

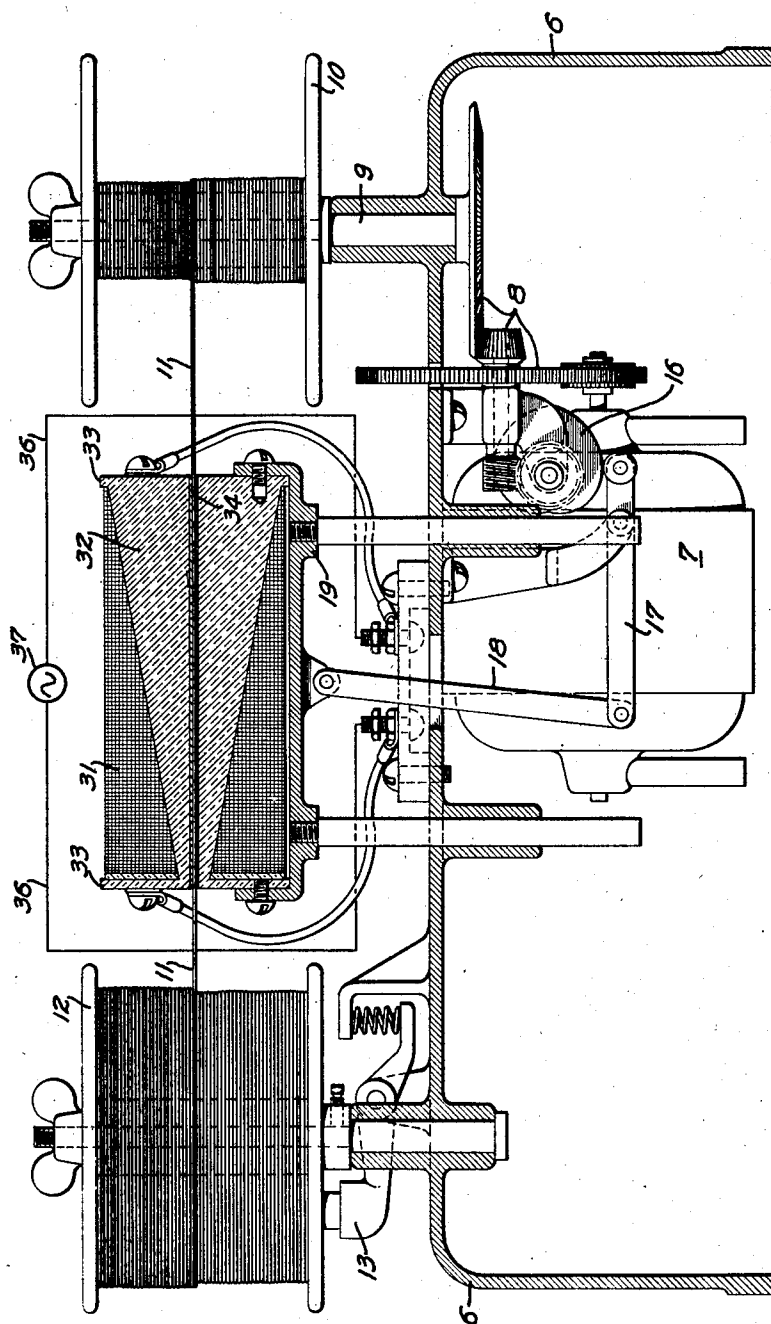
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C. W. RHODEHAMEL

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MAGNETIC RECORD WIPER

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INVENTOR
CARL W. RHODEHAMEL

BY *Charles S. Evans*
HIS ATTORNEY.

UNITED STATES PATENT OFFICE

CARL W. RHODEHAMEL, OF HOLLYWOOD, CALIFORNIA

MAGNETIC RECORD WIPER

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My invention relates to magnetic recorders of electrical impulses, and particularly to a method and apparatus for "wiping" the record, i. e., for removing from the record, preparatory to making a recording thereon, of such non-uniform magnetic polarizations as it may carry. These polarizations may result either from a previous intentional recording or from accidental influences to which it has been subjected in the course of manufacture or handling. Whatever the source of such polarizations, they will be referred to herein as "recordings".

An object of my invention is to provide a means of removing previous recordings more completely than has hitherto been possible.

Another object of my invention is to provide a means of preparing a magnetic record for receiving a recording in such a manner that mechanical vibrations of the record will not appreciably affect the reproduction therefrom.

Still another object of my invention is to provide a means of wiping the record such that even though residual polarizations be left upon the record, they will be of such a nature as to have substantially no effect upon reproduction therefrom.

My invention possesses other objects and valuable features, some of which will be set forth in the following description of my invention which is illustrated in the drawing forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said description and drawing, as I may adopt varying forms of my invention within the scope of the claims.

Magnetic records of electrical impulses are made by passing a steel wire, tape or disc at a constant rate between the polepieces of an electromagnet or magnets, whose coils carry a current corresponding to the impulses to be recorded. This polarizes elementary portions of the record, and if the impulses are cyclic in character, as is ordinarily the case, each cycle occupies a space on the record which is equal to the speed with which the record is traversed divided by the frequency of the impulses. This space may be called the "record wave-length" of the impulse. Ingen-

eral the polarizations are transverse to the direction of travel of the record, or of the recording coil if the record be the stationary member. Reproduction is accomplished by moving the record between the polepieces of a magnet similar to that with which the recording was made. This causes a changing flux thru the windings of the magnet, and if suitable reproducing mechanism is connected to its terminals, the original impulses are duplicated therein.

This system finds its primary use in the recording of telephonic or sound impulses, but it is also applicable to the reproduction of telegraphic, televisional or other cyclic or transient impulses.

One of the advantages of this method of recording is that the record may be "wiped", i. e., the polarizations comprising the recording be removed, and another recording formed on the same steel.

This permits of corrections to a record, and also greatly reduces the cost when the recording is needed for temporary use only. In the past the wiping has been accomplished by running the record over the poles of a magnet, thus impressing on it an unvarying polarization.

I have found, however, that a record so wiped will set up undesired and interferent potentials in the reproducing coils as a result of mechanical vibrations, and that subsequent recordings are masked by noises which are not present if the record is initially in a wholly unmagnetized state. Moreover, it is very difficult to remove completely all former recordings by this method, and "ghost" recordings consequently remain to confuse the later reproductions. My invention overcomes these difficulties.

Referring to the drawing:

The figure is a longitudinal sectional view of an embodiment of my invention adapted for wiping a magnetic record of the wire type. Portions of the electrical circuit are shown schematically.

Broadly considered, my method of wiping the record comprises demagnetizing the record, the demagnetizing field being preferably parallel to the direction in which the

record is traversed in recording and reproduction, and having a record wave length less than that of the highest frequencies that can be recognized in the output of the reproducing apparatus. This is accomplished in my apparatus by traversing the record with a spatially graduated alternating magnetic field at a rate such that the space traversed on the record by the field during a single cycle is less than the space required for the recording of a cycle of the highest frequency to be reproduced.

The embodiment of my invention which I have chosen for detailed description is adapted particularly to wiping a wire record, as this is the form of magnetic record which in practice has proved the most generally useful.

The wiping device may conveniently be made interchangeable with the recording and reproducing coil box on a wire handling mechanism comprising essentially a frame 6 which carries a motor 7, coupled by suitable gearing 8 to a spindle 9 on which is mounted a receiving reel 10. The wire 11 is fed from a delivery reel 12, which is prevented from over-running by a brake 13.

Geared to the spindle 9 is a spooling cam 16, operating a lever 17 which connects by a link 18 with a slide 19 on which the coil box or the wiping device is mounted. By this arrangement, the treated wire is spooled smoothly into place on the receiving reel, which may either be transferred to the delivery position when filled, or by a suitable gear mechanism the machine may be reversed and the functions of the two reels interchanged. This mechanism will not be described in detail here, however, since such devices are well known in the art, are not essential to the operation of my device, and would complicate the drawing unnecessarily.

The wiping mechanism which is mountable on the slide 19 comprises a coil 31 which is wound on a non-magnetic core 32 provided with end flanges 33. The core is conical in form, having a minimum diameter at the end adjacent the delivery spool, and increasing to substantially the full diameter of the end flange at the end adjacent the receiving spool. One coil used successfully consumed about five volt-amperes, giving a total magnetomotive force of about one thousand ampere turns. There is a wide latitude permissible in the design of the coil, depending on the wire speed, but the coil should be several record wave lengths along.

Thru the axis of the core is a small tubular guide 34 for holding the wire accurately in the longitudinal axis of the magnetic field of the coil.

It will be appreciated that the field from such a coil is spatially graduated, being intense at the end where the wire enters and

decreasing gradually to nil a short distance beyond where the wire leaves.

Supplying the coil 31 thru the leads 36 is a source 37 of alternating current. This source may be the ordinary city power supply, but I prefer to use a high frequency oscillator supplying current at a frequency of ten thousand cycles or more per second.

If the usual sixty cycle power supply is used, the driving mechanism is preferably geared down to move the wire at a much slower rate than that used for recording and reproduction, and wiping the wire is therefore a relatively slow process. Thus, if the normal recording speed is 5 feet per second, and the reproducing mechanism will respond to frequencies up to five thousand cycles per second, but not to higher frequencies, the shortest record wave length which will be reproduced will be $5/5000$ or .001 foot, and the record wave length of the wiping frequency is preferably less than this value. If sixty cycle current is used for wiping the record at the recording speed, the record wave length would be $5/60$ or .083 feet, or 83 times the minimum reproducible wave length, and in order to reduce it to the desired value, the record speed must be reduced to less than $1/83$ rd of the recording speed. A wiping speed of .05 feet per second would therefore be suitable in this case.

If the high frequency oscillator be used as the source of wiping current, the wiping may be accomplished at the recording speed or even at a greater speed, as long as the record wave length is held below the minimum. In case sound is being recorded, a twenty thousand cycle oscillator may be used to wipe the record at the recording speed, regardless of apparatus limitations, as the average ear ceases to function materially below this frequency. With most present types of reproducing apparatus, however, frequencies of over ten thousand cycles are rejected, and an oscillator operating at this frequency or above will therefore usually be sufficient.

As the record is passed thru the wiping coil, its magnetic field produces a magnetic induction longitudinally of the wire and parallel to its direction of motion, which eliminates the previous transverse polarizations forming the recordings. This would obtain even were direct current used in the coil, and as long as the wire is moved truly axially of the coil the net effect is to destroy the transverse polarizations completely. Since, however, mechanical imperfections or neighboring magnetic structures may distort the wiping field to some extent, the alternating current is used, and, as the field is graduated, each portion of the wire is subjected to a plurality of alternations of magnetomotive force of decreasing amplitude, which finally become vanishingly small. The effect of this is to reduce the polarizations on the wire corre-

spondingly, and the transverse components are thus reduced to a second order infinitesimal. The effects are further reduced by the high frequency character of the residuals, which nullifies their effect upon reproduction.

It must be realized that modern methods of amplification and reproduction have made appreciable quantities which were undetectable by former methods. By former standards each of the three effects produced by my apparatus, viz., induction parallel with the motion of the record, progressive cyclic demagnetization, and short record wave length of the wiping field, results in a complete wiping of the record, and each is separately producible. Their combination does not produce merely the sum of the individual effects, but their product, and it is in this fact that the great advantage of the treatment lies. A record wiped by my method may be used, for example, to record the speech of a performer standing many feet from the microphone, and when reproduced at the original sound level, the voice is not masked by an overwhelming record noise such as has made the magnetic recorder unsuitable for such use in the past.

I claim:

1. The method of wiping a magnetic record of electrical impulses which comprises traversing each portion of the record with a gradually spatially decreasing alternating magnetic field, said field being distributed over a longer portion of the record than the field used to produce recordings thereon.

2. The method of wiping a magnetic record of electrical impulses which comprises traversing the record with a magnetic field transverse to the direction of recording polarizations.

3. The method of wiping a magnetic record of electrical impulses which comprises traversing the record with an alternating magnetic field transverse to the direction of recording polarizations at a rate such that the space traversed during a single cycle is less than the record wave length of the highest frequency to be reproduced.

4. The method of wiping a magnetic record of electrical impulses which comprises traversing the record with an alternating magnetic field transverse to the direction of the recording polarizations.

5. The method of wiping a magnetic record of electrical impulses which comprises traversing the record with a spatially decreasing alternating magnetic field transverse to the direction of the recording polarizations.

6. A wiper for magnetic records of electrical impulses comprising means for producing a substantially uniformly spatially graduated alternating magnetic field, and means for moving the record thru said field.

7. A wiper for magnetic records of elec-

trical impulses comprising means for producing a substantially uniformly spatially graduated alternating magnetic field, and means for moving the record thru said field longitudinally thereof.

8. A wiper for magnetic records of electrical impulses comprising a coil having a decreasing number of turns per unit length along the axis thereof, and means for moving the record thru said coil.

9. A wiper for magnetic records of electrical impulses comprising a coil having a decreasing number of turns per unit length along the axis thereof, means for moving the record thru said coil, and a source of high frequency alternating current connected to said coil.

10. A wiper for magnetic records of electric impulses comprising a coil having a conical form, and means for moving the record axially thru said coil.

11. A wiper for magnetic records of electric impulses comprising a coil having a conical inner form, and means for moving the record axially thru said coil.

In testimony whereof, I have hereunto set my hand.

CARL W. RHODEHAMEL.