W. D. LUTZ.

ALTERNATING CURRENT MAGNET.

APPLICATION FILED JULY 31, 1913.

1,166,699. Patented Jan. 4, 1916.

Fig. 1.

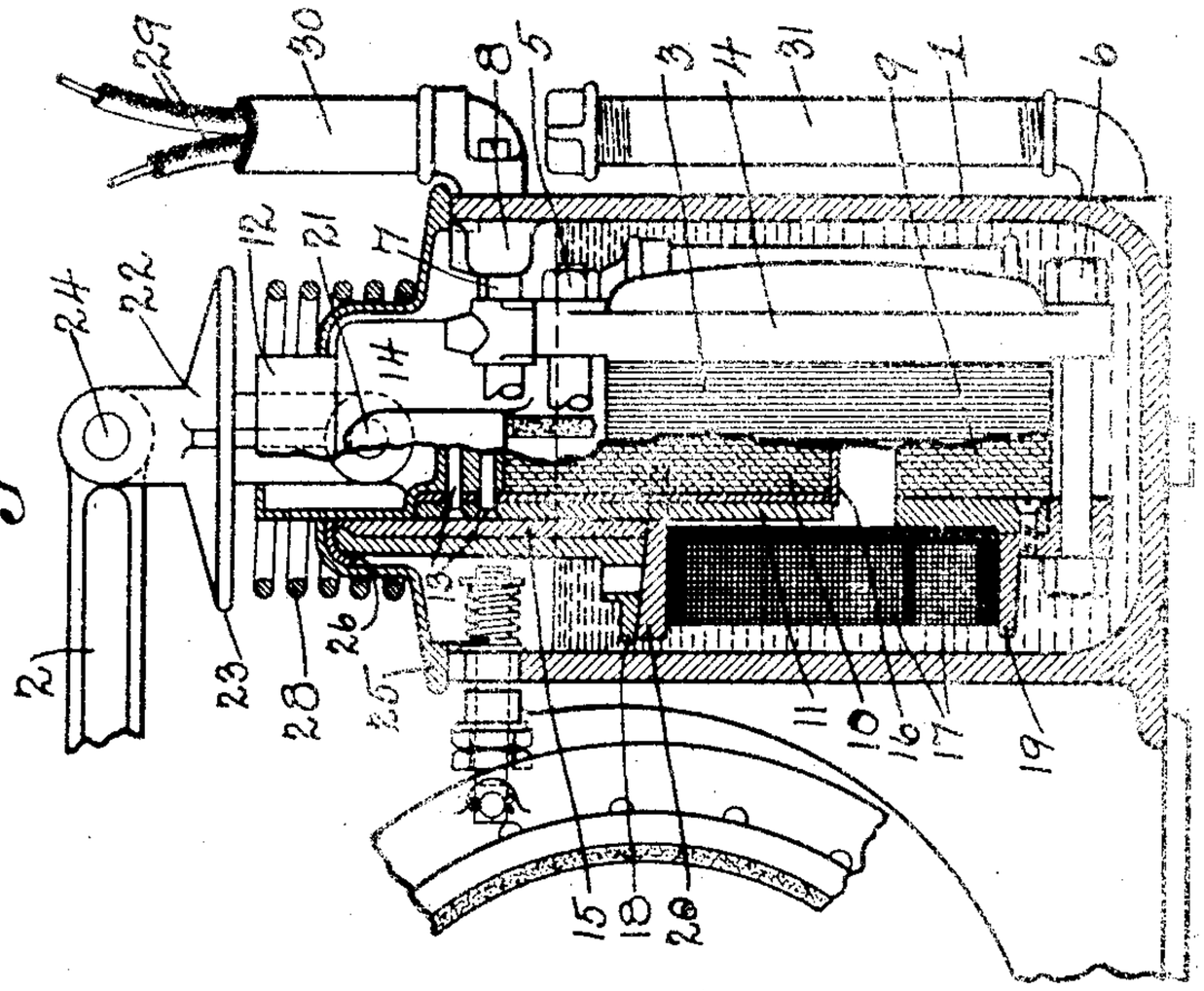


Fig. 2.

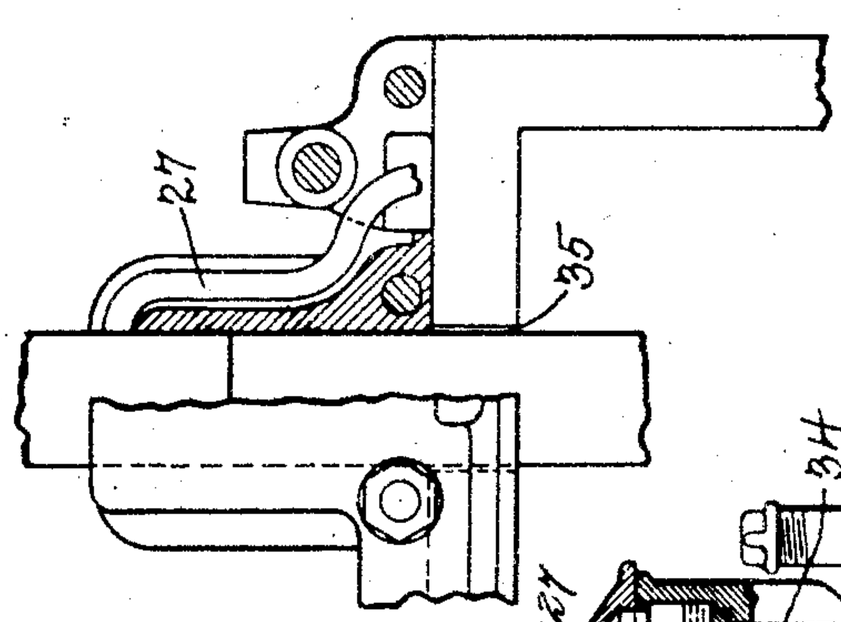
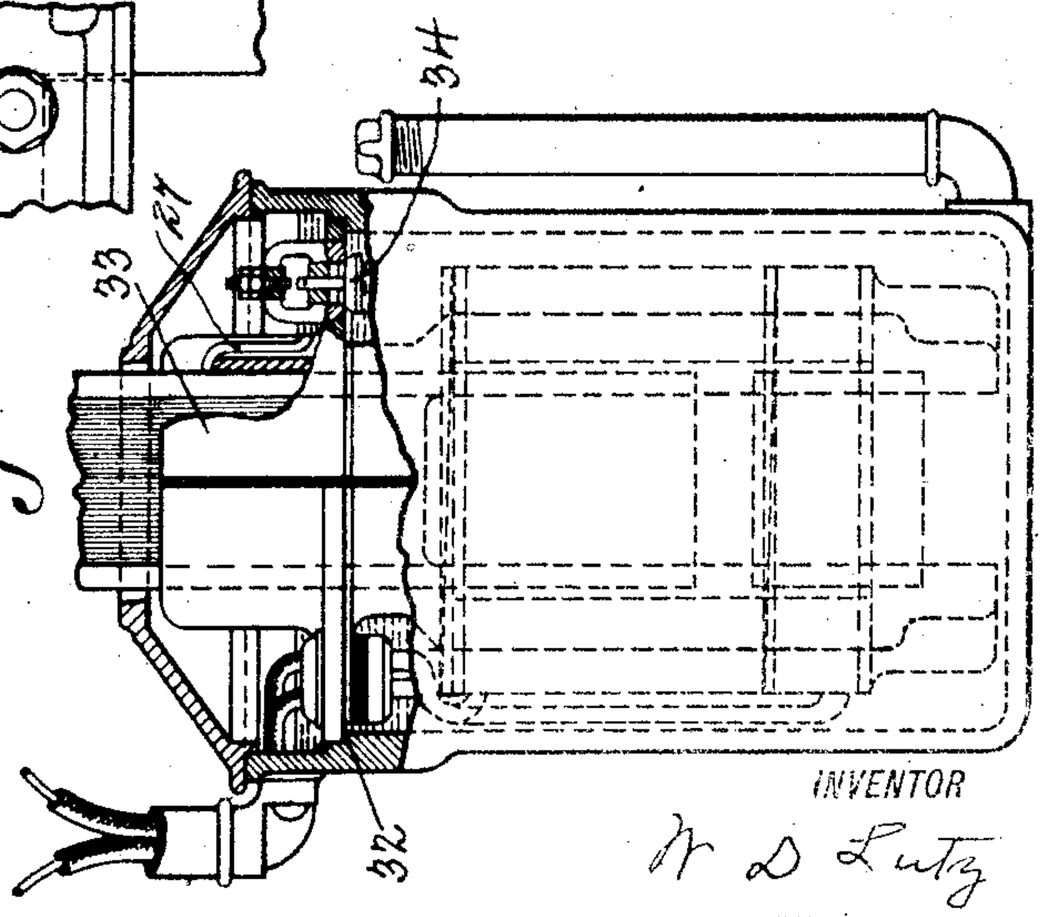


Fig. 3.



WITNESSES:

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WILLIAM D. LUTZ, OF ALLENDALE, NEW JERSEY, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ALTERNATING-CURRENT MAGNET.

1,166,699. Specification of Letters Patent. Patented Jan. 4, 1916.

Original application filed March 20, 1912, Serial No. 685,112. Divided and this application filed July 31, 1913. Serial No. 782,164.

To all whom it may concern:

Be it known that I, WILLIAM D. LUTZ, a citizen of the United States, residing in Allendale, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Alternating-Current Magnets, of which the following is a specification.

My invention relates to improvements in alternating current magnets, and although it can be adapted for general use, it is more particularly adapted for use in conjunction with brake apparatus such as is used in conjunction with electric elevators.

The present case is a division of my copending application for a patent on alternating current brake magnets, Serial No. 685,112, filed March 20, 1912.

One of the objects of my invention is to provide a simple and cheap alternating current magnet which is of a highly efficient construction and which involves a minimum amount of machine work.

Another object of my invention is to provide a simple and practical means for keeping the parts lubricated in a manner whereby all wear and noise is practically eliminated, and the heat generated therein greatly reduced.

Other objects will appear hereinafter, the novel combinations of elements being pointed out in the appended claims.

Referring to the drawings, Figure 1 is a sectional view of the magnet and other parts, Fig. 2 is a detail sectional view of the upper part of the magnet showing an improved method of guiding and lubricating the magnet core, Fig. 3 is a view in part section of a modified form of magnet.

Like reference characters denote similar parts in all figures.

The casing or pot 1, contains an electromagnet operatively connected to the mechanism to be operated, as for example a brake lever 2. This magnet comprises a field member built up of laminæ 3 as is usual in the construction of alternating current magnets, the assembled laminæ being held in position by means of end plates 4 and bolts, such as 5 and 6. This field member is rigidly secured in position inside of the pot 1 by means of rods 7, which pass through the end plates 4 and are retained in bosses such as 8 cast in the pot. The laminæ are stamped out of sheet iron and in form are substantially rectangular with a pole piece 9 extending upwardly at the lower end and an opening at the upper end to receive a core 10. The core is also of laminated construction, comprising a number of stampings 10 having stays or end plates 11 preferably made of bronze; the laminæ and end plates 11, together with a core head 12 being fastened together by suitable rivets 13. The head 12 and the upper part of the core are surrounded by a divided casing 14 formed by an extension of the field end plates 4 and the space therebetween is filled with Babbitt metal 15, which is poured in in a molten state. The lower end of the core may be tipped with some non-magnetic material such as German silver 16 which forms an abutment between the core and the field pole 9 and tends to counteract the effects of residual magnetism. The magnet winding 17 is made in two sections so as to facilitate assembling, and the sections are electrically connected with each other so as to form a single solenoid in effect. The winding is wound on spools which are held in place in the field frame by means of the field pole 9, and the top and bottom supports 18 and 19, respectively, one or more wedges such as designated by the numeral 20 being driven in between the upper support 18 and the top magnet spool, after the magnet spools have been assembled, and held in place by means of a set screw as shown. The core head 12 is hollow and contains a bearing, to which is pivoted by means of a pin 21, a connecting link 22 provided with a flange 23. The upper end of this link is in this instance pivoted by a pin 24 to the brake lever 2. The upper end of the pot 1 is provided with a cover 25 which loosely fits the core head 12 and holds in place a felt washer 26 which is in contact with the head and which serves the purpose of a stuffing box therefor, excluding all dust and dirt from the interior of the magnet casing or pot. The pot is partially filled with transformer oil which has free access to all parts of the magnet and its function is to keep all parts thoroughly lubricated and to act as a cushion for the solenoid core, while at the same time the oil acts as a heat conveying medium for carrying the heat generated in the magnet to the pot where

it is radiated. As an additional means for insuring that all parts of the core may be supplied with lubricating oil, I sometimes provide a channel in the Babbitt metal surrounding the core (see Fig. 2), which contains a wick 27, one end of which dips into the oil contained in the pot, while the other end is in contact with the core.

The pot cover 25 carries a stiff coil spring 28, which is somewhat shorter in length than the distance between the cover and the flange 23 upon the connecting link 22. This spring serves the purpose of overcoming the residual magnetism of the core and magnet field after the magnet winding is deënergized. The conductors 29 lead to the terminals of the magnet winding and are incased in a conduit 30 secured to the pot. A riser 31, capped on one end, is connected to the lower end of the pot and furnishes a convenient means for filling and emptying the pot with oil whenever necessary.

In the modification shown in Fig. 3, a circumferential groove 32 is turned to receive a flange on the divided casing 33, and the cover 25, flange and pot, are held together by means of through bolts threaded into the pot. These bolts are not shown in the sectional view Fig. 3, since their presence would tend to confuse the drawing. This construction dispenses with the rods 7 of Fig. 1, and in some respects is preferable thereover. The flange 32 divides the pot into two sections which are in communication with each other through the adjustable puppet valve 34. This valve is independently adjustable in both directions and is so arranged that it will never close tightly but will merely restrict the flow of oil from the lower section to the upper section when the core is drawn downwardly, and will control the flow of the oil in an opposite direction. This action tends to cushion and retard the release of the mechanism operated by the magnet core, such as the brake, but permits of a rapid application thereof.

By the use of Babbitt metal for guiding the magnet core, I provide a simple, cheap and highly efficient construction involving a minimum amount of expensive machine work. The amount of clearance or air gap 35 (see Fig. 2) between the lateral faces of the magnet core and the magnet field, may be very slight indeed, thereby improving the efficiency of the magnet, and, when alternating current is used to excite the magnet, cut down the current consumption. The Babbitt metal forms a very efficient wearing surface for the core, and since ample provision is made for keeping the parts lubricated, all wear of the magnet parts is practically eliminated. It will be observed that the oil contained in the magnet casing or pot 1, not only acts as a lubricating agent, but also as a means for dampening the vibrations set up in the magnetic parts when the same are energized by an alternating current. The oil has free access to all parts of the magnet and forms a film over the lateral faces and lower end of the core, which prevents an actual contact of metal to metal. In alternating current magnets, the flux constantly varies, and when said current is of single phase the magnetism is reversed with each alternation of current. That is to say, for each alternation of current, the magnet is dead and there is no pull upon the core. Now, since the spring 28 is tending to pull the core in an upward direction at all times when the circuit of the magnet is closed, it follows that the core will tend to move away from the field pole 9, while the flux passes through zero, only to be pulled back in contact again when the flux rises in value. Ordinarily this action sets up a violent hammering effect which not only tends to batter the end of the core out of shape and to make the action of the magnet extremely noisy, but also to reduce the effective pull of the magnet.

The tendency of the residual magnetism to cause sticking of the magnet core after the exciting current has been cut off, is practically overcome by means of the air gap or break in the magnetic circuit found at the bottom of the core and at the lateral faces of the core where it passes through the field at the point 35, and this tendency is reduced by this construction to such an amount that if desired the German silver spacer 16 upon the lower end of the core may be removed without danger of the core sticking, the oil preventing the metallic parts from actually contacting.

While I have described my invention in conjunction with a single phase alternating current, the same may be used to equal advantage with polyphase or other currents of any nature.

Without limiting myself to the precise construction and arrangement of parts herein described and illustrated, what I claim and desire to have protected by Letters Patent of the United States is:—

1. The combination with an electro-responsive device, of a movable core, a guide for said core, and means for supplying oil to both ends of said guide.

2. In an electro-responsive device, the combination with a solenoid magnet, of a movable magnet core, a casing containing fluid surrounding said magnet and core, a partition dividing said casing into two parts, and a valve in said partition for regulating the passage of fluid displaced by said magnet core.

3. In an electro-responsive device, the combination with a solenoid magnet, of a movable magnet core, a casing containing fluid surrounding said magnet and core, a

partition dividing said casing into two parts, a valve in said partition for regulating the passage of fluid displaced by the magnet core, and means for limiting the movement of said valve toward closed position.

4. In an electro-responsive device, the combination with a solenoid magnet, of a movable magnet core, a casing containing fluid surrounding said magnet and core, a horizontal partition dividing said casing into two parts, a valve in said partition for regulating the passage of fluid displaced by the magnet core, and means for limiting the movement of said valve toward closed position.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM D. LUTZ.

Witnesses:
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