

FEBRUARY 1967

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TAPE

RECORDING MAGAZINE

INSIDE

FULL COVERAGE OF
Hi-Fi & Video Topics

INCLUDING

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'PROS'**

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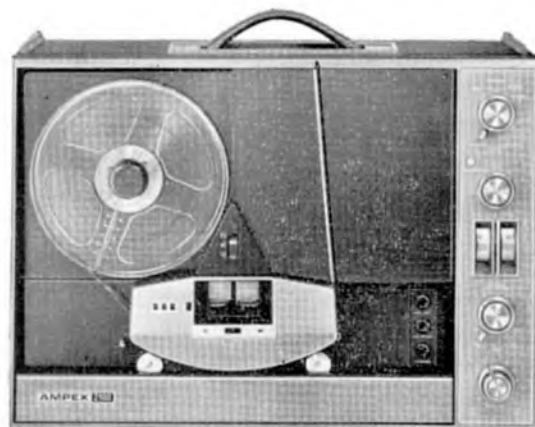
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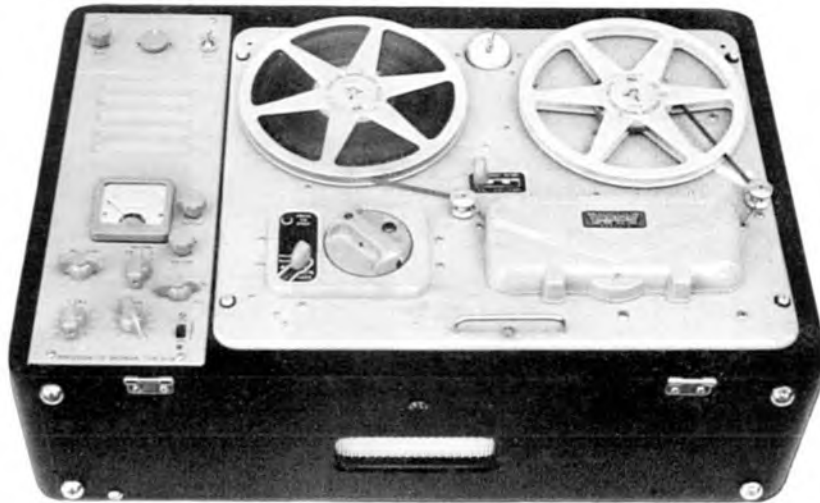
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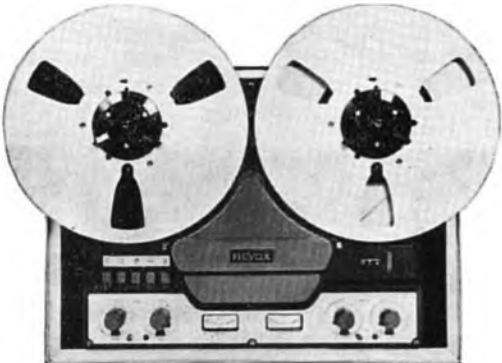
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TAPE

RECORDING
MAGAZINE

Vol. 11 No. 2 February 1967

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COVER PHOTOGRAPH: In his Barnes cutting room, John Hassell of John Hassell Recordings makes critical adjustments of levels; his disc cutting lathe is in the background. Both he and another professional, Denis Comper of Sound Level Studio, talk about their work and offer expert advice to amateurs on pages 50 and 51 of this issue.

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Tape trends and tape talk

By the Editor

TAPE RECORDERS for amateur enthusiasts were not on sale in Eastern Europe until several years after we had them freely available here; naturally, therefore, the amateur movement took longer to become established.

From what I have heard recently, however, about progress in Czechoslovakia, we are going to have to look to our laurels. At the last International Recording Contest I had a long talk with Dr. Miroslav Stepanek, a Prague biologist who is a leading figure in the amateur organisation, and Mr. Jaroslav Pour, of the Czech Radio.

The amateur movement started there about six years ago, with half a dozen enthusiasts meeting in Prague. At that time only Hungarian and Russian recorders were available, but two Czech models, the Supraphon and the Teslar, came on the market soon afterwards. Four years ago it became possible, for the first time, to buy recorders manufactured in the west—Philips and Grundig, but only machines with a single 3.75 ips speed.

It is estimated that about 175,000 recorders have now been sold to amateurs. This is an impressive total, for I think the cost in Czechoslovakia—measured in terms of average earnings—is a lot higher than over here.

Around the club in Prague a number of others formed over the years. Today half the total of 300 to 400 organised amateurs are in a club in the town of Olomouc, which has a population of 70,000. The explanation, I was told, was that one particular enthusiast living there was an exceptionally able organiser.

It was interesting to me to hear that individual enthusiasm counts for so much even in a country where the hobby, now it is established, gets official backing on a scale undreamt of here.

The break-through in Czechoslovakia came when the radio took a hand in the hobby. The third programme there, as here, is a cultural one, but I think the term must be more broadly interpreted by the Czechs, for it is on this programme, at a peak listening hour (5 to 6 p.m. on Fridays, repeated at 9 to 10 a.m. on Sundays) that a programme for recording amateurs is regularly transmitted each week.

The programme has its own special producer and he also plays a much wider role in assisting the amateur organisation. "Without the help of the Czech Radio, it would have been impossible for the amateurs to organise themselves," Dr. Stepanek assured me. "When groups had been organised in a number of towns, the Radio made possible the first national contest. This contest can be considered the beginning of a national Czech organisation."

The first Czech contest attracted 117 entries and, as we have already reported, some of the best tapes

made a notable impression at the CIMES international judging in Hilversum recently.

The way in which the Czech contest is judged will interest those who have entered British contests. All tapes are first heard by a technical jury, composed of five radio men and two amateurs. They produce a technical report on quality and they allot points. Last year they passed 76 of the 117 entries forward to an artistic jury, composed of five radio men and five amateurs, who then awarded supplementary points for content and technique.

Of course, the best amateur tapes form a principal part of the Czech Radio's weekly programmes to amateurs. They also include examples of outstanding commercial recordings, folklore items, technical information at two levels—for beginners and for experienced amateurs, and news of amateur recording activity in Czechoslovakia and abroad. Many of the tapes broadcast are discussed in detail on the programmes by professionals, who point out what has been done well, what might have been better, and so on.

The Czechs are now talking a great interest in what amateurs in other countries are doing. Mr. Pour visited France early last year and, as a result, secured an hour-long programme about French amateur recording activity. In Holland last October he gathered knowledge of Dutch activity. And he has asked me to try to provide him with 60 minutes of programme material about amateur recording in Britain.

I shall welcome ideas from readers.

* * *

IN AMERICA, an Ampex spokesman has poured cold water on the idea of a significant market for video recorders among amateur enthusiasts. "The fact is that all videotape recorder sales are industrial, educational, professional or business in nature," said Mr. John H. Trux, vice-president of Ampex Corporation. He added that his firm is working to capacity to meet the demands of police, railways, schools, hospitals and other institutional users.

About all this, Mr. Trux speaks with authority and no-one is likely to challenge his view. But he also said: "There is no such thing as a home market for videotape recorders."

At the moment, of course not. But is there going to be such a market, of significant proportions? Clearly, some other manufacturers think so, and are preparing their marketing campaigns accordingly. When, eventually, the cost of video equipment comes down, the home market will open up; then it is the manufacturer who has laid the groundwork in terms of retail organisation and projection to the general public who will gather in the benefits.

SO far in this series we have confined ourselves to "simple" recording. On one length of tape we might have a number of such simple recordings. Although each might be complete in itself they are separate and disjointed, perhaps not following any logical sequence. We should lack continuative sounds linking them together—and the sounds themselves will all be precisely as recorded without any modification whatsoever.

What we really have is no more than the raw material for programme production. To be used as the basis for an actual programme the recordings will have to be "processed" in one or more of a number of different ways. The techniques involved are superimposition, mixing and editing and splicing.

Superimposition is certainly the easiest, but also the most dangerous aid to programme building. It means precisely what the name implies, the superimposition of one sound on top of another to give a resultant complex sound. We have seen in earlier articles how the erase head effectively removes an existing recording before the new one is registered on the tape. If the erase head were to be rendered inoperative the original recording would not be removed; the new recording would be superimposed on top of the existing. This is the principle of superimposition.

Many machines have a facility for switching the erase head out of circuit. When this control is operated the existing recording on the tape, which might be an amalgam of two or more earlier recordings, will be preserved and new recordings will be literally added on top.

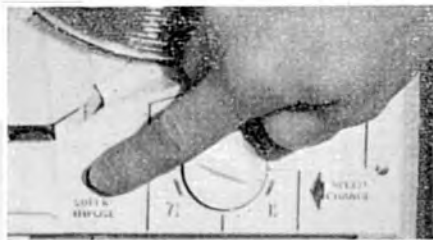
The possibilities for creative work in this way are obviously enormous. No additional equipment is required. Sounds are simply added, one on top of the other, with no more difficulty than conventional recordings—or so it would seem at first glance. Unfortunately there is a snag or two to overcome.

We have already discussed the effect of the high frequency bias current applied to the record head at the moment of recording. It was pointed out that this is not dissimilar in character to the rapidly alternating polarity applied to the erase head that effectively wipes clean a recorded tape. If this is so it would not be unreasonable to suppose that if, after operation of the superimposition control, a recorded tape were to be passed across the live record head, then the effect of the bias current would be to partially erase the existing recording. In practice this is exactly what does occur.

This effect can easily be proved. Take any tape with an existing recording on it (but please not a valuable recording, because we are about to make rather a mess of it!), fast wind a few feet into the recorded length and then go into the record function with the erase head switched off. Keep the record level control at minimum and allow the spools to turn for 15 or 20 seconds. Stop the machine, wind back to the beginning and play back.

TAPE RECORDING TECHNIQUES

WHY BE DETERRED FROM STARTING CREATIVE RECORDING? DENYS KILLICK



The superimpose control is often a simple push-button, as shown here on a Robuk RK 5.

At first you will hear the original recording, but at the moment you went into record you will hear a fall in level of output. This reduction in level will be maintained until the tape arrives at the point where you went out of record. At once the full level of the original recording will return. It will be noted that not only has the level been reduced, but also the quality has been degraded. As the tape passes the record head the partial erasure it suffers is mostly in the form of a loss of top frequency.

This, then, is the first disadvantage of superimposition—partial erasure of the original recording, together with loss of quality. Another big disadvantage for precise work is that it is not possible to hear the existing sound on the tape as the new sound is being superimposed upon it. This makes the fine placing of one particular sound on top of another a matter of chance.

It is obviously unwise to use valuable, original recordings when experimenting with superimposition techniques—or indeed to use original recordings at any time. Once two sounds have been brought together in this manner they can never again be separated. If the resultant combined recording is not exactly what was wanted, then the original will have been lost for all time. The technique of superimposition is often used in radiophysics where original sounds can be reproduced quite easily and the danger of loss is of little importance.

A common use of superimposition techniques is to create a complex sound combining a number of different pieces of aural information to convey a desired impression. For instance, we might wish to produce a recording of some dialogue which the listener is intended to believe is taking place on the seashore. Our first recording might be of the seashore noises—the sound of the waves. This would be dubbed at full level on to the tape on which the composite recording is to be built up. We would dub at full level because this allows for the partial erasure we know will take place, and therefore helps us to arrive at a final acceptable balance.

On top of that we might superimpose the sound of the seagulls. This could appear at random points on the seashore recording, but we must be careful to run the whole of the first tape past the record head so that it will all suffer the same amount of erasure. Neglect of this requirement would mean that the sea sounds would unaccountably recede into the background whenever a seagull opened its beak. In other words we should have an un-natural effect.

The final step would be to record the human voices reading their scripts in superimposition on the combined recording of sea and seagulls. You will note that in the sequence of events the voice recording goes on last. Whenever superimposition is being used one always selects the most important ingredient of the sound picture and uses that as the final recording; and wherever speech is included this is always given priority over other sounds. The reason is quite simple; the last recording to go on the tape is the one that will not suffer partial erasure and will therefore be preserved intact precisely as recorded.

No-one should under-estimate the difficulties of the superimposition technique. It takes a great deal of experience to correctly assess relative balances of sound, but once mastered superimposition can offer the means of creative production that would otherwise only be possible by using a great deal of costly and complex equipment. First results are often disappointing. Don't give up—persevere. When properly done with suitable material, superimposition can give dramatically brilliant results.

Even if equipment does not have a superimposition control, the effect can still be achieved by either masking the erase head or re-routing the tape through the sound channel so as to avoid contact with the erase head. Much depends upon individual deck layout. Even the placing of a visiting card in front of the erase head will effectively prevent the tape from being erased. If smaller pieces of paper are used one must keep an eye on them to make sure they are neither dislodged nor allowed to travel through the sound channel to jam the capstan and pinch wheel assemblies.

Experiments of this kind can be carried out at no financial cost at all; the cost is limited to mental effort and imagination. Contrary to what some people might believe, it is far easier to spend a few pounds over a shop counter rather than to "spend" a little mental effort. One of the finest articles ever published on the aesthetic aspects of programme building appeared under the title, "Composing a Sound Picture" by Alec Nisbett in our October edition.

(Please turn to page 54)

DENIS COMPER OF SOUND LEVEL STUDIO

HELLO! Do come through to the studio. We're just having a break and there will be time to have a chat to you.

"This is where we do the recording; the control room is immediately behind us. It's a convenient arrangement because for this work it's essential that I should be able to actually see the performers as they are recording, so we have the double glass panel between the two rooms.

"I didn't explain, did I? My speciality is speech recording. When I say speech recording, I really mean recorded drama. Most of my work is done for the big gramophone companies, and my tapes end up as commercial discs in the shops.

"I came into this business through a deep interest in theatre. Most successful recording engineers are musicians. This is very necessary because the bulk of their work consists, naturally, of the recording of music. But a musician doesn't necessarily know what is best for the human voice, and when that voice belongs to an actor recording drama, then highly specialised treatment is required.

"I've noticed that your magazine has been dealing with recording the spoken word recently. To many the human voice might seem to be the easiest subject to record; in my opinion it's the most difficult. Has it occurred to you that the dynamic range of the human voice is even greater than any musical instrument, with perhaps the exception of a big church organ? By dynamic range we mean, of course, the range of intensities from the quietest whisper to the loudest shout. These have to be handled by the speech recordist.

"Use of the right kind of microphone for speech recording is absolutely vital. Ribbon microphones can give good quality at low cost for music. For speech recording they can give endless trouble. Too close an approach by the speaker will lead to bad distortion. Ribbon microphones are sensitive to air disturbances caused by the breath. In my opinion the correct microphone to use is a good quality moving coil, preferably with a cardioid directional pattern. The alternative is the condenser, but this is expensive.

"Some amateurs have the strange idea that a slow tape speed is adequate for speech recording. This is completely wrong. The first requirement for good recording of the human voice is the best possible quality that can be obtained. So one should use the fastest speed available.

"Let me explain what I mean by quality. I know exactly what effect I am aiming for.



Denis Comper of Sound Level Studio at the mixing console.

I have got to get so much reality and presence into the recording so that if it were to be played back in the dark I would feel that if only I could get to the light switch quickly enough I would just catch a glimpse of the speaker before he vanished. This is the acid test of good voice recording. Mere intelligibility is only the beginning. The voice on the telephone is intelligible. But this is not what we want from a voice recording.

"When recording drama we are creating an illusion. One false move, one mistake on the part of either the recordist or the reader, will completely ruin the entire effect. Lack of quality is only one mistake that can be made. On the reader's part the slightest hint of insincerity is sufficient to dispel the illusion and wreck the recording. A good voice recording is the result of an intense co-operative effort, with the recordist and the reader working closely together.

"May I offer a simple piece of advice? One reason why I have specialised in this rather unusual field is because, right at the beginning, I decided to define my own limitations and then restrict myself to working to the very best of my ability within those limits. Too many people are too ambitious. One should decide just what is possible and what is not possible; it's the easiest thing in the world to concentrate on those things that can be done, whilst ignoring those that cannot. But having decided what one *can* do, the need is then to do it just as well as is possible.

"In many amateur tapes we come across strings of sound effects linked with short, continuative dialogue. The ability of recording equipment to reproduce brilliant effects is a grave danger. The successful recorded drama will probably have a minimum of such effects. A sound effect should only be included if it adds to the meaning of the action; if the action is clearly defined without the effect, then its inclusion will only detract the listener's mind. Effects can often be suggested by careful scripting; we can refer to footsteps that are never heard—if the reference is skilfully made the listener will gain a more realistic impression than if the footsteps had actually been heard. What is needed is discipline, discipline, discipline. Everything we record in a dramatic production is designed to carry the action for-

ward—anything which does not contribute in this way is ruthlessly cut out.

"I learned very early on that there was only one way to get the results I wanted. It wasn't enough for me to simply record someone else's production, or to produce the drama for someone else to record. I have found that the only way to get exactly what I want is to direct, produce and record the entire programme myself. This is the way I like to work.

"When I saw my first tape recorder, a Ferrograph Mk I, I realised its enormous creative potential. Today tape recorders are common pieces of equipment, and yet not sufficient thought has really been given to the creative side of the medium. There must be great scope here for amateurs. In professional life there's never really the time to do all the things one would like to do. The amateur is in the happier position of having all the time in the world to explore his ideas. And professionals, let me remind you, do not necessarily have a monopoly of the best ideas!

"What professionals do have, of course, is professional equipment and expertise. They have to, otherwise they wouldn't remain professional very long. I think we have to face up to the limitations of domestic recording equipment. I would like to see amateurs doing far more original work on their own, but I would like to suggest that their domestic equipment should be used for working out ideas and rehearsal; they should then call in the services of a professional studio for final recordings.

"From my connection with the gramophone companies I can honestly assure you that they are simply crying out for talent. The tragedy is that music groups particularly send poorly recorded tapes to gramophone companies hoping vainly to find an opening for their work. Gramophone companies deal in gramophone records. If a group of musicians want to be sure of having their work heard they should submit it on disc, not on tape. To get that disc they should work diligently at rehearsal with their own recording equipment, but when the desired standard of performance has been achieved they should then go to a professional studio for a proper recording session from which a proper disc can be cut. By doing this they will increase their chances of success enormously.

"Charges at professional studios will vary; this is mainly due to the different kinds of facilities they can offer. It would pay to shop around a bit and find the right studio at the right price. What ever the studio charge, it is surely well worth while in relation to all the hard work that has been put in preparing and rehearsing. One of the first rules of salesmanship is to present your product in the right package and in the best possible way. The best way to sell to a gramophone company is with the best quality disc that can be obtained.

"Sorry to go on about this, but it's a pet subject of mine and I think you would be doing a service to both professionals and amateurs by giving it an airing. Well, it's time for us to carry on, so I'll wish you all the best. And don't forget, keep those spools turning. . . ."

JOHN HASSELL OF JOHN HASSELL RECORDINGS

HOW nice to see you! Please do come in. You've called at just the right moment, because I happen to be playing back an amateur tape. It's recorded at $3\frac{3}{4}$ ips, and I've got it on the Philips machine over here. Do listen to it, and remember that I have to cut a disc from this.

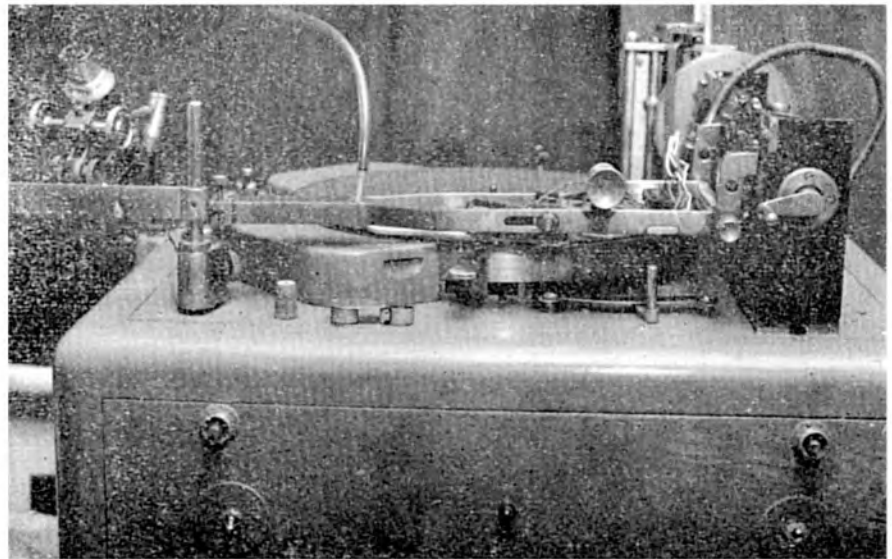
"D'you see what I mean? It's got just about all the faults one could imagine. Heavy hum—bad distortion. Of course we can get rid of the hum by applying hefty base cut like this. There, that's got rid of it, but the recording begins to sound a bit thin. Distortion at the top end is rather a different matter. In the disc cutting process we have to put a heavy emphasis on the top end. Any distortion present will tend to be accentuated. This is just one of the problems we get.

"Compare that sound to this professionally recorded tape. I'll put it on the TR90, and we'll listen to it on the Lockwood Mk II speaker. There's a fifteen-inch Tannoy dual concentric unit in there; it's pressure-loaded and gives a very, very sharp, clean sound. Here we go, and what a contrast to the other tape! If the sound were any sharper you could almost cut a piece of paper with it.

"Don't think we never get good tapes in from amateurs, in fact many of them are excellent. But the one you heard is typical of far too many recordings that have been unnecessarily spoilt through poor recording technique. There's no need to produce a recording full of hum; there's no need to produce a recording that's horribly distorted. And if a gramophone record is ultimately to be made from a recording, there's just no excuse for not taking the care to avoid simple faults like this.

"I'm afraid it's going to sound pompous for someone like me to start giving advice to amateurs, and the last thing in the world I want is to appear to be pompous. But you know all of us professionals have learnt our jobs the hard way—through bitter experience. And however much we know, or however much equipment we own, we never stop learning. That's half the fun of the game. So can I just make a few suggestions that people might like to bear in mind in the hope that it will be of some help to them?

"Recordings of weddings are favourite ones for people to have discs cut from. I get an awful lot here. It's surprising how many recordists forget the most important part of a wedding service is the speech. It's not a bit of use recording the organ from half way down the church, usually with



The modified MSS CB disc cutting lathe in the John Hassell studio. Disc cutters have to be specially mounted to reduce the effects of outside vibration. Note the microscope attachment for visual examination of the groove.

plenty of shuffling feet right in the foreground, and hearing the exchange of vows as tiny, almost inaudible, voices in the far distance. Microphones must be positioned in the right places. Don't you publish a little book on how to record weddings? I wish more of the people who send me wedding tapes had bothered to read it.

"If someone thinks they might want to have a disc cut, they should be aware of that before ever they start recording. Too many tapes are chance, haphazard recordings that have obviously been sent to the poor old disc-cutter as a last-minute afterthought. I can assure you that working on poor material can be a most frustrating business. Having decided that the recording will be converted to disc, the fastest speed available on the tape recorder should be used. This will help to provide the best possible quality, whatever the limitations of microphones might be.

"Record levels should be watched very, very carefully. It's far better to slightly under-modulate, rather than over-modulate. Over-modulation leads to distortion. The less efficient the tape recorder, the greater the risk of distortion, even before the record level indicator shows it.

"Why not have a trial run through with the equipment at home to check to make quite sure there is no hum present? This seems to be a prevalent fault with amateur recordings, and very often it's caused either by not using a fully-screened jack plug on the microphone cable, or through the recordist neglecting to ensure that high impedance mike lines are kept well clear of mains leads and transformers. When at the location of the recording, a quick check should always be made to ensure that hum is not present; if there is hum it might be

lost by simply moving the mike cable a few inches. Such a simple precaution, but so often ignored.

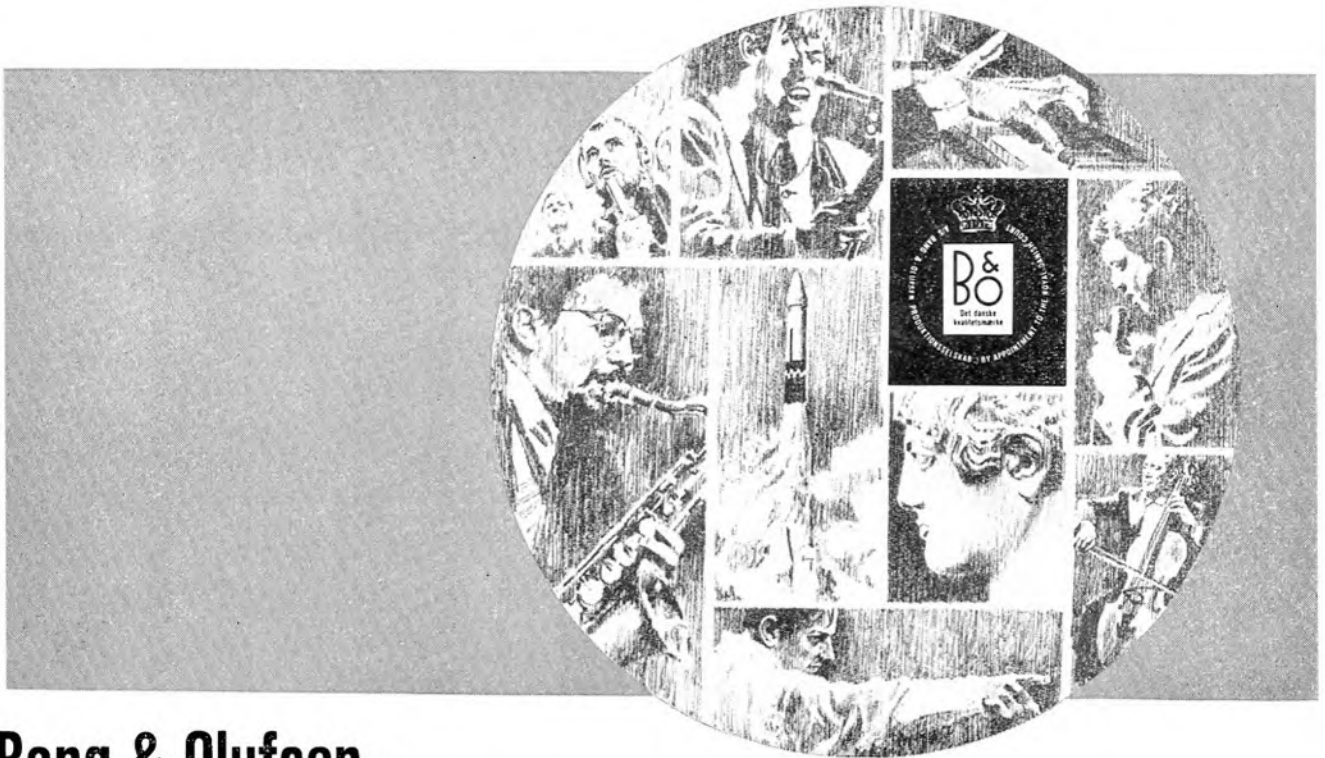
"The very best advice I can give to any amateur is to 'know your animal.' Mind you, this advice applies equally well to us pros. The man who is so familiar with his equipment he could operate it blindfold will get good results; the professional can't afford not to get good results.

"A couple of final tips. Always clean record heads and pressure pads before any important recording and, lastly, use clean, or bulk-erased, tape if possible. Even if the erase head is working properly, an existing recording on the tape might be heavily modulated and leave a ghost behind. If this happens, that ghost will appear on the disc. It's not really very much trouble to run a tape past the erase head a couple of times before an important recording job. Many of these checks are so simple, and yet they will avoid a great deal of disappointment.

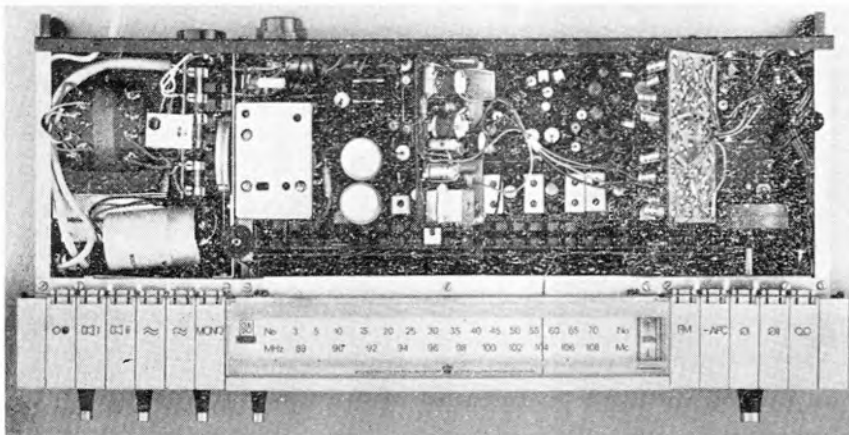
"This is where we cut the discs, over here. We have a 100-watt Grampian amplifier, and this provides the high frequency lift for the cutter head. This is where we're in trouble with a distorted tape. The actual cutting equipment is a modified MSS CB cutting lathe. Yes, they're called lathes, not turntables. You'll notice it's mounted on a very massive support; this is to prevent vibration and rumble. I don't think the turntable itself would be very suitable for a domestic gramophone—it weighs thirty or forty pounds.

"The discs we cut are known as 'acetates.' An acetate is specially cut, one at a time, from a recorded tape. Where a number of discs are required, from the same recording, it might be cheaper for us to

(Please turn to page 66)



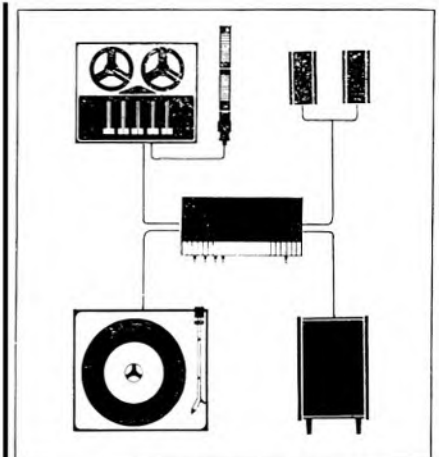
Bang & Olufsen— for those who consider design and quality before price



This is what you would see under the elegant case of a Beomaster 1000K F.M. Tuner Amplifier. Solid state circuitry throughout, separate and hinged component panels, stereo decoder already fitted, and components of the highest quality and closest tolerance.

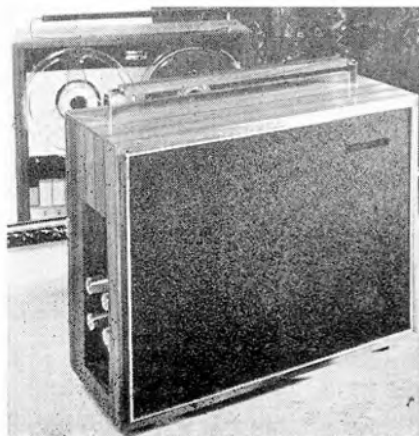
Notice too the positive piano key mode selectors, which require only finger-tip pressure to operate, the long tuner scale for easier and more accurate station finding, fly wheel balanced tuning drive and large radicator type tuning indicator. This must be the most sophisticated high fidelity tuner amplifier available at such a modest price.

Technicalities *Tuner unit:* 88-108 Mc/s with switchable A.F.C. Sensitivity 2 μ v for 26 dB signal/noise ratio. Aerial 75 to 240 ohms. Stereo transmission channel separation > 34 dB. *Amplifier section:* Power output 2 x 15w R.M.S. Less than 1% distortion. *2 Gram inputs:* Crystal 250 mV, magnetic 7 mV for full rated output. *Tape Recorder:* Input 20 mV for full rated output. *Outputs:* 2 x 3/5 ohms in duplicate and switched. *Frequency response:* 30 c/s to 20 kcs \pm 3 dB. *Bass Control:* +10 dB to -14 dB/80 c/s. *Treble Control:* \pm 12 dB/10 kcs. Price: 80 Gns.



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VR 4

NEW IDEAS

A NEW name has recently appeared amongst the lists of tape recorder manufacturers. With that new name has come a new look and a new approach to problems of recorder design. The name is Van der Molen, and we tracked him down in his office adjoining the works at Romford.

Born within the sound of Bow Bells, and proud of it, Michael Van der Molen owes his continental sounding surname to remote Dutch ancestry. Although perhaps unfamiliar to the public, he has been associated with the electronics industry all his life. For about twelve years he was with a very well-known firm of tape recorder manufacturers where he was responsible for design. Finally he became technical director. To his credit there can be attributed a brace of firsts; the first British four-track machine and the first British fully transistorised machine.

About eighteen months ago Michael Van der Molen did a long, hard think about current tape recorder design. One thing he had learnt was the impossibility of providing adequate sound quality on the built-in speaker provided in the equipment. He realised that any machine, at any price, was capable of recording on the tape far better quality than would ever be heard by the user unless an extension speaker was used. It was an attempt to overcome this problem that guided him towards the vertical tape deck.

Most machines are designed for horizontal operation. To make them portable they must be of suitcase-like proportions. And because they lie flat on the table the built-in speaker must be in either one of the long or the short sides. This requirement limits both the size and shape of the speaker. Some manufacturers have overcome this problem by mounting a large speaker in a completely detachable lid.

But if the equipment were to operate in a vertical position, the speaker could then be accommodated either in the front, beside

INVESTIGATING THE V E R T I C A L

the deck, or could even occupy the whole of the rear area. This would make it possible to use a much larger speaker, and therefore would produce an improvement in quality.

In the words of the pop song, "Nothing comes Easy." It's just not possible to take an ordinary tape deck, designed for horizontal operation, mount it vertically, and hope for the best. Vertical decks have special requirements, and unless these are strictly observed the mechanism would very quickly fail.

When Mr. Van der Molen went to Italy to discuss the design of a vertical deck with an Italian manufacturer, he found that one of the biggest problems was to provide the correct tension on the take-up spool. In horizontal decks this is easily solved by a slipping clutch; a slipping clutch will not operate satisfactorily in the vertical plane. So how about a slipping belt? This was tried but found to be unsatisfactory until a flat belt of special nylon was developed. Even that was not regarded as satisfactory until it had been vulcanised on one side to protect against humidity changes. It's strange to think that an apparently insignificant item, such as a simple belt, could be a major design problem. The final solution, flat nylon with an outer vulcanised surface, was only arrived at after months of research.

Even the bearings in the motor, capstan and pinchwheel have to be specially designed for vertical operation. If the normal fixed bearings were to be used, the tiniest amount of play in the spindles would quickly become exaggerated and cause speed irregularity. This is overcome by using self-aligning, floating bearings which permit the moving parts to rotate accurately on their axes.

Several other ideas from a long experience of recorder design were incorporated. The motor, for example, has overwind and thus eliminates the mains transformer. All mechanical adjustments can be carried out quite independently of each other; the new deck had to avoid unnecessary or complicated servicing.

So finally the vertical deck was designed in Italy and arrangements were made for it to be brought into this country in part assembled condition. Final assembly is carried out in the Romford works.



VR 7

NEW SHAPES

The next, and most important, decision was to determine what kind of machine the deck should be built into. From his experience of the tape recorded market, Mr. Van der Molen decided there was a demand for a medium priced machine that would both look attractive and also offer good quality sound. He had already proved the rugged reliability of the deck to his own satisfaction; now it had to be built into an attractive casing with electronics that would offer first-class recording facilities. Most important of all, it had to have a speaker large enough to enable the listener to hear as much as possible of the recorded signal on the tape. So the VR4 was born.

The deck occupies virtually the whole of the vertical front panel; similarly the speaker grille occupies the whole of the rear. The speaker itself, an eight-inch round model, is driven by the five watt output of the transistorised, built-in amplifier. Operating on the standard four-track system, the deck has three speeds, $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{3}{4}$ inches per second.

In designing the record facilities every consideration was given to the practical requirements of recording enthusiasts. For instance, although monitoring is "before record" through the built-in speaker, the level of the monitored signal may be adjusted independently of the record level. The two inputs, microphone and radio, may be independently mixed for programme building; alternatively use can be made of the outlet provided from the stereo head for synchronisation pulses for cine or slide projectors. When used with an external amplifier stereo tapes can be reproduced. And of course full provision is made for the connection of external loudspeakers.

There were unexpected bonuses obtained from the unusual design. Education authorities have been delighted with the deck and speaker arrangement. When used in a classroom the machine will be positioned so that the deck is towards the teacher, whereas the speaker is facing the students. Some people have commented on how pleasant it is to be able to listen to the reproduced sound without having the distraction of watching the spools go round. Production actually started a year ago.

Being a man of ideas, Mr. Van der Molen very quickly had another happy thought. Why not produce what is virtually an identical machine, but in a very much cheaper case? The scheme was to produce a really

(Please turn to page 66)

TECHNIQUES (Continued from page 49)

Quite rightly Alec Nisbett drew a parallel between the building of a sound complex and the work of the visual artist. There is some inexplicable driving force which compels the artist to draw—if he lacks pencils he will use crayons, if he lacks crayons he will use charcoal. The true artist will draw and nothing will stop him. Even under the most apparently impossible conditions, with improvised materials, he will continue to draw.

The artist in sound is in much the same position. He will work in his chosen medium regardless of the lack of facilities or equipment. If he can't record on tape he will record in the mind, building up mental pictures of auditory experiences and noting them down for future use. Instead of being discouraged by difficulties, both financial and technical, one should be encouraged by the limitless breadth of the possibilities of recorded sound.

The technique of mixing is a good example of what I mean. Mixing means simply the combining of a number, two or more, of sound sources. These might comprise the outputs from microphones, perhaps mixed with other recorded sounds. Referring back to our example of dialogue on the seashore we might, instead of superimposition, play back the sea sounds on one machine, the sea gull cries on a second machine, feed both these outputs into a mixer together with the output from a microphone to cover the live dialogue, and then record the mixed sound on a third machine.

By superimposing we were able to build up the sound picture using only one machine. If we are to mix instead we shall require no fewer than three machines, together

with a mixer. It is this thought that is so defeating to many.

But experiments in mixing techniques can be carried out without incurring any additional cost whatsoever. Some machines have a built-in facility for mixing between microphone and radio inputs. In these cases there is just no excuse for not "having a go."

But to make it more difficult let's consider a simple machine with no mixing facilities or auxiliary equipment whatsoever. Is the owner of such limited resources completely debarred from such work? The answer is emphatically no!

The artistry in mixing involves the selection of sounds to be mixed together, combined with the way in which those sounds are mixed. If equipment is limited one must then restrict the kinds of sounds one works with. But the all-important considerations of balance and fade can be investigated quite simply. To achieve acceptable quality it is essential to use proper mixing equipment; but reference to the recently published programme/content chart reveals the inescapable fact that content is more important than quality. So without the necessary equipment we shall lack quality—but at least we can experiment with the technique.

A simple exercise in mixing involves the blending of sound, often music, with the spoken word. We have already discussed the problems involved in recording words read from the typed or printed page. Logically the next progression is to provide those words with an introduction, or background, of some other sound. This, by the way, is the essence of recording sound tracks to accompany cine films where the requirement is often to provide a spoken commentary combined with either music or

suitable sound effects.

Although quality will suffer, it is possible to mix in to a live microphone recording the sound from a radio loudspeaker or other suitable source. All that is needed is to position the radio rather carefully in relation to the speech microphone, and to fade in or out by turning the volume control on the radio up or down. Whilst the quality will be poor, this simple method provides excellent experience in the choice of material for mixing and in studying effects of balancing and silences.

Just consider the many variations that are possible with even as simple a subject as this. The music could be at full level for a period (how long?) then faded down for the voice to start. We could fade the music out altogether at some point (at what point?), resulting in a proportion of the voice being recorded on silence. The music could be brought up below voice level near the end of the piece (again at what point?), and then brought to full level at the end of the voice recording.

Alternatively the music could be faded right out before the speech started and possibly faded back in again during the course of the reading, or vice versa. The permutations are almost endless. And the answers to questions like these are not solved by using expensive equipment.

With the most costly professional equipment available the self-same questions have to be answered. If your programme structure is incorrect when using the rather crude set-up described, it would not be any more correct when using proper equipment. Quoting from Alec Nisbett, "art lies in interpretation." In the practice of interpretation lies one of the most original uses to which ordinary recording equipment can be put.

FRANCIS OF STREATHAM

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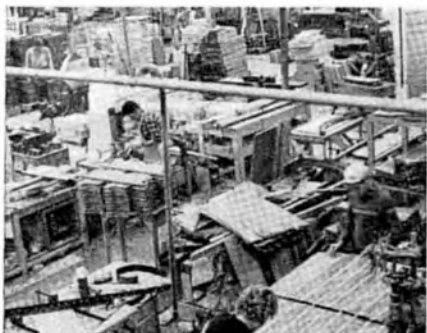


EMITAPE

THE MOST ADVANCED MAGNETIC RECORDING TAPE IN THE WORLD



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A small corner of the works at Banbury

ON THE FRINGE . . . HOUSING HI-FI EQUIPMENT



Above: A Revox recorder nestles comfortably beside a Collaro transcription unit and Quad amplifier and tuner, in an EQC 14 cabinet by Design Furniture Ltd.

THE dealers' shop windows are filled with quality equipment. We may look covetously through the glass at tape decks, amplifiers, transcription units, tuners, speakers; regretfully we might perhaps turn away and stroll down to the next shop window. Have you noted how hi-fi shops tend to grow in small clusters? But one day we might pluck up our courage, walk through the door and actually buy the equipment we have been looking at so enviously for so long.

A large cardboard carton will be delivered at home. From a mass of intricately fitted corrugated insulation we shall extract our latest acquisition. Beautifully engineered and finished, it will be shining and bright, smelling of new solder and burnished plating.

But sooner or later, perhaps even before the novelty of our new purchase has worn off, we have to face the serious technical problem of how to house it. The original idea might have been to construct our own cabinet; final plans could obviously not be drawn until we had the equipment at home to check on actual dimensions. This is the moment of truth—either we can construct an attractive cabinet to adequately house the equipment, or, as in my case, we can't.

An interest in high quality sound reproduction does not necessarily confer an ability to perform the joiner's craft. The acquisition of hi-fi equipment should be a source of joy and pleasure to both husband and wife. When it causes family disputes it's usually because the wife complains of unsightly cabinets, often crude adaptations of desks or old washhand stands, or possibly even of no cabinet at all—just an accumulation of dust, and an inextricable confusion of muddled wires.

Proper housing of hi-fi equipment is not merely a matter of tidiness. If equipment is littered around the home in an unprotected condition it is not only liable to suffer damage, but it is not likely to operate efficiently. There's nothing like a jumble of wires to induce hum in a system. Apart from which the lady of

the house is entitled to be proud of her own home. If she can take a pride in your hi-fi installation she can then settle down to enjoy the quality of the sound and become as enthusiastic as you are yourself.

High fidelity equipment must be housed in properly designed cabinets. There are two ways of doing this—we either make them or we buy them. For a good many people buying is likely to be the most satisfactory. More than one man has wasted money on timber and fittings only to admit defeat in the end. Any silly ass can knock a nail in a piece of wood. Even I can do that. But this is a far cry from producing a piece of joinery that will be as functional as it is pleasant to look at and live with. This is quite beyond me, so I thought I would have a look at one of the specialist firms who produce top quality hi-fi furniture to see if I could find out how they tackle the problem.

A 700-year-old manor house in an English provincial town sounds an exciting prospect. The mellow stonework of the front entrance is reached from a sweeping drive. A discreet sign informs us that we are at the office and works of Design Furniture Limited, of Banbury.

It goes without saying that the first requirement for making hi-fi furniture is a basic knowledge and experience of furniture design and manufacture.

This is where most of us, as private individuals, tend to over-estimate our competence. Mr. H. W. Adams, managing director of the firm, explained that his company has been engaged for many years in the manufacture of high grade furniture for hotels, universities and industry. It was an interest in high fidelity sound reproduction, both on his part and his co-directors', which influenced him to investigate the possibility of designing and manufacturing cabinets on a commercial scale.

As I strolled around the works I could not help feeling embarrassed at my own clumsy endeavours. The handling of timber calls for a high degree of skill and craftsmanship. Here, at the old Manor House, they have both. And I was soon recognising some very familiar objects. Leak Sandwich speakers, renowned for their high quality, have their enclosures made here. At first I thought they were building pianos, but the "pianos" turned out to be Hammond M102 organs. Next time you see one examine the cabinet work carefully—it's an excellent example of the consistently high standard of workmanship from Calthorpe Manor.

A cabinet intended to house hi-fi equipment is a highly specialised piece of furniture, so the very first step is to work out a design around the equipment. At this stage ideas are expressed as drawings. Later a scale model in hardwood will be produced. I saw one of these scale models in Mr. Adams' office; it was an exquisite example of craftsmanship and ingenuity, combining to produce an entirely new product.

It is not enough just to make sure that a cabinet is the right size to accept the various bits and pieces that will be fitted into it. So long as we have valves in amplifiers and tuners heat will be generated. This immediately creates a problem. Cabinets must be properly ventilated and the heat-producing items must be positioned where the heat will not rise to damage components immediately above. No such problems exist with transistorised equipment as it does not get hot, but we may then be faced with even worse problems of audio quality if the equipment is not well chosen.

Thicknesses of timber and methods of construction have to be decided. A hi-fi cabinet must be absolutely rigid to offer effective support for tape decks or transcription units, but it must not be unnecessarily massively constructed as this would spoil the line and create unnecessary weight. The design team must be alive to all the latest developments in the audio world. We are beginning to see quite a few tape recorders that have been deliberately con-

How important is proper housing of equipment?

DENIS GILBERT thinks any installation however modest, should be as easy on the eye as it is on the ear.

So went to see for himself how cabinets are designed and made



A delicate job of veneering.

structed for vertical operation. This is a most significant trend that will ultimately affect the layout of hi-fi cabinets. Down at Banbury they know all about these things.

The modern mill is well equipped with the latest woodworking machinery from Scandinavia. To the uninitiated a confusion of activities appears to be taking place. Stacks of rough timber, recently arrived, are piled near one of the works entrances. All around timber is being run through saw benches, planing machines, four-cutters, and glueing machines. Cabinets in various stages of assembly are stacked along the 700-year-old corridors of the Manor. Finer hand processes are carried out by groups of craftsmen in small workshops; partially completed cabinets are wheeled up and down the corridors on wooden trolleys. Every now and then a trolley bearing a beautifully finished piece of furniture arrives in the packing department.

Without attempting to trace the progress of any one item through the works I concentrated on the individual craft processes. I learned that cabinets today are rarely made of solid hardwood. This is not because plywood is cheaper, but because it is highly resistant to warping under a wide variety of temperature and humidity changes. Additionally the laminations of plywood give strength without bulk.

The veneers are applied in the works. I watched fascinated as narrow strips of veneer were glued around curved sections of a sub-assembly. The speed and accuracy with which the work is done is amazing.

As the carcass is assembled it begins to look like a cabinet. A great deal of the finishing work, filling the grain, staining and polishing is done by hand. I watched raw teak being oiled and wondered why I could not do it—it looked so simple. I tried and the result was a very nasty mess. The operator laughed cheerfully as he oiled a couple more panels whilst I was turning away.

They showed me a new type of plastic finish. This is sprayed on to the woodwork and gives a silk smooth feel to the touch without the hard glassy look of some other plastics. This material, Melamine, has considerable elasticity so it will expand or contract as the timber moves. The natural movement in timber is taking place all the time—remember how doors and windows stick in winter but are loose in summer. The temperature changes within a cabinet can be very wide indeed.

Modern finishes have to combine an attractive appearance with durability and ease of maintenance; many are kept in gleaming condition by merely wiping over with a soft cloth.

One of this firm's latest products is an exquisite piece of reproduction furniture named the "Sheraton." Having a serpentine front with inlaid veneers of mahogany incised with lines of boxwood it is a superb example of craftsmanship and design. One of the foreman was proudly showing me one of these cabinets which he had just modified. To contain some specialised equipment the whole thing had to be made six inches deeper. There was the cabinet, standing amongst its fellows—all identical except this one, six inches deeper than the rest—and the closest examination would not reveal where the join had been made although it was still in its unpolished state.



The "Sheraton" cabinet, latest in Design Furniture's range, receiving careful hand treatment. This is a beautiful piece of reproduction furniture.

I can honestly envy the pride of accomplishment that the private individual must feel if he is capable of turning out work to this exceptionally high standard. I do know one man who does; he has a thoroughly equipped workshop, a fascinating collection of tools, and no time at all to listen to any music. For my part I am content to allow Design Furniture Limited, and other firms like them, to do all the hard work of cabinet building. And I shall get as much pleasure from the functional efficiency of a proper hi-fi cabinet as my wife will derive from the beauty of its lines; with that thought behind us we can both sit down and enjoy high quality sound reproduction in the way it should be enjoyed—without tears.

TEST BENCH

A SPECIAL TRM EVALUATION OF SCOTCH 203 DYNARANGE TAPE

OF recent years developments in recording equipment have been towards slower tape speeds and narrower tracks. The reason is obvious. By using slower speeds and/or narrower tracks "running costs" are reduced; more programme material can be stored on a given length of tape.

This trend is all very well so far as it goes. Unfortunately, as all of us who are realists are aware, a reduction in tape speed or track width means a deterioration in the signal to noise ratio, a degrading of the frequency response and an increase in the tendency for "drop out" to occur. These disadvantages are not likely to be overcome by electronics; but they might be overcome by drastic improvements in recording tape.

There is little point in designing and selling equipment which will function to certain high standards if the tape itself is incapable of performing up to the machine specification. As a result much research has been carried out with these problems in mind. Tape manufacturers are very conscious of the fact that if the use of their own brand of recording tape were to ensure that sound quality at $3\frac{1}{2}$ ips would be as good as when using a competitor's tape at $7\frac{1}{2}$ ips it would give them an enormous advantage.

These were doubtless problems that engaged the attention of the Minnesota Mining and Manufacturing Co. Ltd. when they produced their new Dynarange magnetic tape.

We have subjected this tape to a searching investigation to try to find out if the manufacturer's claims for it are justified. The method of investigation was to compare it with Scotch type 150 tape. This retails at 49s. for a 7 in. spool holding 1,800 ft. The comparative Dynarange tape was type 203 which sells at 57s. 6d. for the same size spool. The question we have to answer is, what do we get for the extra 8s. 6d., and is it worth it?

The manufacturer's claims for Dynarange are an improved noise level, which is said to be from 3 to 5 db down, improved frequency response and a greater dynamic range. We were also concerned to check on the "drop out" effect and to see how resistant the tape is to print through.

It is difficult to accurately measure tape noise, since for this to be produced the signal must be amplified and the inherent noise in the amplifier system is likely to be too close to the tape noise itself to differentiate between the two. This is in fact what occurred, and we could therefore detect no measurable difference in noise level between the 150 and 203 types of tape at $3\frac{1}{2}$, $7\frac{1}{2}$, or 15 ips, either virgin as delivered from the manufacturer or virgin erased.



Equipment lined up for the Dynarange evaluation, including Heathkit Audio Signal Generator and Audio Valve Voltmeter, Vortexion Record/playback Amplifier and Wright & Weaire 6H Deck.

For a test of frequency response we recorded a sequence of tones, each at the three speeds of 15, $7\frac{1}{2}$ and $3\frac{1}{2}$ ips and checked the response on playback. Results of these tests prove conclusively that Dynarange 203 tape produces a better high frequency response than type 150. The advantage increases as tape speed decreases. Recording at 15 ips we measured 3 db greater output on 203 at 18 kHz (kc/ps), whereas at $3\frac{1}{2}$ ips the 203 tape was 9 db up on 105 at 14 kHz (kc/ps). This ability to hold and reproduce high frequencies was found to be consistent.

Frequency response is affected by bias setting. Dynarange 203 is said to require a somewhat higher bias level than type 150. On checking we found that the optimum level was about 15 per cent up on the requirement for 150. Consequently the readings were taken at optimum bias levels for both tapes. However, since in practice many owners of recording equipment do not have a facility for adjusting bias we proceeded to carry out additional tests with the 203 over a fairly wide range of bias settings. When working below optimum bias level (that is, at the correct level for 150) we found there to be a decrease of only 1 db in high frequency output. When fairly heavily overbiased the output dropped by about 3 db.

The measurements quoted indicate a very definite advantage in using the more expensive tape. One factor that must be taken into account however is *distortion*. The ideal is not merely to obtain maximum output, but to obtain maximum *undistorted* output. We therefore increased the level of the signal fed to each tape in turn and checked aurally by loudspeaker for distortion.

Some might complain that this was a rough and ready test. We maintain that the only thing that interests us is what we hear. We are not interested in effects that may be seen on an oscilloscope but will not be heard at the loudspeaker. Within a wide frequency range it was found that audible distortion occurred on the 150 tape about 3 db before it occurred in the 203.

From the user point of view these results are most significant. We have established beyond doubt that when all other factors are equal we shall get a better frequency response and a greater distortion tolerance on 203 as compared to 150.

For practical tests a recording of part of a choral recital at Rochester Cathedral was undertaken by members of the staff using one spool of 150 tape and another of 203. The results were carefully compared on playback.

The question of noise level is a very difficult one. Remembering that the 203 has a better frequency response it will be appreciated that less treble boost need be given on playback to arrive at a flat response at the speaker. The effect of what is literally top cut is always to reduce the level of tape noise; the improved frequency response will in itself bring advantages in signal to noise ratio. Similarly the increase in dynamic range (tolerance to distortion) will also inevitably be accompanied by an improvement in tape noise. Critical listening to the recorded tapes confirmed that this is so.

The two recorded spools were then stored for a month and checked for print through. None was audible on the 203 but in all fairness we must add that none was audible on the 150 either.

To check for drop out we continuously recorded and played back another spool of 203. The machine used was one that has been notorious in producing drop outs on other makes of tape. The 203 was run through at $3\frac{1}{2}$ ips half-track three times. No audible drop out occurred.

Finally we recorded the 203 tape at $3\frac{1}{2}$ ips with a wide range of bias settings and then played back to a listening panel to see if anyone could detect where the bias alterations had occurred. High quality amplifiers and speakers were used, but no one present could accurately determine the points of change. At the very low end of the bias settings there is a point at which distortion rises and output falls steeply. We did not go to this point for our test as it would have been too obvious.

(Please turn to page 66)

CROSS

TALK

By Audios

SO at last we know the government's plans for both the pirate radio stations and local broadcasting. These fall broadly within the suggestions made in this column a couple of months ago.

The pirates are to be prosecuted and put out of business. In their place the BBC will transmit on medium wave a programme of continuous pop music. That there is a demand for such broadcasting is obvious from the support the pirates so easily obtained. Whether or not a public corporation has the right to transmit continuously a programme aimed at one section of the listening public is, however, quite another matter.

An answer to this criticism might well be that the present Music programme on the Third Network does, in fact, transmit "classical" music almost exclusively, and that too is aimed at a minority audience. Quite true, but comparisons were ever odious—and who is going to suggest that one hour of pops is of the same value as one hour of classics? Intrinsically, that is in terms of what cash might be earned, the pops are undoubtedly of far greater value. Far be it from me to assess relative intellectual values. . . .

But, as I have said before, it is we who will pay, whether we like it or not. Just as we shall indeed pay for the cost of the nine local broadcasting stations it is proposed should be set up. These are what we have been waiting for. It now remains to be seen whether they will be prepared to take advantage of the enormous store of amateur talent in the recording world. If local stations are to be truly local then they must depend upon amateurs for a proportion of their material. Many amateurs have been working with this end in mind for a very long time. I hope now they will push their material just as hard as ever they can. All amateurs do not produce bad work; neither are all amateurs complete idiots. The sooner the broadcasting authorities realise it the better.

* * *

IN my opinion any tape recorder (or any other piece of equipment for that matter) is only as good as the service facilities that are available for it. However cheap or costly equipment might be, breakdowns are sooner or later inevitable. By breakdowns I don't necessarily mean that the equipment refuses to work; after years of use it is not unreasonable to expect wearing parts, such as belts or even magnetic heads, to require replacement. Unlike a motor car, which requires service every 500 or 1,000 miles, the periodic maintenance required on a tape recorder is likely to be timed at intervals of so many years use.

But like a motor car, the unexpected breakdown will sometimes happen—and when it does the owner usually wants to have the fault corrected just as soon as possible. There is therefore an obligation on manufacturers to provide adequate servicing facilities. Notoriously these are usually regarded as a necessary evil, costing a great deal of money for little cash return. One company which takes this obligation very seriously is the Philips organisation. They have a number of service centres, each of which is an independent works devoted entirely to the speedy and efficient servicing of all classes of Philips equipment.

Service departments often get kicks; rarely do they get thanks. So I am delighted to find room for a letter from one of my readers, Mr. S. D. Ison of Sheringham, Norfolk. This is what he says in his letter about his experience with Truvox Ltd.:

"From time to time one hears complaints of poor service given by manufacturers of tape recorders, and I would like to place on record an example of excellent service by Truvox Ltd. As my machine had a rather elusive fault I decided to take it directly to the makers. Due to the distance involved and transport difficulties I did not arrive at the firm's service department until shortly after 11 a.m. Although they were busy the work was put in hand immediately and by 2 p.m. I was able to collect the machine with the fault duly located and corrected. This prompt action enabled me to catch an afternoon train back home.

"The work involved considerable time and the replacement of expensive parts, but was made without any charge under the firm's guarantee."

Service departments are not all villains and it was very encouraging to find that one reader at least was prepared to take the trouble to say so.

* * *

AN announcement has recently been made by the British Electrical and Allied Manufacturers' Association and the British Equipment Manufacturers' Association of the withdrawal of their applications for exemption from the provisions of the Resale Price Act. This means that dealers will no longer be under an obligation to sell at the manufacturers' published prices a vast list of products, which will include radios, radiograms, tape recorders, etc.

Already one multiple firm with nineteen branches has announced cuts of up to 10 or 11 per cent in the prices of electrical goods. This might be regarded as a wonderful opportunity for bargain hunting; and there's nothing like the word "bargain" to induce the public to part with hard earned money.

Manufacturers are not the only people who have service obligations. The dealer should reckon that his profit margin includes a percentage to allow for service time attending to minor adjustments. If his profit margin is cut the first and most obvious economy he is likely to make will relate to service.

Already one large concern is considering using a "dual" pricing system. At the lower price the customer would pay cash, remove the goods himself, and not expect any service facilities. At the higher price the goods will be delivered and service facilities offered.

At least that is an honest approach to the problem where all the cards are laid plainly on the table. What worries me is the possibility of cut-price sales where the disadvantages of the lower price are not made clear to the purchaser. So be warned and look carefully at temptingly reduced prices—the goods offered might turn out to be not so cheap as it seemed.

* * *

ANY movement which sincerely endeavours to foster peace and understanding between the nations deserves support. "Esperanto Tapefriends" has a membership of 125 from 23 different countries. This is a startling achievement. Their British secretary, Mr. G. Stephenson, tells me that amongst the members are people who have been learning Esperanto for only three months, whilst others have known the language for over thirty years. Their countries of origin are as diverse as France, Denmark, Jugoslavia, Czechoslovakia, U.S.A., Australia, and Russia. Members correspond by tape, speaking Esperanto, and they all understand each other.

At the Esperanto Congress in Budapest this year over 4,000 people from 42 different countries met and talked WITHOUT an interpreter. The British club became affiliated to the International League of Tape Amateurs. Perhaps those interested would care to write to Mr. G. Stephenson, Crutchfield Brae, Hookwood, Horley, Surrey. I'm sure he would be only too pleased to send particulars of this truly international movement. The enormity of present-day world problems can make individual effort appear to be so insignificant as not to be worthwhile. This should deter no one—individual effort not only gives satisfaction to the person making it, but is also a real contribution to the survival of civilisation. Big words, perhaps, but international understanding is a big problem.

* * *

YOU may notice in our New Products feature this month a reference to the new Jordan-Watts Stereola loudspeaker system. The existence of this unit was first exclusively reported in this column last November. As you will see from its description, it is a most unusual and interesting piece of equipment.

The concept of a single unit stereophonic loudspeaker system is by no means new. It does, however, pose a number of questions regarding the basic idea of reproducing sound stereophonically by means of a two-channel system. Advocates of the highly directional stereo effect might find the single-piece method of reproduction disappointing. On the other hand those who are troubled by obtrusive directional effects originating from a pair of separate speakers may look favourably on this approach to reproduction.

Personally I believe that the single-piece stereophonic speaker system has a great future. The aim is to provide high quality sound whilst at the same time reducing the floor area that the speaker occupies. In these days of small living rooms this could be an important consideration. Few people to-day have space for very large, and probably expensive, mono speaker enclosures. The future trend is likely to be towards the frankly bookshelf unit, or the one-piece stereo unit. In the latter case some embarrassment could be caused to people like me who for years have been patiently explaining that one MUST have TWO separate speakers for a stereo system. . . .

A glossary of tape terms—part 11

BY HARRY MACK

SQUEAL. There can be two possible sources of tape squeal. First, the purely mechanical friction of tape on guide and head faces, and of pressure pads on the outer surface of the tape. The only cure is correction of pressures and cleanliness of running surfaces. The effect often occurs when a thinner tape is used, because of its ability to wrap more intimately on the running surfaces. Guide surfaces can be re-polished, and attention should be given to the angles between the flanges of the guides and the vertical surface, where oxide particles may be trapped, causing slight uneven running of the tape. This fault may cause erratic rewind by the type of deck which uses balanced drive, opposing motor torque, or has a weak primary drive, such as a slack belt. If the squeal is more evident on rewind, check the guide flanges; if on Play/Record, and still obviously mechanical, check head facings, pressure pads and slings.

The second possible cause of tape squeal is the tape itself. One property of tape is its regular adherence of the oxide to the backing material, and to achieve this a special kind of bond is used—often a "secret" proprietary mixture. Under certain conditions of humidity or heat, this binder can become gummy, and the tape can stick, layer to layer, causing a squeal when unwound fast. The tape may also tend to stick to the head, releasing suddenly, giving a characteristic staccato noise that is then reproduced through the amplifiers. Special manufacturing processes include lubricants in some brands of tape, and these can ease this tendency. These also incorporate cleaners which maintain the transport system with which the tape is in regular contact.

Some research has been done into the effect of static charge on the highly polished tape. This was a real problem in past years, but is not nearly so noticeable with modern tape. The use of glass and p.t.f.e. guides, and slings of the latter material to carry off the charges met with some success, but sometimes caused additional problems due to a building up of friction.

* * *

STALLING. Colloquially, the stopping of a motor by an excess of back torque. Technically, the stalled-motor is one used for take-up (or to maintain back tension); i.e. prevented by opposing forces from running at its full speed. This technique can give constant tension with a well-designed motor. There is some argument among design engineers about the desirability of a "hard wind" when direct spooling is also used for fast wind and rewind, supplying the motors with full power. The "soft wind" obtained by belt or clutch action causes less tape distortion.

STACKED HEAD. Record, Playback or Erase head with the windings for individual tracks placed vertically so that simultaneous signals will produce co-incident magnetic responses. This is the normal system with domestic stereo machines. The gaps in the head facing lie vertically above each other.

STANDARDS. There are a number of different standards relating to audio matters, but the standards with which we are mainly concerned in tape recording are those determining the equalisation of the amplifier circuits to allow for the non-linear characteristics of the process of magnetic recording.

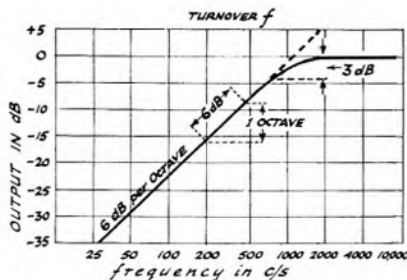


Fig. 1. Output from relay head from a fully modulated tape, showing the straight-line rise of an "ideal" output and the practical (hard-line) curve that may be obtained.

To make an efficient recording, it is necessary to feed the recording head with a constant current at all frequencies and produce an even magnetisation pattern on the tape. In practice, the constant current will be modified to allow for certain losses, i.e. pre-emphasis will be employed. But the aim is to produce this even magnetisation previously mentioned.

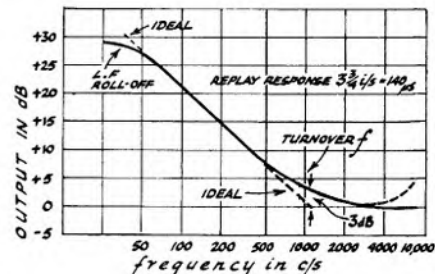


Fig. 2. Equalisation curve for 3½ ips. DIN/CCIR standard, with time constant of 140 microseconds.

During replay, very different conditions obtain. The replay head is sensitive to the rate-of-change of the magnetic flux. The recorded magnetic field changes more rapidly as the frequency of the recorded signal rises (more reversals of the waveform in the same time span), and thus the voltage output from the replay head rises with the frequency of the signal.

Fig. 1 shows the curve for the output from a replay head, and it will be noted that the "ideal" curve, i.e. assuming no system losses, is a straight line, rising 6 dB per octave. In other words, each time the frequency doubles, the curve traces a 6 dB increase of the signal. A practical curve is also drawn to illustrate why, in Fig. 2, the equalisation curve does not necessarily follow a straight-line reciprocal of the ideal 6 dB-per-octave of Fig. 1. In practice, it can be seen, there is a low frequency "roll-off" and a flattening of the curve, often followed by a small peak, towards the high frequency end. This is caused by limitations in gap length, the relationship of gap length and signal frequency to tape speed, and other factors. In general, the lower the

TIME CONSTANT TABLE

Standard	15 i.p.s.		7½ i.p.s.		3½ i.p.s.		1½ i.p.s.	
	Time constant	Frequency	Time constant	Frequency	Time constant	Frequency	Time constant	Frequency
NARTB	50 μs.	3.2 kHz (kc.p.s.)	50 μs.	3.2 kHz (kc.p.s.)	90 μs.	1.8 kHz (kc.p.s.)	90 μs.	1.8 kHz (kc.p.s.)
DIN/CCIR ...	35 μs.	4.5 kHz (kc.p.s.)	70 μs.	2.3 kHz (kc.p.s.)	140 μs.	1.14 kHz (kc.p.s.)	280 μs.	570 Hz (c.p.s.)
Old CCIR	—	—	100 μs.	1.6 kHz (kc.p.s.)	200 μs.	800 Hz (c.p.s.)	—	—

TWO UNUSUAL PUBLICATIONS

HOW TO CHOOSE A LOUDSPEAKER by Raymond E. Cooke, published by KEF Electronics Ltd., Tovil, Maidstone, Kent. Cost 6d. postage only.

The firm KEF Electronics Limited are manufacturers of very fine loudspeakers. When I received a copy of their new booklet, "How to choose a loudspeaker," I naturally assumed that reference would be made to their own products. In fact, the entire work is devoted to guiding the amateur in the difficult task of assessing sound quality without mentioning either their own, or anyone else's, products. As the publication is offered free of charge on application to their Maidstone address (but please do enclose sixpence to cover postage) it comprises a most worthwhile and unselfish endeavour to help prospective purchasers form a completely unbiased opinion on the relative merits of loudspeakers.

May I quote directly from Mr. Cooke's booklet:

"The basis of all subjective comparisons of speakers is the A-B listening test in which two loudspeakers placed side by side are compared by switching from one to the other whilst reproducing the same programme. There is no substitute for this test which is more revealing than reams of technical specifications and measurements. However, it is necessary for such listening tests to be carried out with certain precautions otherwise the results can be misleading."

How very, very true that statement is. The rest of the book is devoted to both explaining the precautions that should be taken and to listing a suggested test programme. Notes are also given on the kinds of distortion commonly found in loudspeakers.

This book should be of enormous interest to all who are interested in the reproduction of good quality sound, whether they are intending purchasers of new loudspeaker equipment or not. For those who are seriously looking for a new loudspeaker the booklet is invaluable.

ELECTRONICS HOBBIES MANUAL. Price 10s. 6d., published by Electron- iques (Prop. STC Ltd.), Edinburgh Way, Harlow, Essex.

It is unusual to find oneself reviewing a component catalogue; and this is what the Electronics Hobbies Manual basically is. However, it is far more than a mere list of items and prices. The 600-odd pages are full of suggestions for the amateur constructor.

In its purely catalogue function it lists more than 11,000 items with full descriptions and prices. These range from a 6d. knob to a £75 transceiver. It also lists a large number of "kits" which may be built up from this single-source supply.

The circuit diagrams must run into hundreds and throughout the book are found pages of "tips" including basic laws of electricity, tables and charts.

Whether your constructions problem is merely to provide a suitable plug to match a particular socket, or to build a complete stereo amplifier, the Electronics Hobbies Manual is an indispensable aid. There has been a need for a comprehensive volume of this kind for a long time. I am glad that need has now been so well met.

tape speed the greater the departure from an "ideal" curve. Most of the losses occur at the upper frequency end of the response.

To enable tapes to be replayed on machines other than those on which they were recorded, a common standard of equalisation is agreed, tape amplifiers being built to reproduce "standard" tapes, i.e. to have a standard replay response.

The standards are now agreed between international authorities, and there are two main groups. The British standard generally falls in with the DIN/CCIR group and the NARTB (abbreviated to NAB) is used in the United States of America. A table of equalisation time constants is given below, and includes the previous CCIR figure where it differs, as an example of the changes made within the past few years.

The use of a time constant to define a curve is a device that assists the engineer, and is simply a statement of the time-constant of a resistor capacitor combination that will produce the standard curve. The actual time constant figure is achieved by multiplying the capacitance in microfarads by the resistance in megohms. The answer is in seconds, or sub-divisions of a second (i.e. microseconds) and is the time in which the capacitor will charge up to 63.2 per cent of the applied voltage with the given resistance in series.

Because a capacitor is frequency-conscious, its reactance falling as the frequency of the applied voltage increases, at one particular frequency the reactance of the capacitor will exactly equal the resistance. This frequency, called the *Turnover frequency*, is actually the point at which the response curve has deviated just 3 dB from the straight line "ideal," as shown in the diagrams. Thus, our table states both a time constant and a turnover frequency for each standard at the speed of tape travel. The four "popular" speeds are quoted. See also Fig. 2.

In addition, a time constant of 3180 μ s. is used for low frequency roll-off for the NAB standard and for the 3½ ips DIN standard. A non-standard curve with a time constant of 280 μ s. has been shown for DIN 1½ ips.

* * *

STATOR. The fixed portion of the drive motor. In the case of the outer-rotating cage motor, the stator comprises the windings. With central hub motors, the stator lies around the windings of the rotor, but many types of induction motor are constructed with the rotor as a solid unit.

* * *

START CAPACITOR. Some types of induction motor employ capacitor starting, with a high voltage, medium capacity (around 1mfd is normal) unit across one section of the windings, to provide the necessary phase shift which inaugurates the flux-cutting needed to make the rotor turn.

* * *

STEREO RECORD AND PLAY. Using two channels, with separate amplifiers and loudspeakers, the signal is recorded from separate sources and replayed from twin tracks on the stereo head. A four-track head can be employed for stereo replay by coupling the unused track to a separate amplifier, with correct equalisation. A number of machines have this facility, the output leads from the four-track head being

brought out, via the track switch, to a special socket. See Fig. 3. Special amplifiers are used for this purpose, but as these are intended for replay only, such adaptation will not convert a four-track mono machine to a fully stereo model. Half-track or quarter-track stereo may be employed, but replay of a half-track stereo tape on a quarter-track machine is not successful unless the replay head is repositioned (see Tracks).

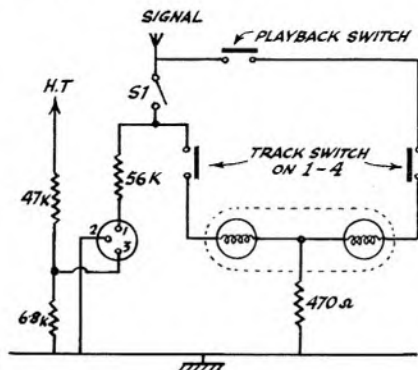


Fig. 3. Simplified circuit of the take-off socket and head wiring of a number of Philips machines. The fixed potentiometer from h.t. provides 16.5 volts for powering the pre-amplifier. To use this type of circuit the machine must be operated with the track switch in the Track 1-4 position, and the paralleling switch S1 opened. Machines with a separate socket and superimposition switch can be adapted in this way.

STEREO ADD-ON UNIT. Special-purpose amplifier to convert twin-track machine to stereo replay, (see above). The equalised output from the unit should correctly load a power amplifier.

* * *

STETHOSET. Headphones constructed on the stethoscope principle, with acoustic tubes from the transducer unit, hinged and padded to insert in the user's ears.

* * *

STEREOSET. A term sometimes used to indicate the wiring from the two transducers of a pair of headphones has been brought out separately and can be used to reproduce stereo signals.

* * *

STOP FOIL. See also Auto-stop. The type of autostop device that depends on the short-circuiting of contacts insulated from each other is actuated by metallic-faced tape known as stop-foil.

* * *

STORAGE. Tape should be stored in correct conditions to avoid brittleness. High temperature and low humidity quickly ruin tape. Tight spooling can also cause deterioration, especially if respooled in humid conditions when it expands slightly, then contracts and stretches unevenly. Overtight spooling and long storage can also lead to print-through. Magnetic fields should be avoided and spools should be stored in dust-excluding containers, not subjected to pressure. Several excellent library containers are at present on the market.

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Tape records reviewed

AN OUTSTANDING OPERATIC SELECTION

**FAMOUS DUETS FROM THE OPERA—
GREAT SOPRANOS OF OUR TIME.**
Angel (Y2S 3692) four-track stereo
3½ ips. 120s.

Permit me to list the artists who appear in this ninety-one minute recording: Callas, Crespin, de los Angeles, Nilsson, Pirazzini, Schwarzkopf, Sciutti, Simionato, Stella, Sutherland, Blanc, Corelli, del Monte, Gedda, Gobbi, Sereni, and Wächter. What is the reviewer to say in the face of such a concentrated barrage of talent? If, that is, he has the strength left after ninety-one minutes of pure voice power to say anything at all.

The complete recording comprises no fewer than seventeen different items, and it would be impossible to discuss them all at length. So I'll just mention my own personal favourites. From Verdi's *La Traviata* Victoria de los Angeles sings three brilliant arias (in my compilation of the seventeen items I have counted all three as one...!). The last of these, *Sempre libera* (ever free shall I still hasten madly on from pleasure to pleasure) is a sheer tour de force of the kind at which de los Angeles excels above all else. I would willingly buy the tape for this aria alone.

Still with Verdi we can change the scene to *Macbeth* and hear the superb malevolence of Maria Callas singing the famous sleep-walking scene, *Una macchia—è qui tuttora*. In this aria one really appreciates the great breadth of the Callas voice. Her performance is as effortless as it is exquisite.

With dramatic change of mood Callas sings *L'Amour est un oiseau rebelle* from Bizet's *Carmen*. With the rhythm of the Habanera Callas is transformed into an intimate wanton—what an actress that woman is!

As if this were not enough, listen to Wächter and Sciutti singing Mozart's duet *Là ci darem la mano* from *Don Giovanni*. "You'll lay your hand in mine, dear!" sings Don Giovanni. With a voice like that I have no doubt but what she will.

And so they continue for a full ninety-one minutes. Of course one can find fault if one really wants to criticise. I could complain that many of the arias are cut off abruptly at the last note, even slicing off the expected resonance. This can be irritating, but it is obviously due to the fact that each part has been taken from a longer recording. In no other way could such a collection of vocalists be brought together on a single tape. Considering the speed is 3½ ips the quality is remarkably good. This does not alter my opinion that the soprano voice deserves the faster tape speed. However, it would be ungracious to stress what are relatively insignificant faults. This is a great collection of great works by great performers. Exhausting to listen to, yes; but exhausting in the most agreeable way. As sheer value for money it could hardly be bettered.

The other works included but not mentioned are:

Victoria de los Angeles—Gounod: *Faust—O Dieu! que de bijoux!* (Jewel Song).

Birgit Nilsson—Beethoven: *Fidelio—Abscheulicher! . . . Komm, Hoffnung.*

Elizabeth Schwarzkopf—Mozart: *Le Nozze di Figaro—Dove sono.*

Régine Crespin—Wagner: *Die Walküre—Eine Waffe lass' mich dir weisen . . . Der Männer Sippe.*

Joan Sutherland—Mozart: *Don Giovanni—Or sai chi l'onore.*

Elizabeth Schwarzkopf—Mozart: *Le Nozze di Figaro—Porgi, amor.*

Nicolai Gedda and Ernest Blanc—Bizet: *The Pearl Fishers—Au fond du temple saint.*

Victoria de los Angeles and Miriam Pirazzini—Puccini: *Madame Butterfly—Scuoti quella fronda* (Flower Duet).

Carlo del Monte and Victoria de los Angeles—Verdi: *La Traviata—Parigi, o cara.*

Franco Corelli and Antonietta Stella.—*Giordano: Andrea Chénier—Vicino a te.*

Mario Sereni and Nicolai Gedda—*Puccini: La Bohème—In un coupé?*

Maria Callas and Tito Gobbi—*Rossini: The Barber of Seville—Dunque io son.*

Franco Corelli and Giulietta Simionato—*Verdi: Il Trovatore—Se m'ami ancor.*

Even reading the list makes one weak at the knees!

THE PLEASURE OF VIVALDI'S HUMANITY

VIVALDI. The Four Seasons. Virtuosi Di Roma. Conducted by Renato Fasano. Angel (ZS 35877), four-track stereo, 7½ ips, 75s.

Of all Vivaldi's works, *The Four Seasons* is possibly the most popular. It is a descriptive work dealing with spring, summer, autumn and winter.

Each is a complete concerto and is prefaced by a sonnet which serves as an introduction to the music; these have been printed on the back of the box so may be read as one listens.

I have commented before upon the virtue of using a tape speed of 7½ ips for baroque music. The fine instrumental quality would be lost at a slower speed.

Let me quote the lines that accompany the largo from Winter:

"To stay by the fireside, happy and content,
While those outside are drenched by pouring rain."

That was precisely how I listened to this recording of the *Four Seasons*, sitting by the fireside, happy and content. How smug and self-satisfied one can be listening to fine music by the flickering firelight whilst others less fortunate struggle about their business in the pouring rain. One's heart goes out to Vivaldi—he experienced just the same feeling more than two hundred years ago. But he could interpret that feeling and immortalise it in music.

For every season there are moments of equal humanity, each to be savoured with, I hope, equally human enjoyment.

This recording can be thoroughly recommended to all who have an appreciation of the 18th Century composers, and perhaps some who lack that appreciation will acquire it. If they do they will look back and realise that they had before missed one of the finest experiences that civilised life can offer.

INVITE RAY INDOORS

DEDICATED TO YOU—RAY CHARLES.
World Record Club (TT 566), $\frac{1}{2}$ -track mono, 3 $\frac{1}{2}$ ips, 29s. 6d.

The linking theme of these numbers is a list of girls' names. The six girls to whom Ray is dedicated on track I are: *Hard-hearted Hannah, Nancy, Margie, Ruby, Rosetta* and *Stella by Starlight*. With nonchalant infidelity he turns his attentions on track II to: *Cherry, Josephine, Candy, Marie, Diane* and *Sweet Georgia Brown*.

In this recording the beautifully rich, gravelled tones of Ray Charles are not merely in the foreground—they are in the room beside you, as intimate and as close as a voice can be. Why then, oh why was he provided with an impersonal, sugary choral backing which keeps intruding now and then on this delightfully personal attack? However angelic the "heavenly voices" with which he has been encumbered might be, they are quite out of place in this otherwise charming collection.

Perhaps the mistake lies in the artifice of using a string of girls' names as an excuse for producing an album. One result of this approach is to impose upon the vocalist the need to modify both his style and emotional attack on almost every number. This he achieves with consummate artistry, resulting in an album that is as easy and pleasant on the ear as it is desirable to own.

JOY OF LIVING

GETZ MEETS MULLIGAN. Stan Getz and Gerry Mulligan. World Record Club (TT 587), $\frac{1}{2}$ -track, mono, 3 $\frac{1}{2}$ ips, 29s 6d.

Would it be original to describe the Getz and Mulligan partnership as a "saxtet"? Probably not, but whatever it is called the result is memorable.

In the true spirit of all great performers the pair do not merely perform—they proceed to extract from their instruments all the *joie de vivre* that the advertising boys try to convince us we should find in merchandise as diverse as baked beans and bottles of perfume.

The tapes reviewed this month are issued by the following companies:

"Angel," "ABC Paramount," E.M.I. Records Ltd., 20, Manchester Square, London, W.1.
"W.R.C.": World Record Club, Box 11, Park-bridge House, The Little Green, Richmond, Surrey.

The numbers on track 1, *Let's Fall in Love, Anything Goes* and *Too Close for Comfort*, are an example of what I mean. As a leading exponent of the baritone saxophone, what does Mulligan do but borrow the Getz tenor? And Getz, of course, extracts the very most out of life by blowing baritone. On the second track, *That Old Feeling, This can't be Love* and *A Ballad*, are performed in the more orthodox fashion with Mulligan baritone and Getz tenor.

Orthodox was, of course, quite the wrong word. This is a display of brilliant improvisation that will delight their devotees. Recording quality is absolutely excellent; the comparative tones of the two instruments are delightfully set off the one against the other. This is a tape that can be strongly recommended without qualification.

BUY IT— IF YOU HAVE THE COURAGE

FERRANTE AND TEICHER WITH PERCUSSION. ABC Paramount (ABCT 1001), 4-track, stereo, 7 $\frac{1}{2}$ ips, 75s.

Before attempting to play this record the publisher's explanation on the rear of the box should be carefully studied. This will reveal that the two artistes, Ferrante and Teicher, are attempting something far more serious than the mere production of an acceptable musical sound. Their recordings are described as "exploration into sound."

Using only two Steinway pianos, and backed on this tape by percussion and bass, the pair proceed to produce the most unorthodox sounds. We are told on the box (and I don't believe it!) that the only qualification required of the recording engineer was that he should be a "first-class idiot." If the engineer in charge of this recording was of dubious sanity then this would explain why so much mediocre quality is produced by other studios.

What we have on this tape is not so much music as a brilliant display of performing and recording virtuosity. As Ferrante and Teicher do the most unmentionable things with their pianos, such as running their fingers over the open strings, the sounds leap into life with a realism that I have rarely heard matched before. Needless to say, the numbers performed are freely adapted, and the highly individual interpretation is ideally suited to the unorthodox approach.

One could complain that the directional stereophonic effect is too prominent; but that would be a very mean criticism of a superb example of recording technique. This tape cannot be explained—it must be heard. And once heard it is liable to make the listener realise just how feeble some of his other, perhaps highly-prized, recordings really are. So buy it only if you have the courage, or if you want to set for yourself the highest standard in recorded sound.

The vehicles used for this extraordinary display are: *How High the Moon, The Nearness of You, Che Si Dice, Temptation, Three O'Clock in the Morning, Va Va Voom, Beyond the Blue Horizon, Aflame, Get out of Town, Parade of the Bobbies, Yesterdays* and *Cielito Lindo*.

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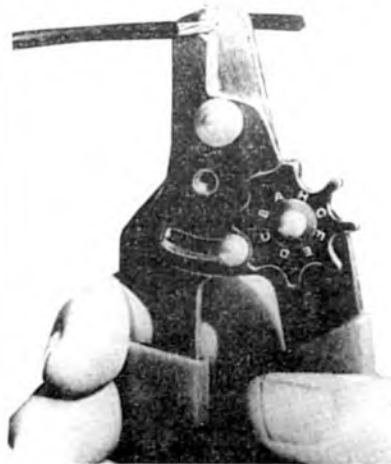
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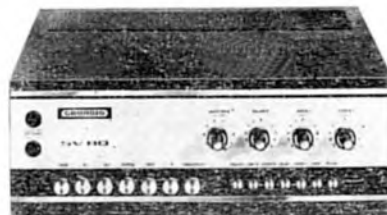


The model 8 wire stripper can be adjusted quickly to the wire thickness required by the special pre-set selector gauge which is conveniently marked at each setting with a letter for simple identification. The wire stripper has red, plastic-covered handles for easy grip. Costing 8s. 6d. it is available from most electrical and hardware shops and all branches of Halfords.

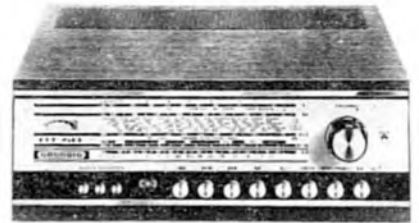
Multicore Solders Limited, Multicore Works, Maylands Avenue, Hemel Hempstead, Hertfordshire.

HI-FI FROM GRUNDIG

IN the new Grundig SV80 transistorised mains powered stereo amplifier, shown below, provision is made for the connection of a radio tuner, tape recorder and



record player. There are output sockets for loudspeaker assemblies and headphones, and incorporated in the design is an "after record" tape recorder monitoring facility. The wide range of controls is said to allow perfect reproduction of every conceivable type of sound when the unit is used in conjunction with its complementary tuner, the Grundig RT40, and Grundig high-quality loudspeaker combinations.



Especially designed to work in conjunction with the SV80 stereo amplifier is the RT40 tuner unit, above, a high-quality, self-powered, fully-transistorised radio tuner with built-in automatic stereo decoder for the reception of stereo broadcasts on VHF/FM.

A switched automatic frequency control is said to ensure drift-free reception on the FM band and independent selection of AM/FM stations is effected by the Grundig Duplex drive system. The audio selector provides variable band widths on AM of 3, 5 and 9 kHz (KcS). The RT40 is housed in a wooden case finished in teak or walnut to match the SV80.

Both those items of equipment are available only through accredited Grundig hi-fi dealers, the names of whom may be obtained from the manufacturers:

Grundig (Gt. Britain) Ltd., Newlands Park, Sydenham, London, S.E.26.

A "ONE-PIECE" STEREO SPEAKER

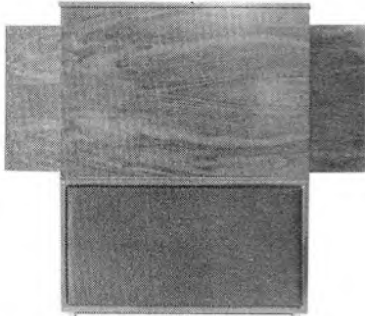
MOST stereo recordings are reproduced through two separate loudspeakers, one radiating the right hand, the other the left hand, channels. Exaggerated separation of the channels, prevalent in the novelty days of stereo, has given way to the "total sound envelope" concept. By skilful integration both channels convey the breadth and mobility of the whole rather than the two distinct halves of the original.

Highly directional speakers systems tend to reveal the position of the speaker delivering the sound rather than the relative position of the sound component in the original. Omni-directional loudspeakers overcome this but reduce precise stereo effect to some extent.

The Jordan-Watts Stereola is said to combine in a single cabinet the benefits of both types by having directional and omni-directional loudspeakers arranged to best advantage. The lower compartment contains two directional driving units angled to provide optimum sound spread, with common bass supplemented by radiation from a forward facing reflex port. Directional effect is achieved by two horizontally radiating drive units in folded columns, the low frequencies of which are projected rearwards from two ports and diffused by the wall throughout the entire room.

The reflex and folded column enclosures are tuned to different resonant frequencies to spread the bass over a wide frequency band. In total there are seven sound outlets projecting at six different angles to provide full room coverage of high fidelity sound and to convey the stereo image throughout.

The Jordan-Watts Stereola handles amplifiers up to 25 watts per channel, although its over-all size is smaller than many 15 watt monaural loudspeaker systems. The system offers stereophonic sound from a single, one-piece cabinet which can be placed almost anywhere in the room. By a simple change in connections the unit can handle 50 watts mono.



The frequency range is quoted as 40 to 20,000 Hz (cps) and the impedance 15 ohms. Over-all size is 25½ x 31 high x 10½ in. and finishes available are teak or walnut with Vynair front. The net weight is 70 lbs. (packed in two parts) and the price in the U.K. is £89 10s.

Jordan-Watts Limited, Benlow Works, Silverdale Road, Hayes, Middlesex.

LOW COST TRANSCRIPTION UNIT

THE UA 70 is a new automatic/manual turntable unit designed and introduced by BSR to appeal to the audio enthusiast and the discerning listener. Its 11 in. diameter turntable is driven from a dynamically balanced, four pole, dual voltage induction motor and the stacker spindle accommodates up to eight 7 in., 10 in. or 12 in. diameter records for playing automatically at the four usual speeds. Alternatively a stub spindle is supplied for use when records are played singly. Record sizes are pre-selected and only like sizes may therefore be stacked together.



The low mass pick-up arm is supported on horizontal ballbearing pivots. Of lightweight tubular aluminium it is counter-balanced vertically and laterally. A coarse and fine counter-balance adjustment permits accurate balancing of the arm to suit the various cartridges which might be fitted. Stylus pressure is variable from 0 to 6 grammes, with click stop intermediate intervals on the rotary pressure control.

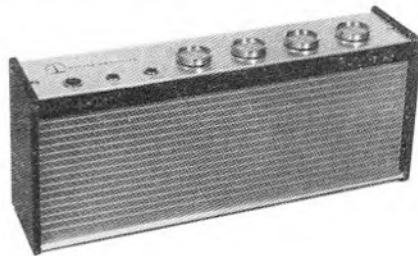
An integral mechanical cueing device allows the pick-up arm to be raised or lowered at any selected point on the record when records are played manually. Raising the cueing lever lifts the pick-up arm which may then be positioned above the record at the chosen point. The stylus is lowered to the groove by returning the lever to the rest position. Accuracy is said to be to a single groove. Any standard monaural or stereo cartridge can be fitted; wow is said to be below 0.2 per cent rms and flutter below 0.06 per cent rms.

Finished with satin black mainplate and black turntable mat inlaid with brushed aluminium rings, the cost is £12 18s. 3d. including purchase tax and surcharge, but excluding cartridge.

B.S.R. Limited, Monarch Works, Old Hill, Staffordshire.

ACCESSORIES FOR BRC MACHINES

ARANGE of no fewer than 17 extremely useful tape recorder accessories have been introduced by the British Radio Corporation Ltd. Designed especially for use with Ferguson, H.M.V. or Ultra tape recorders they include a cardioid dynamic microphone price six guineas, monitoring stetho sets at 23s. 6d. and a remote control pause switch with a 20-foot lead at 10s. 6d. A foot switch at £3 enables tape recorders with provision for its connection to be used as dictating machines.



Two other interesting accessories are the Thorn SA 101 general purpose transistor amplifier. This has a built-in loudspeaker and is designed for use as a second channel for the playback of pre-recorded stereo tapes on four-track tape recorders. Illustrated above, the cost is 13½ guineas.

At 9 guineas the Thorn TA/01 Synchro-Amp adaptor, top right, is a pre-amp unit for second channel playback of stereo tapes. The unit also enables the monitoring of one track whilst recording on another. A further feature is that automatic slide projector synchronisation is possible. On BRC 7-inch spool machines it will also provide for the transfer of recordings from one track to another.

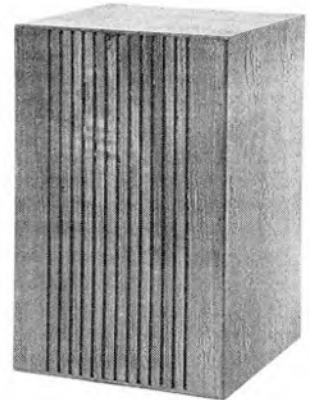
British Radio Corporation Ltd., 284, Southbury Road, Enfield, Middlesex.



DNH SPEAKERS FROM HIGHGATE ACOUSTICS

HIGHGATE Acoustics Limited announce that they have taken over the agency for distribution of DNH loudspeakers which will now be available in this country ex-stock. Manufactured in Norway, each unit has been specially designed both to suit domestic conditions and to give finely balanced reproduction in the bass, middle and treble regions.

Model B-520/T contains two DNH speakers within a teak wood cabinet to form the largest of the DNH extension speakers. Its power handling capacity is said to be 20 watts and the frequency range is quoted as from 40 to 18,000 Hertz (cps). The retail price is 19 gns.



Handling 10 watts of power with a stated frequency response of from 50 to 18,000 Hertz (cps), model B-455/T measures only 10½ x 6½ x 7½ inches and therefore could be classed as a "bookshelf" loudspeaker. Illustrated above, the enclosure contains both 6-inch and 4-inch drive units and the cost is 13 guineas inclusive of purchase tax and surcharge.

Also within the range is the B-616, a single pressure chamber speaker with double cone. Fabric covered in a walnut cabinet it will cost 10 guineas inclusive of purchase tax and surcharge. The least expensive speaker is the B-415, power handling capacity 6 watts, and frequency response quoted at 60 to 16,000 Hertz (cps). Mounted in a teak veneer cabinet not dissimilar to the other models in appearance it will cost five guineas inclusive of purchase tax and surcharge.

Highgate Acoustics, 71-73, Great Portland Street, London, W.1.

VERTICAL

(Continued from page 53)

down-to-earth priced recorder that would still offer all the facilities of the more expensive model. Thus the VR7 came into being at the realistic retail price of 39 gns. Unlike the VR4, the speaker is this time positioned in the front, and is an eight-inch elliptical. True to his original idea, Mr. Van der Molen provided all the advanced recording facilities of his other model—even including independent mixing and separate bass and treble controls. The deck is identical.

So we have two new, rather strange-looking, additions to the list of recorders "Made in Britain." All the work on these two machines is carried out in the Romford, Essex, works. And though their appearance might be strange to us today, it will probably be very familiar indeed tomorrow. Other manufacturers have been taking an equally hard look at the possibilities of vertical operation, and this may well be the shape of the future.

Speaking of the future in the recording world today usually means a reference to cassette machines. At Romford they have the prototype of a typically original design almost ready for release. Full details cannot yet be announced, but we can assure you that it will be as vertical in its operation as the two spool-to-spool machines, and will be as brilliantly original in its design and conception. At a retail price of under £45 we are going to be offered a remarkable piece of equipment—but be quite sure that in the Van der Molen tradition it will offer all the facilities that the true recording enthusiast would want to see.

There has been a great deal of contention recently as to whether the cassette machine is destined to be regarded as simply a piece of playback equipment, or whether it is capable of use as a "proper" tape recorder. We can only assure you that if the Van der Molen machine had not been capable of "proper" recording, he would never have bothered to design it.

All at T.R.M. pay their respects to a man courageous enough to start up on his own in a very difficult business at a very difficult time, and to bring to that business refreshingly new and original thought. We shall be watching the Van der Molen factory carefully in the future as the birthplace of very worthwhile ideas.

SCOTCH DYNARANGE TAPE

(Continued from page 58)

Our conclusions about Scotch Dynarange tape are that it has definite advantages over the ordinary type 150. These advantages are certainly not so great as to allow us to say that a recording at 3½ ips on 203 would be as good in terms of quality as a recording at 7½ ips on 150. Nevertheless, the recording on the 203 would be of better quality than one taken on 150 tape at the same speed. The improvement diminishes as tape speed increases, but even at 15 ips the increased dynamic range and smoother frequency response would be worthwhile for important recordings.

Although we are strongly opposed to any technique which degrades quality we must admit that the improvement achieved by Dynarange 203 at 3½ ips may well influence some enthusiasts to adopt that speed for home recording in preference to 7½ ips. One word of warning—if your machine is susceptible to wow the finest tape in the world won't make a scrap of difference.

ADVICE FROM THE 'PROS'

(Continued from page 51)

prepare a master and to have pressings taken from that. On this equipment we can transfer to disc within the frequency range from 50 Hz (cps) to 15 kHz (kcps) and, believe me, if you've got 15,000 Hz (cps) on either a tape or a disc from a live microphone recording, you've really got something.

"The acetates should be played back using a lightweight pickup, not over five grammes. When properly used, they should be good for at least two hundred playings; I doubt if many commercial discs get that much use. One word of warning: the 'Dust-bug' accessory that is so useful for keeping vinyl pressings clean can cause damage to the more delicate surface of acetate discs. The slightest wipe with a soft cloth is the only cleaning that should be given and even this is dangerous.

"Cutting discs is a very tricky business. We must get together and write a book about it one day. For instance, we have to keep the central heating running all the time. Any violent change in temperature would upset the cutter head. The shape of

the stylus in domestic gramophones will vary according to the manufacturer. We have to cut a disc so that the groove will suit a wide range of different stylus shapes. It's the easiest thing in the world for me, or any disc-cutter, to make a mistake and ruin a disc. When that happens the only thing to do is to put another blank on the turntable and start again. And believe me, these blanks are expensive.

"Well, it was very good of you to call and it's been a pleasure to have a chat to you. Of course the bulk of my work is on my own recordings. Next time you come I'll take you round the studio. But I enjoy working for amateurs and I hope my remarks might be of some use to your readers. If I've offended anyone by my simple suggestions, I can only beg their pardons and say that obviously they weren't intended for them. All I want is to see more people getting more pleasure out of taking better recordings.

"I must see what I can do to that rather bad tape you heard me play when you came in. So cheerio, and thanks again for calling."

EDITOR'S NOTE: Amongst the many recordings directed, produced and recorded in "Sound Level Studio" by Denis Comper is *Dr. Faustus* with Richard Burton and the Oxford University Dramatic Society for H.M.V. A forthcoming publication will be a new production of Edward II.

The latest choral disc of the London Emanuel Choir, conducted by William Shepherd, was recorded for Pilgrim Records by John Hassell Recordings.

A number of reputable firms offering studio or tape-to-disc facilities regularly advertise in the pages of this magazine, and any of them would be delighted to send full details on request. Alternatively, the Association of Professional Recording Studios Ltd. publishes a list of no fewer than 150 member and associate member firms. The Association Secretary would be pleased to forward this list on request—please write to: **The Secretary, A.P.R.S. Ltd., 47, Wattendon Road, Kenley, Surrey,** enclosing return postage.

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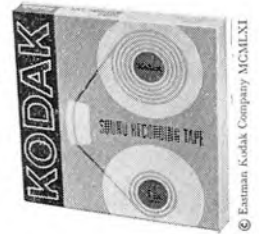
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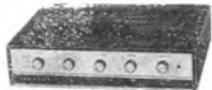
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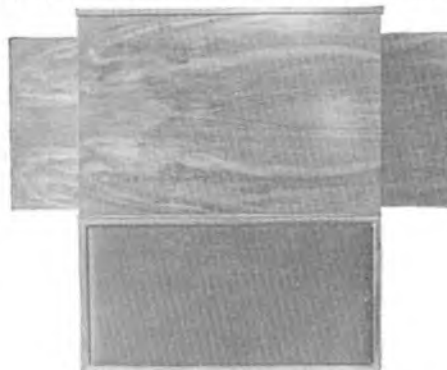
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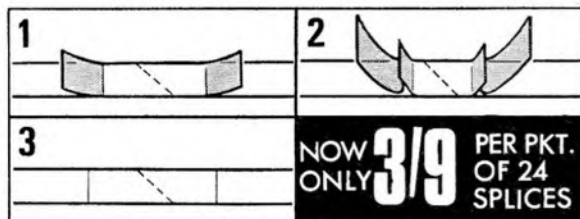
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Moses, John Bryan (34). 37, Cross Street, Cowes, Isle of Wight. Photography, humour, most music. 3½ ips. 7-inch spool. Grundig TK14. Male contacts only in S. America, Spain, Germany, Australia, USA.

Murray, J. (45). 5, Winton Place, Worthing, Sussex. Astronomy, photography. 3½ ips. 7-inch spool. Philips recorder. USA, UK.

Neilson, Stephen (20). 18, West Avenue, Gosforth, Newcastle-upon-Tyne, Northumberland. Photography, humour, pop music. 7½, 3½, 1½, 15/16 ips. 7-inch spool. Stella ST459.

Neville-Statham, V. (46). 141, Halley Road, Forest Gate, London, E.7. Photography, philately, spiritualism, French language. 3½, 1½ ips. 5½-inch spool. Telefunken M55, Grundig Cub battery portable.

Noctor, M. J. (30). 2, Carrington Road, Dartford, Kent. Travel, sport, pop and modern jazz music. 7½, 3½, 1½ ips. 7-inch spool. Fidelity Playmatic, four-track. Female contacts only. USA, Canada.

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Parsons, Frederick (33). 13b, Masefield Drive, Leyfields, Tamworth, Staffordshire. 8mm. cine and 35mm. photography, short-wave radio. 3½, 1½ ips. 7-inch spool. Stella ST458, four-track stereo. Canada, USA. Letters not required.

Perrin, Ray (20). The Flat, Penn House, Penn Street, Amersham, Buckinghamshire. Hi-fi, cars, pop music. 7½, 3½, 1½ ips. 7-inch spool. Elizabethan LZ29, four-track. UK, Australia.

Pinnington, D. (40). 2, Cobham Avenue, Liverpool 9, Lancashire. Judo, Religion. 7½, 3½, 1½ ips. 3-inch spool. Philips AG8108G. Germany, Australia, South Africa.

Porter, Barry D. (22). 3/293, Monument Road, Ladywood, Birmingham 16, Warwickshire. Pop music. 3½ ips. 5½-inch spool. Grundig TK25, Fidelity, four-track. Germany, UK, Italy.

Proctor Ken (24). 8, Sandringham Street, Scarborough, Yorkshire. Outdoor recording, radio. 7½, 3½, 1½ ips. 7-inch spool. Philips EL3301, cassette battery portable, and special Collaro deck.

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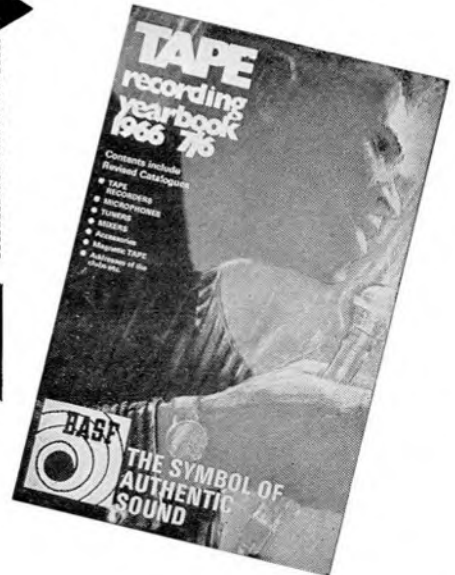
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