Sept. 2, 1930. S. N. BARUCH 1,774,821

SYSTEM OF RECORDING VIBRATIONS AND REPRODUCING SAME

Filed Feb. 4, 1929

Fig. 1.

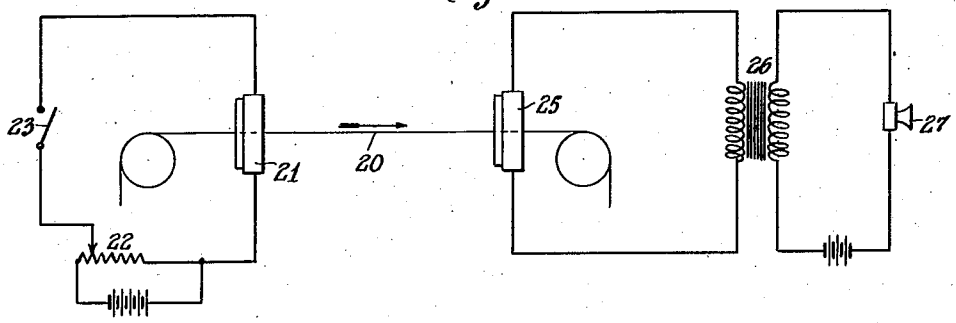


Fig. 2.

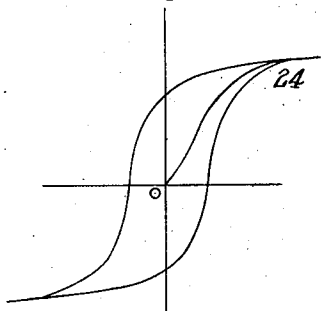


Fig. 5.

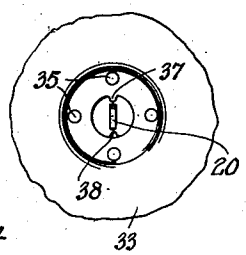


Fig. 2-A.

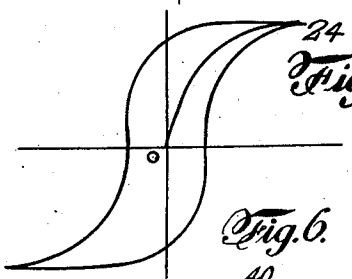


Fig. 4.

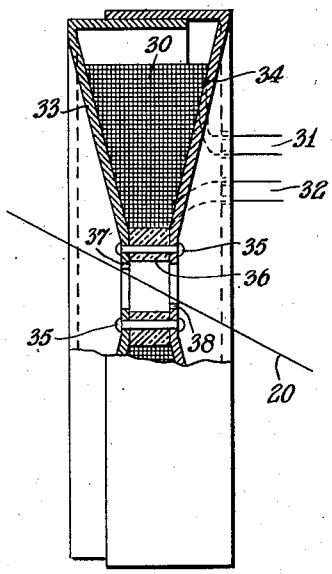


Fig. 6.

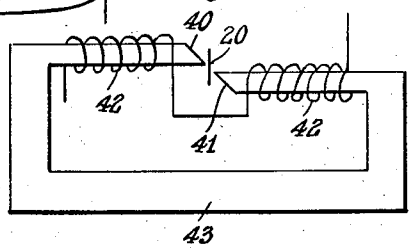
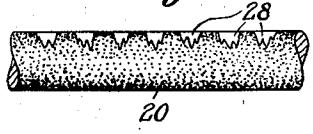


Fig. 3.



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UNITED STATES PATENT OFFICE

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SYSTEM OF RECORDING VIBRATIONS AND REPRODUCING SAME

Application filed February 4, 1929. Serial No. 337,282.

The invention relates to the recording of signals, sound, etc., as represented by electromagnetic impulses, as well as to the reproduction thereof; and more especially by means of a telegraphone which, as is well known, comprises a moving magnetizable wire or surface which is locally magnetized in varying degrees at successive points along the same, whereby when the said wire or the like thus magnetized is placed in proximity to a suitable coil, the variously magnetized spots thereof will reproduce in said coil fluctuations of current. In the production of records on such magnetizable wire or surface, it has been found that there is distortion in the reproduced signal as a result of some previous history in the wire, more especially in connection with the manufacture of said wire and due to a set of its molecules.

The invention contemplates the novel method for eliminating the effects of such set and the production of a new reproducing element of the type which is magnetically saturated except for the portions representing the recorded matter. This is accomplished by first bringing the wire or magnetizable surface to a state where it is magnetically saturated or magnetized to the limits of the hysteresis curve, i. e., polarized beyond the knee of the same, and thereby wiping out all previous history and permanently setting the molecules. The wire is then subjected, without further polarization, to a fluctuating magnetic field produced by the signalling current which it is desired to record and which is of an alternating nature, it being understood, of course, that the positive half of the signal will not be recorded while the negative half cuts into or reduces the degree of saturation, or vice versa, to produce thereby spots along the wire corresponding to the impressed signals. Naturally, the output signal current will be somewhat decreased thereby, but this is compensated for by the greater fidelity in reproduction resulting.

I am aware that it has been proposed, as in U. S. Patent No. 1,459,202, to eliminate all previous history from magnetizable bodies of this nature either by first subjecting the wire to an oscillating current of high frequency or by first magnetizing the same substantially to the saturation point and then when impressing thereon the signal current with a component of magnetism of polarity opposite to that to which the wire was initially subjected. In neither case, therefore, will the wire be left in part in a saturated state with the signal portions cut out therefrom.

The invention has for its object, also, an improved form of magnetizing and reproducing coil for the magnetizable body and record, as well as novel means for the reproduction of the said record whereby the somewhat lesser strength signals may be reproduced with ample volume.

To this end, provision is made for concentrating the magnetic flux to be applied to the magnetizable body as nearly as possible in its linear direction. For example, the coil of magnetizing windings may be formed as a bobbin with central opening through which the magnetizable body is to be drawn, the said windings being enclosed between two interfitting cups or shells of metal centrally perforated to register with the opening of the bobbin and each having a tooth projecting radially inward and the two teeth, thus displaced in the line of travel of the magnetizable body, serving as the poles of the magnet.

The nature of the invention, however, will best be understood when described in connection with the accompanying drawings, in which:

Fig. 1 is a diagrammatic representation of the connections and apparatus suitable for carrying out the method of my invention.

Figs. 2 and 2^a are representations of hysteresis loops for use in the explanation of my invention.

Fig. 3 is a fragmentary view of a section of wire, on an enlarged scale, affording a graphic representation for purpose of explanation of the magnetic conditions prevailing in the wire when a record has been impressed thereon.

Fig. 4 is a part vertical section and elevation of a coil which may be utilized for mag-

netizing, or as a pick-up device; and Fig. 5 is a fragmentary end elevation thereof.

Fig. 6 is an elevation of a modified form of magnetizing or pick-up device.

Referring to the drawings, more particularly Figs. 1, 2, 2ª and 3 thereof, the novel method involves magnetically saturating a magnetizable member, for example the wire 20, as by drawing the same through a magnetizing device 21 which may be of the nature hereinafter more fully described, a field therefore being produced by the storage battery potentiometer 22 when the circuit is closed at the switch 23. The intensity of field produced thereby is so selected that the wire is magnetized to a degree of saturation, or super-saturation, that is to say, beyond the point 24 or knee of the hysteresis loop, Fig. 2. To this end, the material selected is of particularly high retentivity so that the knee portion of the curve becomes somewhat flatter, as indicated in Fig. 2ª.

The wire, having thus been provided with a permanent magentic set, is drawn through a similar electromagnetic device 25 included in the secondary circuit of a transformer 26 whose primary is included in the signal circuit and having, for example, the microphone 27 as a modulating element. The electromagnetic fluctuations produced thereby will act on the wire passing through the device 25 to reduce proportionately its magnetization, the positive half of the signal wave not being recorded at all, while the negative half effects the reduction of magnetization, or vice versa. Spots are thereby produced along the wire which correspond to the impressed signals, an attempt being made to represent the same at the half wave portions 28 of the wire section 20, Fig. 3, the initial magnetization of wire being indicated by the stippled portion.

I have found that by concentrating the magnetic flux in the production of the aforesaid records in as near a linear direction as possible on the wire, that a much clearer reproduction is attainable; and to this end, it is preferred to utilize a magnetizing device of the nature shown in Figs. 4–6, inclusive. In these devices, a field is concentrated on sharp edges or points displaced from each other in the direction of travel of the wire which passes in close proximity to the edge portions of the members thus forming the poles of the magnetizing element.

For example, reference being had to Figs. 4 and 5, the magnetizing device is shown as consisting of a formed coil or annular bobbin 30 of wire including two sets of windings with respective terminal outlets 31 and 32, whereby the magnetomotive force may be varied by either connecting said coils in series or in parallel with each other. Surrounding said bobbins are enclosing metal members in the nature of cups 33 and 34 which are arranged to fit the one within the other and the same are centrally perforated to permit the wire 20 to pass therethrough at an angle. These shells or cups may be secured to each other by means of insulating rivets 35 passing therethrough as well as an annular centrally disposed member of insulation 36 which serves also to support the coil 30. The one shell 33, also, has extending therefrom radially inwardly into its central opening a tooth or pointed portion 37 while, similarly, there extends radially inward from the other shell 34 into the central opening thereof a tooth or pointed element 38 which is diametrically disposed with respect to the tooth 37. These two teeth, of course, are laterally displaced from each other through the separating ring 36 and serve as pole pieces providing the flux for magnetizing, or rather reducing the magnetization, of the magnetically saturated wire 20 as the same is drawn therethrough. In reproducing, the action, of course, is the reverse.

In Fig. 6, the effective pole pieces are represented by the vertically and horizontally displaced beveled edges 40 and 41, which are magnetized by a suitable winding 42 and connected by the yoke 43.

I claim:

1. In a telegraphone: the method of recording signals on a magnetizable body of high retentivity which consists in first magnetizing the body to a saturated state, and then passing the body while magnetically saturated through a magnetic field produced solely by a signalling current to suppress totally thereby the effect on the magnetization of said body of one-half of the current wave.

2. In a telegraphone: the method of recording signals on a magnetizable body of high retentivity which consists in first magnetizing the body to a saturated state, and then passing the body while magnetically saturated through a magnetic field produced by a non-polarized signalling current to suppress totally thereby the effect on the magnetization of said body of one-half of the current wave.

3. In a telegraphone: a reproducing element magnetically saturated in part, all the remaining portions representing a half wave record.

4. An electromagnetic member for use in telegraphones, comprising a magnetizing bobbin of wire, and an enclosing metal casing centrally perforated to register with the bobbin opening and having teeth projecting from its opposite sides radially into the opening.

5. An electromagnetic member for use in telegraphones, comprising a formed annular bobbin of wire with terminals for external connection and having a central opening to permit the passage therethrough of a mag-

netizable body, and an enclosing metallic casing centrally perforated to register with the bobbin opening and having teeth projecting from its opposite sides radially into the opening.

In testimony whereof I affix my signature.

SYDNEY N. BARUCH.