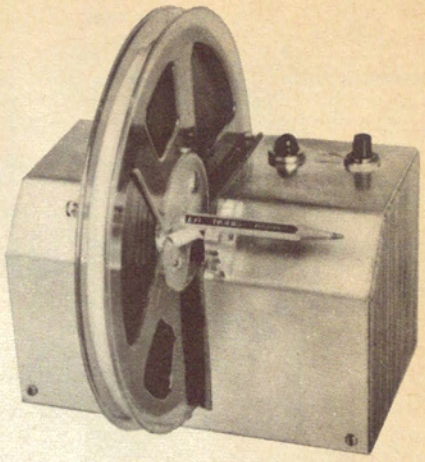
MAGNETIC TAPE BULK ERASER



Here's a useful accessory for the tape recording enthusiast — a bulk eraser which will accept 5 inch and 7 inch spools of standard ¼ inch magnetic recording tape. It can be built around two modified filter chokes or small power transformers, and operates from the AC mains.

by GEORGE HUGHES

As every tape recordist knows, one of the best characteristics of magnetic tape over any other recording medium is its erasibility.

Tape is erased by subjecting the magnetic material to an alternating or permanent magnetic field of sufficient strength to destroy any previous pattern.

The permanent magnet method of erasure is the simplest, but is usually used only on the very cheapest recorders.

The alternating field system uses a separate head, similar to the recording head, but with a much wider gap. While recording, this head is excited by a high frequency power oscillator at, typically, 40-100KHz. The oscillator power, about 1 watt, produces a flux of sufficient strength to erase any previous recording. The erase head is placed before the recording head in the direction of tape transport.

Since recorders are already equiped with erase facilities, why use a bulk eraser?

There are several reasons. In normal use, a tape will collect a whole range of items, many of them irelevant, personal, or even confidential. If, subsequently, the tape has to be passed into someone elses care, but only part of it contains relevant material, there is the problem of how to erase the remainder.

While it can be done by simply running the tape through the machine in the record mode, with no signal input, this can be a tedious operation, particularly with a large reel of tape and a four track system.

With a bulk eraser, the whole tape can be wiped clean in a few seconds before the vital recording is made.

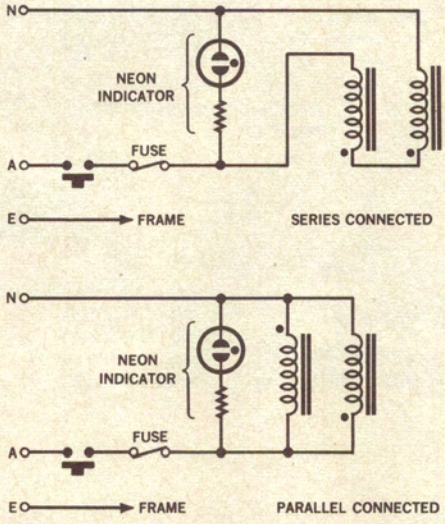


Diagram showing either series (upper) or parallel (lower) connections for the eraser coils. Dots denote abitrary ends of coils, either start or finish, assuming both coils are wound in the same direction.

Again, there is a possible problem when tape is transferred from one machine to another. Unless the alignment of both sets of heads is the same it is quite possible that a recording made on machine No 1 may not be completely erased, for example, along one edge, when a new recording is made on machine No 2. If subsequently replayed on machine No 1, or a machine with similar alignment, a background of the old recording would appear behind the new one.

Fairly obviously, bulk erasure, before transfering to machine No 2 would avoid any such problem.

Finally, there is the problem of noise. While not usually a serious problem, there is little doubt that a tape which has been recorded and erased a number of times will have a marginally higher noise level than the first recording on a virgin tape, since there are many factors which will influence this, such as the grade of tape, the optimisation of the bias level and frequency, etc, it is impossible to forecast just how serious the problem will be in any one situation. Suffice it to say that, where the very best results are required, bulk erase would seem to be good insurance.

In essence, a bulk eraser is an AC electromagnet whose field is strong enough to overcome any premagnetised pattern of oxide particles on a tape, and to leave them in such a random condition that the tape possesses no resemblance of a previous magnetic pattern.

Commercial bulk erasers use a large multi-turn coil, usually connected to the 50Hz mains, with provision to mount the reel of tape in close proximity to it and to rotate it.

A good substitute for such a special coil is a pair of modified chokes or transformers. By adopting a "staggered" layout of the two windings it is possible to use relatively small units and still cover a 7in (177mm) reel of tape.

A cheap bulk eraser can be made with two such windings, a few pieces of wood, some 18 gauge aluminium, a press-button switch, a neon indicator, and a length of 3-core power flex and plug.

Our eraser used a pair of CF396 Ferguson filter chokes, modified by removing the "I" section of the core. (See photo.) Whatever units are used, they will have to be modified to this configuration.

Removing the "I" section provides an open magnetic circuit, allowing the magnetic field to pass through the tape in the final set-up. It also reduces the inductance and increases the current flow. While the increased current flow is desirable, there is a limit set by the tendency for the coils to overheat. Whatever units are finally chosen, their suitability, and the method of connecting them, will be determined by the heat generated during a typical duty cycle.

Before spending money on new components, we suggest you "scrounge" for suitable windings, as components as large as are needed are not cheap when new. Windings extracted from TV vertical output transformers, small power transformers, vibrator transformers, etc, will be suitable with proper interconnection of their windings.

The core size should not be less than a 1in (25mm) thick stack of 1in "wasteless"

lamination, in order to cover the full width of a 7in spool.

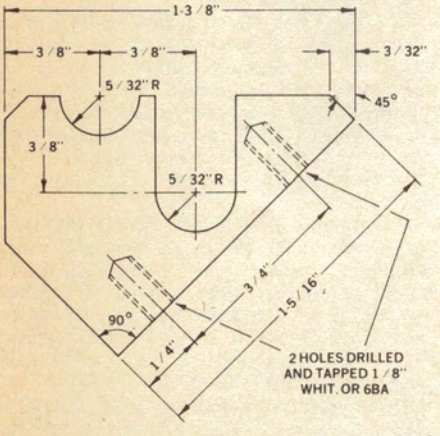
(A "wasteless" transformer lamination is one where the winding spaces in the "E" equals the width of an "I". The size of an "E" lamination refers to the tongue width, which is twice the width of the winding spaces. For a 1in wasteless lamination, the width of the "I" will be ½in, and its length will be 3 inches. Thus, a transformer lamination size can be gauged by its longest edge).

Armed with the above information and a steel rule, it shouldn't be hard to find two suitable items. Try to find two of the same type if possible.

As a guide, windings with not less than about 2000 turns should be satisfactory. Small power transformers would probably have sufficient turns when all windings are connected in series. Assuming a design figure of 5 turns per volt, a 240V primary will have 1200 turns, and a 150V per side HT winding will yield a further 1500 turns. Total, 2700 turns.

To correctly series-connect such windings, connect the primary to the ends of a length of power lead terminated in a suitable terminal block. Connect one end of the HT winding to one side of the primary, and the other end to a spare terminal to keep it away from other wires.

Plug into a 240 volt outlet and switch on. Measure the AC voltage from the free HT terminal to the remaining 240 volt terminal. If correctly connected, the voltage right across the two windings should measure 240 volts plus the HT nominal voltage. If less



Detailed drawing of the lugs to be mounted either side of the slot. A variety of non-ferrous materials may be used.

than 240 volts, the HT winding connections should be reversed. Double check.

When identified, the winding connections should be made permanent, with adequate insulation over the connections.

With the connections established, the transformer core should be modified. Transformers are normally assembled with the "I" and "E" sections interleaved, as distinct from the separate "E" and "I" sections for a choke, with a strip of gap material between them.

This means that the transformer core must be completely removed, the "I" sections discarded, and the "E" sections reassembled all facing the one way. Removing the original core may not be easy. Varnished units will offer some resistance, but when one or two laminations

have been removed, the remaining ones can be peeled off with the aid of a thin knife blade. Wax impregnated units are easier to work on.

Place two mounting feet in position and clamp tightly with two through-bolts. Give the outer extremes of the laminations a squirt of lacquer to anchor them and minimise buzz.

Assuming that the above requirements have been satisfied, it should be possible to connect the two windings in parallel and to the 240V supply without risk of serious overheating during the brief period they will be on. If it should transpire that the best available units have insufficient turns, and do tend to overheat, they may be connected in series. They should be identical units for this arrangement.

We housed the complete eraser in a simple box made from plywood and aluminium. The base and two ends of the box are of plywood, and the front, rear, and top is folded from one piece of aluminium.

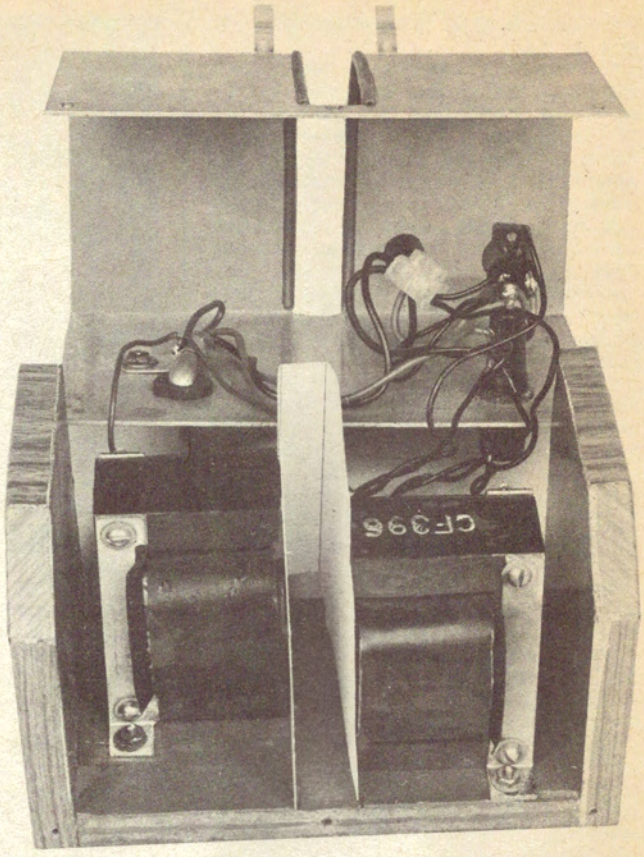
The wooden portion is made from a 3 5/8in (93mm) wide strip of plywood (or Pineboard). The base is 5½in (140mm) long and the two ends are 4in (102mm) high. One corner of each end is cut off, 1in in each direction to form an angle of 45°.

Fasten the end pieces to the base (on the end grain) with PVA wood glue and a few thin nails. When the glue has set, sand the whole assembly. Finish may be to your own taste. We applied a coat of full gloss paint and adhesive backed wood-grained plastic sheet, such as "Con-Tact".

The aluminium cover has a central slot through which the tape spool is inserted. On each side of the slot is a lug shaped as shown in the accompanying drawing. The two slots are designed to support a simple axle, such as a pencil, which, in turn, supports the reel. One pair of slots suits a 5in (127mm) reel and the other a 7in reel. The lugs may be made from any non-magnetic material. We used a piece of ¼in (6.5mm) acrylic, but wood, aluminium, brass etc, could be used by slightly modifying the design.

The cover is best marked out, drilled, and slotted in the flat. Then bend to shape and rub the outer surface with a fine (500) grit "wet and dry" paper, using a rubbing block and plenty of water. Finally, spray with a clear enamel.

Mount the first coil as far forward as possible without it fouling the cover when in place. Place it so that the open end of the laminations are not less than 5/16in (8mm) to the RHS of a centerline drawn across the depth of the base. Use countersunk machine screws (⅛in Whit or 4BA) and nuts, inserted from the underside.



The internal layout of the bulk eraser. Note particularly how the two coils are offset from each other. This provides adequate coverage for the larger reels. The folded cardboard between the coils is to protect the open ends of the windings. Since the unit will be connected to the mains, make sure all wiring is adequately insulated. Note the clamp on the mains lead.

To the LHS of the centerline, and at the same distance from it as the first coil, mount the second coil with its front edge level with the rear edge of the first coil. Cover the underside of the base with ⅛in felt cemented with a suitable contact adhesive.

To protect the open ends of the windings, cut a piece of thin cardboard 3½in x 7½in (89mm x 190mm) and form it into a "U" shape which will fit between the two core assemblies. Leave room in the rear section for interconnecting cables. Fasten with contact adhesive.

Before connecting the windings, ascertain arbitrary ends, ie, "start" and "finish," of each one. Code lead-outs from each winding suitably — either by knots or colors. The two methods of connection are shown in the accompanying diagram.

Fit the neon indicator, fuse holder, press button switch and mains lead (by a clip) to the aluminium cover. Connect to the appropriate leads as shown in the diagram.

With care, lower the aluminium cover over the assembly, making sure all leads are tucked in the space available to prevent them being pinched as the cover is screwed down.

To use the eraser, first take two precautions. Remove all valuable tape recordings to a distance of at least 3ft (1 metre) from the eraser, otherwise there may be a risk of partial erasure. Secondly, remove your watch. Even if anti-magnetic, it may not take kindly to having the hairspring rattled at 50Hz!

Place the tape spool in position with a pencil as an axle. Five inch spools use the inner slot and 7 inch spools the outer one.

Press the power button and rotate the spool at least twice very slowly without releasing the button. Application of power will be accompanied by a heavy hum.

If you release the button momentarily, count your rotation of the spool from the time and position you released the button. If power is disconnected with the spool in position, a "thump" will be recorded for every revolution of the tape.

After rotation, and still with power applied, slowly withdraw the spool a full arm's length from the eraser, and then release the button.

If the spool is rotated or withdrawn from the eraser too quickly, a burble will be recorded for every revolution of the spool.

Use the eraser only for sufficient time to erase a tape, as excessive "on" time may cause the coils to overheat, with the risk of a possible burn-out.