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INTERCHANGEABLE MAGNETIC TRANSDUCER AND SWITCHING SYSTEM

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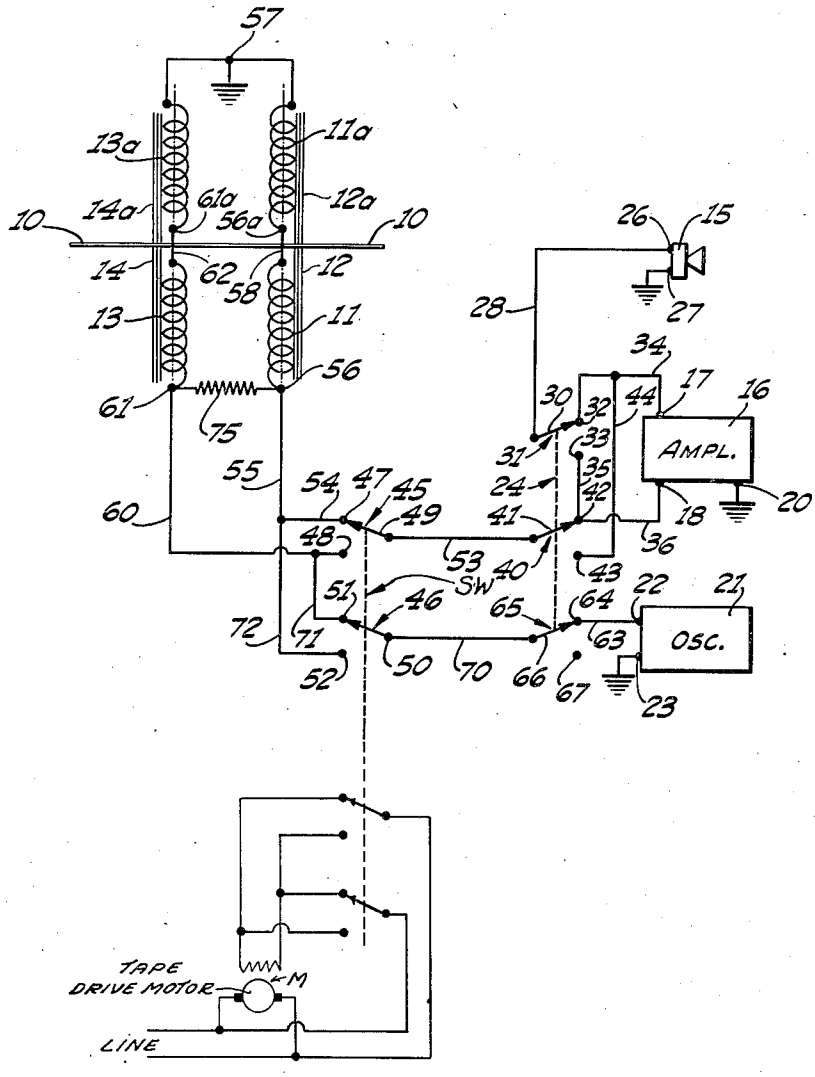

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INTERCHANGEABLE MAGNETIC TRANSDUCER AND SWITCHING SYSTEM

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This invention relates generally to magnetic recording systems and more particularly to such systems making use of a ferro-magnetic tape on which a plurality of recordings are sequentially made in a series of laterally displaced lanes.

While the use of a ferro-magnetic material to record and reproduce sound was advocated by Poulsen many years ago, it is only recently that this system has acquired any popularity. The poor quality of the sound which was reproduced by such a system was due largely to the quality of the materials then available, but an additional disadvantage was in the length of wire or tape necessary to make a recording of any considerable length.

With the improved materials now available the quality of the sound reproduced has been greatly improved, but the disadvantage of the length of recording medium used has been only partially overcome. Recorders are now available which make use of a very fine wire travelling at a relatively high speed between a pair of recording magnets which magnetize the wire in accordance with the frequency and amplitude of the sound to be recorded. This wire is later passed between a pair of reproducing magnets which receive the magnetic impulses on the wire and translate them into sound. However, while the size of the wire has now been reduced to a point where it is possible to store a great length of it on a reel of relatively small size, this wire is so small that it may easily be broken, and the time necessary to rewind this great length of wire becomes a very appreciable factor.

It has been suggested that a metallic tape of ferro-magnetic material be substituted for the wire previously mentioned, and that the tape be magnetized in a relatively narrow lane extending the length of the tape. When the entire length of tape has been magnetized in a manner generally similar to that discussed above, the relative position of the tape and recording magnet is shifted so that a second lane, laterally displaced from the first lane, is then recorded on the tape, the direction of travel being opposite to that first used. With such a system, the length of tape may be greatly shortened, the time necessary for rewinding is greatly reduced, and the physical strength of the recording medium is increased so that it is no longer such a fragile and delicate article.

As is well known in the art, the magnetic effect of one recordation is generally removed by passing the magnetic recording medium between the poles of an electro-magnet having a high

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frequency alternating current impressed thereon. The frequency of this current is chosen to be above the response of the human ear and is known as a supersonic frequency. In addition, it has been found that the use of a supersonic ferquency in the recording of sound, where it may be called a bias frequency, improves the quality of the later reproduced sound by improving the frequency response of the system, by decreasing the so-called "low level" distortion, and by reducing the background noise so that the signal-to-noise ratio is increased. Further information on this subject is given in an article entitled "Supersonic bias for magnetic recording," by Holm and Clark on page 126 of "Electronics" for July 1945.

Previous multiple lane magnetic tape recorders have made use of three sets of electro-magnets connected so that either the inner set acted as the recording and reproducing magnet, and the outer sets were selectively connected to a source of supersonic frequency current, or vice versa. These outer sets of magnets are known as erasing magnets and are not energized when sound is being reproduced from the tape. However, when sound is being recorded, the erasing magnets are energized so that the tape is first subjected to the supersonic frequency of one of the erasing magnets and then passes between the poles of the recording magnet. The remaining erasing magnet is not energized at this time so that the magnetic record remains on the tape. When the direction of travel of the tape is reversed, the erasing magnet which was previously not energized is then connected to the source of supersonic frequency, and the previously energized erasing magnet is disconnected therefrom. It is to be understood, of course, that the relative lateral positions of the tape and magnets have been shifted when the tape reverses its direction. While such a system has worked very satisfactorily and has been the simplest form of construction, with the demand for smaller and still smaller recording instruments, it has become desirable to eliminate as many parts as possible, and make those which must remain serve dual purposes. It is to be understood that many various phenomena may be recorded and reproduced besides sound, but since such devices generally find their greatest usefulness in connection with sound recording and reproduction, that use is explained herein.

It is therefore the major object of this invention to provide a magnetic recording device having a plurality of electro-magnets each of which

may be used to erase, make, or reproduce a record.

Another object is to provide a device of this type wherein a predetermined voltage of supersonic frequency is impressed upon one electromagnet to produce the erasing effect, while a portion of that same voltage is simultaneously used to provide the necessary bias for the recording of sound.

It is a further object of this invention to provide an electrical circuit which may be designed to produce the proper ratio of magnetic effects in the erasing and recording electro-magnets, which ratio, when once secured, need not be further adjusted.

Still another object of the invention is to produce a device of this type wherein all switching is done with very few controls, at least one of which may be operated automatically.

It is a still further object to provide such a device which is simple and fool proof in operation, and economical to manufacture.

These and other objects and advantages of the invention will become apparent from the following description of a preferred form thereof, and from the drawings in which the single figure indicates a schematic wiring diagram of a portion of a recorder incorporating this invention.

In the drawing, the numeral 10 indicates a tape of ferro-magnetic material of any known and suitable type which is sufficiently wide to accommodate a plurality recording lanes, and long enough to operate continuously and record the desired sound without repeating its passage over any of the previously recorded lanes. The tape 10 is driven by a constant speed reversible motor M of any suitable type in any of various well known manners, the motor M being here conventionally indicated as controlled by switch Sw, which is adapted to reverse the polarity of the field of the motor relative to its armature. If desired the motor may be reversed automatically when one end of the tape reaches the electromagnets hereinafter described. Various methods of effecting this reversal are known, one such method being shown in the copending application of Herman S. Heller, Serial No. 608,734 filed August 3, 1945. Located on opposite sides of the tape 10 is a first pair of electro-magnets 11 and 11a having cores 12 and 12a adapted to bear against the tape as it passes between the magnets. Such magnets and cores are well known in the art and are designed so that the surface of the core which touches the tape 10 is very narrow in the direction of tape travel. As a result, any magnetic flux developed within the electro-magnets 11 aind 11a is concentrated by the cores 12 and 12a so that only a very small area of tape 10 is magnetized at any given instant. The cores 12 and 12a are aligned, and the electro-magnets 11 and 11a are so energized that they cooperate to aid each other in producing a transverse magnetization of the tape. When the electro-magnets 11 and 11a are energized, the movement of tape 10 past the pole pieces 12 and 12a will result in a magnetized lane being formed in the tape.

Aligned with electro-magnets 11 and 11a is a second pair of electro-magnets 13 and 13a having pole pieces 14 and 14a which bear against opposite sides of magnetic tape 10. In general, electro-manets 11, 11a, 13 and 13a are identical, as are pole pieces 12, 12a, 14, and 14a. In addition, pole pieces 14 and 14a are located with respect to tape 10 so that they cover the same lane as pole pieces 12 and 12a. Consequently, if tape 10 is moved from left to right, a portion of the tape will rub against pole pieces 14 and 14a, and the same portion or lane will then rub against pole pieces 12 and 12a. It is therefore possible, as previously discussed, to erase or demagnetize a lane on tape 10 and immediately thereafter impress a magnetic record on that same lane. It is to be understood, of course, that pole pieces 14 and 14a are aligned as are pole pieces 12 and 12a, and electro-magnets 13 and 13a are connected to aid each other in transmitting magnetic flux through tape 10.

As previously mentioned, while this device is adapted, when used with appropriate equipment, to record and reproduce various phenomena, the particular embodiment herein described and shown is adapted to record and reproduce sound. Consequently, in the drawing an electro-acoustic transducer 15 is shown which may be of any suitable type, and in some instances is preferably one which will convert acoustical energy into electrical energy and also convert electrical energy into acoustical energy. However, the question of whether the transducer is to be a single unit adapted to convert energy from one form to the other, or whether it is to take the form of two separate units such as a microphone and loudspeaker, is a matter which will generally be determined by the particular application which is to be made of the device. An amplifier 16 is also provided, having an input terminal 17, an output terminal 18, and a common terminal 20. An oscillator 21 is provided with a pair of output terminals 22 and 23 to supply the supersonic current necessary in erasing and providing the necessary bias for recording, and both the amplifier 16 and oscillator 21 may be of any well known type which in and of themselves are not new and form no part of our invention except as they may cooperate and be combined with other elements of the device. A gang switch 24, hereinafter described in greater detail, is provided to make the necessary changes in connections to convert the system from a recording to a reproducing device. Another switch, of which a portion 25 is shown, is provided to reverse the motor driving the tape 10 and to change the various connections to the electro-magnets 11, 11a, 13 and 13a, as hereinafter described.

As shown in the drawing, the transducer 15 is provided with a pair of terminals 26 and 27, one of which, here shown as terminal 27, is grounded or otherwise connected to a common conductor. Terminal 26 is connected by conductor 28 to movable contact 30 of one unit 31 of switch 24. Movable contact 30 is adapted to bear against and complete a circuit to either of two fixed contacts 32 or 33, of which contact 32 is connected by conductor 34 to input terminal 17 of amplifier 16, while contact 33 is connected by conductors 35 and 36 to output terminal 18 of the amplifier. With switch 24 in the position shown in the drawing, where, as hereinafter pointed out, it is placed when a recording is to be made, the electrical output of the transducer 15 is connected to the input circuit of amplifier 16.

Switch 24 is also provided with a switch section 40 having a movable contact 41 adapted to bear against either a fixed contact 42 or a fixed contact 43, and the movable contacts 41 and 30 of sections 40 and 31 respectively are mechanically linked together so that they operate in synchronism to transfer movable contact 30 from fixed contact 32 to fixed contact 33 at the same time that movable contact 41 is transferred from fixed contact 42 to fixed contact 43. Output terminal 18 of am-

plifier 16 is connected by conductor 36 to fixed contact 42, from whence conductor 35 connects to fixed contact 33, while conductor 44 connects fixed contact 43 to conductor 34.

The portion 25 of the reversing switch includes a pair of switch sections 45 and 46, each consisting of a single pole double throw switch. Section 45 includes a movable contact 49 adapted to bear against fixed contact 47 or fixed contact tact 48, and section 46 includes a movable contact 50 adapted to bear against a fixed contact 51 or a fixed contact 52. The movable contacts 49 and 50 are mechanically linked to each other and to the motor reversing portions of the switch so that the position of the movable contacts is shifted when the direction of rotation of the motor is reversed.

Movable contact 49 of section 45 is connected by conductor 53 to movable contact 41 of the switch section 40, previously described; and fixed contact 47 is connected by conductors 54 and 55 to one terminal 56 of electro-magnet 11. The other terminal of electro-magnet 11 is connected by conductor 58 to terminal 56*a* of electromagnet 11*a*, the other terminal of which is grounded at 57, and the connections are such that the electro-magnets 11 and 11*a* are connected in series aiding. The other fixed contact 48 of section 45 is connected by conductor 60 to one terminal 61 of electro-magnet 13, the other terminal of which is connected by conductor 62 to terminal 61*a* of electro-magnet 13*a*, the remaining terminal of which is grounded at 57. Electro-magnets 13 and 13*a* are thus connected in series aiding, similar to electro-magnets 11 and 11*a*.

From the foregoing it will be seen that electrical energy delivered to movable contact 41 of switch section 40 will be transmitted to switch section 45, where, with the switch in the position shown in the drawing, the energy will be transmitted to electro-magnets 11 and 11*a* to produce a magnetizing force therein which is recorded upon the moving tape 10. Under these conditions, electro-magnets 13 and 13*a* receive no energy from movable contact 41, but when the reversing switch is moved to its alternate position, movable contact 49 bears against fixed contact 48 to direct the electrical energy to electro-magnets 13 and 13*a*, simultaneously disconnecting electro-magnets 11 and 11*a* from this source.

To provide the necessary electrical energy of supersonic frequency for erasing and for biasing the recording electro-magnet, output terminal 22 of oscillator 21 is connected by conductor 63 to fixed contact 64 of a switch section 65. This switch section forms a portion of switch 24 and has a movable contact 66 adapted to bear against fixed terminal 64, or to bear against a stop 67 where no circuit is completed. From movable contact 66, connection is made by conductor 70 to movable contact 50 of switch section 46 in the reversing switch, of which fixed contact 51 is connected by conductors 71 and 60 to electro-magnets 13 and 13*a*, while fixed contact 52 is connected by conductors 72 and 65 to electro-magnets 11 and 11*a*. In addition, a resistor 75 is connected between terminals 56 and 61 of electro-magnets 11 and 13.

The circuits for the various elements of the system may now be traced. Consider first the case where the switch 24 is in the position shown in the drawing, the recording position, and switch 25 is in the position indicated, corresponding to the movement of tape 10 from left to right. The electrical energy from the transducer 15 is transmitted from terminal 26 through conductor 28, movable contact 30, fixed contact 32, and conductor 34 to input terminal 17 of amplifier 16 from whence it returns through grounded terminal 20 to terminal 27 of the transducer. The output of amplifier 16 is transmitted from terminal 18 through conductor 36, fixed contact 42, movable contact 41, conductor 53, movable contact 49, fixed contact 47, conductors 54 and 55, to one terminal 56 of electro-magnet 11 and then through conductor 58 and electromagnet 11*a*, from when it returns through grounded terminal 57 to grounded terminal 20 of amplifier 16.

At the same time, the output of oscillator 21 is transmitted from terminal 22 through conductor 63, fixed contact 64 and movable contact 66 to conductor 70. From there, the energy is transmitted through movable contact 50, fixed contact 51, and conductors 71 and 60 to terminal 61 of electro-magnet 13, from whence it returns through grounded terminal 57 to terminal 23 of the oscillator. In addition, a portion of the energy appearing in conductor 60 is transmitted through voltage dropping impedance 75, preferably a resistor, to terminal 56 of electro-magnet 11 from whence it returns to grounded terminal 57 to terminal 23. By selecting the proper value for resistor 75, the amount of power from amplifier 16 which is transmitted through resistor 75 will have no effect upon the erasing function of electro-magnets 13 and 13*a*, while a sufficient amount of power from oscillator 21 will flow through the resistor to furnish the necessary biasing voltage for electromagnets 11 and 11*a*. As an example of the relative magnitudes of the erasing and biasing voltages, but not as a limitation, it has sometimes been found desirable to make the erasing voltage 150 volts, and the biasing voltage 40 volts. In this way, a supersonic recording bias is provided in addition to the erasing power supplied by the oscillator 21.

Heretofore, it has been assumed that tape 10 has been moving from left to right, so that electro-magnets 13 and 13*a* which have a supersonic frequency impressed upon them, act as erasing magnets to remove any signal which may have been on that particular lane of the tape, and the electro-magnets 11 and 11*a* then act as recording magnets to selectively magnetize the tape in accordance with the combined output of amplifier 16 and of oscillator 21 as reduced by resistor 75. As the end of tape 10 approaches the electromagnet, however, switch 25 is thrown to its other position, the motor driving the tape is reversed, and all of the electro-magnets are laterally displaced with respect to the tape so that recording is done in a new lane, as previously described. When the portion 25 of the reversing switch is thrown to its opposite position, the output of amplifier 16 appearing on movable contact 49 of switch section 45 is transmitted through fixed contact 48 and conductor 60 to terminal 61 of electro-magnet 13 from whence it is returned through grounded terminal 57 to terminal 20 of the amplifier. Similarly, the output of oscillator 21 appearing on movable contact 50 of switch section 46 is transmitted through fixed contact 62, conductor 72, and conductor 55 to terminal 56 of electro-magnet 11 from whence it returns through grounded terminal 57 to terminal 23. Consequently, the full output voltage of oscillator 21 is applied to electro-magnets 11 and 11*a*, while

a reduced or biasing voltage is applied to electro-magnets 13 and 13a. Electro-magnets 11 and 11a now become the erasing magnets, while electro-magnets 13 and 13a, which are now connected to amplifier 16, become the recording electro-magnets. Tape 10 is now being driven from right to left, so that electro-magnets 11 and 11a first erase the lane in which the recording is to be done, and electro-magnets 13 and 13a then record in that same lane.

When it is desired to reproduce the sound which has been recorded on tape 10, the tape is placed so that it is properly located with respect to the electro-magnets 11, 11a, 13, and 13a and the motor reversing switch is placed so that the tape will be driven in the same direction as it was when the sound was recorded. If this position is the same as that shown in the drawings, switch 24 is thrown to the lower or opposite position to that shown in the drawing, and the reproduction is heard from the transducer 15. Under these conditions, the selectively magnetized tape 10 passes between the pole pieces 12 and 12a to induce minute electrical currents in electro-magnets 11 and 11a. These currents are transmitted through conductors 55 and 54, fixed contact 47, movable contact 49, conductor 53, movable contact 21, fixed contact 43, conductor 44 and conductor 34 to the input terminal 17 of amplifier 20 from whence the circuit is completed through grounded terminals 20 and 57. The output of amplifier 16 is transmitted from terminal 18 through conductors 36 and 35 to fixed terminal 33 and then through movable contact 30 and conductor 28 to terminal 26 of the transducer 15 from whence the circuit is completed through grounded terminals 27 and 20. When so used, electric currents are also generated in the electro-magnets 13 and 13a, but it will be seen, by following the possible paths of the current, that the circuit, from terminal 61, through conductors 60 and 71 to fixed contact 51, and then through movable contact 50, conductor 70 and movable contact 66, is not completed so that no use is made of electro-magnets 13 and 13a under these conditions. Similarly, the output of oscillator 21 is not connected to any current-using device when the system is reproducing the previously recorded sound.

When the end of tape 10 approaches electro-magnets 11 and 11a, the reversing switch is operated and the direction of travel of tape 10 is reversed. When this occurs, movable contact 49 is transferred from fixed contact 47 to fixed contact 48 to connect electro-magnets 13 and 13a to conductor 53 through conductor 69. Similarly, movable contact 50 is transferred from fixed contact 51 to fixed contact 52 so that electro-magnets 11 and 11a are connected through conductors 55 and 72 to conductor 70. Since, however, as previously explained, no circuit is completed by conductor 70, the voltage generated in electro-magnets 11 and 11a is not used under these conditions, but the voltage developed in electro-magnets 13 and 13a is transmitted through movable contact 41 and fixed contact 43 to input terminal 17 of amplifier 16 as previously described, and the resulting amplified voltage is used to operate transducer 15.

From the foregoing it will be seen that a new and improved system for use with magnetic recording and reproducing has been devised. It has heretofore been necessary to use three sets of electro-magnets, instead of two, using the center electro-magnet for recording and reproducing only, while the outside electro-magnets were alternately connected for erasing purposes whenever recording was being done. As previously mentioned, certain prior devices have reversed this, and used the center electro-magnet for erasing, and the outer electro-magnets for recording and reproducing, but still using three electro-magnets. Since the electro-magnets with their cores are relatively expensive, and switches are relatively cheap, it will readily be seen that the present method of construction provides a more economical unit, and one which has its space requirements greatly reduced. In addition, the system provides the correct amount of supersonic bias for recording sound without regard to which of the electro-magnets is recording and which is erasing. This biasing voltage is supplied at all times when a recording is being made, and will be substantially unvarying regardless of which of the coils is recording.

It is to be understood, of course, that this recording device is not limited to the recording and reproducing of sound alone, since any phenomenon, such as light, which is capable of being translated into electrical energy, may be recorded on the tape 10 and reproduced at some later date.

It will be apparent that modifications may be made in this device without departing from the spirit of the invention as disclosed herein, and the latter is not to be limited to the particular form or arrangement of parts herein described and shown or limited by the following claims.

We claim:

1. A magnetic recording and reproducing device in which the recording medium is a ferro-magnetic tape having a plurality of laterally displaced recording lanes, and which includes: reversible means to drive said tape; an electro-magnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; an oscillator; means operable to reverse said means driving said tape; and switching means synchronized with said reversing means to connect said transducer to one of said electro-magnets and said oscillator to the other of said electro-magnets when said tape is driven in one direction, and to interchange the connections of said electro-magnets to said transducer and oscillator when said tape is driven in the opposite direction.

2. A magnetic recording and reproducing device using a ferro magnetic tape having a plurality of laterally displaced recording lanes thereon as a record medium, and which includes: reversible means to drive said tape; an electro-magnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; an oscillator; means operable to reverse said tape driving means; switching means synchronized with said reversing means to connect said transducer to one of said electro-magnets and said oscillator to the other of said electro-magnets when said tape is driven in one direction, and to connect said transducer to said last mentioned electro-magnet and said oscillator to the other of said electro-magnets when said tape is driven in the opposite direction; and selectively operable switching means acting to con-

nect said transducer for recording and to complete the connection of one of said electro-magnets to said oscillator when in one position, and to connect said transducer for reproducing and to disconnect said oscillator when in the other position.

3. In a magnetic recording device using a ferromagnetic tape recording medium adapted to receive a plurality of laterally displaced recording lanes thereon, and having a transducer and an oscillator, the combination of: reversible means to drive said tape; an electro-magnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a voltage dropping impedance connected between said electro-magnets; means adapted to reverse the direction of travel of said tape; and switching means operated in synchronism with said reversing means to connect said transducer directly to one of said electro-magnets, and adapted to connect said oscillator directly to the other of said electro-magnets when said tape is driven in one direction, and to connect said transducer directly to said last mentioned electro-magnet and adapted to connect said oscillator directly to the other of said electro-magnets when said tape is driven in the opposite direction.

4. In a magnetic recording device using a ferromagnetic tape recording medium adapted to receive a plurality of laterally displaced recording lanes thereon, and having a transducer, an amplifier connected to said transducer, and an oscillator, the combination of: reversible means to drive said tape; an electro-magnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; an impedance connected between said electro-magnets; means adapted to reverse the direction of travel of said tape; switching means operated in synchronism with said reversing means to connect said amplifier directly to one of said electro-magnets, and adapted to connect said oscillator directly to the other of said electro-magnets when said tape is driven in one direction, and to connect said amplifier directly to said last mentioned electro-magnet and adapted to connect said oscillator directly to the other of said electro-magnets when said tape is driven in the opposite direction; and selectively operable switching means connected between said synchronously operated switching means, and said amplifier and oscillator to connect, when in one position, said transducer to the input of said amplifier, the output of said amplifier to one set of contacts of said synchronous switching means, and said oscillator to another set of contacts of said synchronous switching means, and to connect, when in another position, said transducer to said output terminals of said amplifier, said input terminals of said amplifier to said first mentioned set of contacts of said synchronous switching means, and disconnect said oscillator from said other set of contacts of said synchronous switching means.

5. A magnetic recording device in which the recording medium is a ferro-magnetic tape having a plurality of laterally displaced recording lanes, and which includes: reversible means to drive said tape; a first electro-magnet having a core adapted to bear against said tape; a second

electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; an oscillator; means operable to reverse said means driving said tape; switching means comprising a plurality of switch sections operated in synchronism with said reversing means, each of said sections having a movable contact and a first and second fixed contact; means connecting said first fixed contact of one of said switch sections to said first electro-magnet; means connecting said second fixed contact of said switch section to said second electro-magnet; a resistor; means connecting one terminal of said resistor to said first electro-magnet, and the other terminal of said resistor to said second electro-magnet; means connecting said second fixed contact of a second of said switch sections to said first electro-magnet; means connecting said first fixed contact of said second switch section to said second electro-magnet; means connecting said movable contact of said second switch section to said oscillator; and means connecting said movable contact of said first mentioned switch section to said transducer.

6. A magnetic recording device using a ferromagnetic tape having a plurality of laterally displaced recording lanes thereon as a record medium, and which includes: reversible means to drive said tape; a first electro-magnet having a core adapted to bear against said tape; a second electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; an oscillator; an amplifier; means operable to reverse said tape driving means; switching means comprising a plurality of switch sections operated in synchronism with said reversing means, each of said sections having a movable contact and a first and second fixed contact; means connecting said first fixed contact of one of said switch sections to said first electro-magnet; means connecting said second fixed contact of said switch section to said second electro-magnet; a resistor; means connecting one terminal of said resistor to said first electro-magnet and the other terminal of said resistor to said second electro-magnet; means connecting said second fixed contact of a second of said switch sections to said first electro-magnet; means connecting said first fixed contact of said second switch section to said second electro-magnet; a record-reproduce switch means comprising a plurality of switch section each having a movable contact adapted to complete a circuit to either of a first and second fixed contact; means connecting said transducer to said movable contact of a first switch section; means connecting said first fixed contact of said first switch section to the input of said amplifier; means connecting said second fixed contact of said first switch section to said output of said amplifier; means connecting said second fixed contact of a second switch section to said input of said amplifier; means connecting said first fixed contact of said second switch section to said output of said amplifier; means connecting said movable contact of said second switch section of said record-reproduce switch means to said movable contact of said first switch section of said first mentioned switch means; means connecting a first fixed contact of a third switch section of said record-reproduce switch means to said oscillator; and means connecting said

movable contact of said third switch section of said record-reproduce switch means to said movable contact of said second switch section of said first mentioned switch means.

7. A magnetic recording and reproducing device in which the recording medium is a ferromagnetic tape having a plurality of laterally displaced recording lanes, and which includes: reversible means to drive said tape; an electromagnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; an oscillator; means operable to reverse said means driving said tape; and circuit means including switching means synchronized with said reversing means to connect said transducer to one of said electro-magnets and said oscillator to the other of said electro-magnets to supply an oscillator erasing voltage thereto when said tape is driven in one direction, and to interchange the connections of said electro-magnets to said transducer and oscillator when said tape is driven in the opposite direction, and voltage reducing means included in said circuit means controlled automatically by said switching means to supply a reduced oscillator biasing voltage to the electro-magnet to which said transducer is connected at any given time by said switching means.

8. A magnetic recording and reproducing device in which the recording medium is a ferromagnetic tape having a plurality of laterally displaced recording lanes, and which includes: reversible means to drive said tape; an electromagnet having a core adapted to bear against said tape; another electro-magnet having a core adapted to bear against said tape at a point laterally aligned and longitudinally displaced on said tape with respect to said first mentioned core; a transducer; a source of erasing current; means operable to reverse said means driving said tape; and switching means synchronized with said reversing means to connect said transducer to one of said electro-magnets and said source of erasing voltage to the other of said electro-magnets when said tape is driven in one direction, and to interchange the connections of said electro-magnets to said transducer and source of erasing voltage when said tape is driven in the opposite direction.

9. A combination as defined in claim 8, in which said source of erasing voltage is a supersonic oscillator, and in which a voltage dropping resistor is connected between said electro-magnets to furnish a biasing voltage to the electro-magnet to which the transducer is connected at any given time by said switching means.

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