAPE RECORDS



SIX tapes again this month, five mono and one stereo, covering chamber, orchestral and dance music, a popular singer and a successful show.

That universally loved composer Tchaikovsky is represented by *Manfred*, a rarely performed work described as a "Symphony in Four Tableaux". The London Symphony Orchestra is conducted by Sir Eugene Goosens on *World Record Club TT209*.

Byron seems to have had a considerable effect on some 19th century composers: Berlioz based his *Harold In Italy* on one Byron poem, while Schumann and Tchaikovsky were both moved to composition by *Manfred*. This is a saga of a man who seeks redemption by travelling in strange places and meeting fantastic people and spirits—a sort of adventurous quest which evidently attracted the Romantic composers.

Tchaikovsky's orchestral version of the story is played so infrequently, and so few persons have heard it, that a recording without some introductory notes is little short of absurd. This underlines the point we made last month, that those who choose to buy their recorded music on tape have a right to expect at least a condensed version of the information offered on disc sleeves.

While lacking the structural unity of the established symphonies, this work is pure Tchaikovsky from beginning to end. Its form is more that of an extended tone-poem, and it combines styles found in the ballets with the mood of *Francesca de Rimini* and the more tempestuous episodes from the symphonies. Tchaikovsky fans will find much to enjoy here, and of special interest is an openly fugal passage in the last movement. The LSO and Goosens give a good sturdy performance, and the recording is clean and clear.

Another type of adventurous quest, this time in the jungle of modern American business, is that depicted (not very seriously) in the musical show *How to Succeed in Business Without Really Trying*. Fourteen items from the show are recorded in the best *WRC* "musical" tradition on *TT322*. The soloists are: Maggie Fitzgibbon, Louie Ramsay, Mary Preston and Mike Sammes, with the Mike Sammes Singers and the New World Show Orchestra conducted by Alan Braden.

This is a competent but rather uninfectious performance which may bring back pleasant memories to those who have seen the show. To others it might be rather disappointing, as there seems to be a complete absence of *tunes* to make up for the missing stage spectacle. The best musicals live-on because of their memorable melodies; however, we may be a little "off beam" in this case, and the tape is certainly well recorded.

Also well recorded is the unusually massive combination of instruments found in Berlioz's *Grande Symphonie Funèbre et Triomphale*. This is the mono tape version (*WRC TT251*) of the stereo disc highly commended in the November *Hi-Fi News*, and despite the inevitable limitations this little tape still manages to convey something of the impact evidently intended by the composer.

This work was composed for a ceremonial occasion and is scored for a large array of brass and wind instruments which are joined by a chorus in the last movement. An authentically French performance is given by the Chorale Populaire de Paris and the Musiciens des Gardiens de la Paix conducted by Désiré Dondeyne.

From the power of massed Berlioz brass to the personal touch of Nat King Cole, who invites us to *Dream a Little* on *WRC TT315*. This popular American Negro singer with a very individual style gives us sixteen songs on this tape, eight with the help of his own trio, and the others with orchestras under various conductors. The recording is good, and conveys the inflections of the voice quite well. If you like "Nat" you will like this tape.

Intimate music of a vastly different type, in the form of *Sonatas for 'Cello and Piano*, is found on *WRC TCM43*. Janos Starker ('cello) and György Sebök (piano) give fine well-controlled performances of Brahms' two Sonatas, *Op. 38 in E minor* and *Op. 99 in F major*. The first of these provides very relaxed listening, with the "flowing" lyrical Brahms of the symphonies very evident at the start, and a pleasing and tuneful elegance in the other movements. The second sonata is a later work which leaps straight into a more powerful and dramatic idiom at the first bar. This work demands more of the players, who give of their best in a most expressive manner. The recording is full-bodied and clear.

Our last tape is for those with four-track stereo machines. *The Era of Glenn Miller*, on *Crown ST102* (imported from the U.S.A. by *Teletape*), features members of the Glenn Miller Orchestra playing ten items. These are mostly arrangements of war-time things like *Kalamazoo* and *Chattenooga Choo Choo*, though the last piece on the tape is actually a jazzed-up version of *Anitra's Dance* from *Peer Gynt!*

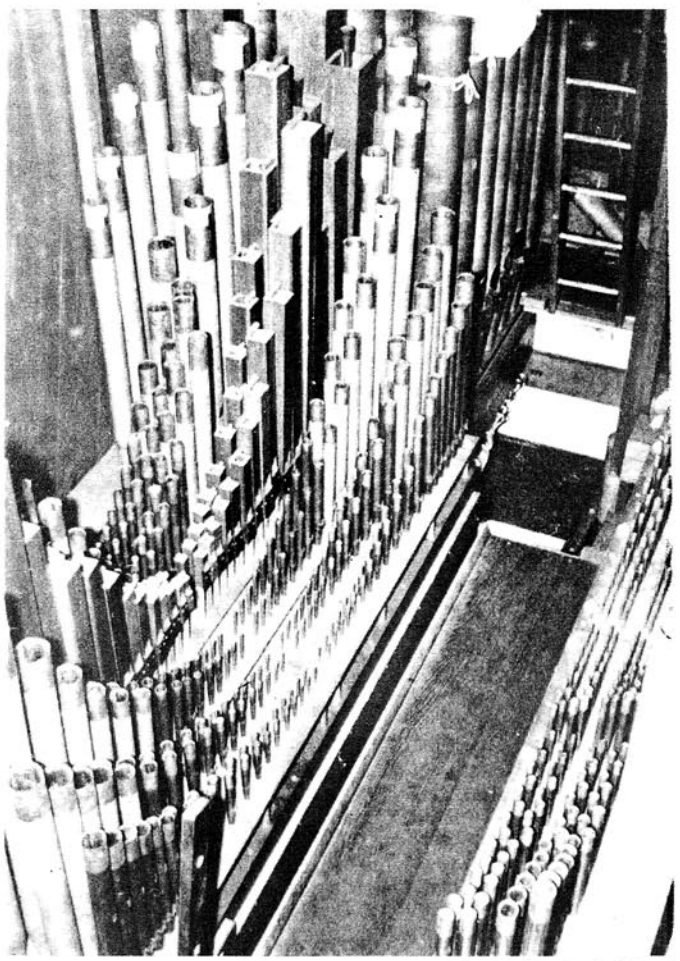
This is fairly lively "brassy" dance-band music played with good rhythm, but indistinguishable in style from similar stuff by dozens of other American bands. Its appeal will be mainly nostalgic for those who remember the war-time popular songs.

The recording is crisp, with a reasonably open sound and a very quiet background. A note on the box says that the left-hand channel may be rather low in level—but this is deliberate and is done to facilitate balancing! It *was* low and we *were* able to balance it, but why the unbalance to start with?

RECORDING THE KING OF INSTRUMENTS

by M. F. WOODWARD

● *The organ is a popular target for enthusiastic recording amateurs—and the bigger the instrument the greater the thrill. Sometimes, with good luck, a good recording is achieved with little or no experience; but more often the work is followed by disappointment. We therefore asked*



Part of the great division of the organ at the Royal Hospital School, Holbrook. All the pipes shown here are flues, mostly made of metal. The four-manual console for this organ is shown separately

NO other instrument encompasses so completely the extremes of the power and frequency ranges as the pipe organ, and it is unlikely that any other instrument makes such a test of a tape recorder's electronic and mechanical qualities. To the majority, organ music is withdrawn and obscure—another and foreign world of music making. It is the purpose of this article to introduce readers to the instrument so that the pleasure of its music may supplement the general pleasures of recording in other walks of life. More perhaps than any other instrument, the organ needs to be understood technically for its music to be appreciated. Of ancient origin, it can be traced back to prehistoric man, who fashioned bundles of hollow reeds—gathered on the river bank—into "Pan Pipes", a version of which can still be seen today. The present-day types are generally sold in the chain-stores however, with *Empire Made* stamped on their plastic bodies.

Ancient Basic Principle

The basic principle of pipes blown by wind, and controlled by levers worked by the hand, was developed by the time of the Roman Empire, and this was refined until Renaissance times saw instruments which are erected on the Continent quite recognisable by modern standards. Thereafter, each century saw further mechanical improvements supplementing the pipe-maker's ancient art, the result being a series of enormous instruments erected at the beginning of this century. Sheer size and power can be, in itself, a doubtful quality, and at present there is concentration on smaller instruments of greater tonal development and refinement (quite apart from artistic matters, organ building is expensive—a medium-size bill can amount to £30,000).

Fundamentally, an organ consists of ranks or *stops* of pipes controlled by a keyboard or *manual*. Generally each stop has one pipe to each note on the controlling keyboard, but some compound stops can have several. Many stops of differing tone and pitch can be controlled by one keyboard, the organist selecting various sounds by operating the individual stop knobs at the *console* (the term used for the keyboards, the "nerve centre" of the instrument).

Manual stops of "normal" pitch (i.e. those sounding, say, middle C when the note is played) are called 8 ft. stops, as the longest pipe sounding the lowest note in the rank (CC or 64 c/s) is of eight-foot "speaking" lengths. Stops sounding an octave lower are called 16 ft. stops and give gravity to the chorus, whilst those sounding one or two above are called respectively, 4 ft. and 2 ft. stops. These give brightness and brilliance to the effect. *Mutation* stops, like the *Twelfth* (2⅔ ft.) and *Quint* (5⅓ ft.) give harmonic development. Compound stops give yet more brilliance and harmonic development. A typical compound stop is the *Mixture* and a typical four-rank one will sound the 19th, 22nd, 26th and 29th harmonics until the notes become too high to be heard, then they break back an octave, or sound other harmonics.

Types and Sizes of Stops

The pipes themselves are of two families, the *flues* and the *reeds*, the flues are really glorified penny-whistles, and range from flutes to string-toned stops, with mid-way between, the *diapasons* whose tone is fundamental to the organ alone. The reeds range in tone from powerful trumpets and tubas to gentle orchestral clarinets and oboes. In construction the reed stops are basically similar, consisting of a brass tongue (like a mouth-organ reed) coupled to a resonator which amplifies certain chosen harmonics in order to obtain the desired tone. The curvature of the reed tongue and the wind pressure also have their effect on the tone. "Voicing" the various stops so that they blend at differing pitches and tonalites is a task in which only a master can succeed.

Traditional Stop Names

Stop names are traditional, and in many cases bear little relation to the tone produced. *Sesquialtera*, *Unda Maris*, *Ophicleide*, *Viol de Gamba*, and many others all appear. There is also *Viol d'Amour*, which a straight-laced Vicar, fearful for the choir-men's morals, once threatened to have nailed up by his carpenter should it appear in the new organ being built for his church! The only way to know the stops is to hear them being played, there are in addition, books on the subject.

A large organ will have four manuals for the hands controlling four distinct divisions of stops, and called, respectively, the *Choir*, *Great*, *Swell* and *Solo* organs; there is also the *Pedal* division, played by the feet. Smaller instruments will omit the Solo, Choir and Swell (in that order), but do not despise the smaller organ; the great *Archive* recordings of Helmut Walcha playing Bach, were recorded on a small two-manual Schnitger organ.

The Choir organ comprises gentle and chirpy voices, used for quiet accompanimental or interlude purposes, whilst the Great is the "beef" of the organ, having a powerful diaspason chorus and a flute and chorus reed or two. The Swell is enclosed in a large, thick, timber box with a thick venetian-blind-like front which can be opened and closed by the organist to obtain crescendo and diminuendo effects. The Swell stops are generally a minor diapason chorus, some flutes and a powerful reed chorus. The Solo organ has solo stops, ranging from powerful dominating trumpets and tubas to gentle flutes and reeds; it too can be set in its own swell box (just to confuse you, the

our contributor, M. F. Woodward, to tackle this subject for us very thoroughly—first with a description of the organ and then with some useful information from the recording angle, and we think the following article will be of great interest and potential use.

Choir organ can also be set in its own swell box, but never—or hardly ever—is the Great so treated).

The compass of the manuals is five octaves, starting at CC (64 c/s), whilst that of the pedalboard, to which we now turn, is 2½ octaves, starting at CCC (32 c/s). The Pedal organ provides the bass of the organ, and "normal pitch" is 16 ft. (requiring a pipe of 16 ft. "speaking" length to sound the bottom note). Sub-octave stops are 32 ft., whilst octave and super-octave stops are also the mutations and compounds based on the same principle as those on the manuals, except that they are an octave lower in pitch.

Couplers and Pistons

Accessories at the organist's command are *couplers*, by which he can control all or some manuals from one particular manual (or the pedalboard), and *pistons*. Pistons are either little ivory buttons set under each manual, or larger brass ones for operation by the feet set just over the pedalboard, the operation of which will move pre-set combinations of many stops and couplers. There is the old story of the young Curate thanking, in church, "the generous donor of the new pistons for our organ, which will allow the organist to change his combinations without taking his hands from the keyboard".

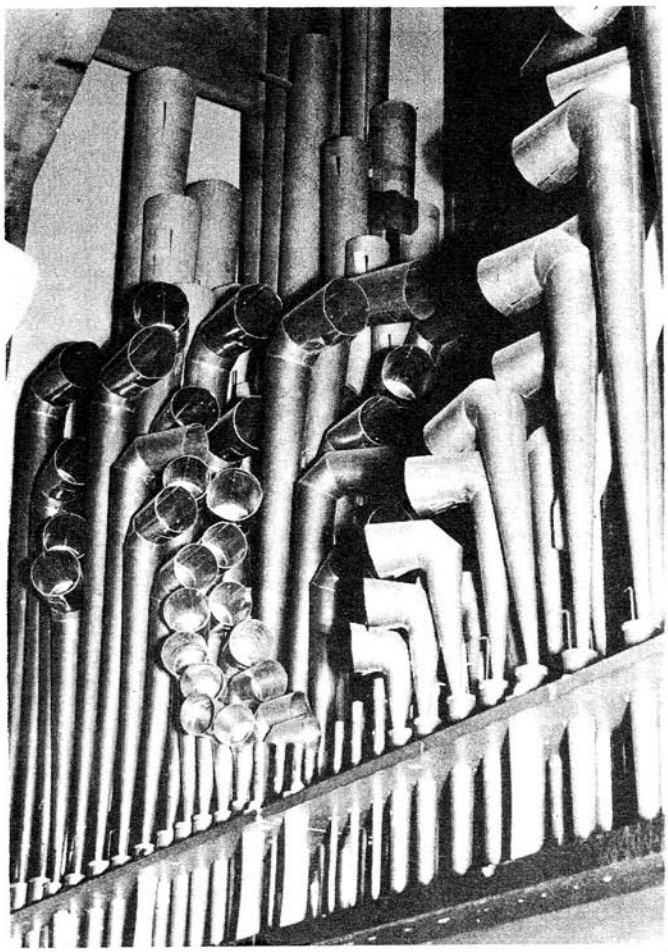
So there you are—in a nutshell that is the organ, an instrument capable of sounds extending from both ends of the frequency range audible to our ears, and a fearsome thing to play well. Given the finest organ however, there is one factor beyond the builder's control, and that is the acoustic in which it is set. An organ needs a reverberant acoustic in which to sound well; perhaps the six seconds of Kings College Chapel or St. Paul's Cathedral is too long for average players, although a master-player can handle it with superb effect. Those buildings blessed (or cursed?) with a one-second reverberation (or thereabouts) cut organ tone off as with a knife, and nothing can be done about it.

Recordist's First Steps

The first thought of the recordist should be to select the type of microphone and its placing so that the primary sound is properly registered with, nevertheless, the reverberation of the building as a very important part of the whole effect. A further important characteristic needing attention is the characteristic some pipes have of a slight hesitancy as they come on to "speech". This "initiation" is part of the tonal effect, and it is an advantage to be close enough to pick up some of this (not making a fetish of it, though).

All instruments produce a subtle background of plops and clicks as the *action* operates, together with a hissing of wind and a gentle hum from the blower. In an old instrument this can produce quite a high background noise and it should be avoided as much as possible. Many organs are set in a church with their various divisions facing in different directions, thus whilst the majority may speak out of the chamber towards the south, a powerful pedal trombone may lurk around the corner, blasting out to the west.

All the foregoing conflicting claims have to be assessed, and probably discussed with the organist, and the microphone placing decided upon—perhaps after some experiment. My own approach with monophonic recording, is to set the microphone as close as proper balance allows, and to use an omni-directional instrument to get as much of the reverberation as possible. A rough rule of thumb I start



This is not a pipe-rack but a powerful reed stop. Each pipe has its actual reedset in the "boot" at the base, with the resonator immediately above. The resonator is turned over at the top (mitred) to prevent dust falling on to the reed and spoiling the "speech". This is an 8 ft. Posaune stop which, in this case, is part of a pedal division

with is to place the microphone 40 to 60 ft. from a large organ, 15 to 30 ft. from a medium-sized one, and 10 ft. or under from a small one. For stereo recording, where the secondary sound is more in perspective one can, if necessary, be further away, providing the result is not all mush and muddle.

One can, of course, use two microphone positions and a mixer unit, to get intimate effects yet not lose the reverberation, but I feel that this is rather beyond the ability of many to control. It also gives rise to a certain temptation to make the recording sound too good to be true, and if not properly done can sound very faked. The programme played should be analysed; contrapuntal music needs the inner voices to sound clearly, so a closer placing is required than for lusher Romantic music, which is designed to be heard "with the building". Music of a quiet nature played on gentle flutes and reeds can be recorded more intimately than that played on the full chorus, but do avoid the temptation of recording direct from the pipe mouths.

Does Organ Tone "Rise"?

The recording level should be set for each individual piece, and not adjusted during it to emphasise, say, a quieter section. To do so is artistically unacceptable, quite apart from the fact that the ever-present ambient level of mechanism noises will simultaneously alter in character and betray the fraud.

It is a firm belief amongst organ builders that organ tone "rises", as a mere onlooker I dare not disagree, but I secretly suspect that tone projected downwards rather gets mopped up by seats and carpets. Be that as it may, the effect is the same, for it *is* better to get the microphone up at least on a level with the pipe mouths, preferably above. Beware in your enthusiasm, though, and remember the experience of certain gentlemen, strivers after perfection, who hung the microphone slap over a certain organ. It fell, crushing some very important pipes, just

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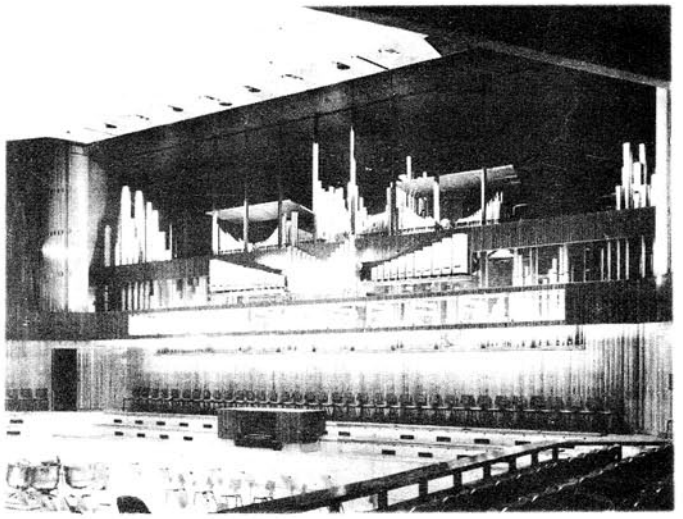


Stereophonist's dream, the spread-out organ in the Royal Festival Hall, London. This organ has featured in a BBC Saturday morning experimental stereo broadcast

before a very important recital. Flattened organ pipes cost a lot to repair.

I use a long timber boom, counter-weighted by a *Cow & Gate* tin (the brand is unimportant should you wish to copy it) filled with concrete and carried on a sturdy ex-army instrument tripod. This affair protects a microphone from odd building vibrations which can be a nuisance—especially if caused by suspended timber floors. It has not been unknown for surveyors of the fabric to forbid the organist the use of his powerful 32 ft. pedal reed lest its vibration bring down an already shaky tower. Recordists run little risk of that, but building vibrations, also sympathetic vibrations from loose light fittings and windows, etc., can ruin a recording, and must be watched carefully. It is preferable to monitor a recording continuously, using headphones to check on such matters.

A Doubtful Quantity

Power supplies in churches are sometimes a doubtful quantity; earth returns can be suspect and if you rely on them for hum elimination a little test beforehand is called for. Other problems are interfence from aged blower motors, or odd loose contacts. I remember once when trying everything to eliminate a persistent crackle, a kind friend suggesting that it must be a contact which was loose in the recordists! Power points are often few and far between, and I always take what my children call "The Toddley Roll"—a 75 ft. coil of heavy T.R.S. 3-core flex, together with a box of obsolete plug tops. Churches can be cold so go warmly clad!

And now for equipment. Whilst it is agreed that there is nothing to touch *good* stereo, if there is a limited budget I would prefer good mono to indifferent stereo. The prime need is a good microphone; the harmonics and intermodulations produced by a well-developed organ chorus will tie up a poor one in little knots. I use an *STC* 5021 *Ball and Biscuit* with, as second string, a *Lustraphone* ribbon. Both serve well, but for reasons expressed earlier I prefer the 5021. Likewise the electronics; despite the ultra-high frequencies produced by an organ, I feel that a recorder with an extended but perhaps suspect performance at the top end is out. Far better to have 13,000 cycles cycling strongly away than 20,000 bewhiskered old men squeaking into second place.

Reliable Mechanics

The mechanics of the deck have to be just right. If ever wow and flutter are going to raise their ugly heads, a quiet clarinet solo in a Bach chorale prelude, or something like the top note held on full organ just before the climax of the Toccata from Widor's 5th Organ Symphony will show them in a new and horrible light.

After some nasty experience, I have found that a *Shirley Laboratories* TWA15 tape amplifier matched to a *Planet Projects* U1 deck a most satisfying answer to the problem.

Before forgetting wow and flutter, I should warn you that organists can use (occasionally please) a *Tremulant* to cause an artificial vibrato

RECORDING AN ORGAN

to solo stops. Also some instruments suffering from inadequate blowing equipment or if out of tune, can produce odd wobbly noises. Don't, however, play a tape wowing and fluttering from start to finish and blame the tremulant and wobbly wind. I would just recommend you try a better organist and organ!

Recording Etiquette

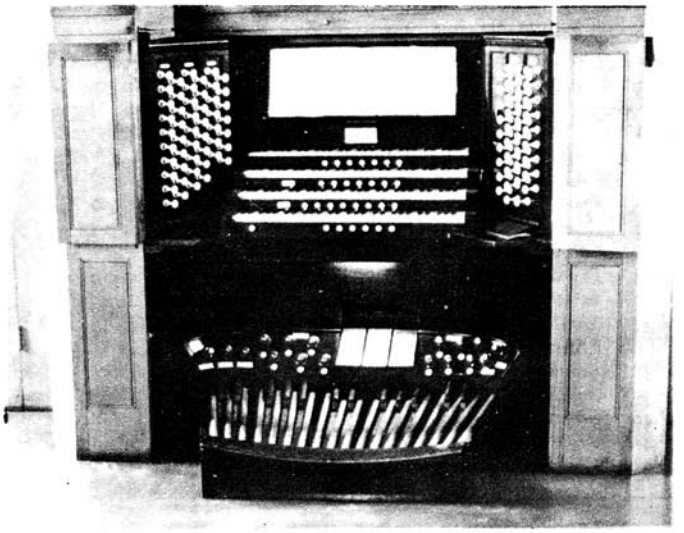
The etiquette of organ recording is important. In the Church of England, the Incumbant is in charge of the organ; likewise in the Free Church the Minister, and it is to these people you are advised to apply first. From there you should go to the organist, generally a most approachable person, provided you have a good reason. Wanting to use the organ as a substitute for a tone generator is not a reason that would commend you in the majority of cases, so beware!

Remember the organists earn or supplement their income by music, so a fee should be involved, or at least (if not as well) a donation to the organ or church funds. A conversation with the organist about the programme and other relevant details is worthwhile, and don't forget to ask where the best place is—in the organists opinion—for getting the balance just right.

It is best to arrange a session just after the organ has been tuned; once again the organist will help in this matter. The final point, whilst on the subject of the organist, is to ask him beforehand to wait several seconds after the end of a piece before pressing any pistons or operating any of the mechanism. If this is not done, the carefully recorded "die away" of the final reverberation may be ruined by the comparatively powerful notes of operating mechanism.

Treat with Respect

It goes without saying that a religious building must be treated with respect. Remember, also, the Verger and his problems: be scrupulous in tidying up afterwards. I have found the possession of a sectional toolbox, enamelled a sober shade, a great boon. Into it go all the odds and ends of gear, bits of wire, plugs, microphones, etc.



Console of a four-manual organ, with the bench removed to show the pedalboards; just above the main pedals are pedal pistons and three swell pedals. The manuals are flanked by knobs controlling stops and couplers, and below each manual is a row of pistons

Not only does it keep the place tidy, it ensures one's arrival (or should) with all the necessary equipment.

This will do for the moment, except for a grave warning. The business of organ design can grow on one, and people find themselves trotting around the countryside, notebook in hand, taking details of each and every organ they can find. This can be quite a serious matter, for if one has a wife and children they are probably already Tape Recording Widow and Orphans. With the new enthusiasm to contend with, they will graduate to the rank of Organ Enthusiast and Tape Recording Widow and Orphans; the latter state is far worse than the former!

TAPE RECORDER SERVICE

by H. W. Hellyer

No. 25—SOME SOUND ADVICE

AT the last Radio Show, August 1962, visitors were greeted by a stand just inside the main entrance with no less than eight new models of tape recorder in the "popular" price range. *Sound*, the evocative trade name of *Tape Recorders (Electronics) Ltd.*, hit the trade headlines very effectively. In addition, when I visited their stand on preview day, they had still not completely unwrapped a *Stereo-Add-on Unit*.

This is not the commercial column, so I am not concerned with success, or otherwise, of their enterprise. But the direct result of this sales "push" has been a fair number of *Sound* machines arriving in the workshop during the past two years—not, I must hasten to explain, because of any specific deficiency, but rather because a very large number are in use. In this month's article, we shall try to sort out the variations, for the sake of readers who have asked for guidance, and to point out some of the faults with which we have had to cope.

In doing so, it should be stated that most of the faults on these "popular" machines are common to similar units by different manufacturers, so should be of interest to a majority of our readers. The models we are principally concerned with are the *Prince*, *Studio*, *Connoisseur*, and the *Slimline* and *Riviera* ranges.

Two tape *decks* feature in this survey: the *BSR* TD2, single-speed deck which was described in the first of these servicing articles, January 1962, and the *Magnavox* (Collaro) *Studio* three-speed deck, which I dealt with in February 1962, and which has formed the basis of succeeding articles and correspondence. Both two- and four-track versions of these decks have been employed and certain minor variations will crop up as we deal with specific points. All are AC mains machines.

To summarise the models:

A25 *Prince*, BSR two-track (Valves: EF86, ECL82, EL84, EM84).
A26 *Studio*, Magnavox two-track, with similar circuit.
A29 *Connoisseur*, similar, but with four loudspeakers.
A33 *Prince-de-Luxe*, with extra amplifier stage and four-track switching.
A37 *Slimline*, "*One-Two*", BSR two-track (EF86, ECL86, ECL86, EM87, metal rectifier).
A38 *Slimline*, "*One-Four*", BSR four-track, similar circuit.
A39 *Slimline*, "*Three-Two*", Magnavox two-track, similar circuit.
A40 *Slimline*, "*Three-Four*", Magnavox four-track, similar circuit.
A41 *Riviera*, BSR two-track (ECC83, ECL86, EM84, metal rectifier).
A41A *Riviera*, BSR two-track (ECC83, ECL86, EM87, metal rectifier).

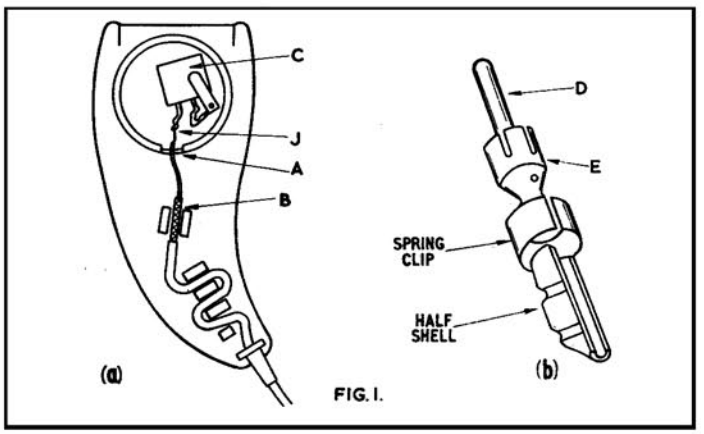


FIG. 1.

A42 *Riviera de-Luxe*, BSR four-track, similar circuit.
A43 *Riviera Three-speed*, Magnavox three-speed, two-track, similar circuit.
A44 *Riviera Three-speed de-Luxe*, Magnavox three-speed, four-track, similar.
A46 *Dual-Sound*, BSR two-track, as A41, with tweeter added.

The *Sound Stereo Add-on unit* A47 enables all four-track models to replay stereo tapes. 3W stereo amplifier with mains unit and inbuilt loudspeaker, matched.

This is not intended to be a review, and there is not sufficient space to go into details of response figures, input and output sensitivities and impedances, etc. These will be found in the relevant sections of the *Hi-Fi Year Book*, or have been published from time-to-time in the New Product announcements in these pages. Common features, however, are the two-input, two-output arrangements and the use of a crystal microphone.

The microphone, its phono-plug and the particular type of socket has given rise to some queries, and the subject merits a few words. Earlier models used the *Cosmocord* unit, *Acos Mic 39*, which was a "short-stick" crystal unit, with desk or floor stand. But the more widespread machines have had either the *Mic 40* or the *Mic 45* supplied. The *Mic 40* is available in a more expensive version as a ceramic unit with a slightly greater sensitivity and with its familiar fold-over swivel stand.

It is with the *Mic 45* that we are concerned here, for this crystal unit has been supplied with many other makes of tape recorder, and its very ruggedness has tempted some readers to treat it with less than the respect one should apply to a piezo-electric transducer.

Fig. 1a shows the well-known shape of the casting, which is in a slim shell form, held together by two Phillips-headed self-tapping screws. First word of warning: after having been dismantled once or twice, the microphone may not clamp as tightly as it should, with a resultant loss of response and odd noises due to rubbing metal.

On opening the casing, and removing the front section with its gold-anodised grill, the cable can be seen winding between its clamp mouldings and entering the capsule well. Second word of warning: this is not a capsule in the sense that older types of microphone employed, and any attempt to prise it out may result in damage to the diaphragm. Remove the filter plate first, gently easing it from its snug fit with the point of a pen-knife blade inserted in the aperture (A). Beneath this plate will be found several thin washers and the foil diaphragm. This last must not be bent, buckled or scratched. It can be eased from its seating in the same way, but very gently, and laid somewhere safe until you are ready for re-assembly.

Once this is removed, the crystal unit (C) with its connections can be seen, as in the diagram. Note that the outlet wires from the crystal are fine flat copper. Only one has a direct connection from the cable, the other being taken to the earthing clamp, return path being via the metal-work of the casing. The outer braid of the cable makes contact at (B), where it passes and is pinched between two ribs. If the joint at (J) has been severed, resoldering should be carried out with the utmost care, using a heat shunt on the crystal side of the connection.

Before reassembling, make sure the outer braid is making a good connection at (B). When replacing the diaphragm, lift gently with two pieces of card, or other light material, supporting the foil from beneath

and dropping it gently into its original position by slipping the cards out sideways.

At the other end of the microphone cable we have another prevalent cause of trouble. The phono-plug consists of a twin shell of plastic, clamped on to the contact assembly by small lugs which seat in holes, the whole being held together by a split cylinder of spring. There is an improved version with a longer plastic skirt and additional spring clip, but the type which gives most trouble is shown in exploded view in **fig. 1b**.

The inner of the microphone cable passes through the hollow pin (D) and the braid is made-off to a short tail and soldered to the outer shield (E). When remaking these joints, always tin the cable first, to ensure that the minimum of heat is applied to the plug when the final joint has to be made. Too much heat for too long and you will find the plastic insulation of the inner cable melting back, giving a pretty short-circuit just as you come to tape that important party-piece.

It should perhaps be mentioned that the most frequent cause of bad joints with these plugs is purely and simply mishandling. Readers of this magazine should need no reminding that plugs should be withdrawn by a grip on the plug casing, not a tug at the cable!

If there is doubt as to a microphone's efficiency, remembering that an ohmeter across the plug will prove nothing when testing a crystal unit, it can be used as an earphone, by inserting the plug in the hi-fi or monitor output and replaying a pre-recorded tape. The output is weak, but quite clear.

Insertion of the microphone plug into the loudspeaker (external) socket will also give results, but some care should be exercised here as the microphone has a high impedance and this socket is often of the "isolating" type, switching off the internal loudspeaker when the plug is inserted.

There are several types of isolating socket in use, but the one that concerns us mainly when discussing the *Sound* range is that shown in **fig. 2**, the microphone input. The physical shape is seen at **(a)**;

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Mic 45

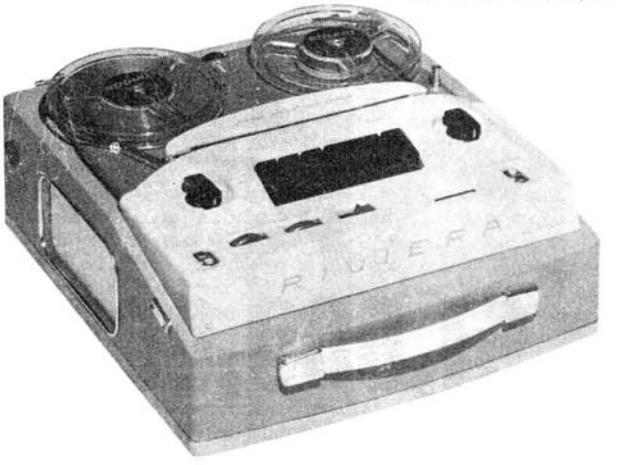
★

the microphone plug is inserted so that the central pin goes down through the hole, and the skirt sits over the screen to make a chassis connection. With no plug inserted the input to the first stage, via the Record/Play switch, is connected to the pin (B) by the spring action of the clip (A). This places R2 effectively across the input, damping the first stage sufficiently to stop hum pick-up. Inserting the plug pushes (A) away from (B), as seen in **(b)**, and the microphone "live" lead connects to (A) only. The theoretical circuit is shown at **(c)**.

A faulty contact where (A) meets (B) can cause intermittent reduction of signal level, hum and noise pick-up, and, in certain circumstances, a rather confusing loss of bass. Some idea of the effect is obtained by inserting the microphone in the high-level input socket and recording this way. If R2 is then disconnected, the result of high resistance joints becomes obvious. Persistent hum that is aggravated when the hand approaches the socket indicates that the spring tension of (A) has been lost and an open-circuit exists at this point.

Even more confusing is the open-circuit earth return at the input. On some *Riviera* models, where the *Magnavox Studio* deck is used and the printed circuit panel is horizontally placed, the input sockets are on thin plate brackets, secured to the panel by open rivets. If the machine has been dismantled, there is a danger that these rivets may have been strained, resulting in poor earth-return, hum and noise.

The answer is either a direct soldered connection or a countersunk screw inserted from below, after the rivet has been drilled out. (From below, because the panel must sit correctly on the shallow shelf of the cabinet or there is a danger of the lugs of the electrolytic



capacitor at the other side of the board touching on the lower part of the speed-change mechanism.)

On the same range of machines, trouble is occasionally experienced with the Record/Play switch. The layout beneath the deck is shown in **fig. 3 (a)**. The switch spindle is flatted and inserts in a Yaxley wafer (not shown), and just beneath the deckplate is an angle-bracket (A) held by a spire clip (S) and kept in the Play position normally by the tension of spring (T). When the knob is turned to the Record position and the Start key pressed, the tongue (B) of a lever pivoted at (P) holds the angle-bracket in place. The setting of (B) is thus important, but before altering this, the tightness of the bracket on the spindle should be checked, and the tension of the return-spring.

The whole switch is held in place by a $\frac{5}{12}$ in. BSF nut and the upper portion of the support bracket has screws inserted through the slots in the deck, one of which acts as a stop pin for the bracket. Check for wear at this point also.

In fairness to users, it should be mentioned that most of the "overtrain" faults on this switch are due to the knob working loose. The grub-screw is toward the front, very awkward to get at, hidden

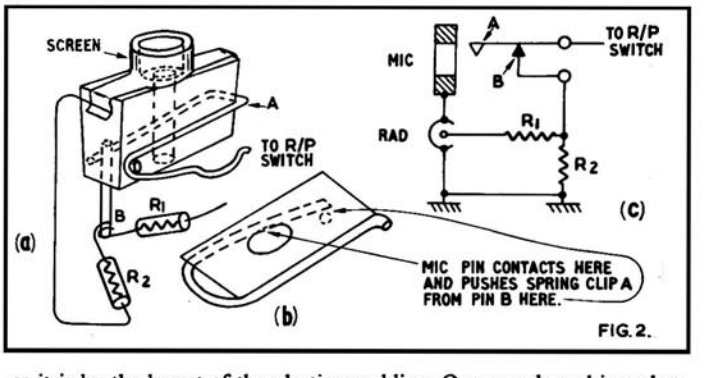


FIG. 2.

as it is by the breast of the plastic moulding. On several machines that have come to my workshop for switch faults or broken knobs I have fitted different knobs—with the owners' permission, of course.

A switch action used in machines with the *BSR* deck and a vertically mounted chassis is shown in **fig. 3 (b)**. The switch is a slider, with a brass pin of quite adequate dimensions acted upon by a double leaf as the spindle is turned. The difficulty here is that adjustments to the leaf position cannot easily be made, and when re-inserting the deck in the cabinet, it is easy to over-ride the switch.

A word of warning: do not be tempted to lubricate this switch if the action is sluggish. The slide action must be perfectly clean, return

Tape Recorder Service—*Contd.*

to Play being effected by the pressure of the leaf on the brass stud. Oil between the paxolin surfaces of the sliding switch will tend to retard it.

There is another mechanical factor, which often traps the owner into searching for electronic faults in the oscillator when intermittent bias and erase show up. This is the variable resistor RV in **fig. 4 (b)**, shown physically at **(a)**. The usual fault is a poor connection between

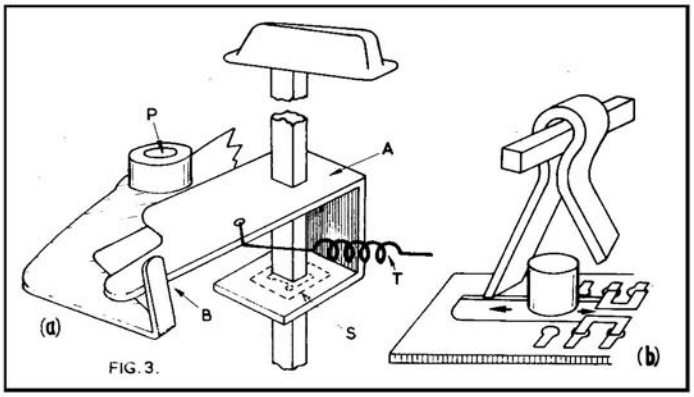


FIG. 3.

the slider and the mounting bar. The resistor is an arc of composition track on the reverse of the component as shown, and the slider is an arm which has a circular base. This base is formed to sit in the circular aperture so that two lips ride on the rim. If the control has been adjusted clumsily, with a screw-driver that does not fit the central slot, the contact between lips and rim loses efficiency.

Genuine oscillator faults are sometimes caused by failure of the capacitors C1, C2. In the circuit shown, the valve is the pentode section of an ECL82, used as playback output stage and recording oscillator, with the anode feedback circuit undisturbed and the selection of function at the grid, via the R/P switch.

Different values of capacitor will be found in different machines. The feedback capacitor, C3, is 1,000 pF, and must be a high-working voltage component, at least 750V DC. C1 is normally 5,000 pF., but C2 may be either 3,000 or 5,000 pF, and again, quality components should be used for replacement. The feed to the erase head is taken from a tapping on the oscillator transformer, via switching and a series resistor. This is normally 220 ohms, but must be increased to 470 ohms if four-track heads are fitted. On these models, too, there are differences in the signal feed to the R/P head.

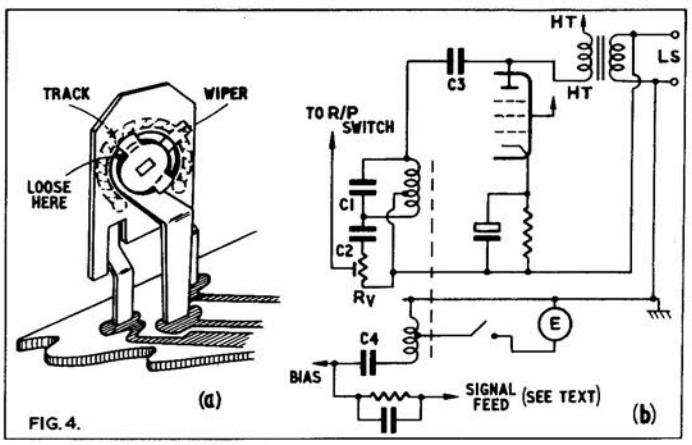


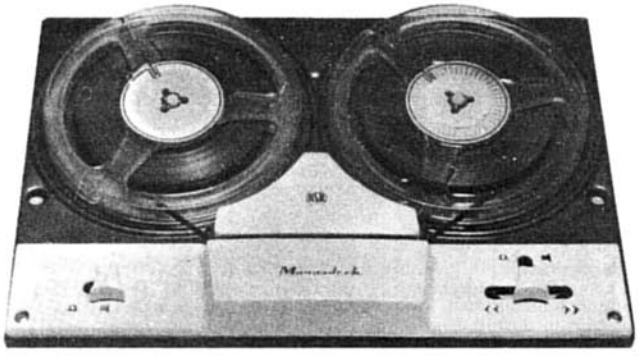
FIG. 4.

Models using the *BSR* deck, two-track, have a 220 K resistor with 100 pF capacitor across it, linking with the bias feed capacitor C4, a 33 pF component, as shown in **fig. 4 (b)**. This shunting capacitor is reduced to 47 pF on the four-track deck and omitted altogether on machines with the *Studio* deck. Other changes are made in the *Slimline* range to allow for the difference in decks and tracks, but these modifications are quite small, and can be supplied to those readers who wish to modify their machines from two-track to four-track with the minimum expense.

For the benefit of readers who are still with me—not only *Sound* owners, I hope—let me wish you all good taping in 1964.

THOUGHTS ON DESIGN

A LIGHT-HEARTED ANSWER TO THE ARTICLE, "THOUGHTS ON DESIGN", BY RAFE SEABROOK, WHICH APPEARED IN THE NOVEMBER "TAPE RECORDER"



THERE has long been the contention in the radio trade that every designer's mother must have been frightened by an overalled figure with flashing screwdriver and a huge, alarming pair of pliers. This is, perhaps, the most charitable explanation of those inaccessible nuts, unnecessary screws and incomprehensible circuits. With every season the radio trade has thrown up a regular crop of gimmicks: sets with some special feature, making a publicity virtue from a technical necessity—as for example, the various names and claims given to automatic gain control systems. It is an almost unfailing rule that these gimmicks are the items that give the most trouble.

Evolution or Design

Tape Recorders are no exception. The workshop bench becomes littered with the relics of defunct manufacturers or the punctured dreams of designers who actually managed to break the production barrier with their ideas. (For it would certainly appear that much equipment is not so much designed as developed—or perhaps, like Topsy, it "just growed.") After several years of replacing that particular capacitor, the idler with pernickety mounting, the clutch drum as eccentric as the chap who dreamed it up, the belt that tries to become a trapezium or the regular, inevitable adjustment, the service engineer may be forgiven for running screaming up the wall when a glassy-eyed enthusiast begins burbling about "design".

Which is why, when I read the remarks of Rafe Seabrook in the November issue of the *Tape Recorder* ("Thoughts on Design", page 425), I can hardly resist a surreptitious chuckle. "Perhaps, somewhere," he says wistfully, "someone is at work on the drawing board, planning a deck . . ."

The Perfect Mousetrap

Having worked in one or two factories, as well as in the field, I can take the liberty of assuring my idealist colleague that there are indeed a legion of boffins assiduously trying to shape a better mousetrap. But it is a myth that the world will beat a path to their door if they succeed. This is what happens: an idea is born, a prototype developed, maybe a production mock-up sent as far as the board-room. Then, some black-trousered gent with a feint-ruled mentality begins paring away the finer points. Modifications are made, often with the aim of reducing production costs. Afterthoughts are called for to allow for these modifications. Material supply enters the picture and drastic revision has to be made. Mark 1 becomes Mark 2 and 3 and 4 . . . Eventually a marketable product is launched, with the attendant ballyhoo that picks out the very points the door designer grew grey hairs trying to improve. By the time the serviceman gets hold of the model a few more modifications have been made, and his manual is hopelessly out of date. He resigns himself to the usual inaccessible nuts, unnecessary screws, etc.

The one or two firms who produce machines that approach very nearly Mr. Seabrook's ideal are not likely to make fortunes for their shareholders. With one uneasy eye over their shoulder at the Inland Revenue men, their managing directors, too, have to gear their production to the rising cost of labour and materials. They make a few, careful, high-priced models, a good deal of prestige, and, if they are lucky, an adequate living.

My point is that good design is exactly the opposite of what Mr. Seabrook calls his "idle pipe dream". At the risk of bringing the howling wrath of the perfectionists about my ears, let me state that I consider the model of good tape deck design to be the current BSR range.

All right, now cool down and listen. As a service engineer, I have to handle and repair all manner of machines. As a technical writer, I have to study the developments of the professional models that might never come my way. As an enthusiast with a long list of wants and a very short purse, I feel that the best possible way of attempting the ideal is to assemble one's equipment oneself. Given unlimited resources, most of us could produce the "ideal"—or get it made to measure.

Practical Design

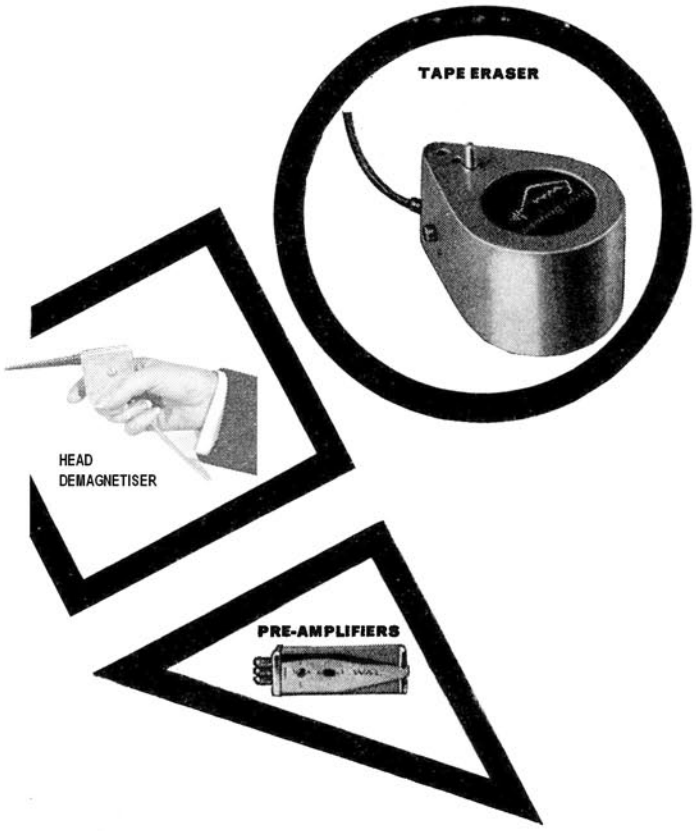
The BSR people, and to a similar extent, other makers in the "domestic low-range" bracket, have made a deck that is simple to operate, simple to repair, and inexpensive enough to bring thousands of people the rewarding experience of playing with tape that they otherwise might not have had. From the basic model, a good many users catch the fever and graduate upwards. But it is the simplicity of that original design which made their enthusiasm possible. It does exactly what it sets out to do, aiming at a standard that, for a modest price, is quite praiseworthy.

I call that good design although I do not necessarily regard it as an "ideal machine". In fact, some manufacturers have built around the basic BSR and Magnavox *Studio* decks cheap and nasty machines that hardly do the decks justice. But while I join with Mr. Seabrook in yearning after the moon, it seems necessary also to acknowledge the debt we all owe, as enthusiasts, to the earthbound plodders.

Ironically, a new magazine has just appeared on my desk. Its title? *Design Electronics*. Its leading article? Why, none other than our eternal moan, "Why can't we have a multi-speed capstan motor especially designed for the tape recorder?"

On page 421 of the November issue of *The Tape Recorder* Dr. J. D. Poldy brings out the point that belts suffer in the Hong Kong climate—(and not only there, sir!). He asks for an improvement in drive and transport systems. My own postbag is heavy with queries about connecting up equipment, and the correspondence columns "hum" with complaints. On pages 426-7 of the November issue of *Hi-Fi News*, Gordon King gives a lot of practical advice on isolating equipment from the mains. Has it occurred to us that good design of electronic equipment would entirely eliminate this problem?

Of course, it would probably eliminate the service engineer, too, so keep on battling Mr. Seabrook. On the road to your pipe dream an awful lot of gimmicks will trip you, and give us all something to play with.



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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.*

*

Memo Corder

Battery Portable

*

MEASURING only 5¼ x 3¾ x 2 ins. and weighing two pounds, the new *Memo Corder "Audio Pocket Notebook"* can claim to be one of the smallest battery recorders available to the public. We must emphasise, however, that it was designed solely for use as a dictaphone and could not be expected to give particularly high-quality reproduction, even of speech. Taking 2¼ in. spools, it has a maximum playing time of 45 minutes (two-track) using extra-play tape. Battery life is 25 hours. Controls include record, play, rapid rewind, variable speed, volume and recording level. A foot-switch and telephone adaptor are available as optional extras. Playback is through a built-in loudspeaker. Erase is by DC bias.

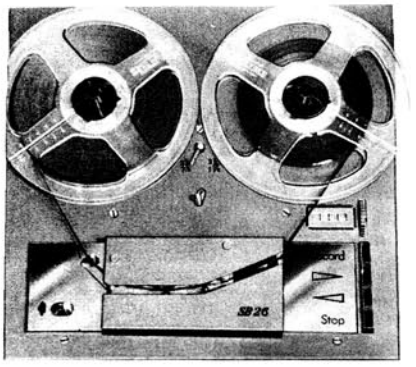
The price of the recorder, complete with crystal microphone, leather carrying case, and tape, is £23 12s. 6d. **Distributor: Felcort Limited, 251 Edgwarebury Lane, Edgware, Middlesex.**

*

Lorlin SB26

Tape Deck

*



A NEW three-speed tape deck, the *SB26*, was announced recently by *Lorlin Electronics*, a subsidiary company of *Jason Electronic Designs*. A completely new style has been adopted in the layout of controls and considerable use has been made of solenoids which operate the brake system and pinch wheel. Wow and flutter is given as 0·1% at 7½ i/s, the two other speeds being 3¾ and 1⅞ i/s. Other facilities are: four-digit rev. counter, provision for three heads, automatic transport release in event of current failure, three motor, and safety erase lock.

The deck is available in two versions, both of which have three heads. Four-track stereo (price £40 19s.), and two-track mono (£32 11s.). The dimensions are 13⅛ x 12¼ ins., weight 18½ lbs. **Manufacturers: Lorlin Electronic Co. Limited, 23 Wardour Street, London, W.1.**

Global Splicer and Sound Effects Tape

TWO recent additions to the range of accessories now being produced by *Global Products* are a metal splicing block and a pre-recorded sound-effects tape.

The splicer is of the semi-automatic type, being equipped with clamps to lock the tape in position while being joined. It is 5 ins. long and has cutting slots for vertical and oblique splices. Fixing holes are provided so that the block may, if required, be mounted on to a wooden base or tape recorder. Retail price is 15s. 6d. (plus 6d. postage costs if purchased direct from manufacturer).

The sound effects tape satisfies a long-wanted need for the enthusiast, as surprisingly few such tapes are commercially available. Designated *Sound Effects No. 1* it contains a varied selection of authentic sounds that may be used, for amateur purposes only, free from any copyright restrictions. Professional use of the recordings will call for the consent of *Global Products*.

The contents of the tape include: bath sequence, aeroplane sounds, breaking coal, chopping wood, thunder, motor cycle, footsteps, TV aerials (?), children playing, motor boat, railway sounds, water-fall, pipe-smoking sequence, electric shaver, baby laughing, playing, and crying, bird song, fire sounds, etc.

A further sound effects tape will be available shortly, including "unique" air raid sirens, and low-flying aircraft, etc. It is planned to bring out a stereophonic version.

Sound Effects No. 1 is available at two speeds, price £1 2s. 8d. (3¾ i/s), and £2 2s. (7½ i/s). Both are two-track recordings. **Manufacturers: Global Products, 13 Stanley Street, Rothwell, Northants.**

*

Tapemaster

Twin

*

A NEW recorder, using the B.S.R. *Monardeck*, is the *Tapemaster Twin*. Housed in an attractive two-tone case of red and ivory, it has a neat and compact appearance and measures 14½ x 12 x 5 in. The list price is £23 2s. and the manufacturers are: **Baird Television, Seymour Mews House, Wigmore Street, London, W.1.**

* * *

Acos Microphone Inserts

TWO new microphone inserts have just been introduced by *Cosmocord*. They are the *Mic 61* magnetic, and the *Mic 49* crystal. The former is a moving-iron unit developed mainly for transistorised hearing-aids. It is said to be ideal for all situations requiring high-quality speech reproduction and can be fitted to the Acos *Mic 40*, *Mic 55*, and *Mic 60* microphones. The *Mic 49* is used in the *Mic 60* stick, and *Mic 55* lapel microphone. A ceramic version is available. which has similar characteristics except that the output is 6 dB lower.

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EQUIPMENT REVIEWED

Wyndsor Trident

Manufacturer's Details: *Tape speeds:* 7½, 3¾ and 1⅞ i/s. *Speaker:* 7 x 4 in. elliptical, 9,500 gauss. *Microphone:* High impedance. *Level indicator:* Magic eye. *Frequency range:* 50 c/s to 15 Kc/s at 7½ i/s 50 c/s to 9 Kc/s at 3¾ i/s; 50 c/s to 7 Kc/s at 1⅞ i/s. *Output:* Four watts. *Other Features:* Superimposition, tone, and pause controls, position indicator. *Inputs:* Low level (1·5 mV), high level (0·25V). *Output:* Extension speaker (3 ohms), external amplifier (0·5V, 10 K/ohms. *Valves:* EF86, ECL86, EM85, silicon diode rectifier. *Dimensions:* 14½ x 15½ x 7¾ ins. *Weight:* 25 lbs. *Price:* £34 13s. (two track), £36 15s. (four track). **Manufacturer: Wyndsor Recording Co. Ltd., Wyndsor Works, Bellevue Road, Friern Barnet, London, N.11.**

* * *

THIS machine uses the well-proven Magnavox (Collaro) Studio deck with three motors and three speeds together with a most economically-designed two-valve amplifier (high-gain pentode and triode-pentode, not counting the magic-eye indicator tube). The cabinet design is very elegant, and the combination of cabinet and high-flux speaker gives a sound quality which is much better than the usual run of self-contained home recorders, indeed the excellent acoustic balance covers up a number of minor imperfections and inadequacies in the technical performance of the amplifier. A contributory factor to the good sound quality is the provision of adequate bias to the record head during the recording process.

Designed by Ear

I would say that this recorder has been "designed by ear" rather than on the basis of technical measurements. This is not to say that improvements in amplifier design would not be worthwhile, they almost certainly would be, but it does tend to show that response curves do not always tell the full story although they often point the way to possible improvements. The ear is still the final judge, and considerable curtailment of frequency response at both ends of the spectrum will be tolerated if distortion and intermodulation are kept at a low level and the overall response is well balanced about a centre frequency of about 800 c/s. Thus, if the bass response falls below 200 c/s, the high note response should be allowed to roll off above 3,200 c's (two octaves above and below the centre frequency); any extension of response in one direction must be balanced by equal and opposite extension in the other.

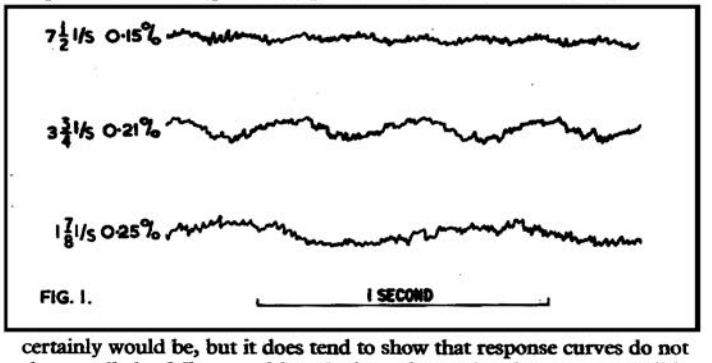

FIG. 1.

Wow and Flutter

Fig. 1 shows the "fluttergrams" or high-speed pen traces of small deviation from the mean tape speeds at the three speeds provided by this recorder. The traces show the combined record and play wow and flutter, and it will be seen that a capstan wow at 5, 2½ and 1¼ c/s is the main offender at the three speeds of 7½, 3¾ and 1⅞ i/s due to a slight eccentricity in the capstan or flywheel. The RMS meter readings were 0·15%, 0·21% and 0·25%. The wow could be heard on a sustained pure tone at the two lower speeds, but was not audible on most types of music at 7½ and 3¾, nor on speech at 1⅞ i/s.

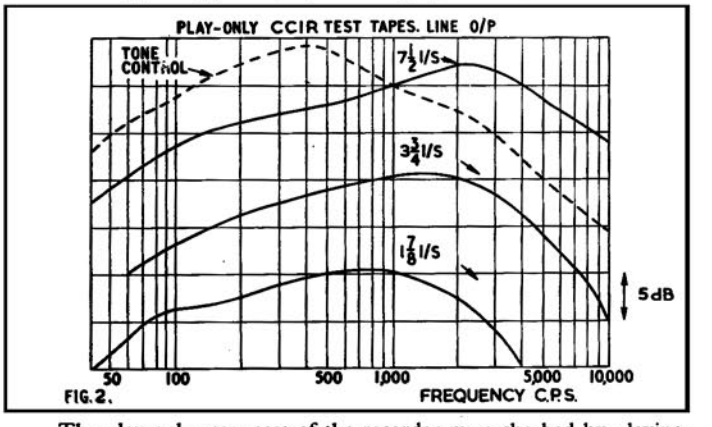

FIG. 2.

The play-only responses of the recorder were checked by playing tapes recorded to standard CCIR 100 µs, 200 µs, and 400 µs time constants at the three speeds of 7½, 3¾ and 1⅞ i/s. Tests were first made at the line output socket provided to feed a signal to earphones or an external power amplifier. Turning the tone control clockwise tilted the response to give maximum top response, and turning it anti-clockwise cut the high note response and boosted the middle-bass response (see dotted curve **fig. 2**). It was noticed, however, that the sound output from the loudspeaker behaved quite differently; turning the tone control fully clockwise cut the top response which was at its best around the middle or half-way position. Turning it fully anti-clockwise gave a slight bass rise with no appreciable change in high note response. The responses were therefore re-plotted by measuring the voltage across the loudspeaker voice coil, **fig. 3**, and by measuring the sound output

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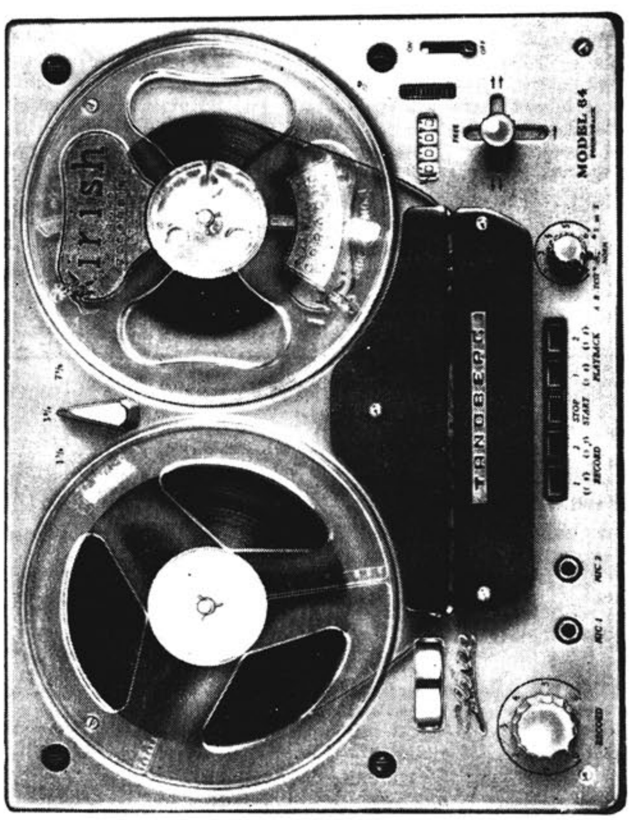

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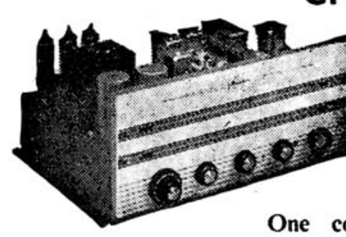

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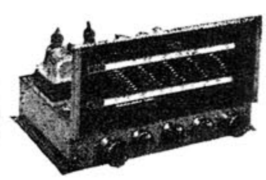

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EQUIPMENT REVIEWED—(*continued*)

of the speaker with a calibrated microphone whilst playing a $7\frac{1}{2}$ i/s white-noise test-tape to give the response shown in **fig. 5**.

The odd behaviour of the line output is due to it being taken from a point *within* the feedback loop around the output and penultimate stages.

Frequency Response

The overall record/replay responses were measured at the three speeds by feeding an oscillator signal to the radio input on Record, and measuring the voltage across the speaker voice-coil on Replay. The tone control was left at the midway position for these tests. **Fig. 4** shows the resultant responses. It will be seen that these responses are very similar to those of **fig. 3**, showing that the recording characteristics are close to the CCIR standards.

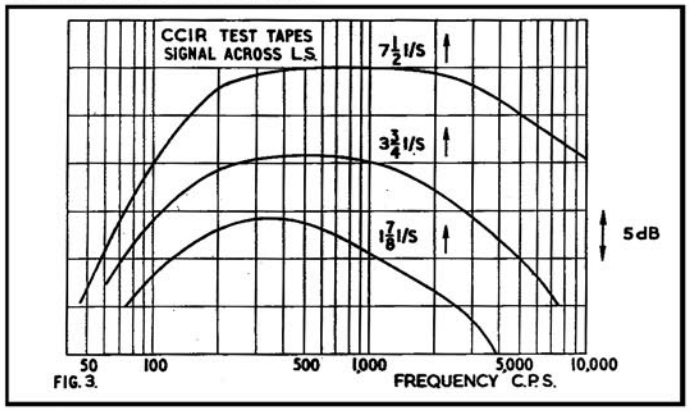

FIG. 3.

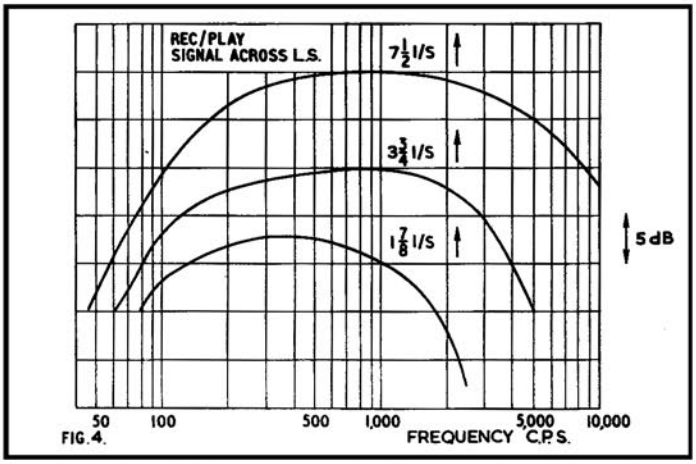

FIG. 4.

A signal 13 dB above test-tape level was recorded without distortion with the magic-eye beams just closed, and hum and noise across the LS voice-coil was 36 dB below test-tape level, so that the total dynamic range or signal/noise ratio was 48 dB. Recorded noise was only 2 dB above that of bulk-erased tape. The low hum level is partly due to the sharp fall in low note response below 200 c/s.

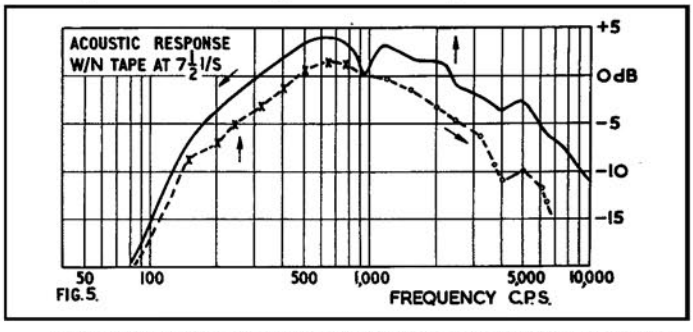

FIG. 5.

The crystal microphone supplied with this recorder has a sharply-rising high note response (**fig. 6**), and this explains why speech recordings made on this recorder sound clean and well balanced despite the considerable high note drop shown in **fig. 4**.

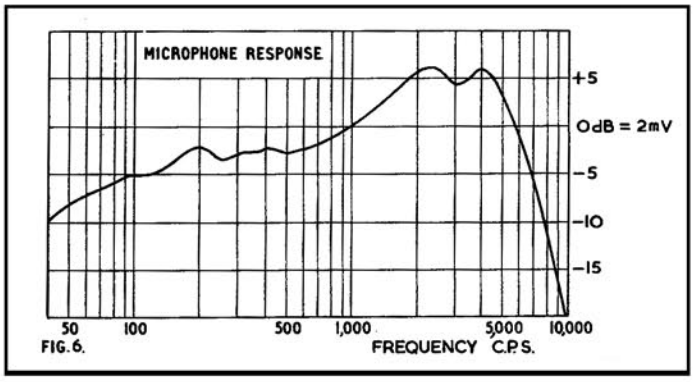

FIG. 6.

Comment

This recorder could never be classed as a Hi-Fi machine despite the optimistic frequency response figures quoted in the technical specification, but it does nevertheless sound a lot better than many recorders I have tested which do in fact meet such a specification.

I have stressed many times the over-riding importance of low distortion and intermodulation in the recording process and the danger of striving for a very extended frequency response at the expense of such distortion by underbiassing or exaggerated pre-emphasis of the high note response during recording. It is, unfortunately, not possible to measure harmonic distortion at high frequencies on a tape recorder, as the very high frequency distortion products fall outside the range of the recorder, particularly at medium and low speeds where such measurements are most needed. Measurement of intermodulation products between two closely spaced high frequency tones holds more promise of giving results which correlate with subjective impressions of high note distortions, but much more work must be done before such tests are included in these reviews. In the meantime we still have to rely on the ear and rather nebulous subjective impressions of "clean" or "dirty" high note response. **A. Tutchings.**

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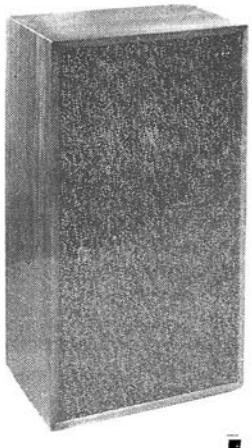

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From: Mr. W. Craigie, 6 Saint Giles Street, Edinburgh 1.

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Yours faithfully.

* * *

. . . about crosstalk

From: A. C. Griffith, Recording Manager, World Record Club, Parkbridge House, The Little Green, Richmond, Surrey.

Dear Sir, I would like to make a few comments concerning M. G. O.'s letter in the October *Readers' Problems*, and your reply to it.

Having a Ferrograph deck with stereo heads, and my own electronics, I have also experienced cross-talk trouble. When it first occurred, while playing mono tapes, I suspected my amplifier. However the cross-talk is present if the lower track windings are left open-circuit or short-circuited. I was, at the time, using an *FP.14* stereo replay head which has a 55 thou. clearance between the two tracks. I have had some correspondence with Ferrograph on this subject and was informed that they had brought out a new head, the *FP.16*, with an 85 thou. head-gap to minimise this trouble. With this new head in position the cross-talk is certainly very much less, although still present to a small degree. Ferrograph quoted a figure of better than 50 dB. I think one is bound to get a certain amount of cross-talk when playing mono tapes on a stereo machine in this way.

I know of one well-known critic who reviewed some 3¾ i/s pre-recorded mono tapes and complained of echoes. On enquiry it transpired that the effects were due, not to the tape but to cross-talk on his machine.

Yours faithfully.

* * *

. . . about an unfulfilled promise

From: Mr. J. E. Hunter, 445 High Street North, Manor Park, London, E.12.

Dear Sir, During the 1963 Audio Fair I made enquiries at a manufacturer's room where a reverberation unit was being demonstrated. At the same demonstration room I made a similar enquiry at the *1962* fair. I left a card in each case and last year received an acknowledgement with the promise of much more information to follow. I am still waiting for the glad tidings but in the meantime I am wondering what the idea was in putting on such demonstrations?

Surely in two years the makers must have produced something, although I must admit that I have not seen the unit advertised. The firm in question bears a well-known name which makes it even more puzzling. But who knows, it may even come up again at this year's show!

Yours faithfully.

* * *

. . . about signal-to-noise

From: Mr. T. Court, 58 Carter Knowle Road, Sheffield 7, Yorks.

Dear Sir, In view of your November editorial, I am taking the bull by the horns and raising a point which has long interested me.

I believe that signal-to-noise ratio is a cardinal feature to consider when acquiring a tape recorder. The articles I have read which deal with the subject are unanimous that 40 dB is the *minimum* acceptable for a good average domestic recorder and it is therefore perplexing to note that one of the leading Continental manufacturers offer 40 dB for all their recorders, regardless of prices, which range from about £25 to £90. One would have thought the figure would have been much higher for the more expensive machine!

Perhaps there is some obvious explanation for this which I, in my relative ignorance, have failed to appreciate.

Yours faithfully.

TRADE NEWS

Roy Russell Leaves Wyndsor

A POPULAR figure in audio circles, Mr. Roy Russell, recently resigned from his post of Director and General Manager of Wyndsor Recording Company. Having written several successful plays for the theatre and television, as well as short stories and magazine articles, he intends to devote his full time to journalism and technical writing.

* * *

Service Note

IN recent months we have received an increasing number of letters from owners of *Walter*, *Harting*, and other absolete recorders, asking for the addresses of service agents for these machines. These are as follows: *Walter—Tape Recorder Maintenance Ltd.*, 323 *Kennington Road, London, S.E.*11. *Harting—Technical Suppliers Ltd.*, *Hudson House*, 63 *Goldhawk Road, London, W.*12.

* * *

Mastertape Price Reductions

CONSIDERABLE cuts in the prices of their tape were announced recently by *M.S.S.* The new prices are as follows:

Standard Play		
Spool	*Length*	*Price*
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5 in.	600 ft.	15s.
5½ in.	900 ft.	£1
7 in.	1,200 ft.	£1 5s.
Long Play		
3 in.	225 ft.	6s.
4 in.	450 ft.	11s.
5 in.	900 ft.	£1
5¾ in.	1,200 ft.	£1 5s.
7 in.	1,800 ft.	£1 15s.
Double Play		
3 in.	300 ft.	9s.
4 in.	600 ft.	17s.
5 in.	1,200 ft.	£1 13s.
5¾ in.	1,800 ft.	£2 2s.
7 in.	2,400 ft.	£2 15s.

Manufacturers: M.S.S. Recording Co. Limited, Colnbrook, Bucks.

* * *

Magnetic Recording Conference

DURING the week beginning on 6th July 1964, an International Conference on Magnetic Recording is to be held in London. Sponsored by Brit.I.R.E., I.E.E., and Institution of Electrical and Electronics Engineers, the conference will cover aspects of audio, video, computors, and data recording. A programme of social events and technical visits will be associated with the lectures and items connected with the various papers will be on display.

* * *

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Continued on page 534

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