

July 19, 1932.

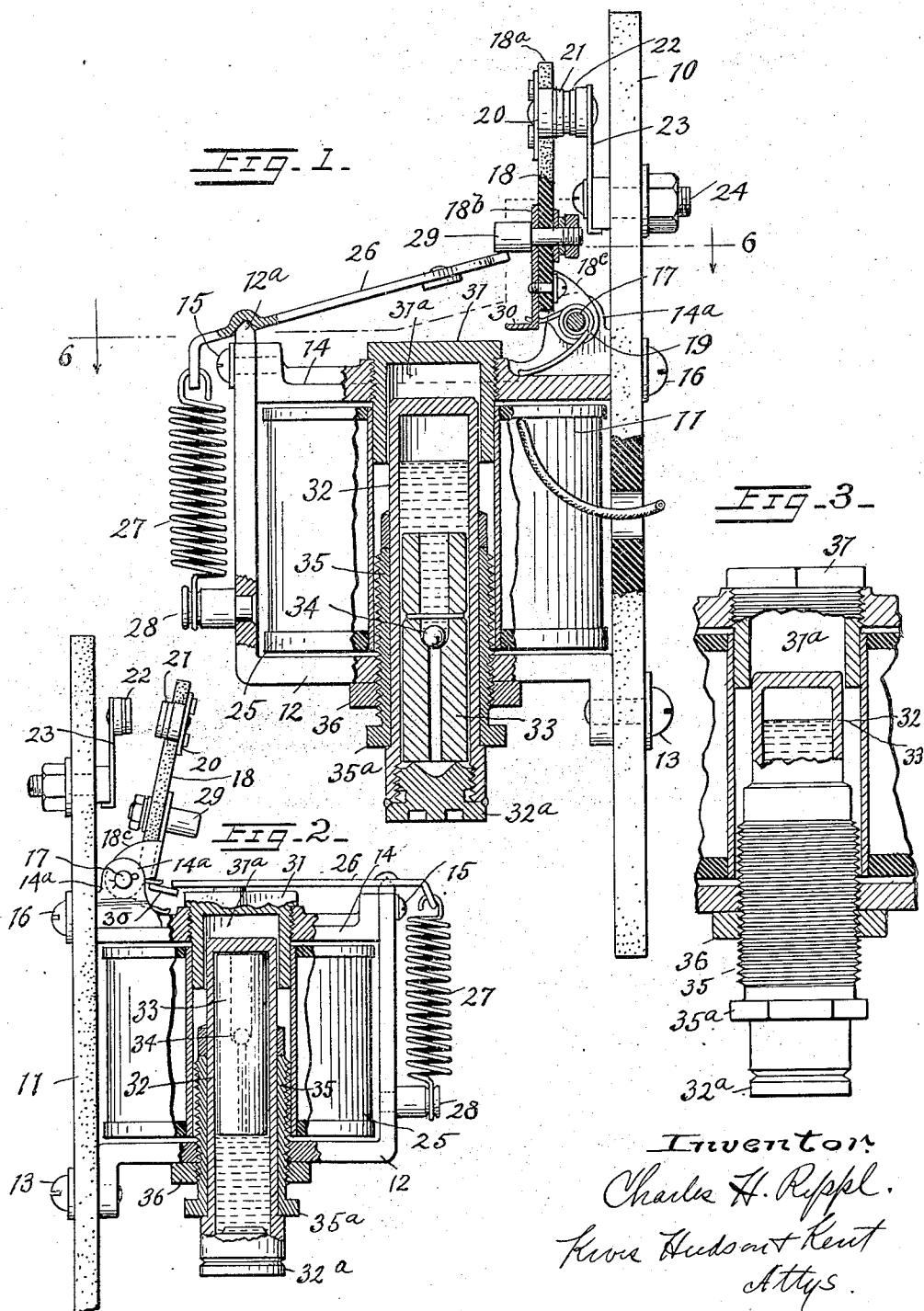
C. H. RIPPL

1,868,256

TIME LIMIT OVERLOAD SWITCH

Filed May 11, 1929

2 Sheets-Sheet 1



Inventor
 Charles H. Rippl.
 Revis Hudson Kent
 Attys.

July 19, 1932.

C. H. RIPPL

1,868,256

TIME LIMIT OVERLOAD SWITCH

Filed May 11, 1929

2 Sheets-Sheet 2

Fig. 4-

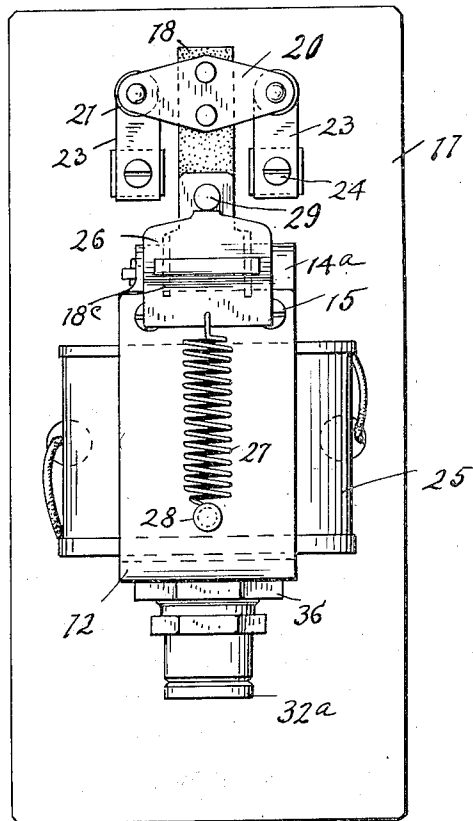


Fig. 5-

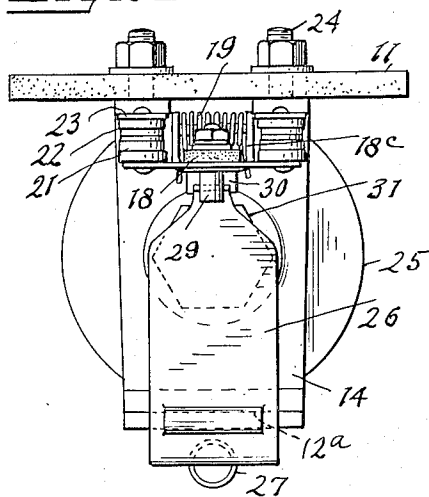
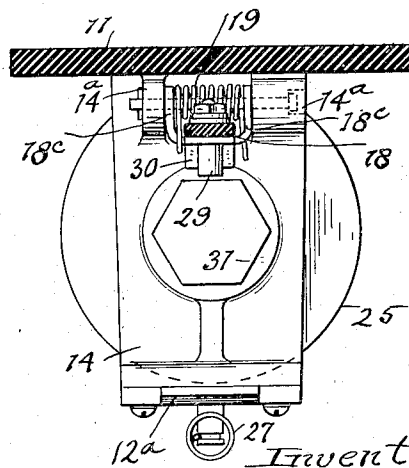


Fig. 6-



Inventor:
Charles H. Rippl.
Kline Hudson & Kent
Attys.

UNITED STATES PATENT OFFICE

CHARLES H. RIPPL, OF EAST CLEVELAND, OHIO, ASSIGNOR TO THE CLARK CONTROLLER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

TIME LIMIT OVERLOAD SWITCH

Application filed May 11, 1929. Serial No. 362,269.

This invention relates to time limit overload switches, the same having particular utility when the switch is used as a relay, though not necessarily confined to that type of switch.

One of the objects of the invention is to provide a time limit overload switch which will operate satisfactorily at moderate overloads with the time limit effect and instantaneously at a predetermined heavier overload with a wide range of adjustment of the current values at which the switch will operate with the time limit effect.

A further object is to provide a switch wherein the time limit effect is obtained through the retarded movement of a plunger in a chamber containing oil or other suitable fluid, which the plunger must displace in its travel under the action of the magnetic field to bring about the actuation of the switch, the chamber being arranged for adjustment axially of the magnet and preferably within a hollow portion of the magnet, the whole being so constructed that the overload value of the current at which the switch will operate with the time limit effect can be widely adjusted without materially varying the overload value of the current which will cause instantaneous operation.

Still further, the invention aims to accomplish the above objects with a very compact and efficiently operating switch structure, together with a maximum safety against leakage of the oil or other fluid from the chamber containing the plunger.

The above and other objects are attained by the present invention which may be here briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings showing an embodiment of the invention which operates with high efficiency,

Fig. 1 is a side elevation of the switch in the form of a relay, in its normal closed position, parts being broken away and in section;

Fig. 2 is a similar view, on a reduced scale, showing the switch open;

Fig. 3 is a fragmentary view showing the central part of the overload magnet with the chamber containing the plunger adjusted to a position other than illustrated in Figs. 1 and 2, the chamber being lowered with respect to the core or plug at the top of the magnet so as to increase the current value at which the switch will be opened with the time limit effect;

Fig. 4 is a front view of the switch on substantially the scale of Fig. 2;

Fig. 5 is a top plan view of the switch; and

Fig. 6 is a transverse sectional view substantially on the line 6—6, the parts being shown on the reduced scale of Figs. 2, 4 and 5.

Referring now to the drawings, 10 represents the base of the switch, which may be formed of any suitable insulating material. The base may be relatively small, as herein illustrated, or at times much larger, as when it consists of the switch panel on which the parts of the switch and other electrical apparatus are mounted. Mounted on the front of the base 10 is an overload magnet coil 11 supported in a frame including in this instance an L-shaped piece 12 of magnetic material, such as iron, secured by one or more screws 13 to the base, this piece 12 forming the bottom and the outer side of the frame. The top of the frame consists preferably of a casting 14 of non-magnetic material, such as bronze, which is secured by a screw 15 to the outer top portion of the frame member 12 and by a screw 16 to the base 10.

The non-magnetic frame member 14 is provided adjacent the base 10 with a pair of spaced ears 14a and in these ears is mounted a pivot pin 17 for the movable switch member 18. The movable switch member 18 includes a body portion 18a of insulating material to the lower part of which is secured a stamping 18b preferably of non-magnetic material having ears 18c mounted on the pivot pin 17. This switch member is biased toward closed position by a spring, in this

instance a coil spring 19, surrounding the pivot pin 17.

Secured to the top of the insulating body portion 18a of the movable switch member is a stamping 20 extending to opposite sides of the member 18a and having at its ends contacts 21 which are adapted to engage normally stationary contacts 22 secured, in this instance, to the upper ends of the spring fingers 23, the lower ends of which are secured by screws or bolts 24 to the base 10. As the stamping 20 with its two contacts 21 constitutes a bridging contact, the stamping may have a slight swivel action at the center so that the two contacts 21 will bear with equalized pressure on the contacts 22. The last named contacts 22 are mounted on the spring fingers 23 so as to avoid shock in the closure of the switch and to otherwise improve the action of the switch in the closing and opening movements of the movable switch member. When the switch is closed by the action of the spring 19, the contacts 22 yield backward slightly with both pairs of contacts held in engagement under the same pressure, and when the switch opens the contacts 22 move forward slightly. It will be understood that conductors (not shown) for the circuit to be opened and closed by the switch will be connected to the bolts 24 at the rear of the base 10.

As aforementioned, the switch is closed and held in closed position by the spring 19. It is adapted to be opened by an armature 26 when the armature is attracted and pulled down against the core, to be shortly explained, of the magnet. This armature, which of course is formed of magnetic material, is fulcrumed on the outer upper end 12a of the frame member 12, this portion being somewhat wedge-shaped and fitting into an offset recess in the armature, as best illustrated in Fig. 1. The armature is normally held in its off or released position, illustrated in Fig. 1, by a spring 27 which in this instance is attached at one end to the outer end of the armature just outwardly of the upright side of the magnet frame member 12 and at its other end to pin 28 on said frame member.

When the armature is in its released position, as in Fig. 1, the inner end of the armature bears against an abutment 29 carried by the switch member 18 a short distance above its lower pivoted end, the armature thus assisting the spring 19 in holding the switch closed. But when the armature is attracted it engages a second abutment in the form of an outwardly projecting lip 30 at the bottom of the stamping 18b forming a part of the switch member 18 and opens the switch quickly or with a snap action. Between the abutments 29 and 30, the armature has a free movement and when it engages the lower abutment 30 it strikes it with a sufficient blow

to quickly open the switch in the manner just stated. Of course, as long as the magnetic pull which caused the armature to open the switch is maintained on the armature, it will hold the switch open in the position shown in Fig. 2. But when the magnet is deenergized or when the magnetic pull is decreased sufficiently, the spring 27 will restore the armature to its normal position and the switch will be closed.

The magnet coil 11 surrounds an insulating spool 25 composed of top and bottom members and a hollow barrel. Extending into the coil and, in fact, in the hollow barrel of the spool is a core 31 formed of magnetic material, the core being, in this instance, in the form of a hollow plug which extends through and has threaded engagement with the non-magnetic top member 14 of the magnet frame. In this plug there is a hollow chamber or space 31a extending from the lower or open end of the plug to near the top thereof, as clearly shown in Figs. 1 to 3. The upper end of the plug is given a hexagonal or other suitable shape so that it can be conveniently screwed into a place for assembly purposes by a wrench, but when the plug is once in place its position is not ordinarily varied.

Extending up centrally through the bottom of the magnet and having threaded engagement with the bottom of the member 12 of the magnet frame is a vertically adjustable chamber and core assembly including a chamber 32 formed of non-magnetic material and adapted to contain oil or other suitable fluid. The chamber 32 is in the form of a hollow cylinder closed at both ends, the lower end being closed by a screw plug 32a which, when screwed in place, is preferably sealed by soldering or otherwise to make the chamber absolutely leak-proof. Adapted to travel lengthwise of this chamber is a plunger 33 of magnetic material. This is likewise cylindrical in form, its external diameter being just slightly less than the internal diameter of the chamber 32. The plunger has an opening extending therethrough from end to end and through this passageway the major portion of the oil passes from one end of the plunger to the other when the oil is displaced by the return movement of the plunger to the lower part of the chamber. A ball check valve 34 controls this passageway so that the upward movement of the pull of the magnet will be relatively slow (the passageway then being closed by the ball valve) and its downward movement, when the magnet is deenergized, will be relatively fast (the ball valve then being unseated).

The chamber is adapted to be adjusted up and down to vary the current value which will cause the switch to open with a time limit effect, and, for that reason, the outer wall of the chamber has fitted around it a

sleeve 35, preferably but not necessarily of magnetic material, threaded for substantially its full length as shown. The sleeve 35, which is held from endwise movement on the chamber 32, permits of a considerable adjustment of the chamber and plunger assembly axially of the magnet. It is not essential that the threads be formed on a separate sleeve 35 but this is done in this instance for convenience of manufacture only. The lower end of the sleeve 35 is somewhat enlarged, as shown at 35a, and this part is hexagonal or otherwise shaped to receive a wrench or adjusting tool which will enable the position of the chamber and plunger assembly to be varied axially of the magnet. When it has been adjusted to the right position, it can be locked in that position by a nut 36 which engages the threads of the sleeve 35 and is adapted to be screwed up against the lower side of the magnetic frame member 12, as illustrated in Figs. 1 to 3.

When the magnet is energized by a current of predetermined value (below the current value which causes instantaneous operation) the switch is not at once opened, but the pull of the magnet will cause the plunger to travel upwardly in the chamber 32 at a predetermined rate, and when it reaches a position more or less close to the upper end of the chamber, the reluctance of the magnetic field is decreased to the extent that there is now a sufficient attractive force exerted on the armature to pull it down against the top of the plug 31 and open the switch. If the overload is only temporary, the switch will not be opened, but if it continues until the plunger reaches the given position above stated, the switch will be opened. Thus, for a moderate predetermined overload a certain time will elapse between the energization of the magnet at this overload value of current and the opening of the switch, but if a severe overload occurs, and, in fact, when the current value exceeds a certain predetermined amount, there is a sufficient pull exerted on the armature to attract it without requiring any decrease in the reluctance of the magnetic path by the upward travel of the plunger. In other words, the switch is then opened instantly.

The core or plug 31 being hollow, the upper part of the chamber can be moved well up into the core or it may be lowered wholly or partially out of the same, as will be seen by comparison of Figs. 1 and 3. By thus raising or lowering the chamber and plunger assembly, I am able to vary, over a very wide range, the value of the current which will cause the switch to open with the time limit effect. The more the chamber and plunger assembly is lowered the higher this current value becomes, and the more it is elevated, the lower it becomes. By making the core hollow so that the chamber can be adjusted up into it, I am able to obtain this adjustment without

requiring a large and bulky construction, that is to say, I secure a degree of compactness otherwise not obtainable. Furthermore, what is equally, if not more important, I find that with this construction there is such a distribution of magnetic material that the overload value of the current at which the switch will open instantaneously is not materially affected by the adjustment of the chamber. These advantages, coupled with the efficient action of the switch proper explained earlier in the specification, and the fact that leakage of the fluid in the chamber is absolutely prevented, render the present improvements quite important, particularly when applied to time limit overload relays.

While I have shown the preferred construction, I do not desire to be confined to the precise details of construction or arrangement, but aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of the invention.

Having thus described my invention, I claim:

1. In a time limit switch, stationary and movable switch members, a magnet for operating the switch and provided with a hollow core of magnetic material, and a chamber adapted to extend into the core, the chamber containing a fluid and a plunger adapted to be moved toward the core by the action of the magnetic field.

2. In a time limit switch, stationary and movable switch members, a magnet for operating the switch, there being arranged centrally of the coil of the magnet a hollow core formed of magnetic material, and a chamber formed of non-magnetic material and containing a plunger movable longitudinally thereof, the core and chamber being relatively adjustable so that the chamber may be caused to extend different distances into the core.

3. In a time limit switch, movable and stationary switch members, a magnet for operating the switch and comprising a coil having a hollow core, and a chamber containing a plunger movable toward the core and adjustably supported so that it may be moved varying distances into the core, the chamber being formed of non-magnetic material and the plunger of magnetic material.

4. In a time limit switch, stationary and movable switch members, a magnet for operating the switch and comprising a coil, a frame, a core mounted in one part of the frame, and a chamber mounted in another part of the frame, the core and chamber being telescopically arranged and being relatively adjustable and the chamber containing a plunger movable lengthwise thereof by the action of the magnetic field.

5. In a time limit switch, stationary and movable switch members, a magnet for op-

erating the switch comprising a coil, a frame, a hollow core mounted in the top of the frame, and a chamber adjustably mounted in the bottom of the frame and extending up into the coil and adapted to be extended different distances into the core, the chamber containing a plunger movable toward the core by the action of the magnetic field.

In testimony whereof I hereunto affix my
10 signature.

CHARLES H. RIPPL.

15

20

25

30

35

40

45

50

55

60