No. 833,741. PATENTED OCT. 23, 1906.

H. H. HANSEN.

ELECTROMAGNET.

APPLICATION FILED MAY 1, 1905.

Fig. 1.

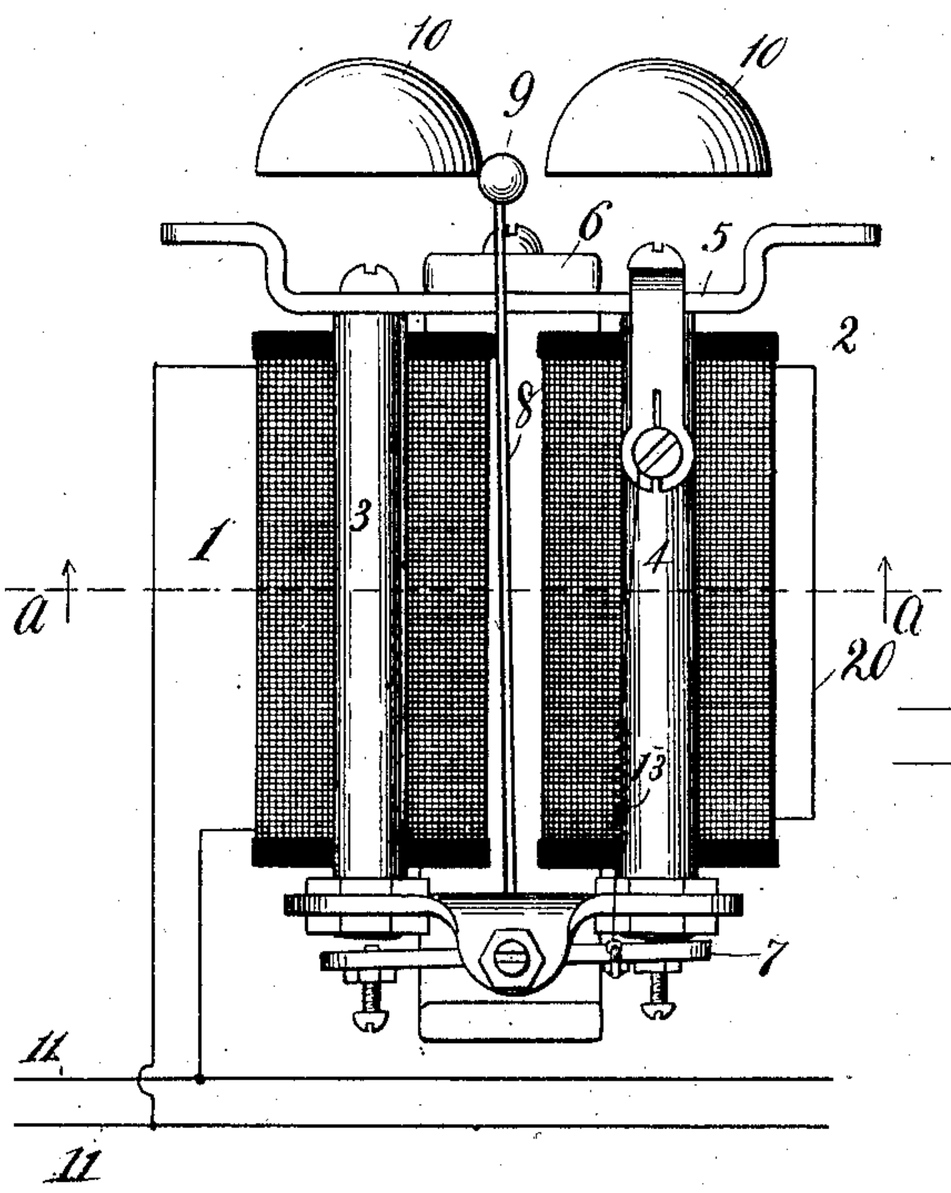


Fig. 4.

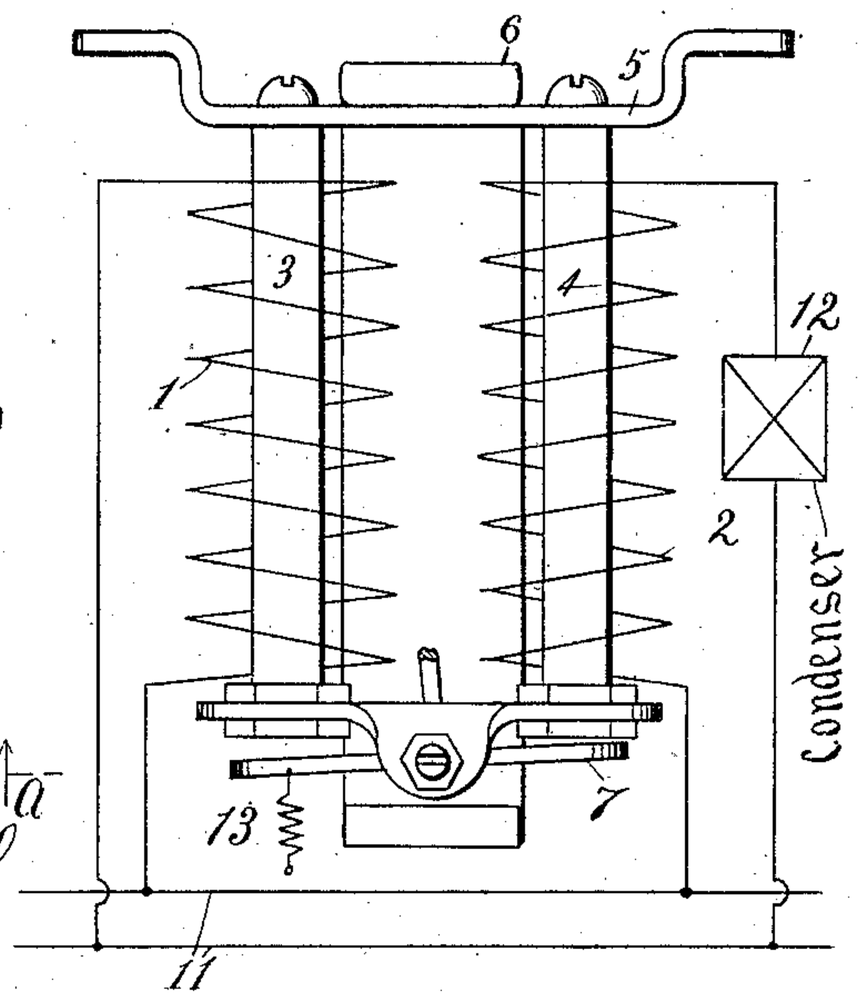


Fig. 2.

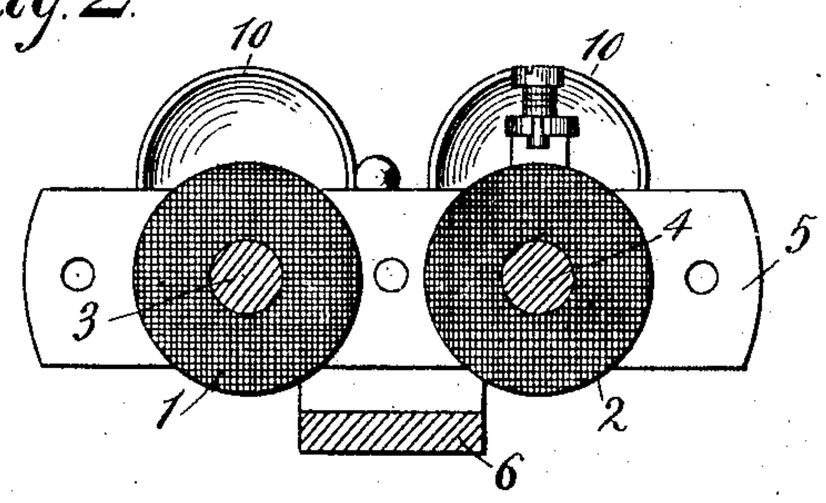
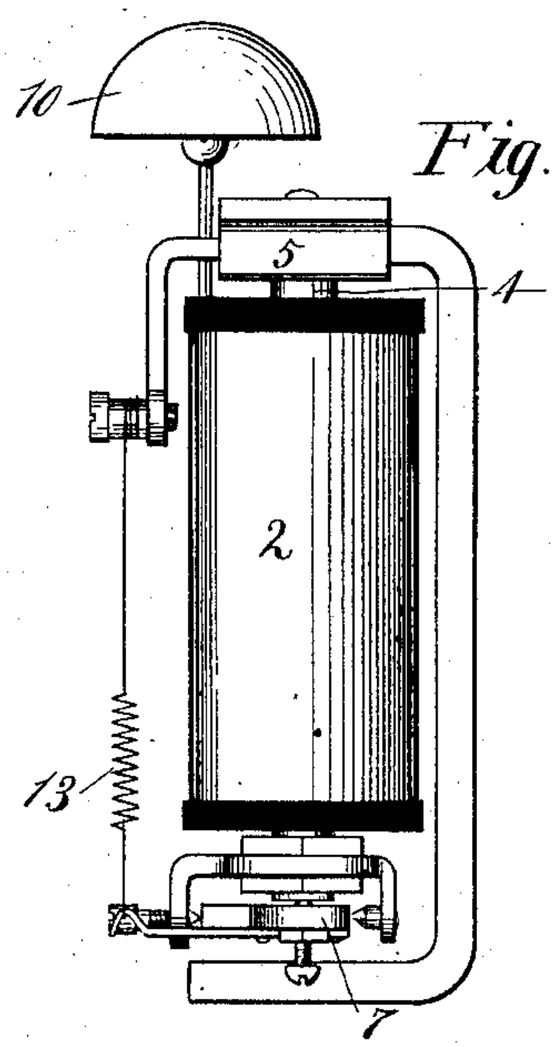


Fig. 3.



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ELECTROMAGNET.

No. 833,741. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed May 1, 1905. Serial No. 258,275.

To all whom it may concern:

Be it known that I, HANS H. HANSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electromagnets, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention herein relates to electromagnets which may be used for many purposes, the particular adaptation of the device of my invention herein being to party-line service, in which connection the electromagnet is used at some of the substations for the purpose of operating signal-bells.

While the invention finds a very important application to party-line practice, it is not to be limited in its scope and adaptation to such utility.

It is the main object of my invention to produce an electromagnet which while being subject to alternating current will not respond thereto, but which will respond to current of other character, as continuous direct current or intermittent current.

By means of my invention there may be placed upon the same circuit electromagnets that are only responsive to alternating currents and other electromagnets that are only responsive to pulsating, intermittent, or direct currents.

In carrying out my invention I subject a single armature to the operation of two helices, both of which are supplied with current from an alternating-current generator, but which receive current in such a manner from said generator that their effect upon the common armature is neutralized or opposed to such an extent that there is no effective operation of the armature. This result is preferably accomplished by displacing the phase of the currents in these coils. This phase displacement may be secured by having one coil in secondary relation with the other and in a closed circuit, the coil which acts as a primary receiving its current directly from the generator, or both coils may be in conductive relation with the alternating-current generator; but the phase of the current in one coil with respect to that in the other may be suitably displaced by any suitable means. In the transformer arrangement a phase displacement of one hundred and eighty degrees approximately is secured, and this arrangement I prefer. In this way a magnet structure may be secured that will respond to direct or pulsating currents, while alternating current may for other purposes be impressed upon the line with which the magnet is connected without affecting the operation of the magnet.

It will be apparent to those skilled in the art that the adaptability of the invention is wide.

In the preferred embodiment of the invention the armature is polarized and the cores of the coils are also polarized, the said armature, the cores, and a heel-piece of iron being desirably employed, whereby a magnetic circuit which is only open at the gaps between the armature and the opposed ends of the cores is secured. The armature, heel-piece, and cores are desirably made of soft iron, a permanent magnet being attached to the heel-piece and extending over the armature to secure the desired polarization thereof and of the cores, somewhat as in the magnet of the polarized bridging-bell used in party telephone-line practice.

In the ordinary polarized magnet as employed for bridging-bells in party-line practice, for example, the ends of the soft-iron cores opposed to the armature were given poles of the same sign by a permanent magnet, and the soft-iron armature was polarized by the same magnet. Each core bore a winding, these windings being in series relation and so relatively disposed that when the currents pass therethrough in one direction one pole would be increased in strength and the other pole would either be reduced in strength or reversed, these results being reversed when the direction of current is reversed, whereby an oscillation of the armature would be set up. Obviously in this arrangement the currents in the coils and the magnetisms due to the currents were identical in phase, so that the magnet-winding would be bound to respond to alternating current.

In my structure the time at which the magnetism due to one coil is produced is caused to vary with respect to the time at which the other coil produces magnetism, so that the instrument may be unresponsive to alternating current, while permitting it to be operable by direct or intermittent current. This is so because the coils of the magnet are in independent circuits, which is the case whether one coil is in a closed circuit and in

secondary relation with the other or whether two coils are in parallel relation. Whether or not the electromagnet has a permanent magnet provided therefor for polarizing parts thereof I prefer to provide the magnet with two circuits, which are closed for alternating current, while one of which is open for direct current and the other closed for direct current, so that the magnet will not be responsive to alternating current, the windings of the magnet exerting opposing effects upon the armature, while it will be responsive to direct current, as then the armature is subject only to one of the coils.

I will explain my invention more fully by reference to the accompanying drawings, showing preferred embodiments thereof, in which—

Figure 1 is an elevation of a magnet, the helices thereof being shown in section, while the bell structure is indicated in coöperative relation with the magnet, circuit connections being diagrammatically indicated. Fig. 2 is a sectional view on line *a a* of Fig. 1. Fig. 3 is a side elevation of the structure. Fig. 4 diagrammatically indicates another circuit arrangement that may be employed.

Like parts are indicated by similar characters of reference throughout the different figures.

Two helices 1 2 are disposed about soft-iron cores 3 4, respectively, which soft-iron cores are united by a soft-iron heel-piece 5, to which is directly secured one of the poles of the permanent magnet 6, which therefore tends permanently to polarize the free ends of the cores 3 4, to which free ends there is opposed the armature 7 that is also polarized by the permanent magnet 6, this armature being desirably centrally pivoted, the pivotal mounting being between the cores.

The structure thus far described may be used in any suitable form of instrument. In the drawings it is embodied in a bell structure, in which case there is provided a stem 8, that carries a clapper 9, working between gongs 10. The armature is preferably mounted upon the cores as indicated; but any suitable mounting for the armature may be provided.

In order that the magnet may not be responsive to alternating current, I preferably include one of the coils in a closed circuit metallically disconnected from the line and in secondary relation with the companion coil, this arrangement being diagrammatically indicated in Fig. 1. When alternating current is impressed upon the circuit 11, the polarity of the free ends of the cores 3 4 is not relatively modified in the same way as in the case with the magnets of bridging-bells, for example, but the coils produce magnetic polar regions at the free ends of the cores in such a manner that the oscillations of the armature are prevented.

While I prefer to secure the desired phase relations between the currents in the coils 1 2, as indicated in Fig. 1, I do not wish to be limited to this practice, for, as indicated in Fig. 4, the coils 1 2 may be placed in conductive relation with the circuit 11, and the phase of the current in one coil may be displaced with respect to that in the other coil by putting these coils in parallel relation and including in circuit with one of them a suitable phase-modifying device, as that indicated at 12.

In order that the armature will not respond to alternating current of very low frequency, I provide some suitable retarding agency, as a spring 13, that will prevent that coil which is to respond to the direct or pulsating current from operating the armature when the magnet is subject to alternating current of low frequency. The spring is also useful when the magnet is operating by pulsating or direct current to aid in moving the armature in one direction after it has been magnetically moved in the other direction. I have successfully used the structure, however, without the spring, and I do not wish to be limited thereto. In short, I have produced an electromagnet having two windings in independent circuits of different electrical character, and by the expression "different electrical character" I mean that when alternating current is impressed upon the electromagnet the phases of the currents in the windings are displaced, so that the magnetisms they produce are displaced to secure the effect desired.

It will be seen that in the preferred embodiment of the invention the secondary circuit is not closed for direct current, it being unconnected with the line, but that the primary winding of the magnet is closed for direct current. Both windings of the magnet are closed for alternating current. Hence it is impossible in the preferred form of the invention to pass direct current through one of the coils, although this current may be passed through the other coil of the magnet, while both windings of the magnet are adapted to have alternating current passed therethrough.

It is obvious that changes may be made without departing from the spirit of my invention, and I do not, therefore, wish to be limited to the precise construction and arrangements indicated; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An electromagnet provided with an armature, two core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one of the circuits carrying wave-form current dephased with respect to wave-form current carried by the other circuit to prevent the operation of the armature.

2. An electromagnet provided with a polarized armature, two core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one of the circuits carrying wave-form current dephased with respect to wave-form current carried by the other circuit to prevent the operation of the polarized armature.

3. An electromagnet provided with a polarized armature, two polarized core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one of the circuits carrying wave-form current dephased with respect to wave-form current carried by the other circuit to prevent the operation of the polarized armature.

4. An electromagnet provided with a polarized armature, two core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one circuit being in a locally-closed circuit and in secondary relation to the other.

5. An electromagnet provided with an armature, two polarized core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one circuit being in a locally-closed circuit and in secondary relation to the other.

6. An electromagnet provided with a polarized armature, two polarized core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one circuit being in a locally-closed circuit and in secondary relation to the other.

7. An electromagnet provided with a polarized armature, two core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one circuit being in secondary relation to the other.

8. An electromagnet provided with an armature, two polarized core portions and two circuits, one for each core portion, each core portion presenting a pole portion to the armature, one circuit being in secondary relation to the other.

In witness whereof I hereunto subscribe my name this 28th day of April, A. D. 1905.

HANS H. HANSEN.

Witnesses:
G. L. CRAGG,
CHAS. F. BASSETT.