

No. 886,870.

PATENTED MAY 5, 1908.

H. ROWNTREE.

ELECTROMAGNET.

APPLICATION FILED APR. 6, 1907.

FIG. 1

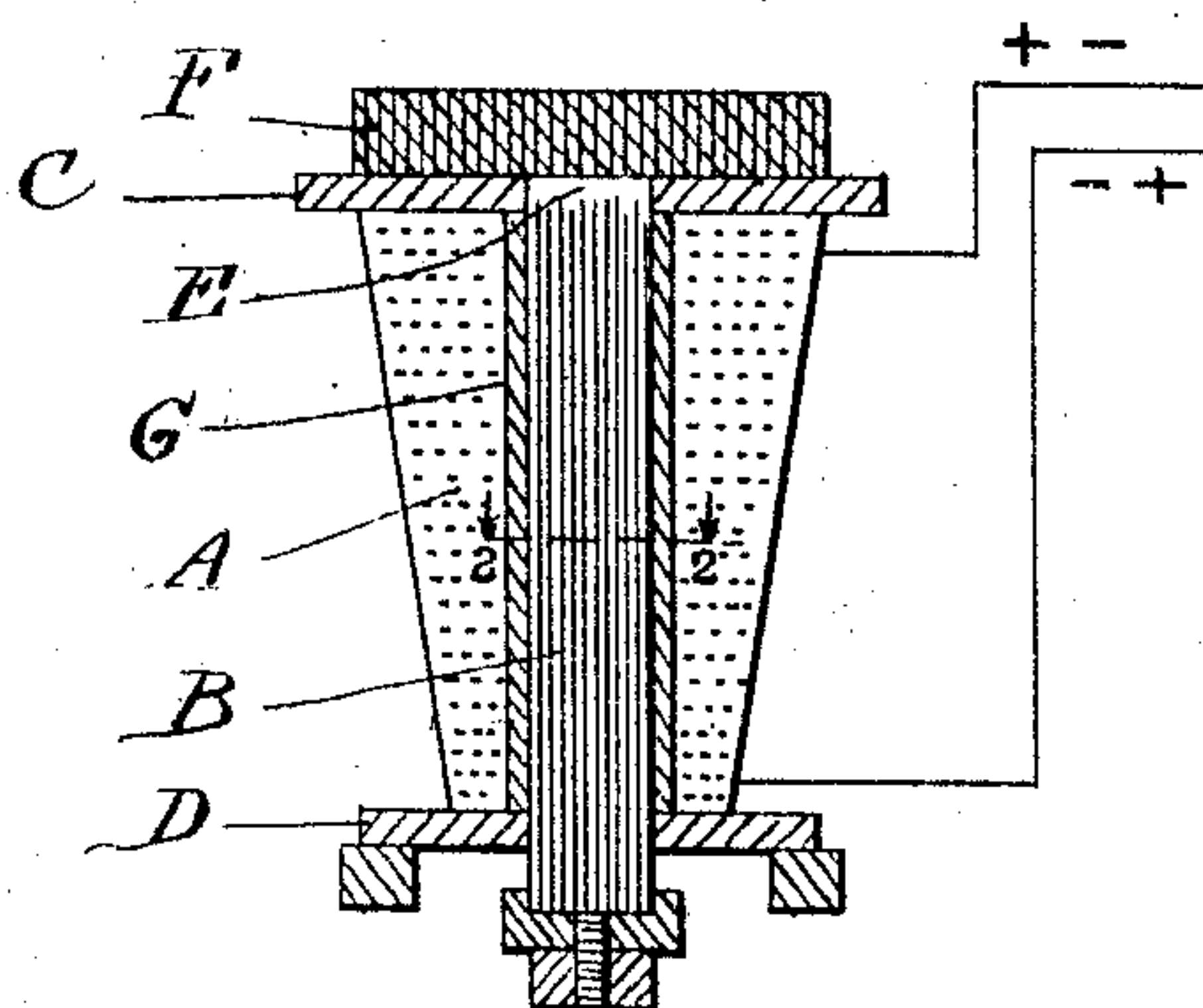
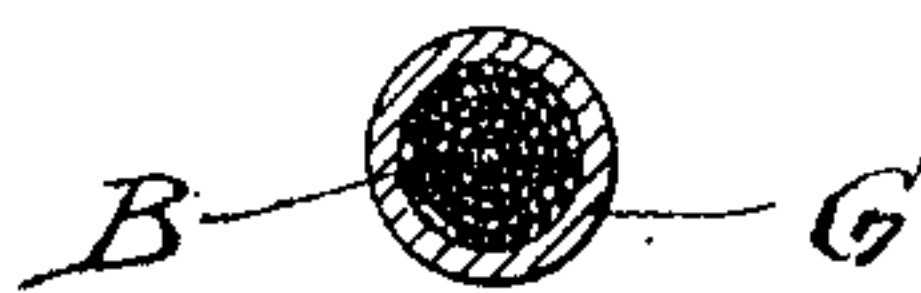


FIG. 2



Witnesses:
Joseph Klein.
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Inventor
Harold Rowntree
By his Attorney
Samuel E. Parke

UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF CHICAGO, ILLINOIS, ASSIGNOR TO BURDETT-ROWNTREE MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTROMAGNET.

No. 886,870.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed April 6, 1907. Serial No. 366,650.

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have made a certain new and useful Invention in Electromagnets, of which the following is a specification.

In my pending application, Serial No. 266,542, filed June 23, 1905, I have shown, described and claimed broadly a construction of electro magnet in the form of a solenoid, in which the induced current is accentuated as the core or plunger of the solenoid is drawn into the winding or coils thereof, or to restate the same broad idea, wherein the induced retroactive effect is abnormally increased as the plunger is drawn into the coils or windings. While this idea is claimed broadly in my pending application referred to, the particular embodiment therein shown and described for carrying out my invention consists of a winding or coil arranged in sections with means normally short circuiting a portion of the sections of such coils or windings at the beginning of the movement of the core or plunger into such coils, and the subsequent breaking of the short circuit as the plunger or core approaches the limit of its movement into the coil.

The present invention relates to electro magnets of this nature.

The object of the present invention is to provide another form of embodiment of means for accomplishing the result set forth and claimed broadly in my prior application.

Another object of my present invention is to impose a strong pull upon the core or plunger of the solenoid throughout the greater portion of its length.

A further object of the invention is to cut down to a minimum the consumption of current after the core or plunger attains the end of its movement into the coils or windings.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and arrangement of parts, all as will be more fully set forth as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the accompanying drawing and to the various views and reference signs appearing thereon, Figure 1, is a view in

longitudinal section of an electro magnet embodying the principles of my invention. Fig. 2, is a transverse section on the line 2, 2.

The theoretically perfect alternating current solenoid is one which is so constructed that the plunger or core is almost entirely outside the coils or windings at the commencement of the movement of such core, and almost entirely inclosed by the coils or windings at the time of the movement so that there may be no induced deterrent effect at the outset, and a strong induced effect at the end of the movement of the core into the coils or windings, which induced effect results in reducing the amperage or consumption of the current at that point. This theoretically perfect condition is difficult to attain in practice with the ordinary constructions of solenoids. In the accomplishment of these desirable objects, in accordance with my present invention, I propose to provide means whereby at the beginning of the movement of the solenoid plunger or core, it is subjected to the action of a comparatively few turns of wire producing a very small induced effect, and at the end of its movement into the coils such plunger is subjected to the action of a large number of turns of the wire, resulting in the production of a strong induced effect.

In carrying out my present invention, I propose to employ a winding or coil which is tapering, as shown in the drawing, that is, the number of turns of the wire around the core increases from one end of the coil to the other.

In the drawing reference sign A, designates the exteriorly tapering coil or winding for the solenoid; B, the plunger or core, arranged to operate within a non-magnetic tube G. The coil A, is held between the non-magnetic end plates C, D. In practice I prefer to employ a core or plunger for the solenoid made up of laminations or sections. I prefer to employ for this purpose short sections of soft iron wire as thereby I am enabled to secure better laminating effect. These laminations are assembled preferably in a parallel relation with respect to each other to form the core or plunger. At one end the various laminations employed are formed into a closed magnetic circuit with respect to each other for a very short portion of their lengths, as indicated at E. This

may be accomplished by brazing, welding or otherwise forming the ends of the laminations into a solid homogeneous mass. For the remaining portions of the lengths of the laminations, said laminations are in open magnetic circuit with reference to each other. By employing a laminated core, the laminations being united or joined into a closed magnetic circuit at one end only, I not only avoid noise and chattering when an alternating current is used, but I also avoid undue heating of the core.

In the operation of the electro magnet the closed magnetic circuit end of the laminations moves toward that end of the coil or winding which has the greater number of turns of wire. In order to concentrate the pull upon such end of the core or plunger, I may, if desired, place the laminated magnetic block F, over or adjacent the larger end of the coil as shown, the smoothed surface of the end E, of the core or plunger, making sufficient contact with the surface of the laminated magnetic block to prevent fluctuations of the current which might otherwise cause mechanical vibrations and thereby produce an objectionable noise.

By employing a tapering coil the number of turns of wire around the plunger at the commencement of the movement of the core into the coil, is less than if the coil was of uniform diameter throughout its length, and, therefore, while the pulling effect exerted by the coil as a whole upon the core is practically the same as if the core was of uniform diameter, yet the induced deterrent effect is comparatively small owing to the comparatively few number of turns of wire around the core at the beginning. The number of turns of the wire which surround the core increase more rapidly as the core moves into the coil, in the case of a tapering coil, than in the case of a cylindrical coil. In other words, the number of turns of wire which surround any particular point in the length of the core increase the farther the core is drawn into the coil. By reason of this there is secured a very great increase in the induced deterrent effect, in proportion to the comparatively small deterrent effect at the commencement of the movement. In other words the object is to have as few turns of wire as possible around the core at the commencement of the movement of the core, and as many turns as possible at the completion of such movement. This object I attain in the present instance by the peculiar shape of the coil, that is, by the tapering form thereof.

From the foregoing description it will be seen that the increased induced effect of the current becomes greater in a constant ratio as the plunger continues its movement into the coil. It will also be seen that the effect of the induced action is applied over an increasing length of the core or plunger.

An electric magnet embodying the principles of my invention is well adapted for use in any situation where the service of a solenoid is required. I do not desire, therefore, to be limited or restricted in respect to the use to which an electro magnet embodying my invention may be put.

An electro magnet embodying the principles of my invention is specially designed for use in connection with an alternating current, and particularly a one phase current, but I do not desire to be limited or restricted in this respect.

Variations and changes in the details of construction and arrangement might readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited to the exact and specific details shown and described.

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent is:

1. In an alternating current solenoid, the combination with a laminated core or plunger having the laminations thereof united into a solid mass at one end and separated at all other points, of a coil or winding therefor, said coil increasing from end to end in the number of turns thereof which surround the core.

2. In an alternating current solenoid a laminated core or plunger, the laminations being united into a solid mass at one end and in open magnetic circuit at all other points, and a tapering coil for said core or plunger.

3. In an alternating current solenoid, a laminated core or plunger, having the laminations thereof united into a solid mass at one end and in open magnetic circuit with respect to each other at all other points, a tapering coil for said core or plunger, and means arranged at the larger end of said coil for concentrating the pull on said core or plunger.

4. In an alternating current solenoid, a laminated core or plunger, said laminations being united together at one end into a solid mass to form a closed magnetic circuit with respect to each other, and disconnected from each other at all other points to form an open magnetic circuit with respect to each other, and a coil or winding, said coil or winding increasing in the number of turns thereof from end to end, and means arranged at the end containing the larger number of coils for increasing the induced effect thereof.

5. In an alternating current solenoid, a laminated core or plunger, having the laminations united together into a solid mass at one end and disconnected at all other points, and a coil, said coil increasing in external

diameter towards the end to which the core or plunger is drawn the bore of said coil being of uniform transverse area.

6. In an alternating current solenoid, a laminated core or plunger having the laminations united into a solid mass at one end and disconnected at all other points and a coil, said coil increasing in external diameter from end to end, and a stationary magnetic block arranged adjacent the larger end of the coil.

7. In a solenoid, a core and a coil, said core being laminated, the lamination being united solidly together at one end to form a closed magnetic circuit and disconnected to form an open magnetic circuit with reference to each other throughout the remaining portion of the length thereof, said coil being tapered.

8. In a solenoid, a core and a coil, said core being laminated, and having the laminations thereof united into a solid mass to form a closed magnetic circuit at one end, and being in open magnetic circuit with respect to each other throughout the remaining portion of the length thereof, said coil increasing in the number of turns thereof, from end to end, and a laminated magnetic block arranged adjacent to the end of the coil, having a larger number of turns.

9. In an alternating current solenoid, a

core or plunger composed of laminations, said laminations being united into a solid mass to form a closed magnet in circuit at one end for a portion of its length, and an exteriorly tapering coil into the bore of which said core is adapted to be drawn.

10. In an alternating current solenoid, a laminated core or plunger of uniform cross sectional area throughout its length, said laminations being united into a solid mass to form a closed magnetic circuit at one end only, and an exteriorly tapering coil into which the core is adapted to be drawn.

11. In an alternating current solenoid, a laminated core or plunger, the laminations being united into a solid mass to form a closed magnetic circuit at one end only, and an exteriorly tapering coil having a bore of uniform transverse sectional area throughout its length into which the core is adapted to be drawn.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 28th day of March A. D., 1907.

HAROLD ROWNTREE.

Witnesses:

JOSEPH KLEIN,
S. E. DARBY.