R. E. HELLMUND.

ELECTROMAGNETICALLY OPERATED APPARATUS.

APPLICATION FILED APR. 4, 1906.

928,516. Patented July 20, 1909.

Fig. 1.

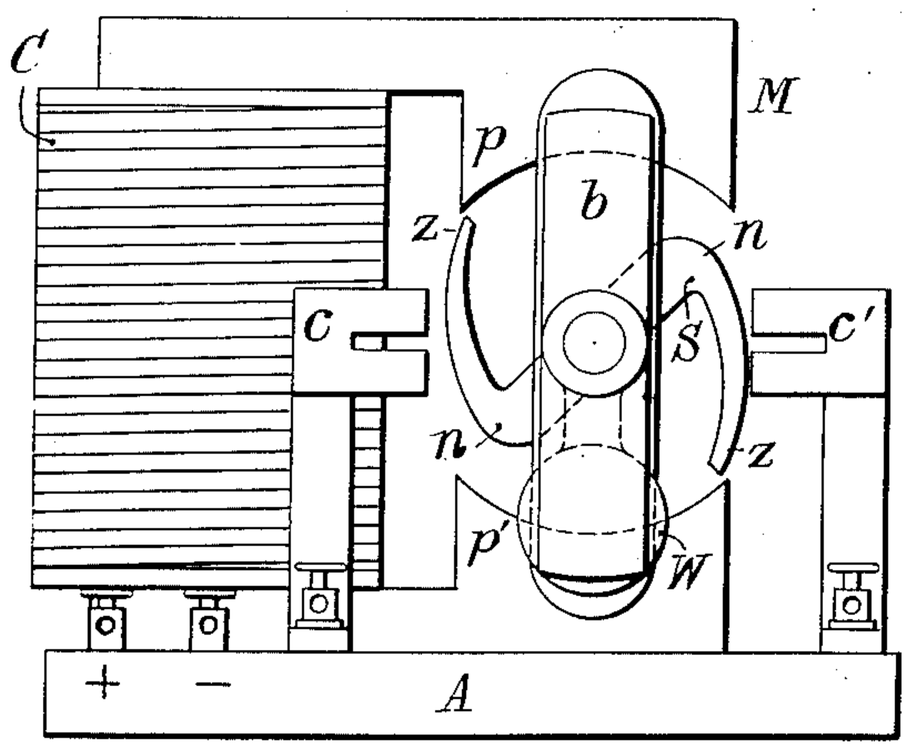


Fig. 2.

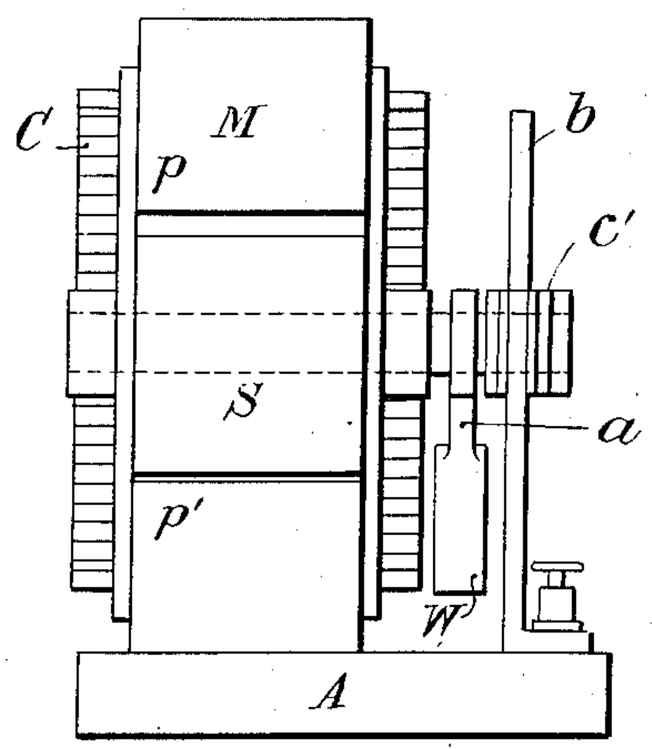


Fig. 3.

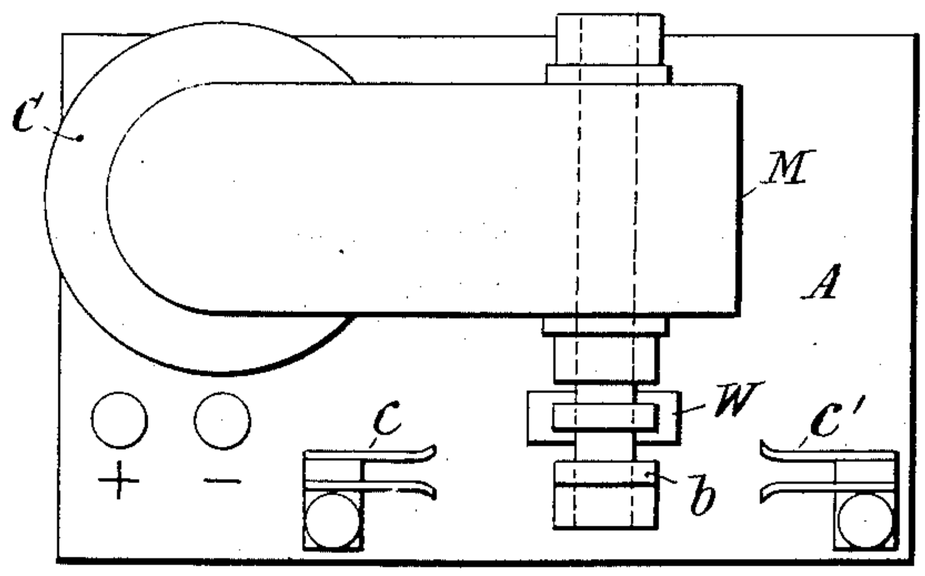
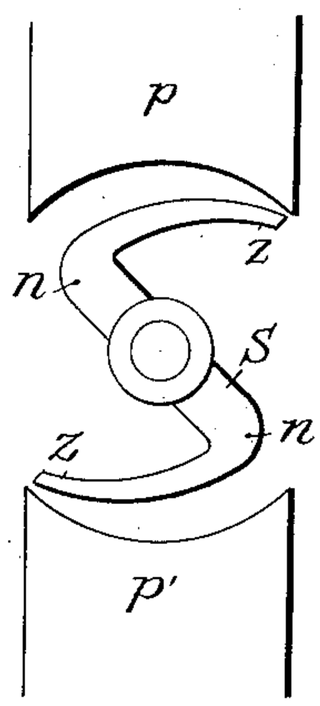


Fig. 4.



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RUDOLF E. HELLMUND, OF HINSDALE, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, OF EAST PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ELECTROMAGNETICALLY-OPERATED APPARATUS.

No. 928,516. Specification of Letters Patent. Patented July 20, 1909.

Application filed April 4, 1906. Serial No. 309,932.

To all whom it may concern:

Be it known that I, RUDOLF E. HELLMUND, a resident of Hinsdale, in the county of Dupage and State of Illinois, and having a post-office address of Box 130, in Hinsdale, county of Dupage, in the State of Illinois, have invented Improvements in Electromagnetically-Operated Apparatus, of which the following is a specification.

The object of my invention is to provide an electro-magnet which will effectually prevent the generation of more lines of magnetic force than are necessary to operate the armature of the magnet at any time during its motion and which, at the same time, is simple in its construction and is capable of exerting a force of considerable magnitude.

All armatures for electro-magnets have a certain definite magnetic pull exerted upon them during their first unit of movement in accordance with a certain proportionate number of magnetic lines of force passing through the iron of the armature, the amount of pull and the number of lines increasing rapidly as the armature comes nearer to the operating magnet and thus tending to accelerate the motion of the armature.

An armature that is to overcome any working resistance or element of retardation should, at no time, be attracted by a force greater than that which is necessary to move it during its initial movement, if undue increase of the magnetic lines of force is to be prevented. If the attracting force is allowed to increase, as is now the practice, when the circuit is broken, a self-induction will be set up in the magnet which will be proportionate to the number of lines of force which disappear at the time of breaking the circuit.

With my improved apparatus, I do not allow the lines of force to unduly increase as the armature advances and, consequently, upon breaking the circuit connection, there are fewer lines of force to disappear and thus produce self-inductive action; hence, I am enabled to use coils of greater numbers of turns, which means smaller parts, and also to increase the safety of the installation by lessening the liability to arcing when breaking the circuit, and, at the same time, I am aiding in securing a constant magnetic pull.

The device of my invention may be used with one or more armatures to operate clutches, circuit-breakers, switches or any armature-operated electrical apparatus. In a co-pending application, I have shown the armature as applied to a circuit-breaker, but I have not claimed it broadly therein. In this application I have shown a single armature as applied to a switch for operating an electrical apparatus from a distance.

For cases where a uniform pull has been required, structures have been devised, which were adapted to reduce the acceleration of the flux, some of which were, however, complicated and expensive in their construction and others were not practical, in cases where a considerable magnetic pull was required.

In the accompanying drawings, Figure 1 is a side elevation of an electrically-operated switch with my improved armature attached; Fig. 2 is an end view, and Fig. 3 is a plan view of the same; Fig. 4 shows the armature and the poles of the magnet of Figs. 1, 2 and 3, but with the armature moved through an angle of 90°.

In Figs. 1, 2 and 3, A is a base-plate on which two contact clips *c c'* are mounted for making circuit connection with the device to receive current. C is the coil of the magnet M for receiving current from the terminals +, —. The poles *p*, *p'* have concentric faces between which an S-shaped armature S is adapted to rotate, a radial arm *a* being mounted on the armature shaft to carry a weight W. A contact blade *b* on the shaft is adapted to make contact, under magnetic influence, with the clips *c*, *c'* and to break contact, when under the influence of the weight W only. The S-shaped armature has a toe Z and a heel *n* the toe being at a greater distance from the shaft than the heel *n*, so that, when the armature is revolved 90° from the position shown in Fig. 1, to the position shown in Fig. 4, there will be an air-gap between the poles of increasing width from the toe to the heel. As the armature rotates, more iron is inserted into the field which tends to increase the magnetic pull and to accelerate the motion, but the weight develops an increased moment of

retardation as it is raised. The air-gap produced by the eccentricity of the armature face is just sufficient to cause an increased number of lines of force, in each successive unit of movement, to so lag behind the increase which would occur in a concentric armature, that the increased lines shall develop in that number and power which, in addition to the lines developed in the previous units of movement, will just overcome the increased moment of retardation.

I am aware that it is not broadly new to provide, in an electro-magnet, means for reducing the acceleration of the flux.

I claim as my invention:

1. The combination with an electro-magnet having opposing curved pole faces, of a rotatable armature of S-shape the outer faces of which are eccentric to the pole faces and the toes of which are nearer thereto than the heels.

2. Electrical apparatus having a magnet and an S-shaped armature having an eccentric face designed to face the pole faces of said magnet, the eccentricity of the face of the armature being such that the toe of the S shall be nearer to the pole than the heel, substantially as described.

3. The combination with an electro-magnet having curved pole faces, of a rotatable armature having oppositely projecting arms the free ends of which are nearer to the pole faces than the other portions thereof.

4. The combination with an electro-magnet having opposing curved pole faces, of a pivoted armature having oppositely projecting arms the outer faces of which are eccentric to the pole faces, and the free ends of which are nearer to said pole faces than the body portions.

5. The combination with an electro-magnet having opposing curved pole faces, of an armature of S shape the outer faces of which are separated from the magnet pole faces by air-gaps that gradually increase in width from the toes to the heels.

6. Electrical apparatus having a magnet and an S-shaped armature having an eccentric face designed to face the pole faces of said magnet, the eccentricity of the armature faces being such that the toes of the S shall be nearer to the pole than the heels, in combination with means of retardation that increases in moment as the armature rotates.

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