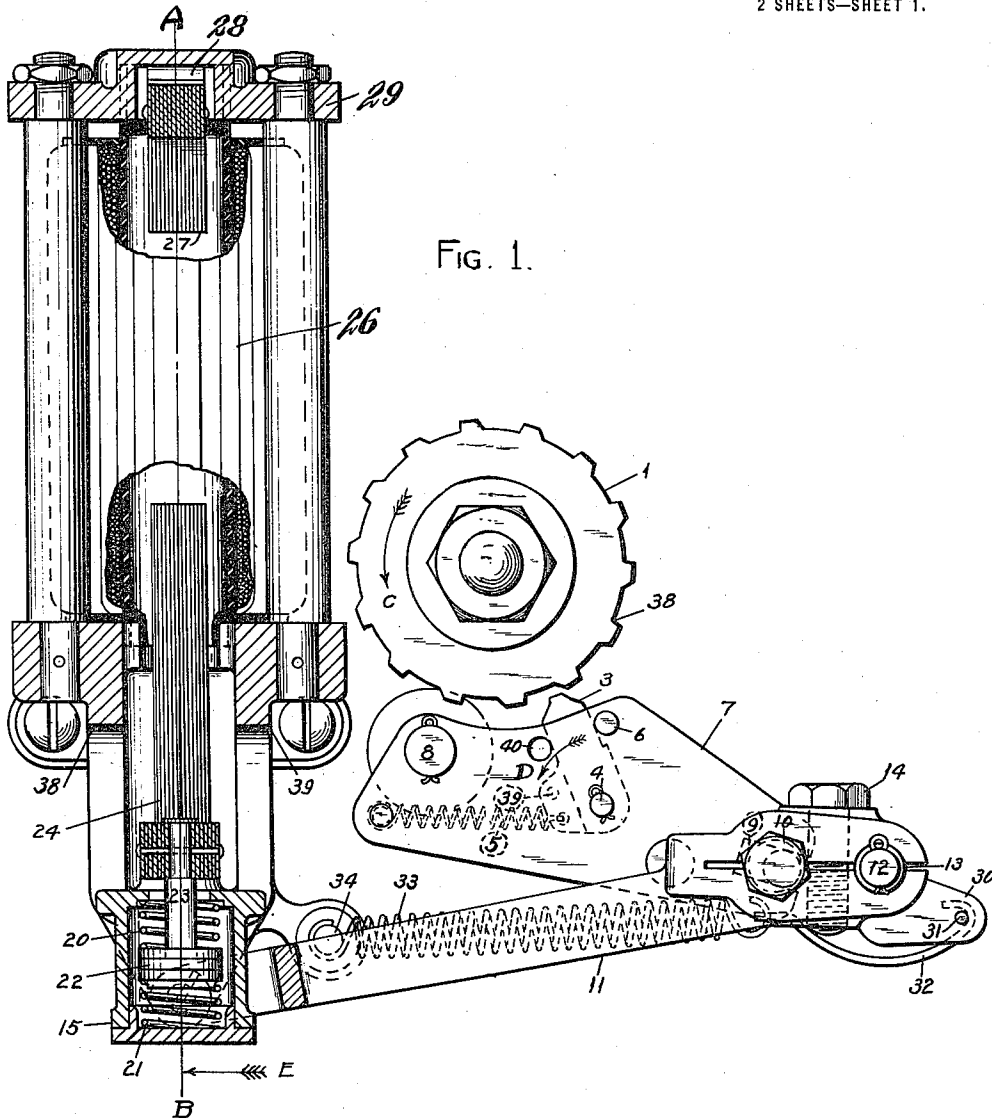


O. A. ROSS.
ELECTROMAGNETIC RETAINING DEVICE.
APPLICATION FILED JULY 27, 1914.

1,165,362.

Patented Dec. 21, 1915.

2 SHEETS—SHEET 1.



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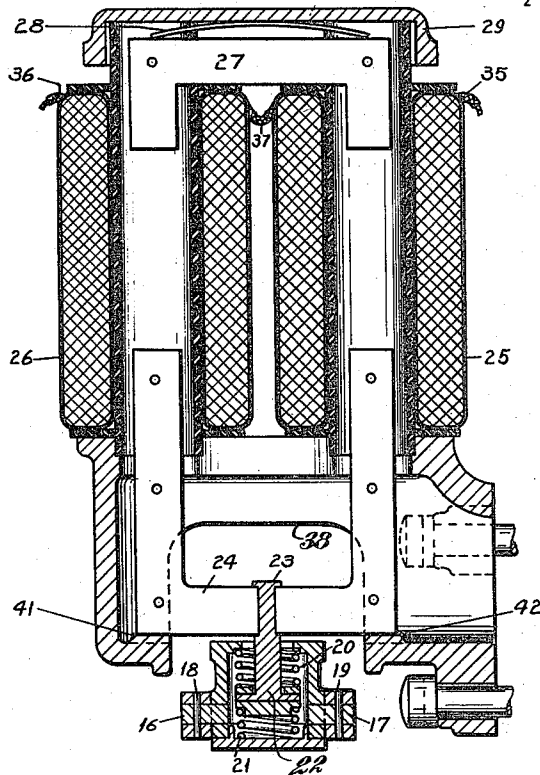


FIG. 2

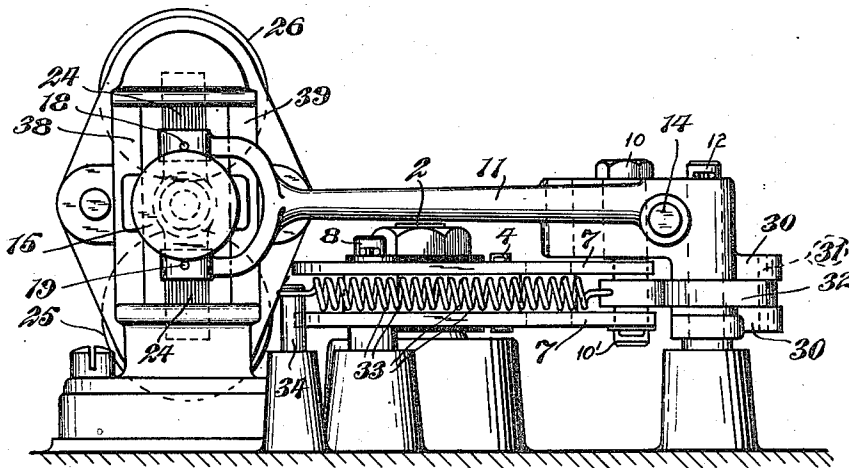


FIG. 3

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ELECTROMAGNETIC RETAINING DEVICE.

1,165,362.

Specification of Letters Patent.

Patented Dec. 21, 1915.

Application filed July 27, 1914. Serial No. 853,472.

To all whom it may concern:

Be it known that I, OSCAR A. ROSS, a citizen of the United States, and a resident of the city of Rochester, in the county of Monroe and State of New York, have invented a new and useful Electromagnetic Retaining Device, of which the following is a specification.

This invention relates to an electro-magnetic retaining device, and particularly to such a device for operation by alternating current.

The primary object of this invention is a construction of electro-magnetic retaining device such that when operated by alternating current it will be free from objectional mechanical vibration.

Another object of the invention is the construction of an electro-magnetic retaining device of high efficiency.

Other objects and advantages will appear as the description of the invention progresses, and the novel features of the invention will be particularly pointed out in the appended claims.

In describing the invention in detail, reference is had to the accompanying drawings, wherein I have illustrated a preferred physical embodiment of my invention, and wherein like characters of reference designate corresponding parts throughout the several views, and in which:

Figure 1 is a front elevation of a device embodying my invention with some parts broken away and others in section to more clearly show the construction; Fig. 2, is a partial sectional elevation upon the line A—B of Fig. 1, viewed in the direction of the arrow E; Fig. 3, is a bottom plan view of the construction shown in Fig. 1.

1 designates a toothed wheel mounted in any suitable or appropriate manner upon a shaft 2, which may be connected in any suitable and appropriate manner so as to be acted upon by a single force, which may cause it to move in one direction only, or by a plurality of forces, which may cause it to move first in one direction and then in the opposite direction.

A pawl 3 is mounted on a pin 4, and is held by the spring 5 so that it may be freely moved in the direction of the arrow D, but is prevented from moving in a direction opposite to the arrow D any farther than is allowed by the pin 6. This pawl when

moved into the path of the teeth upon toothed wheel 1 will engage those teeth and prevent a rotation of toothed wheel 1 in the direction of the arrow C, but will allow a rotation of the toothed wheel 1 in a direction opposite to the arrow C.

If it is desired to restrain the toothed wheel 1 from rotating in a direction opposite to that shown by the arrow C, then the wheel is reversed on the shaft 2 so that the faces 38 of the teeth which coincide with prolongations of the diameters face in the opposite direction. The spring 5 is also fastened into hole 39 and the pin 6 is placed in hole 40. These changes cause the retaining device to act to restrain a movement of wheel 1 in a direction opposite to that of the arrow C, but to allow a movement in the direction of the arrow C.

In order to support the pawl 3, and its associated parts, and to move it into and out of engagement with the teeth on toothed wheel 1, it is mounted upon a lever 7 which comprises two spaced plates and which is pivoted on a fixed support 8. This lever at the end opposite the pivotal support is notched, forming a space 9 for the reception of pin 10, best shown in Figs. 1 and 3. This pin consists of two portions arranged eccentrically, well shown in Fig. 3, and also shown in Fig. 1 by the dotted circles, one portion 10' being fitted in the notch 9 in the lever 7, and the other portion being suitably journaled in another member, hereinafter described. By rotating this latter portion of the pin 10 upon its axis by means of its hexagonal head, the lever 7 is adjusted so that the pawl 3 may be caused to approach or recede from the toothed wheel 1 so that its end, when in the position of rest, as shown in Fig. 1, will just clear the ends of the teeth upon the toothed wheel 1, or by such means the end of the pawl 3 may be placed at any desired distance, within the range of the adjustment, from the ends of the teeth of toothed wheel 1, when in the position of rest.

The pin 10 passes through the split end of a lever 11, which is pivoted on a fixed support 12. Between the pivot pin 12 and the pivoted end of the lever 11, a bushing 13 is placed. The bushing 13 is retained in place and the pin 10 is held in adjusted position by means of the screw 14, which passes through one portion of the split end

of lever 11 and is screw-threaded into the other portion; thus enabling the two portions of the lever to be caused to approach one another so as to hold the bushing 13 in place and the pin 10 in adjusted position, as stated.

The left hand end of the lever 11 as shown in Fig. 1 is forked or bifurcated and engages on either side of a spring box 15, being secured thereto by means of the pins 16 and 17, held in place by pins 18 and 19, best shown in Fig. 2. The spring box 15 contains an upper spring 20 and a lower spring 21, between which is placed a disk 22, which is attached rigidly to a rod 23. The strength of the springs 20 and 21 is so adjusted that the disk 22 is retained in a mid-position, as shown when all parts are at rest and the device is not energized by an alternating current as hereinafter described.

The pin 23 is rigidly attached to a laminated U shaped iron core 24, the two legs of which each project a short distance into wire coils 25 and 26 and rest upon the shoulders 41 and 42. (See Fig. 2.) Another U shaped laminated iron core 27, best shown in Fig. 2, also has its two legs extending into the wire coils 25 and 26. The core 27 rests upon the top of the coils and is held in place by a flat spring 28, which bears at its two ends on the core 27, and at and about its center on the fixed cap 29. As the core 27 bears against the coils 25 and 26 the spring 28 absorbs the vibrations of these coils caused by the flow of alternating current therethrough, so that no perceptible vibration is imparted to the main supporting structure.

The weight of the arm 11 and the parts moved by a movement of the arm 11 are, in the specific embodiment shown, either wholly or partially balanced, by forming a projection 30 on the end of the lever 11, best shown in Fig. 1, and attaching in any suitable and appropriate manner, as by means of pin 31 and connecting member 32, one end of a spring such as 33 thereto, which is caused to exert a constant force on arm 11, balancing the action of gravity on that arm and its associated parts by being attached at the other end to a fixed pin 34. The force exerted by spring 33 may be such that if disk 22, rod 23 and core 24 were removed the arm 11 would, if no force other than gravity acted on it, remain in any position in which it might be placed. This construction decreases the amount of energy needed to be supplied to coils 25 and 26 in order to move and hold pawl 3 into position, thus increasing the efficiency of the device.

If a source of alternating current is connected to the terminals 35 and 36 of the wire coils 25 and 26 (see Fig. 2), which are joined together by means of wire 37, the core 24, as viewed in Fig. 2, is drawn up-

wardly until the top of the spring box 15 rests against the shoulders 38 and 39, thus bringing the lever 11 to a definite stop and so causing the end of pawl 3 to always assume a definite position relative to wheel 1 dependent upon the rotative position of eccentric pin 10. This movement of the spring box communicated to the lever 11 and the pin 10 causes the lever 7 to move on its pivot 8, carrying with it the pawl 3, so that the pawl engages with a tooth on the toothed wheel 1, and so prevents the possibility of rotating toothed wheel 1 by any force exerted upon shaft 2 in a direction to move the toothed wheel in the direction of the arrow C in the form shown in the drawings. At the same time the toothed wheel 1 may be rotated in a direction opposite to that of the arrow C without necessitating any movement of lever 7, as the pawl 3 can be rotated on its pivot 4 against the tension of spring 5.

As is well known to all those skilled in the electrical art, and particularly that part of the electrical art relating to the construction and operation of devices energized by alternating current, the change in the value of the E. M. F. of an alternating current is such that at times it is of zero value, so that any device energized by an alternating current is at certain instances of time practically deenergized. This characteristic of an alternating current when used to operate a tractive device such as a solenoid results in an extreme vibration of the operated part or core such as 24. This vibration is not only objectionable on account of the disagreeable and loud noise which it makes, but is also objectionable because the parts affected by it are sooner or later mechanically destroyed. This last mentioned result follows very quickly in case there is an initial looseness in any connections between the tractive part of the core itself and the parts operated by it, because such looseness affords a good opportunity for a decided vibratory movement of the operated part or core, which soon results in increasing the looseness and so increasing the vibration, and so the disagreeable noise and general efficiency of the device, which is also sooner or later practically destroyed.

The defects above mentioned are especially objectionable in an alternating current device which is practically constantly energized, such as a retaining device in a railway signal, which is used to retain the signal in the clear position as in what are known as "normal clear" systems, and have in the past prohibited the use of such a device for such a purpose. For instance, the electro-magnetic retaining device shown in Patent 1,077,136 granted to F. N. Hall, October 28, 1913, cannot be used if energized by alternating current, as it would soon wear itself

to pieces. To provide a device for such a purpose the structure shown in Patent 1,075,441, granted to G. Rekers, October 14, 1913, was invented, but this also was found
 5 to be far from ideal in practice, due to the mechanical vibration set up therein.

Applicant's construction is such that the operated part of core 24 does not itself at any time come firmly in contact with any
 10 fixed part, in fact it floats in the air. The upper end of the two limbs of the core 24, as shown in Fig. 2, do not, even when fully drawn up, touch the lower ends of the fixed core 27, nor any part of the interior of the
 15 solenoid. The disk 22 is held between two springs, 20 and 21; the upper of which, 20, transmits the force exerted by the core 24 when the coils 25 and 26 are energized by an alternating current, and causes the spring
 20 box 15 to move upwardly until it comes to the limit of its movement that is in contact with the shoulders 38 and 39. The vibration of core 24 is not transmitted to the spring box 15, although the spring box is
 25 brought to a definite stop, when the core 24 is drawn upwardly because the vibrations are absorbed by the spring 20. The spring 21 is inserted because at the moment of zero value of the alternating current the core,
 30 together with its associated disk 22, would tend to drop not only by the force of gravity, but by reason of the force exerted by the tensioned spring 20, so that if it were not for the spring 21 the core 24 would have a
 35 much greater vibratory movement.

Applicant's construction is such that the very slight period of time during which the alternating current E. M. F. is zero value is not sufficient to allow core 24 through
 40 disk 22 and spring 21 to cause spring box 15 to move from in contact with shoulders 38 and 39 so that when coils 25 and 26 are energized the lever 11 assumes a definite position and so remains without the least
 45 vibration, so that no noise is produced and no wear, consequently, takes place. As core 24 contacts with no fixed part when fully drawn up, and as it is connected with spring box 15 through the intermediary of springs
 50 20 and 21, it is practically floating and is drawn into the center of the magnetic field produced by the flow of current through coils 25 and 26 and remains there.

Although I have particularly described
 55 the construction of one physical embodiment of my invention, and explained the operation and principle thereof; nevertheless, I desire to have it understood that the form selected is merely illustrative, but does
 60 not exhaust the possible physical embodiments of the idea of means underlying my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

45 1. In an electro-magnetic retaining de-

vice: a solenoid; a movable core in said solenoid; a lever; a resilient connection between said core and said lever; a pawl actuated by said lever; a movable shaft and means for controlling the movement of the
 70 shaft by said pawl.

2. In an electro-magnetic retaining device: a solenoid; a movable core in said solenoid separated from the solenoid by a body of air when the solenoid is energized;
 75 a lever; a resilient connection between said core and said lever; a pawl actuated by said lever; a movable shaft and means for controlling the movement of the shaft by said
 80 pawl.

3. In an electro-magnetic retaining device: a movable stop; means for limiting the movement of said stop; a solenoid; a movable magnetic core in said solenoid,
 85 which when the solenoid is energized is drawn in and is separated from the solenoid by a body of air; and a resilient connection between said stop and said core, whereby the energization of said solenoid
 90 by alternating current causes said stop to be moved and to be held in moved position and the vibration of said core caused by the alternating current to be absorbed by said resilient connection.

4. In an electro-magnetic retaining device: a solenoid; a movable core in said solenoid; a lever; a spring box attached to said lever; a disk in said box and a spring
 100 in said box between the disk and the inside top surface of the box; means for connecting the said disk with said core; and a pawl operated by said lever.

5. In an electro-magnetic retaining device: a solenoid; a movable core in said solenoid separated from the solenoid by a
 105 body of air when the solenoid is energized; a lever; a spring box attached to said lever; a disk in said box and a spring in said box between the disk and the inside top surface of the box; means for connecting the said
 110 disk with said core; and a pawl operated by said lever.

6. In an electro-magnetic retaining device: a solenoid; a movable core in said solenoid; a lever; a spring box attached to said
 115 lever; an upper and a lower spring in said box; a disk positioned between said springs; means for connecting the said disk with said core; and a pawl operated by said lever.
 120

7. In an electro-magnetic retaining device: a solenoid, a movable core in said solenoid separated from the solenoid by a body of air when the solenoid is energized;
 125 a lever; a spring box attached to said lever; an upper and a lower spring in said box; a disk positioned between said springs; means for connecting the said disk with said core; and a pawl operated by said lever.
 130

8. In an electro-magnetic retaining device: a pawl; a lever upon which the pawl is mounted; a second pivoted lever connected to the first said lever; means attached to the second lever for balancing the levers as nearly as desired so that they will have no tendency to move from a position in which they may be placed; means attached to the second named lever for actuating it; and a movable member having projections adapted to be engaged by the pawl.

9. In an electro-magnetic retaining device: a member, said member mounted for movement and formed with a stop engaging surface; a pawl for engaging said stop engaging surface; a pivot upon which said pawl is mounted; a stop against which said pawl rests; resilient means for holding said pawl against said stop; a pivoted lever for supporting the pivot for said pawl, the stop for said pawl and the said spring, said lever being formed with a bifurcated end forming a space; a lever pivoted intermediate its ends, said lever supporting one one side of its pivot a pin formed with an eccentric portion extending into said space and bearing upon the inside surfaces of the two portions of the bifurcated end of the first mentioned lever; means for turning said pin formed with an eccentric portion and means for holding said pin in turned position; another pivoted lever at the end on the

same side of the pivot that said pin is supported connected to a spring box formed with two spring bearing surfaces; springs, one bearing against each of said last named surfaces; a member positioned between said springs and having one spring bear on one side thereof and the other spring bearing on the other side thereof; a solenoid; a movable magnetic core for said solenoid; a connection between said member positioned between said springs and said magnetic core; means attached to said lever, pivoted intermediate its ends, at the end on the other side of the pivot from that at which said eccentric pin is attached for balancing so much of the two levers mentioned and the parts carried thereby as desired; and means for limiting the movement of the spring box in one direction and the core in the other.

10. In an electromagnetic retaining device: a lever; a pin having two portions arranged eccentrically, one of said portions of said pin being journaled in said lever; a movable member arranged to cooperate with the other portion of said pin; a pawl carried by said movable member; and a toothed wheel having teeth adapted to be engaged by said pawl.

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Witnesses:

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