Jan. 29, 1929. 1,700,228

A. B. KENDALL

ELECTROMAGNET

Filed Jan. 30, 1923

Fig. 1,

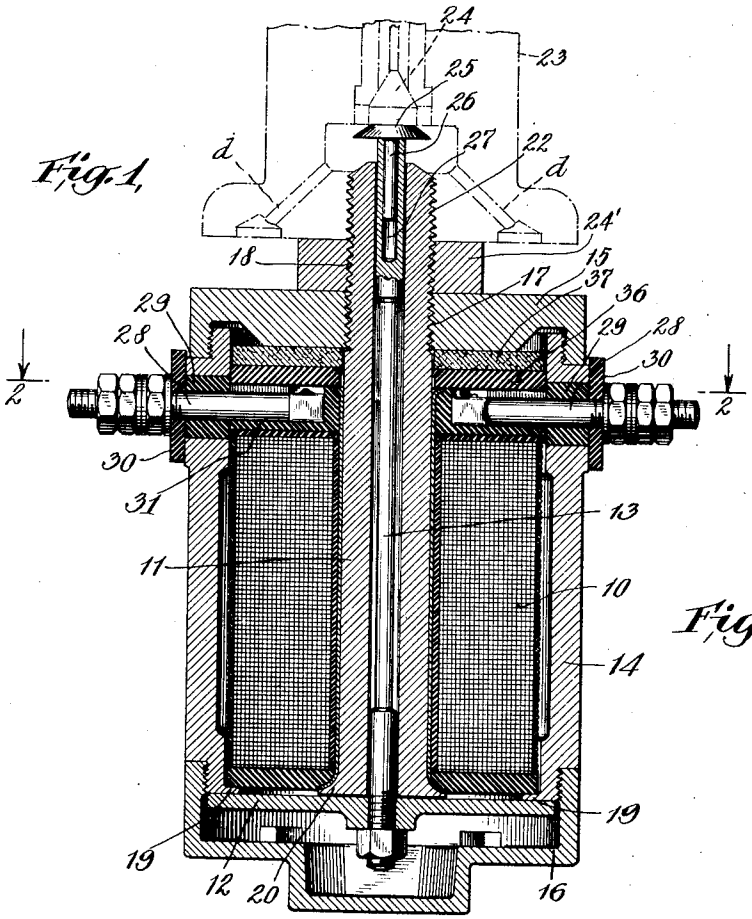



Fig. 3,

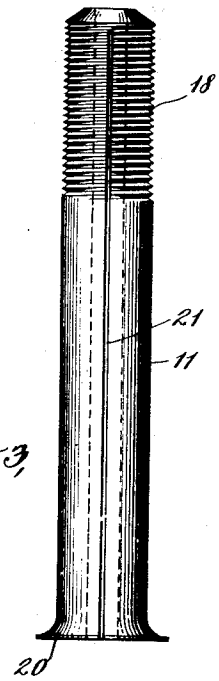
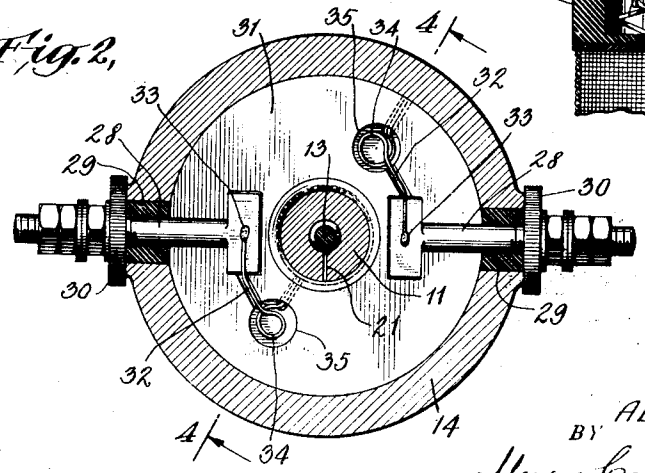



Fig. 2,



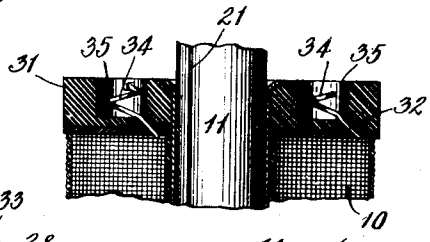




Fig. 4,

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# UNITED STATES PATENT OFFICE.

ALLEN B. KENDALL, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO THE REGAN SAFETY DEVICES COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## ELECTROMAGNET.

Application filed January 30, 1928. Serial No. 615,858.

This invention relates to an electromagnet, and more particularly to an electromagnet designed especially for controlling the operation of train mechanism in train control systems; and has special reference to the provision of an electromagnet especially constructed for employment with the combined reservoir and brake valve mechanism disclosed in the copending application of Allen B. Kendall, Serial No. 600,018, filed Nov. 10, 1922.

Among the principal objects of my present invention are the provision of an electromagnet especially designed to function as an electro-responsive device for automatic train control purposes and adapted for controlling the operation of an air brake valve mechanism in response to roadside or traffic conditions; the further provision of an electromagnet so constructed as to respond with that rapidity, positiveness and certainty fundamentally requisite to assure maximum safety in the automatic control of the movement of trains; the further provision of an electromagnet of this nature which is so constructed as to durably withstand the severe service conditions to which it is normally subjected; and the more specific provision of an electromagnet designed to minimize and counteract the effects of continuous vibration and shock concomitant with normal train running, and to guard against the elements and the disturbing influences of media such as moisture and foreign matter unavoidably present on locomotives or vehicles during train operation.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, my invention consists in the elements and their relation one to the other, as hereinafter particularly described and sought to be defined in the claims, reference being had to the accompanying drawings which show a preferred embodiment of my invention, and in which:

Fig. 1 is a cross-sectional view of my electromagnet showing the same applied for use with train control mechanism,

Fig. 2 is a view taken in cross-section on the line 2—2, Fig. 1,

Fig. 3 is a detailed view of the electromagnet core, and

Fig. 4 is a fragmentary view taken in cross-section on the line 4—4, Fig. 2.

As heretofore referred to, one of the principal objects of the present invention comprises an electromagnet construction designed so as to act with rapidity and surety for operating valve mechanism for controlling the movement of trains, with the parts so constructed as to withstand considerable rough usage, and with the operating parts of the electromagnet protected against disturbing influences. To these ends the electromagnet of my present invention and its operating parts are completely housed by a casing forming part of the magnetic circuit of the electromagnet and so designed as to produce a magnetic path of very small reluctance, and in the preferred embodiment shown in the drawings, the electromagnet 10 provided with the hollow central core 11 and the disk-shaped armature 12 which carries an operating stem 13 are housed by a casing including the preferably cylindrical-shaped side wall 14 provided with the opposite end walls which in the preferred construction comprise the top cap 15 and the bottom cap 16, the said caps being threadedly attached to the opposite ends of the side wall 14, as clearly shown in the drawings. The top cap 15 is preferably centrally tapped as at 17 for receiving a threaded extending portion 18 forming part of the electromagnet core 11, the core 11 being by this means supported by the cap 15 and magnetically united thereto. The core 11, the cap 15 and the side wall 14 are all made of a magnetic material, and the bottom cap 16 is made of a non-magnetic material such as brass, for example, and with this construction the side wall 14, the top cap 15 and the core 11 form a partial magnetic circuit for the electromagnet coil terminating at the inwardly formed side wall ledge 19 and the outwardly formed flange portion 20 of the core 11, which latter support the coil 10 in the electromagnet casing. With this construction it will be seen that the armature 12 may be made to rapidly respond to the energization of the coil 10 for closing the partial magnetic circuit described and for actuating the stem 13 carried thereby.

For the purpose of minimizing the effect of any residual magnetism of magnetic retentivity at any time present in the core 11, the said core is slitted substantially throughout its lengh on one side, as clearly shown

at 21 in Figs. 2 to 4 of the drawings. It has been found that with the provision of this longitudinal slot 21 the effect of residual magnetism may be substantially eliminated, with the result that the armature 12 responds very rapidly to any changes of energization in the magnetizing coil.

As heretofore mentioned, the electromagnet of my present invention is especially designed for use with valve mechanism disclosed in the above-mentioned application of Allen B. Kendall, and this use is illustrated in Fig. 1 of the drawings, which shows the manner of associating the electromagnet with the valve mechanism; and referring to Fig. 1, the extended threaded portion 18 of the core 11 is shown threadedly received at 22 by the combined reservoir and brake valve partially indicated in dotted lines at 23, the said valve being provided with a primary valve member 24 which is actuated by the operation of the electromagnet. In attaching the electromagnet to the valve mechanism 23, the electromagnet is preferably spaced from the valve mechanism by means of the nut 24', which nut also functions for locking the core 11 on the cap 15 and securing the cap 15 to the casing body 14.

When the electromagnet is employed with the valve mechanism 23, it has been found that there is a tendency for condensed moisture as well as impurities which finds its way to the primary valve 24 to become deposited between the stem 13 and the core 11 of the electromagnet, the moisture and impurities being discharged upon the electromagnet parts under certain conditions of operation of the valve, this deposition of moisture and foreign matter interfering with electromagnet operation. To obviate this objection, there is provided means for deflecting the foreign matter discharged through the port of valve 24 and preventing the entry of the same between the electromagnet stem 13 and the core 11, and to this end I provide a preferably umbrella-shaped deflecting means 25 positioned between the valve 24 and core 11 and functioning to protect the electromagnet stem and core and deflect the impurities laterally for passage through the ducts *d* provided in the valve mechanism. The deflecting means 25 may be provided with a stem 26 which is received by a bore 27 formed in the upper end of the stem 13.

As a result of the vibration to which the electromagnet is continuously subjected in service, it has been found that the leads connecting the electromagnet coil to binding posts forming part of the electromagnet structure tend to crystallize and break. To avoid this tendency and to obviate the breaking of the leads, the binding posts 28 of the electromagnet are arranged horizontally in the casing body 14, insulated from the casing body by means of the bushings 29 and the insulating washers 30, the inner ends of said binding posts being seated in a body 31 made of insulating material positioned over the coil 10, and to the inner ends of said binding posts are connected the coil leads 32, the said leads which are soldered to the binding posts as at 33, being horizontally coiled as at 34 to provide a freely movable lead portion which acts in the nature of a shock absorber and minimizes the tendency of crystallization. The coiled portions 34 may be protectingly housed by the insulating body 31, and to this end may be located in recesses 35 provided in the said body 31.

For additionally minimizing the relative vibration between the coil 10 and the casing housing the same, I provide an insulating washer 36 placed over the insulating body 31, and between the insulating washer 36 and the top cap 15 there is provided the vibration absorbing felt washer 37.

While I have shown my invention in the preferred form, it will be obvious that many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention, defined in the following claims.

I claim:

1. An electromagnet comprising a magnet coil, a housing therefor including a side wall and end walls, a core member, one of said end walls, a side wall and the core member being made of magnetic material and providing a partial magnetic circuit open adjacent the other end wall, the said other end wall being made of non-magnetic material, an armature movable between the second end wall and the coil for completing the magnetic circuit upon energization of the coil, and a vibration-absorbing material between the said coil and the first end wall.

2. An electromagnet comprising a magnet coil, a hollow core member therein, an armature movable to and from the core member, a stem carried by the armature and movable in the said core member, and an air deflecting means carried by said stem.

3. An electromagnet comprising a magnet coil, a hollow stationary core member therein, an armature for the coil, a stem movable within the core member and actuated by movement of the armature, the said stem being bored at one end, and an umbrella-shaped deflector provided with a stem seated in the said bore.

4. An electromagnet comprising a magnet coil, a housing therefor including a side wall and end caps, a hollow longitudinally slitted core member threadedly attached to one end cap, an armature movable between the coil and the other end cap, a stem carried by the armature and movable in the core, and a deflector carried by the stem.

5. An electromagnet comprising a casing, a maguet winding therein, vibration ab-

sorbing means supporting the winding in the casing to minimize vibration of the winding, a connecting terminal carried by the casing, the said magnet winding including a terminal lead attached to the connecting terminal and provided with a freely movable coiled portion for minimizing lead breakage due to the unavoidable vibration of the electromagnet.

Signed at Niagara Falls, in the county of Niagara and State of New York, this 19th day of January A. D. 1923.

ALLEN B. KENDALL