E. HEDENSKOOG.

ELECTROMAGNET.

APPLICATION FILED FEB. 20, 1916.

1,190,647. Patented July 11, 1916.

Fig. 1

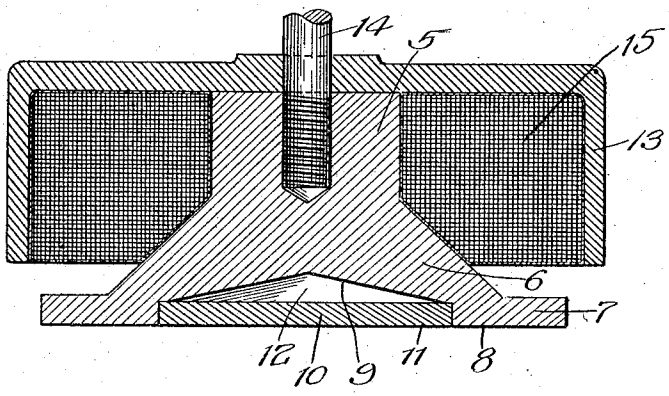
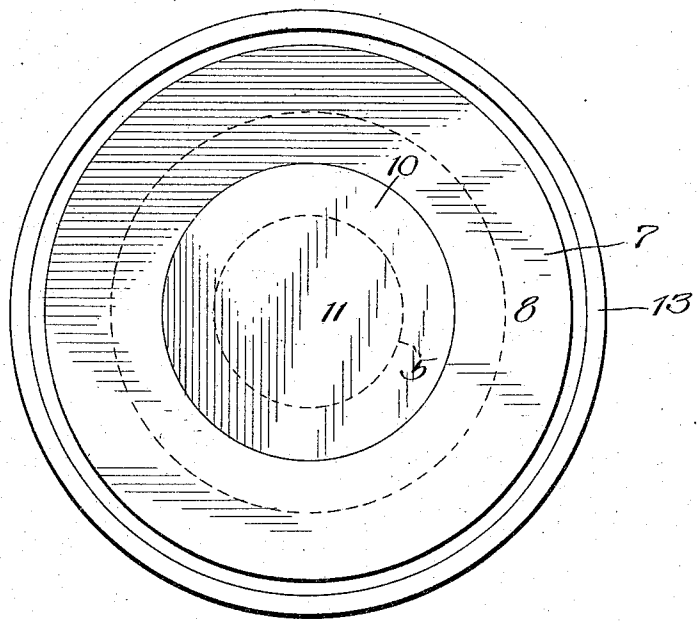


Fig. 2



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTROMAGNET.

1,190,647. Specification of Letters Patent. Patented July 11, 1916.

Application filed February 28, 1916. Serial No. 80,836.

To all whom it may concern:

Be it known that I, ERNEST HEDENSKOOG, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Electro-magnets, of which the following is a specification.

This invention relates to an electro-magnet particularly adapted for use in connection with automatic pin setting machines for bowling alleys such as that described in my application Serial No. 843,872, filed June 6, 1914.

In the course of experiments leading to the perfection of machines for automatically setting pins on bowling alleys and more particularly in the application of electro-magnets thereto for lifting pins from the alley bed during certain operations thereof I have discovered that, when the core of the electro-magnet is flared to produce a face of relatively large superficial area, the lines of force tend to concentrate at the center of the face and that sufficient lifting power is not provided adjacent the edges of the face.

It is the object of my invention to provide means, in an electro-magnet having a face of relatively large superficial area, to equally distribute the lines of force over the entire area so that the lifting power of the magnet at any point on its face is equal to the lifting power of the magnet at every other point on its face.

Further objects and advantages of my invention will be apparent as it is better understood by reference to the following specification when read in connection with the accompanying drawing, illustrating the preferred embodiment thereof, in which—

Figure 1 is a vertical section through an electro-magnet according to my invention, and Fig. 2 is a plan view of the lower face of the structure illustrated in Fig. 1.

Referring to the drawing, 5 indicates a core, preferably of soft iron, which is flared at 6 and provided with a flange 7 so that a face 8 is provided of relatively large superficial area compared to the diameter of the core 5. A recess 9, conical in form, is provided in the face 8 and a plate 10 of metal, such as soft iron or steel, is forced into the recess 9 until its face 11 is substantially flush with the face 8 of the core. A chamber 12 is thus provided within the flared portion 6 of the core 5 which serves as an air gap resisting the magnetic lines of force. It will be noted that the depth of the chamber 12 is greatest rearwardly of the center of the plate 10 and diminishes toward the periphery thereof. Inasmuch as the tendency of the lines of force is to collect at the center of the face of the core it will at once be apparent that the air gap provided by the chamber 12 will cause the lines of force to be more or less deflected and, therefore, equally distributed over the face 8 of the core and the face 11 of the plate 10.

A housing 13 is disposed about one end of the core 5 and is held in position by a bolt 14 which secures the electro-magnet to the supporting structure (not shown). A plurality of turns of insulated conducting material 15 are disposed about the core 5 in the usual manner and are adapted to be connected to a source of electric current which energizes the electro-magnet.

By employing the above-described structure I am enabled to produce an electro-magnet provided with a face of large superficial area which, when the electro-magnet is energized, provides sufficient power at any point on its face to lift a pin from the alley bed. This is essential to a satisfactory automatic pin setting machine for bowling alleys inasmuch as pins, during the play, frequently remain standing, although disturbed from their normal positions and must be lifted from the alley bed while the fallen pins are removed. It will be apparent, therefore, that pins which have been moved from their normal positions must be lifted by the magnets with the same facility with which undisturbed pins are lifted.

It will be readily understood from the foregoing that I have perfected an electro-magnet adapted to accomplish a desirable result in a satisfactory manner and that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In an electro-magnet, a metal core provided with a flaring end presenting a sub-

stantially flat face of relatively large superficial area, and a metal housing partially surrounding said core, said flaring end being provided with an inclosed chamber forming an air gap, whereby the magnetic lines of force are equally distributed over the area of the flat face of the flaring end of said core.

2. In an electro-magnet a metal core provided with a circular flaring end presenting a substantially flat face of relatively large superficial area, and a metal housing partially surrounding said core, said flaring end being provided with an inclosed chamber forming an air gap, the depth of said chamber being maximum rearwardly of the center of said face and diminishing toward the periphery thereof, whereby the magnetic lines of force are equally distributed thereover.

3. In an electro-magnet, a metal core provided with a circular flaring end presenting a substantially flat face of relatively large superficial area, a metal housing partially surrounding said core, said core being provided adjacent said face with a conical recess, and a metal plate secured to said core at the base of said recess with its outer face in substantially the plane of the face of said core to form an inclosed chamber which serves as an air gap to maintain an equal distribution of the lines of magnetic force over the faces of said core and plate.

ERNEST HEDENSKOOG.

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