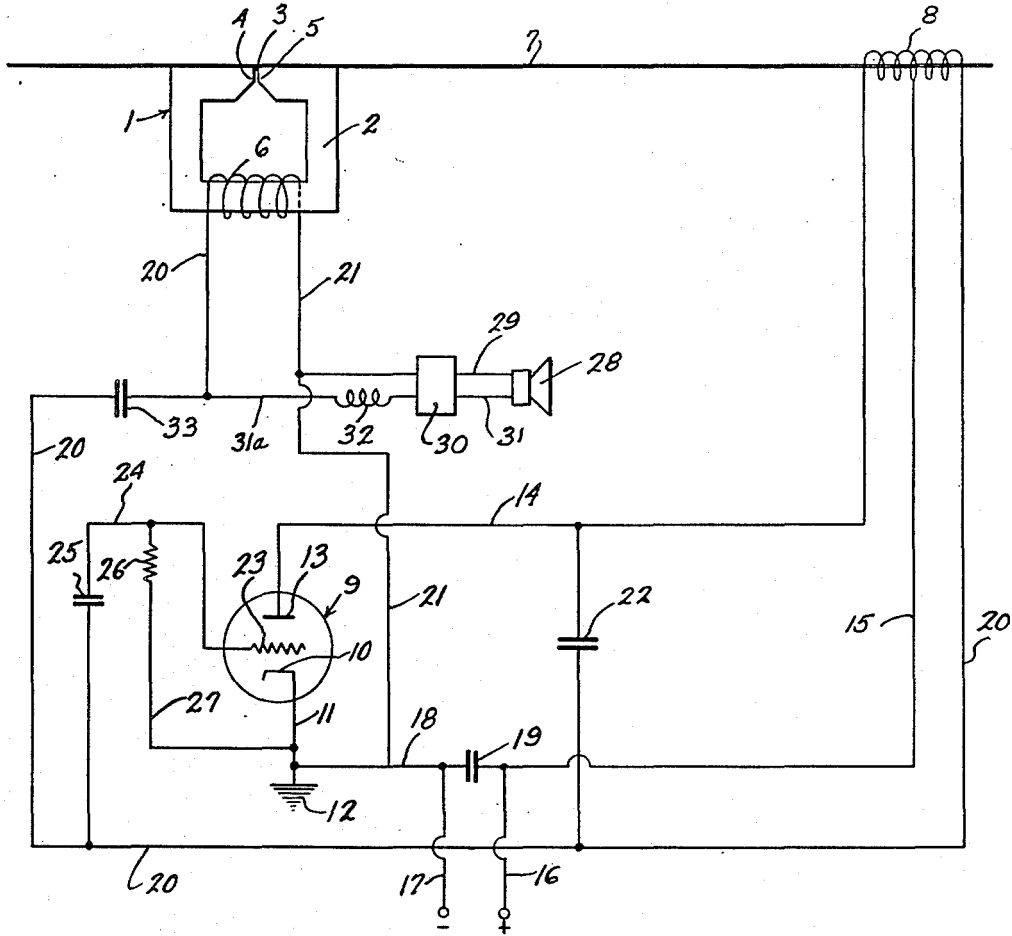


June 13, 1944.

M. CAMRAS
COMBINATION OSCILLATOR COIL AND ERASING
HEAD FOR MAGNETIC RECORDERS
Filed Nov. 18, 1942

2,351,009



INVENTOR
MARVIN CAMRAS.

BY Charles W. Stills ATTORNEY

UNITED STATES PATENT OFFICE

2,351,009

COMBINATION OSCILLATOR COIL AND ERASING HEAD FOR MAGNETIC RECORDERS

Marvin Camras, Chicago, Ill., assignor to Armour Research Foundation, Chicago, Ill., a corporation of Illinois

Application November 18, 1942, Serial No. 465,968

5 Claims. (Cl. 179—100.2)

This invention relates to a combination oscillator coil and erasing head for a magnetic recorder, although the invention has a broader aspect in the provision of a novel circuit and apparatus arrangement for a magnetic recording device or similar apparatus, as is apparent to one skilled in the art.

In a magnetic recording device, wherein a sound recording is made by magnetizing an elongated traveling recording medium such as a paramagnetic tape or wire, it is desirable to provide means for demagnetizing the recording medium prior to the recording magnetization. With a demagnetizing arrangement or erasing head, it is possible to place a new recording upon a wire or other medium already having a recording thereon, without the necessity of first demagnetizing the medium in a separate operation before running it through the recording device.

Magnetic recording devices may be made in the form of a compact instrumentality for easy transportation. Such an instrument, of course, embodies complicated electrical circuits including oscillatory, amplifying and various other types of circuits, and in most instances the electrical apparatus and wiring is crowded into a relatively small space. The crowded condition is increased in the event the instrument is of the type that both makes a recording and also reproduces a made recording since a speaker and further circuit arrangement are then added. It is further desirable, therefore, to keep the instrument as compact as possible in size and yet not sacrifice any useful equipment or arrangement in the electrical circuits.

With the foregoing in mind, it is an important object of the instant invention to provide a circuit and apparatus arrangement for a magnetic recording device wherein an instrumentality embodied in and forming a part of an electrical circuit is caused to perform an additional function extraneous to the particular circuit in which it is included, and thus eliminate the necessity of providing additional means to perform that additional function.

Another object of the invention resides in the provision of a circuit and apparatus arrangement for a magnetic recording device wherein an inductance coil is included in the recording circuit, and this inductance coil is given a position other than that which it would usually occupy, so that the inductance coil performs an additional function extraneous to the function it performs in the particular circuit in which it is included.

Still another feature of the invention resides

in the provision of a magnetic recording arrangement including an oscillatory circuit, and wherein the oscillating coil from that circuit is made to perform an additional and extra function outside of its normal function in the oscillatory circuit.

Still another feature of this invention resides in the provision of a magnetic recorder arrangement in which the magnetizing circuit includes an oscillating coil, which coil is positioned so that the recording medium will be affected by the coil before reaching the recording head of the apparatus, and so be demagnetized prior to being magnetized by the recording head of the apparatus.

A further object of the invention resides in the provision of a magnetic recorder arrangement wherein a high frequency oscillating coil forms a component part of the recording circuit, and wherein the same oscillating coil functions as an erasing head to demagnetize the recording medium prior to the actual making of the recording on that medium.

It is also an object of the invention to provide a magnetic recorder arrangement including an electrical circuit, with a component part of that electrical circuit performing the extra duty of functioning as an erasing head in connection with the paramagnetic medium upon which a recording is made.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawing, in which:

The single figure is a simplified diagrammatic illustration showing certain salient parts of the apparatus embodied in the magnetic recorder, together with a simplified electrical circuit, including means embodying principles of the instant invention.

As shown on the drawing:

In the illustrated embodiment of this invention there is shown a very simplified circuit and apparatus arrangement for a magnetic recorder. Many parts of the magnetic recorder and various other circuits which may be included in the magnetic recorder are omitted, since the invention centers itself in the recording circuit and immediately associated apparatus particularly.

In the upper portion of the figure there is shown a magnetic recording head generally indicated by numeral 1 which is in the form of an electromagnet. The head includes a core 2, preferably laminated, which in its upper leg is divid-

ed by a relatively narrow slot 3 to define opposite pole faces 4 and 5 adjacent the slot. Around another leg of the core 2 is a coil 6 to magnetize the core with a magnetic field varying in accordance with variations of the sound production being recorded. The coil 6 is energized by the output of an oscillatory circuit, and superposed upon this high frequency output of the oscillatory circuit is an audio frequency circuit connected with a microphone or other equivalent pickup device.

An elongated paramagnetic recording medium 7, which in the illustrated instance is shown in the form of a very fine round wire, travels over or through the top portion of the magnetizing head 1 during the making of a recording. Sections of this medium are successively magnetized as they pass over the slot 3 in the recording head in accordance with the variations of the sound being recorded. In many cases, it is desired to place another recording upon a wire which is already magnetized in accordance with a previous recording. It is not deemed desirable to take the wire and rewind it in some other location for purposes of demagnetizing the wire, which would result in two separate winding operations. With the apparatus illustrated, it is possible to record upon an already magnetized wire without the previous recording affecting the one being made in any degree. With this arrangement, the wire passes through or adjacent a demagnetizing or erasing head, illustrated in the form of a coil 8, on its way to the magnetizing head 1, so that when the wire actually reaches the magnetizing head, it is "clean" or thoroughly demagnetized. Thus, if a recording medium is already carrying a recording for which there is no further use, that same recording medium, normally wound upon a reel or spool, may be inserted in the instant machine, and operated just as though the medium were entirely demagnetized, because the medium actually will be demagnetized by the erasing head 8 before it reaches the recording head 1.

In a magnetic recording device, the recording head, together with oppositely disposed reels or spools upon which the recording medium is wound for travel in either direction, and associated apparatus such as guide pulleys and level winding elements are usually mounted upon a panel in a readily accessible position. The electrical apparatus and wiring therefore are usually disposed in compact association within a cabinet, and frequently if the particular recorder is made so that it will also reproduce a recording, the interior of the cabinet is in a rather crowded condition, since it is desirable to have the entire apparatus in as compact a form as possible. The crowded condition within the cabinet or casing would be further materially aggravated in the event a separate demagnetizing circuit was provided; i. e., an erasing head and circuit connections therefor in addition to the other electrical apparatus and wiring necessary to perform the recording and reproducing operations. The present invention seeks to simplify as much as possible the apparatus within the recorder casing and therefore rely upon an instrumentality which is a component part of one of the essential electrical circuits, repositions this instrumentality so that the recording medium 7 will pass through it on the way to the recorder head 1, and causes it to perform the additional function of demagnetizing the recording medium. This instrumentality, in order to acquire the dual result, is preferably disposed on the aforesaid panel in a

readily accessible position, and thus to acquire the benefit of the dual function, it is only necessary to mount the particular instrumentality in a location foreign to that which it would normally occupy if it were only to perform its particular function in the circuit in which it is embodied. Thus, a material amount of space, construction cost, and even operating cost is eliminated.

In the illustrated instance, the coil 8 is the high frequency oscillating coil of an oscillatory circuit, and is disposed out of its normal position so that the recording medium 7 will travel through this coil on its way to the recording head 1, and thus be demagnetized by the coil. The oscillating coil 8 is therefore made to function as an erasing head for the magnetic recording device, and it accomplishes this additional result while performing its necessary function as a component part of the oscillatory circuit.

The simplified circuit arrangement selected for illustration includes an oscillator tube 9 in the form of a triode which has its cathode 10 connected through a conductor 11 to a ground 12. The plate 13 of the tube 9 is connected through conductor 14 to one end of the aforesaid inductance coil 8, and an intermediate tap is taken on this coil by way of a conductor 15 which returns to a positive line wire 16. A negative line wire 17 is connected through conductor 18 to the aforesaid conductor 11. The two line wires 16 and 17 may be associated with any suitable source of direct current, and a by-pass condenser 19 is preferably connected across the line wires.

The opposite end of the inductance coil 8 is connected to a conductor 20 which leads to one end of the aforesaid coil 6 in the magnetizing head 1, and the opposite end of the coil 6 is connected through a conductor 21 to the aforesaid conductor 18. The conductor 20, of course, carries the output of the oscillatory circuit which includes the inductance coil 8 and a tuned circuit condenser 22 connected across the conductors 14 and 20 in parallel with the inductance coil 8.

The feed-back through the grid 23 of the tube 9 is through a conductor 24 connected at one end to the grid and at the other end to the oscillating circuit output conductor 20. The alternating component of the plate current passing through the inductance coil 8 will set up an oscillating current of high frequency in the oscillating circuit, and a grid blocking condenser 25 is included in the conductor 24 to keep the high voltage off the grid of the tube. A grid biasing resistance 26 is connected across the grid by a conductor 27 which joins the conductor 24 on the grid side of the blocking condenser 25 and connects with the ground conductor 11 from the cathode 10 of the tube.

As mentioned above, the lower or audio frequency circuit is superimposed upon the high frequency output of the oscillating circuit. This audio circuit includes a microphone 28 or equivalent sound pickup device connected at one side by a conductor 29 through a suitable amplifying arrangement, diagrammatically indicated at 30, to the aforesaid conductor 21 from the magnetizing coil 6. The other side of the pickup 28 is connected by way of conductor 31 to the aforesaid amplifier 30 and an output conductor 31a connects to conductor 20 leading from the other end of the magnetizing coil 6. In this conductor 31a a choke coil or the equivalent 32 is included which blocks out high frequency from the microphone circuit and passes low frequency. To pre-

vent low frequency current from the audio circuit reaching the oscillating circuit, a blocking condenser 33 is connected in the conductor 20 adjacent the junction between the conductor 20 and the conductor 31a.

The operation of the above described circuits is believed to be sufficiently apparent from the foregoing as not to warrant further description herein. It will suffice to say that the high frequency output of the oscillating circuit is imposed on the coil 6, and the low frequency current from the microphone circuit is superimposed on the high frequency from the oscillating circuit, to thus vary the high frequency current and cause variations in the magnetic field set up in the magnetizing head 1 in accordance with variations of sound being recorded on the medium 7.

The inductance or oscillating coil 8 would normally occupy a position within the casing of the apparatus much more closely to the condenser 22. However, by moving this inductance coil 8 to a position so that the recording medium 7 will have to pass through or by the inductance coil on its way to the magnetizing head so as to travel through the magnetic field of the coil, the inductance coil also performs the extra and added function of an erasing head, that is, it demagnetizes the medium prior to the medium reaching the recording head 1. Regardless of whether or not the recording medium is already magnetized in accordance with a previous recording, the high frequency alternating current in the coil 8 will demagnetize or clean the wire prior to its reaching the recording head 1. Thus, the disposition of the coil 8 not only eliminates the need for a complete demagnetizing circuit either in conjunction with the recording device or such a demagnetizing arrangement at some other location but eliminates the need for demagnetizing a wire in an entirely separate operation before the wire is used in the recording device. Not only are extra connections and the material therefor eliminated by virtue of the disposition of the coil 8, but the compactness of the entire recording device is enhanced, and there is not only a resultant saving of material but also a resultant saving in the cost of operation of the device since no more energy is used in the oscillating circuit above described than would be used if the demagnetizing operation were eliminated.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon other-

wise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a magnetic recording arrangement wherein a sound recording is made by magnetizing an elongated medium, a magnetizing head including a coil for magnetizing the medium, an oscillator arranged to feed said coil, said oscillator having a frequency determining circuit including an inductance coil, and said inductance coil being positioned so the medium must pass through the magnetic field produced thereby and be demagnetized before reaching said magnetizing head.

2. In a magnetic recording arrangement wherein a recording of fluctuating electrical energy is made by magnetizing an elongated medium, means for magnetizing the medium, an alternating current electrical circuit for energizing said means, a frequency determining coil in said circuit and forming a part thereof, and said coil being positioned to act on said medium and demagnetize the same before the medium is acted on by said means.

3. In a magnetic recording arrangement, a recording head to record by magnetizing a traveling elongated recording medium, an electrical circuit to energize said recording head including an oscillator, and a combination frequency determining coil and erasing head in said circuit through the magnetic field of which the medium travels on its way to said recording head.

4. In a magnetic recorder of the type wherein a traveling recording medium is successively magnetized in accordance with variations in electrical impulses, a high frequency oscillator circuit having a frequency determining coil therein, said frequency determining coil being disposed in such a position that the record medium passes in close proximity thereto, whereby said coil performs the dual function of erasing any previous magnetization on said record medium and also determines the frequency of oscillation of said oscillator circuit.

5. A magnetic recorder comprising a magnetizing coil, an erasing coil, said coils being arranged to have a traveling record medium pass through the magnetic fields produced thereby, and a source of high frequency oscillations arranged to supply high frequency electric energy to said magnetizing coil, at least a portion of said erasing coil also being a frequency determining element of said source of high frequency oscillations.

MARVIN CAMRAS,