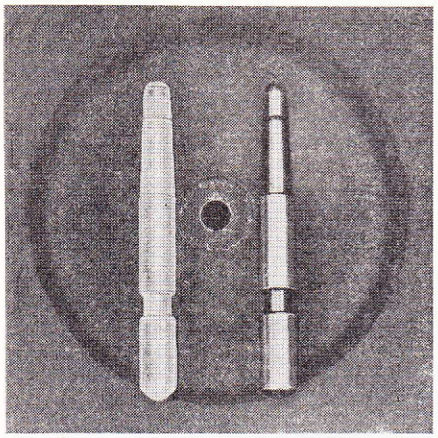


Fig. 7—Poystyrene turntable shaft at left was made cheaply by a machinist.

C2 and by varying the distance between the needle and the metal plate on the pickup (and, of course, by selecting the right frequency on which to operate the oscillator).

There are several other ways of recovering the audio, but experimenters will think of them all and probably improve them, too. In general, the method of Fig. 6 is probably the easiest, though not the kindest to the neighbors, as it may interfere with their radio reception. It is best, for a permanent unit, to make a demodulator of some kind and put a shield around it and the oscillator so that as little r.f. as possible is sprayed into the surrounding air to interfere with the neighbors' radio reception.

It's really surprising that with such simple equipment and so little work you can make such a fine pickup. When better records are made, the FM player will be waiting for them!

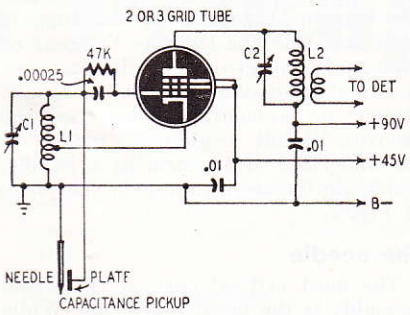
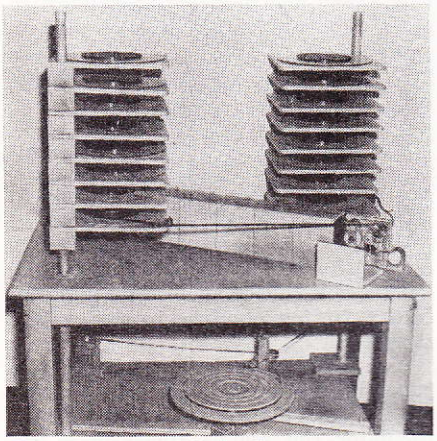



Fig. 8—Output of this circuit can be fed to either an FM or AM demodulator.

# Magnetic Tape "Contact Prints"



This experimental duplicator can turn out 960 hours worth of program daily.

MAGNETIC recording has a number of advantages over disc recording and, conversely, several disadvantages. One of its most serious drawbacks is the relative difficulty of duplicating recordings. Disc records are printed by the hundreds from a metal master disc. Tape records have been reproduced by re-recording, a much slower and more expensive process.

The announcement of a magnetic method of printing magnetic tapes by a process similar to that used for discs may herald a new advance in the acceptance of this new recording medium. A duplicating machine can turn out eight 1-hour reels every 2 minutes (using double-track tape and running the tape at a speed of 10 feet per second). A machine of this type has a conservative output of 960 hours of recording per day, the equivalent of well over 10,000 4-minute discs.

The process is actually very simple. A recorded tape and a blank one are held in contact with each other and passed through a high-frequency magnetic field, called the "transfer field," which produces a distortionless magnetization of the copy tape. See Fig. 1. Frequency of the transfer field current may be as low as 60 cycles and higher than 100 kc, though in practice frequencies close to those used in regular tape recording have been best.

It has long been known that, if a blank tape is held in close contact with a magnetized one, it will pick up the magnetic pattern. But the recording so picked up is very weak, and its level does not vary linearly with that of the "master." The transfer field changes all that. Level is within a few decibels of the master, and distortion is low.

The master tape is made of durable material having high magnetic retentivity. Mechanical ruggedness is essential, as it may have to make thousands of copies. The requirement of high retentivity is due to the transfer field. If this field is strong, there is a tendency to demagnetize the master tape. Yet it is in just such a strong field that the best record is made on the copy tape. Thus the easier it is to magnetize the copy, the more likely it is that the master will be harmed. Good results are obtained with a copy tape of easily magnetized material and a transfer field held just below the point at which it demagnetizes the master.

The copy is a mirror image of the master. This caused no difficulty in single-track tapes, but an attempt to play back some of the increasingly popular double-track and stereophonic recordings resulted in the copy's always playing backward. To avoid this difficulty, the master record runs backward, producing copies which play correctly on a standard machine.

In a practical machine, such as the one in Fig. 2, the beginning and end of the master tape are spliced together to form an endless belt. The extra length of long tapes can be handled by winding around drums or in a number of other ways. The tape is then run through a number of copying heads, each with its own transfer field, to produce as many recordings as desired. The process is continuous, and the master tape itself is not affected by the copying (except as noted above).

The process was developed independently but almost simultaneously by Marvin Camras of the Armour Research Foundation and Robert Herr of Minnesota Mining and Manufacturing Co. The information above draws on both those sources. The illustrations, however, are all from Armour.

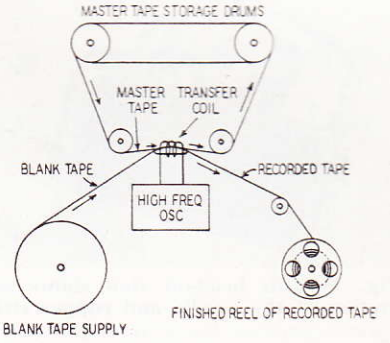



Fig. 1.—Master tape contacts copy in a magnetic field set up by transfer coil.

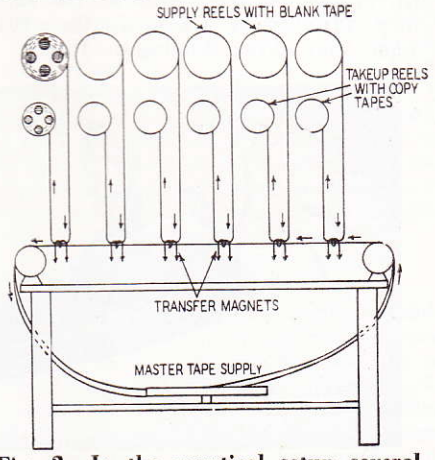



Fig. 2—In the practical setup several copy tapes are made at the same time.

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