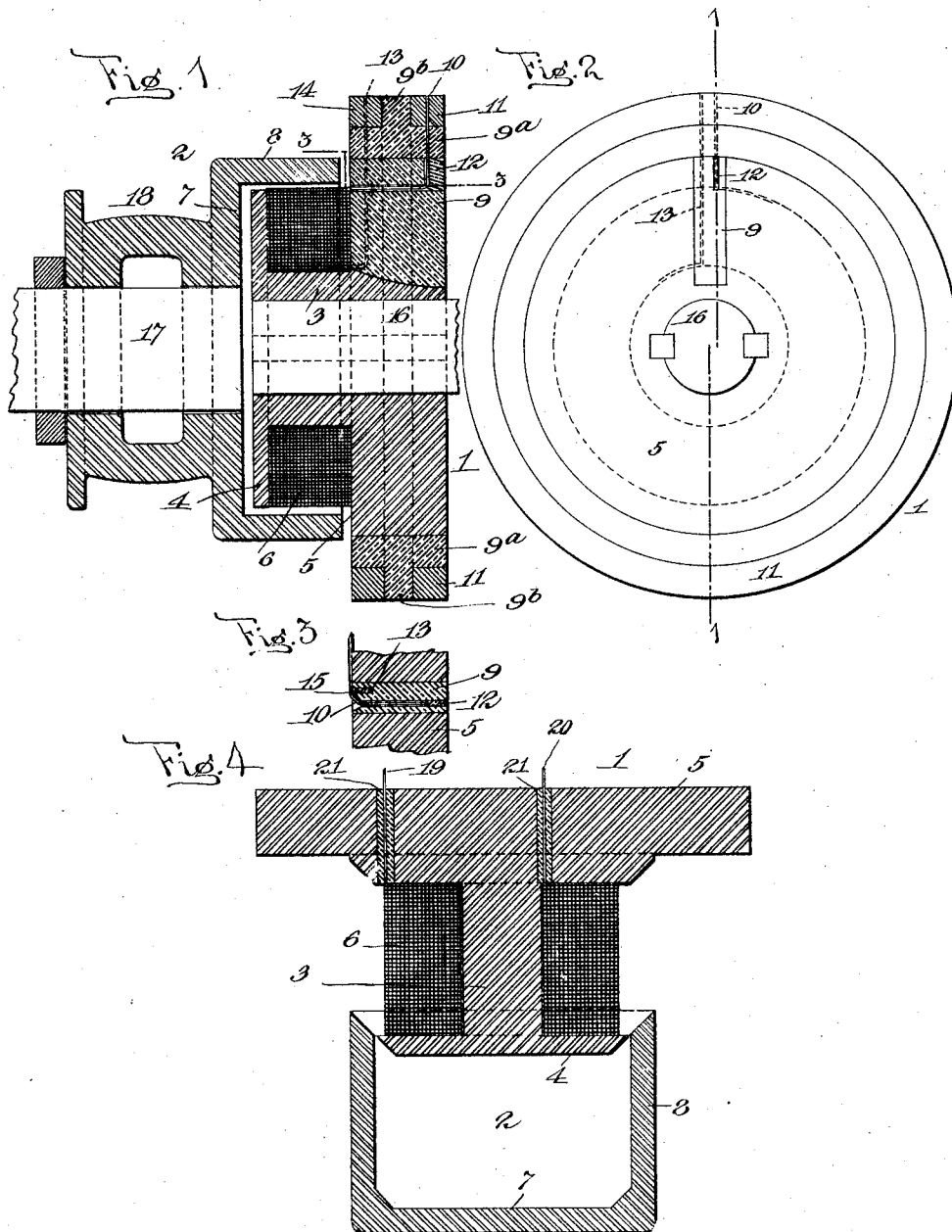


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MAGNET.
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Witnesses:

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UNITED STATES PATENT OFFICE.

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MAGNET.

1,317,786.

Specification of Letters Patent.

Patented Oct. 7, 1919.

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To all whom it may concern:

Be it known that I, STEWART H. HARTSHORN, a citizen of the United States, residing in Short Hills, county of Essex and State of New Jersey, have invented a certain new and useful Magnet, of which the following is a specification.

This invention relates to improvements in magnets of the ironclad type and may be employed as magnetic clutches, magnetic brakes, lifting magnets, or in analogous situations.

The objects I have in view are—

First: To reduce the length of the magnetic circuit to a minimum.

Second: To utilize the ampere turns in the coil to their fullest capacity.

Third: To eliminate all unnecessary breaks in the magnetic circuit when maximum efficiency is required.

Fourth: To produce an ironclad magnet in which the coil may be wound on the core.

Fifth: To make a spool winding which is easily manufactured or repaired.

Sixth: To increase the speed of magnetization and demagnetization.

Seventh: To resist centrifugal forces in structures in which the coil is rotated.

These and further objects will more fully appear in the following specification and drawings, considered together or separately.

In the drawings

Figure 1 is a longitudinal sectional view, on the line 1—1 of Fig. 2, of a magnetic clutch or brake embodying my invention.

Fig. 2 is an end view of the same.

Fig. 3 is a detail sectional view of the same taken on line 3—3 of Fig. 1.

Fig. 4 is a sectional view of a modification showing the invention employed in a solenoid.

In all views like parts are designated by the same reference characters.

Referring to the drawings it will be seen that the magnet 1 coöperates with the armature 2. The magnet is composed of a core 3 having a flange 4 and a flange 5 thereon. The core and the two flanges are made of suitable magnetic material. As an example of such material wrought iron may be employed.

Surrounding the core and lying between the two flanges is a coil 6. The flange 4 is shown as considerably smaller than the flange 5. Preferably the coil is substantially the same outside diameter as the

smaller flange and is less in diameter than the larger flange.

The armature is composed of a base 7 and a hollow cylindrical rim 8. The base and body are preferably integral and are made of magnetic material. A suitable material for the purpose is wrought iron.

In the embodiment illustrated an integral structure, composed of the flange 5, core 3 and flange 4, is used. This form of the device gives the greatest efficiency as the only breaks in the magnetic circuit are between the base 7 of the armature and surface of the flange 4 and the edge of the rim 8 and the surface of the flange 5. These breaks are extremely small when the armature engages the magnet and are almost negligible. If desired the flanges 4 and 5 may, instead of being integral with the core 3, be of separate pieces of the same material intimately engaging each other. When so constructed the core and pole pieces or flanges may be in such intimate engagement with each other that the only break in the magnetic circuit will be caused by the possible faults in the molecular structure of the parts at the points of engagement. This form of magnet may not be as efficient as a structure wherein the core and pole pieces are integral but will be suitable in most situations. There being only the two breaks in the magnetic circuit, as before specified, the magnetic reluctance is reduced to the minimum and the circuit is also reduced to its minimum length.

The coil is wound on the core and between the flanges 4 and 5 and there need be no insulation employed except that on the wire.

The coil is entirely surrounded by and in intimate contact with magnetic material only.

The parts are so proportioned that the body of the armature will surround the smaller flange and the coil. The free edge of the body will coöperate with the larger flange. The base of the armature will coöperate with the face of the smaller flange. According to this arrangement there are no breaks in the magnetic field, except the joints between the points of separation of the armature and the magnet. The coil is wound directly on the core and lies between the two flanges which serve as supports for the coil and also serve as the pole pieces of the magnet.

When my invention is applied to a struc-

ture, such as a magnetic clutch, in which the magnet rotates as shown in Figs. 1, 2 and 3, I provide means for connecting the terminals or leads of the coil in such a manner that they will resist centrifugal stresses. For this purpose I provide an opening or aperture in the flange 5. This opening or aperture is filled by an insulating plug 9 made of any suitable material. The terminal or lead 10 on the outside of the coil passes through an opening made in this plug. This opening extends entirely through the plug. At a suitable point removed from the outer face of the plug is a notch which extends radially to the periphery of the flange 9. The terminal is bent outward and passes through the notch and through an opening in a band 9^a of insulating material, which surrounds the periphery of the flange 9. It is there connected to a collector ring 11 carried on the band 9^a. The notch or groove outside of the bent portion of the terminal is inclosed by a filling plug 12. The terminal or lead 13 from the inside of the coil lies in a vertical slot formed in the inner face of the plug 9. This terminal is connected to a collector ring 14 shown as located beside the other collector ring and on the side thereof nearer the coil. The slot in which this terminal rests is closed by a filling plug 15 of insulating material. By this construction the wire forming the outer layer of the coil passes entirely through the plug 9 and is suitably positioned to resist centrifugal stresses. This wire also crosses the filling plug 15 and tends to hold it in place and this plug also will hold in place the terminal 13. By this means the two terminals are suitably locked in place and resist centrifugal stresses. The insulating ring 9^a has a peripheral flange 9^b which separates the collecting rings 11 and 14 and insulates them from each other while the body of the ring 9^a insulates both rings from the flange 9. The band 9^a and collector rings 11 and 14 will prevent radial movement of the plugs 9 and 12 whereby the plugs will not be affected by centrifugal stresses.

In the embodiment illustrated in Fig. 1, the magnet is mounted upon a shaft 16. The armature is mounted upon a shaft 17 as shown. The armature is provided with a pulley 18. When the electric current is caused to pass through the coil and the pole pieces are energized, the armature will be moved laterally to proper engagement with the magnet. To permit this to be done the armature possesses a certain freedom of movement in the lateral direction. When the device is used, for example, as a brake, either of the shafts 16 or 17 is adapted to be held stationary, by means not shown.

In the structure illustrated in Figs. 1 and 2 the opening or aperture formed in the

flange 5 for the reception of the insulating plug 9 constitutes a gap in the magnetic field and consequently the magnetic lag is decreased and the remnants of magnetism are more rapidly eliminated.

In Fig. 4 is illustrated the application of the invention to a solenoid. In this arrangement the leads 19 and 20 pass through suitable insulating plugs 21 formed in the flange 5.

In accordance with the provisions of the patent statutes I have described the principle of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is merely illustrative, and that the invention may be carried out in other ways.

Having now described my invention what I claim as new and desire to secure by Letters Patent, is:

1. An ironclad magnet having a core with an integral flange, said flange having a radial slot extending from the periphery of the coil to the periphery of the flange to form a magnetic gap, a coil, a terminal of the coil passing into the slot, and means for preventing radial movement of said terminal.

2. An ironclad magnet having a core with an integral flange, said flange having a radial opening therein to form a gap, and an insulating plug in the opening, a coil, and a terminal of the coil passing through the plug, and means for preventing radial movement of the plug.

3. An ironclad magnet having a core with an integral flange, a coil surrounding the core, said flange having an opening therein, two collector rings disposed side by side on the flange and insulated therefrom, a connection through the opening from the inside of the coil to the ring next thereto, and a connection from the outside of the coil to the ring farthest therefrom, said connection passing through the opening toward the side of the flange opposite the coil.

4. An ironclad magnet having a core with an integral flange, a band of insulating material surrounding the flange, a coil surrounding the core, said flange having an opening therein, two collector rings disposed side by side on the band, a ridge on the band separating the rings, a connection through the opening from the inside of the coil to the ring next thereto, and a connection from the outside of the coil to the ring farthest therefrom, said connection passing through the opening toward the side of the flange opposite the coil.

5. An ironclad magnet having a core with an integral flange, a coil surrounding the core, said flange having an opening there-through extending from the core to the periphery of the flange to provide a gap in

the magnetic field, a plug of non-magnetic material in the gap, two collector rings carried on the flange and insulated therefrom, a connection through the plug from the inside of the coil to one of the rings, and a connection through the plug from the outside of the coil to the second collector ring.

6. An ironclad magnet having a core with an integral flange at one end thereof, there being an opening through the flange and extending from the core to the periphery thereof to provide a gap in the magnetic field, a plug of non-magnetic material in the gap, a band of insulating material on the periphery of the flange, two collector rings disposed side by side on the band, the material of the band extending between the rings, a coil surrounding the core, a connection

through the plug from the inside of the coil to one of the rings, and a connection from the outside of the coil to the second ring.

7. A magnet having a core, a flange at one end of the core, and a coil surrounding the core, there being an opening in the flange for the passage of the outer end of the wire forming the coil, there being a lateral notch at that extremity of the opening nearest the coil for the reception of the wire.

This specification signed and witnessed this 24th day of October, 1916.

STEWART H. HARTSHORN.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."