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J. E. WASHBURN.

ELECTROMAGNET.

APPLICATION FILED JULY 28, 1906.

Fig. 1.

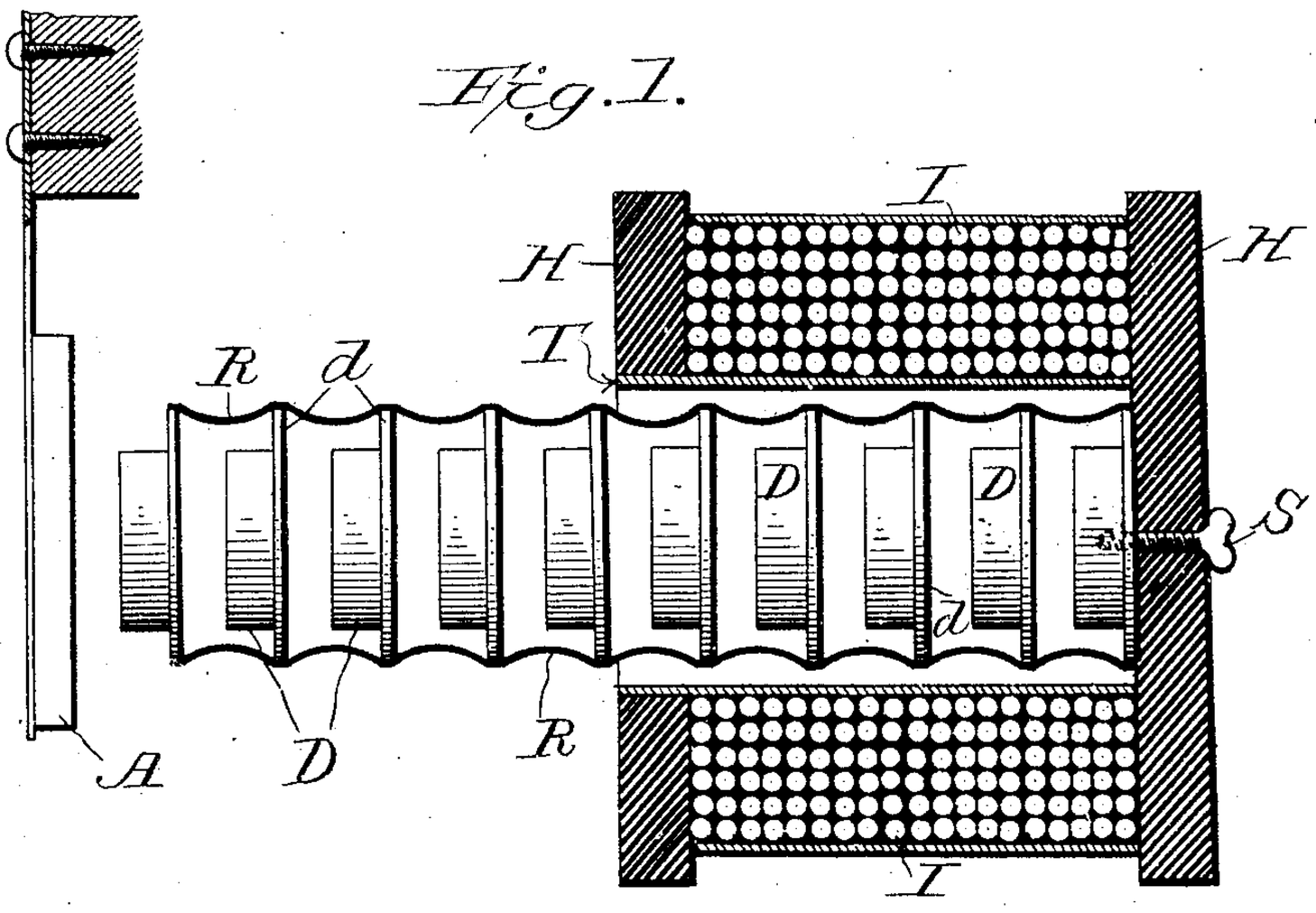
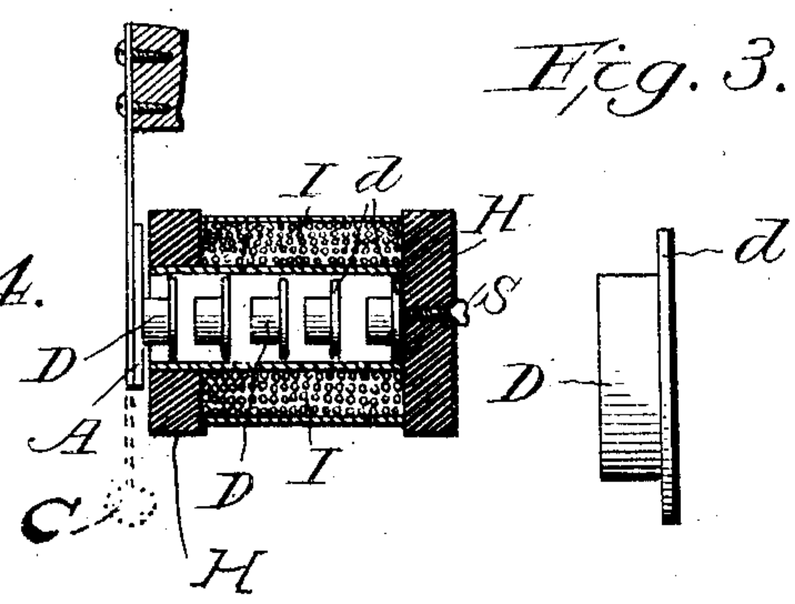


Fig. 2.

Fig. 3.

Fig. 4.



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ELECTROMAGNET.

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To all whom it may concern:

Be it known that I, JOHN E. WASHBURN, a citizen of the United States, and resident of Egmont, Hillsborough county, State of Florida, have invented certain new and useful Improvements in Electromagnets; and my preferred manner of carrying out the invention is set forth in the following full, clear, and exact description, terminating with a claim particularly specifying the novelty.

This invention relates to electromagnets, and especially to the cores employed therein.

Heretofore it has been common to make the core of an electromagnet of a soft-iron rod or bar in one piece, surrounded by the coils or convolutions of the insulated wire, and to make the armature of said magnet of another piece of metal arranged in pivotal or movable relation to the core, and for certain purposes it has been found desirable to make the core of laminated material or composed of a number of wires in longitudinal parallelism and in metallic and electric connection with each other.

The present invention contemplates a radical change in the arrangement of parts, to the extent that the core of the electromagnet is in itself longitudinally expansible and contractible, and hence the armature may be fixed or it may have a limited degree of movement.

The gist of the invention consists in making the core of a series of metallic disks (preferably of soft iron) which are preferably normally out of close contact with each other, but so arranged that they may move under the influence of the electric impulse, as described below.

To this end my invention consists in the use, in an electromagnet, of a core composed of disks and preferably arranged as shown in the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view of an electromagnet embodying the use of my improved core. Fig. 2 is a side elevation of the core itself before the electric impulse is applied. Fig. 3 is an edge view of one of the disks of said core, showing the thinner and thicker parts thereof. Fig. 4 is a sectional view of a modification in which the resilient connecting devices are omitted. This view also shows in dotted lines how a bell-clapper could be carried by the flexibly-supported armature.

In the accompanying drawings I have shown a spool (consisting of two heads H and a tubular shank T) which forms one important part of an electromagnet, and the letter I designates the insulated wire wound on said shank between the heads. As customary in devices of this character, when an electric current is passed through said coil of wire I the soft-metal core contained within the shank T becomes a magnet. The present invention consists in making said core out of a number of disks connected at two or three points at their edges by rubber bands R or other devices which are not under tension, and therefore ordinarily hold each disk out of contact with the adjacent disk, but which permit the contact of the same when they are drawn together by any force. Thus it will be possible to substitute springs for the rubber bands R, and the latter are therefore claimed in this case as "resilient connecting devices," because that is their function. The disks are imperforate, and their larger and thinner portions fit loosely and are guided within the tubular shank T. By preference one of the disks is secured by a screw S to one of the heads H, thence the stack of disks extends loosely through the tubular shank T and the most remote stands adjacent the armature A.

If this device is to be used as a telegraphic instrument, the armature A may be fixed, and the approximation of the various disks will cause a click as they come together, which will take the place of the noise usually made by the armature as it moves between its points, a similar click being made as they separate, and the outermost disk strikes the armature, thereby taking the place of the similar noise usually made by the opposite movement of the armature. However, it is quite possible to employ a movable armature in connection with this improved electromagnet-core, and I therefore do not limit myself strictly to a fixed armature, although the same is ordinarily sufficient where the core itself is expansible and contractible in length. In the construction herewith illustrated I have shown each disk as composed of a thick body portion D and a thinner portion *d*, the latter being of greater diameter, so as to constitute a flange, and all flanges stand relatively at the same side of their respective body portions. These flanges are shown as connected at two or more points longitudinally of the stack of disks by rubber bands R

or other equivalent resilient connecting devices which will permit their relative movement and which, in effect, will permit the approximation and divergence of the various disks. It is possible that all such connecting devices may be dispensed with, as shown in Fig. 4, in which case the wider portions or flanges of the disks would slide longitudinally within the tubular shank T of the spool, and I therefore do not limit myself strictly to the use of any such connecting means, although I consider it advantageous. The material of which the disks is composed is not important, excepting that it should be one which when acted upon electrically will cause the disks to be approximated and when the surrounding coil is deënergized will cause the disks to be robbed of their mutually attractive property, the broad idea being that when the current flows the disks will be approximated and the one farthest remote from the screw S will be drawn away from the armature A; but when the current is shut off the disks will be separated or repelled from each other, (though possibly be held in alinement by the connecting means R,) and the one remote from the screw S may make metallic contact with the armature A.

The uses to which this electromagnet may be put are many; but I do not consider it necessarily within the province of this specification to enumerate them. If the stack of disks is long, although the movement between each two of them is trifling, it will be clear that the movement of the outermost disk away from the armature will be considerable, varying only with the number of disks in the stack and the degree of movement between them. Hence it is possible to employ this device, for instance, in an annunciator-bell and in a circuit which is extremely weak. Perhaps I should not say that the armature is absolutely fixed, because in an annunciator-bell where the clapper is attached to the armature the latter ordinarily vibrates, so as to ring the bell; but it will be clear that with an expansible and contractible core an armature can be employed whose movements are so trifling that it need not be pivoted—may only, in fact, have to be flexibly connected with its support, as shown in Fig. 4, so that the bell-clapper C at its other extremity can vibrate to a sufficient degree to sound an alarm. In a word, the principal advantage attained by this invention may be said to consist in the use of a flexibly-mounted armature with a limited degree of movement instead of a pivoted armature, the expansibility and contractibility of the core of the electro-magnet taking the place of the movement which the armature does not have.

What is claimed as new is—

1. An electromagnet whose core is composed of a series of imperforate disks, each having a thick and a thin portion of different diameter.

2. An electromagnet whose core is composed of a series of imperforate disks, each having a thick body of smaller diameter and a thin flange of larger diameter.

3. An electromagnet comprising a spool having a tubular shank wound with insulated wire, and a core composed of a series of imperforate disks, each having an enlarged flange loosely mounted and guided within the tubular shank of said spool.

4. An electromagnet comprising a spool having a tubular shank wound with insulated wire, and a core composed of a series of disks each having a portion of smaller diameter and a portion of larger diameter, the latter fitting and guided within the tubular shank of the spool and all the disks standing in the same position relatively to each other.

5. An electromagnet whose core is composed of a series of disks which are normally slightly out of contact with each other, resilient connecting devices along the edges of said series, a fixed support for the disk at one end of the series, and an armature adjacent to but disconnected from the disk at the other end.

6. An electromagnet whose core is composed of a series of disks which are normally slightly out of contact with each other, resilient connecting devices along the edges of said series, a fixed support for the disk at one end of the series, and a flexibly-mounted armature at the other end.

7. In an electromagnet, the combination with the heads connected by a tubular shank, and the insulated wire wound around the latter; of an armature consisting of a series of disks each composed of a thicker portion of smaller diameter and a thinner portion of larger diameter, the parts being in the same position relatively to each other and the portions of larger diameter fitting loosely within said shank, resilient connecting devices extending longitudinally of the series and connecting the parts of larger diameter, a screw connecting the disk at one end of the series to one of said heads, and an armature at the other end of the series.

8. In an electromagnet, the combination with the heads connected by a tubular shank, and the insulated wire wound around the latter; of an armature consisting of a series of disks each composed of a thicker portion of smaller diameter and a thinner portion of larger diameter, the parts being in the same position relatively to each other and the portions of larger diameter fitting loosely within said shank, longitudinal rubber bands connecting the edges of said parts of larger diameter, means for attaching the disk at one end to one of said heads, and an armature at the other end of the series.

9. In an electromagnet, the combination with the heads connected by a tubular shank, and the insulated wire wound around the latter; of an armature consisting of a series of disks each composed of a thicker portion of smaller diameter and a thinner portion of larger diameter, the parts being in the same position relatively to each other and the portions of larger diameter fitting loosely within said shank, longitudinal rubber bands connecting the edges of said parts of larger diameter, means for attaching the disk at one end to one of said heads, and a flexibly-mounted armature at the other end of the series.

In testimony whereof I have hereunto subscribed my signature this the 14th day of July, A. D. 1906.

JOHN E. WASHBURN.

Witnesses:
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