Oct. 20, 1931. R. B. T. KILIANI 1,828,190

METHOD OF PREPARING A MAGNETIZABLE BODY TO RECEIVE AND REPRODUCE WAVE FREQUENCIES

Filed June 18, 1930

Fig. 1.

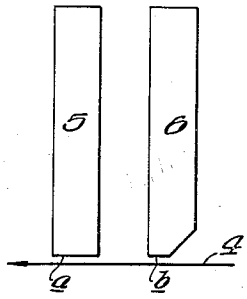


Fig. 2.

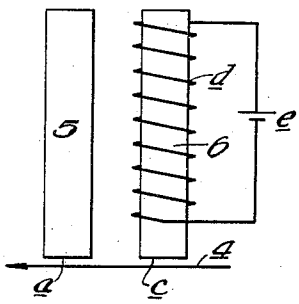


Fig. 3.

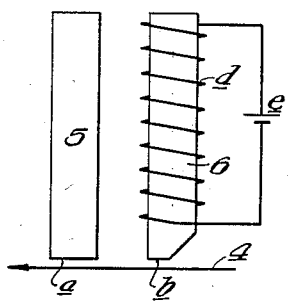


Fig. 4.

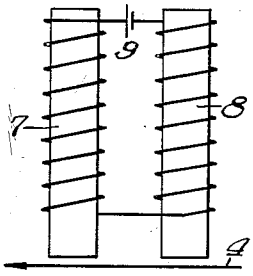


Fig. 5.

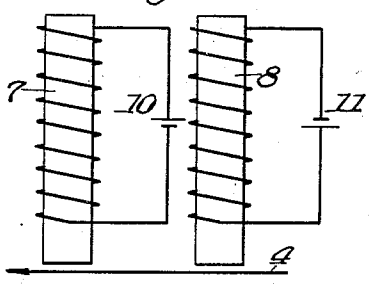


Fig. 6.

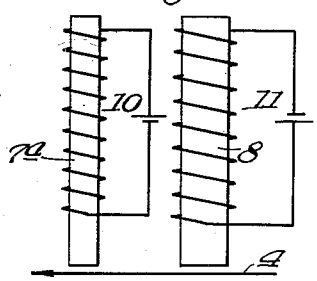


Fig. 7.

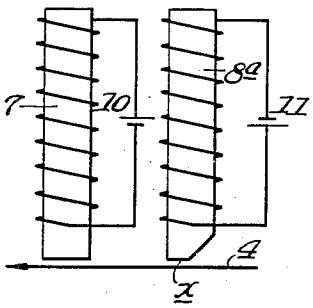


Fig. 8.

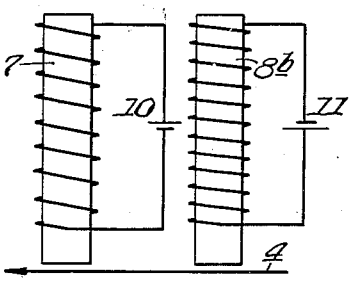
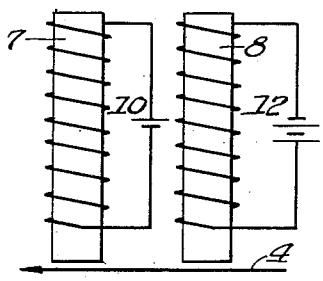


Fig. 9.



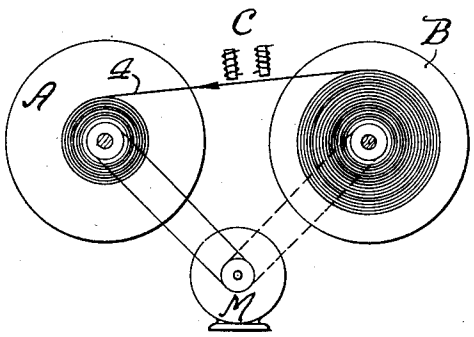


Fig. 10.

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UNITED STATES PATENT OFFICE

RICHARD B. T. KILIANI, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-FOURTH TO ARTHUR GARDNER, OF DETROIT, MICHIGAN

METHOD OF PREPARING A MAGNETIZABLE BODY TO RECEIVE AND REPRODUCE WAVE FREQUENCIES

Application filed June 18, 1930. Serial No. 462,069.

My invention relates to a new and improved method of preparing a magnetizable body to receive and reproduce wave frequencies.

I am, of course, aware that magnetizable bodies have heretofore been prepared for the purpose above stated, but, prior to my invention, much trouble has been experienced in the use of said prepared bodies, in receiving, retaining and reproducing the wave frequencies, due to the methods followed in the preparation of such bodies.

A method for electro-magnetically recording telephone or telegraph signals was invented by Vlademar Poulsen in 1898, but with the method described and used by him, and as improved upon from time to time by himself and others, it is impossible to satisfactorily record and reproduce speech or music which will compare in quality with even the poorest type of modern phonograph. He, and others following him, described methods for erasing such electro-magnetic records and for preparing the magnetizable body on which the record was made, for a subsequent record.

All these methods provided for moving the magnetizable body past a magnet, so that the magnetic condition of the body was brought to some single predetermined level.

It is a simple matter to erase a previous record, since merely passing a magnet of whatever kind over the magnetizable body will achieve this object, but the magnetizable body is then not in a suitable magnetic condition to receive and hold a subsequent record such as is desired.

My invention contemplates a new method for erasing a previous record and for preparing the magnetizable body for a subsequent record, which brings the body into a more suitable magnetic condition for taking and retaining a record than was achieved by the use of the prior art methods.

Under my invention, a record on a magnetizable body may be erased as hereinafter described, the magnetizable body being thus brought into a suitable magnetic condition for a subsequent record to be made. The same method may be used for preparing a magnetizable body on which no record has been previously made, since this preparation preparatory to making a record, whether it be the first record made on the magnetizable body or the "nth" record, is a necessary and important preliminary to making a satisfactory record and to obtaining a satisfactory reproduction of such a record.

For the purpose of satisfactorily erasing a record and preparing the magnetizable body for the following record, the body is caused to move past a particular system of magnets, with the result that its magnetic condition is such as will permit its taking and holding a record which is a true and correct copy of the original waves which it is desired to record and reproduce.

A record made on and reproduced from a magnetizable body prepared by the method disclosed in the present invention is in such a condition that it may be reproduced an innumerable number of times and is permanently retained on the magnetizable body. This permanent retention of a record on a body so prepared is proven by the fact that I have conducted experiments in which I have reproduced records made on a body prepared in accordance with my invention, a great number of times, with the idea of simulating the effect of several years use. Other methods of preparing the magnetizable body, described and known up to this time, do not permit attaining this perfection in a record.

The particular system of magnets above mentioned is so arranged that two or more magnetic poles of opposite polarity act upon the magnetizable body, so that it is first subjected to the action of one pole, being magnetized with a certain polarity of a desired flux density, and immediately thereafter is subjected to the action of a second pole which magnetizes it with the opposite polarity of a different flux density, and so on, each succeeding pole being of opposite polarity to the one immediately preceding it, and magnetizing the wire with a different flux density from that of the magnetic pole preceding it.

Any suitable means may be employed to obtain the desired effect of opposite polarity and flux density which magnetizes the magnetizable body in a different manner from

that of the magnetic poles immediately preceding and following any particular pole. Among these may be mentioned permanent magnets of equal strength, but the surfaces of which, which act upon the magnetizable body, are of unequal area; or the permanent magnets may be of unequal strength and with effective surfaces of equal area; or they may be of unequal strength and with effective surfaces of unequal area.

Electro-magnets may also be used, the desired effect of opposite polarity being obtained by suitable means, such as making the windings of the different poles in different directions, changing the polarity of the energizing current, etc. With the use of electro-magnets, the effect of magnetization of the magnetizable body with different flux densities for the various poles which act upon it, may be obtained by using cores of different materials, cores of unequal cross-section, effective surfaces of unequal area, windings of the same or a different number of turns, energizing current of the same or of different values, etc., or any combination of these or other variables which will give the desired effect of magnetization of a certain polarity of a desired flux density, followed by magnetization of the opposite polarity of a different flux density.

In the accompanying drawings:

Figs. 1 to 9 inclusive are diagrammatic views illustrating various forms of magnetizing apparatus that may be employed in the practice of my invention; and

Fig. 10 a diagrammatic view of a form of means for passing the magnetizable body into close relationship with the magnetizing apparatus.

Referring to the drawings, 4 designates a magnetizable body or wire that is to be prepared; and in the forms of Figs. 1, 2 and 3, 5 and 6 designate permanent magnets of opposite polarity. Fig. 1 shows the magnets of equal magnetic flux density and having effective surfaces, as indicated by *a* and *b*, of unequal area.

Fig. 2 shows the magnets with equal effective surfaces *a* and *c*, the magnet 6 having a winding *d* and a battery *e* to change its flux density, while Fig. 3 shows the magnets with unequal effective faces or surfaces, and having the winding and battery associated therewith for the same purpose as the form of Fig. 2.

In Figs. 4 to 9 inclusive, I have illustrated various ways of utilizing electro-magnets in the practice of my invention. For example, Fig. 4 shows a pair of electro-magnets 7 and 8, the windings of which are of an equal number of magnetic turns, said windings being in the same direction and in series with a battery 9, whereby the effect of opposite polarity is attained with constant flux densities; and in Fig. 5, the windings of said magnets 7 and 8 are each connected in series with a battery 10 and 11, respectively, the directions of current flow being opposite to produce opposite polarity.

Fig. 6 illustrates a similar form to that of Fig. 5, the core of the electro-magnet 7*a*, however, being of lesser cross section than the core of electro-magnet 8, thereby providing unequal flux densities, as well as opposite polarity.

Fig. 7 is similar to the arrangement of Fig. 5, with the exception that the electro-magnet 8*a* has a smaller effective area *x* than that of the magnet 7, so as to produce unequal flux at the region traversed by the magnetizable body 4.

In Fig. 8, the electro-magnet 8*b* is provided with a greater number of magnetic turns for the purpose of inducing a greater flux density therein than the flux density of the magnet 7; and, similarly, in Fig. 9, unequal flux densities are produced by means of unequal energizing currents generated by the batteries 10 and 12.

Thus, it is seen that various combinations of magnets and electro-magnets may be provided for the purpose of obtaining opposite polarity and equal or unequal flux densities.

In Fig. 10, A and B designate two reels, from one of which, for example B, the wire is unwound, and on the other of which (A) the wire is wound. A is driven by suitable means (a belt drive is shown) by a motor M, which is provided with suitable means such as a clutch, etc., to drive A or B, as desired. In the example shown, A is pulling on the wire, with the result that it is drawn past the magnets, generally represented at C, in the direction from B to A. Reel B is not connected to the motor M in this case, but is retarded by a brake, not shown, to maintain a suitable tension on the wire.

In practicing my invention, the magnetizable body or wire 4 is translated in closed proximity to any of the magnetic systems just described, the effect of which is to induce a magnetism in the said body or wire, whereby the same is conditioned to receive and retain a record thereon, and consisting of a series of magnetic impulses produced by sound or light waves of any range of frequencies by means of the apparatus and method shown and described in my companion application, Serial No. 462,068.

As stated, it has been found that a magnetizable body, prepared in the manner herein set forth, will receive a magnetic record more readily than any body prepared heretofore, or than an unprepared or de-magnetized body. Also, the record received thereby will be retained without becoming distorted or destroyed even when brought into contact with itself or other record-bearing wires, as for example, upon a reel.

I claim:

1. The method of preparing a magnetizable body to receive a record of any range of wave frequencies which consists in subjecting the body to the action of three or more magnetic poles of different magnetic effect.

2. The method of preparing a magnetizable body to receive a record of any range of wave frequencies, which consists in subjecting the body to the action of three or more magnetic poles of different polarity.

3. The method of preparing a magnetizable body to receive a record of any range of wave frequencies, which consists in subjecting the body to the action of a plurality of magnetic poles of opposite polarity and of different flux density.

4. The method of preparing a magnetizable body to receive a record of any range of wave frequencies, which consists in subjecting the body to the action of a magnetic pole to impart to the body a magnetism in one direction and then subjecting the body to a magnetic pole of different polarity than the first to impart a magnetism to the body of different value and in the opposite direction.

5. The method of preparing a magnetizable body to receive a record of any range of wave frequencies, which consists in subjecting the body to the action of a plurality of magnetic poles of different flux density at the place of magnetization of the body.

6. The method of preparing a magnetizable body to receive a record of any range of wave frequencies which consists in subjecting the body, in motion, to the action of a plurality of magnetic poles of different flux density.

In testimony whereof I affix my signature.

RICHARD B. T. KILIANI.