P. G. VAN WIJK.

OVERLOAD ELECTRIC SWITCH OR CUT-OUT.

APPLICATION FILED NOV. 11, 1916.

1,280,595.

Patented Oct. 1, 1918.

2 SHEETS—SHEET 1.

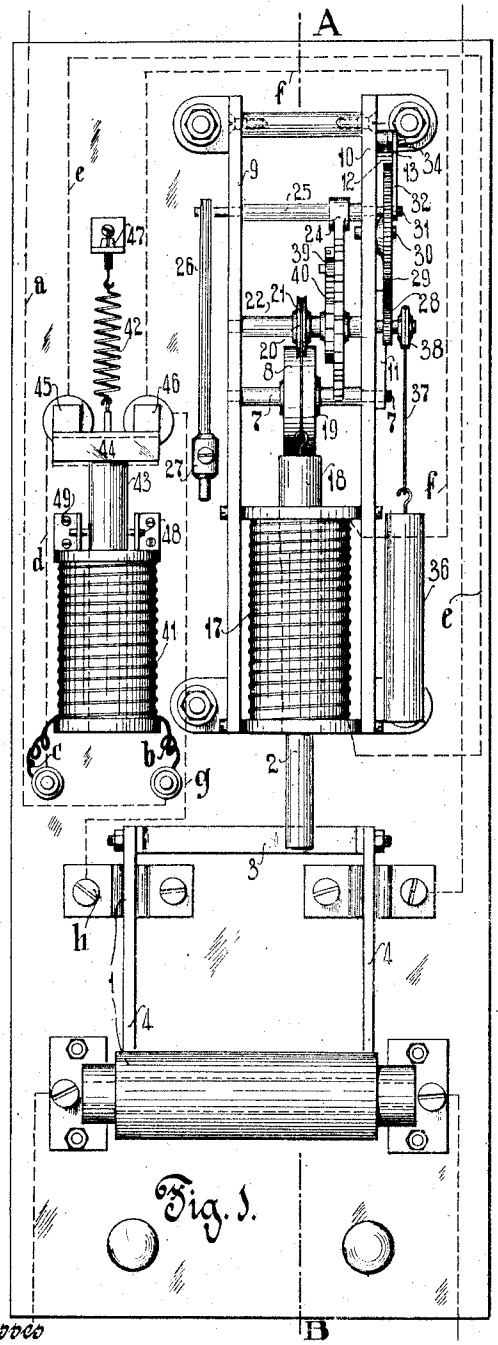


Fig. 1.

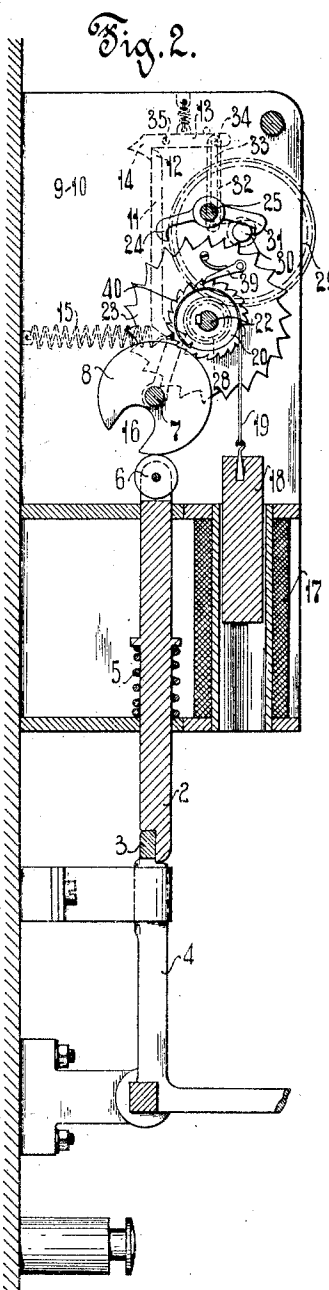


Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig: 3.

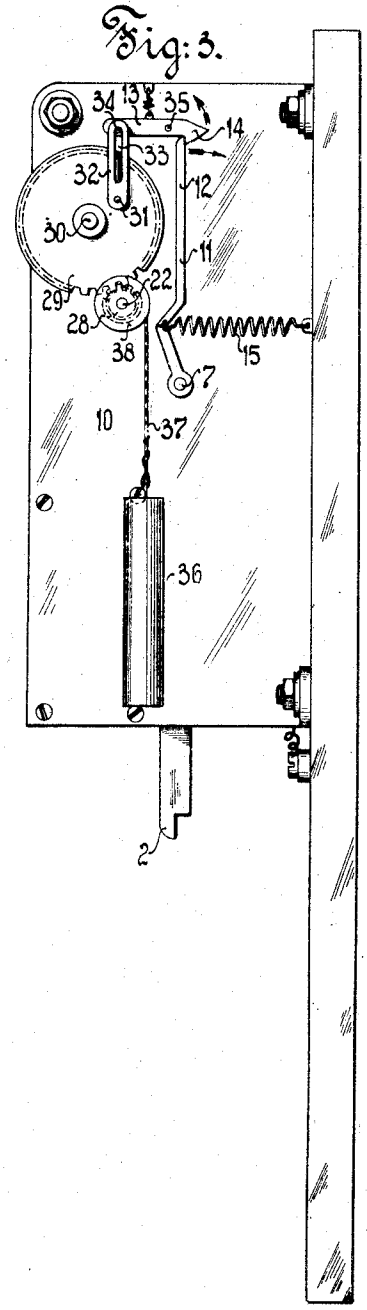
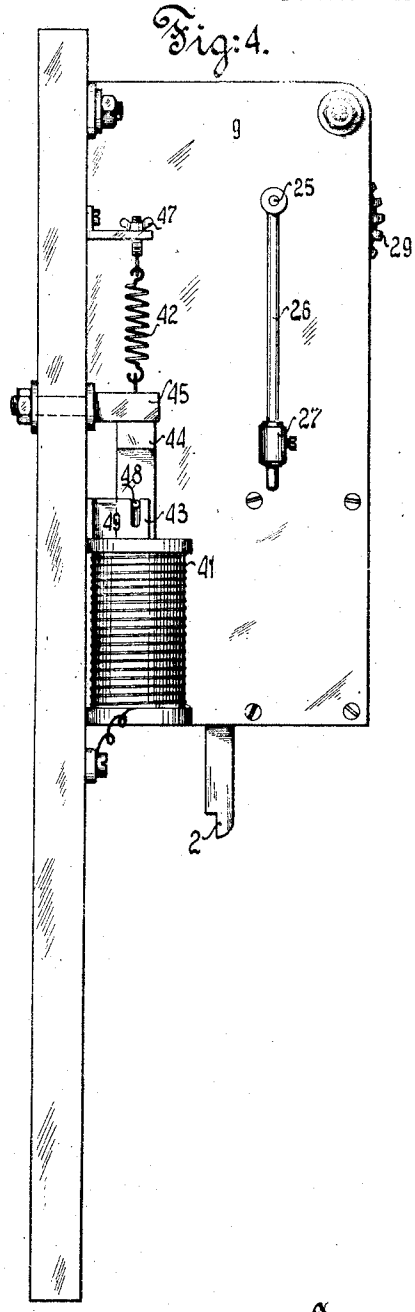


Fig: 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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OVERLOAD ELECTRIC SWITCH OR CUT-OUT.

1,280,595. Specification of Letters Patent. Patented Oct. 1, 1918.

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To all whom it may concern:

Be it known that I, PIETER GERRIT VAN WIJK, subject of the Queen of the Netherlands, residing at Geldermalsen, Kingdom of the Netherlands, have invented new and useful Improvements in or relating to Overload Electric Switches or Cut-Outs; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to automatic overload electric switches. The object of this invention is to provide a switch in which it is possible to regulate simply the retardation with which the switch works, and in which the magnet which brings about the retarded cutting out, does not receive current until the admissible maximum strength of current has been exceeded.

According to the invention, the switch or cut-out is arranged so that when a previously determined strength of current has been exceeded, an electromagnet in the main circuit, owing to the interruption of a contact held closed by a spring, opens the short-circuit of a second electromagnet (time switch magnet) or closes a circuit containing the said magnet. In the first case, the latter magnet is connected to the former in series, in the second case in parallel. On being energized the magnet attracts a core or an armature which turns a spindle on which a second action is exercised in the opposite direction by a spring or balance weight.

The speed of rotation of the said spindle, and consequently the speed of movement of the core, can be regulated by altering the time of oscillation of an escapement which, on the said spindle being rotated by the action of the core, is connected to the spindle by means of a coupling; this coupling does not however become operative in the event of the spindle being rotated in the opposite direction by the action of the balance weight or of the spring.

After the core or armature has traveled a certain distance owing to the attraction of the time switch magnet, it releases, directly or indirectly, a spring-controlled locking disk rotatable about a spindle, which, under the action of the spring, makes a rotation about its axis so that a recess provided on the circumference of the disk, is brought opposite the releasing member of the switch. The releasing member which is also controlled by a spring, is thus released and forced upward by the spring so that the switch is opened.

In the event of the overload discontinuing before the core of the time switch magnet has reached its outermost or end position, the said magnet is again short-circuited (or switched out) and the core or armature is returned to its original position by the spring or balance weight.

A construction in which the two magnets are connected in series, is illustrated in the accompanying drawing in which—

Figure 1 is a front elevation,

Fig. 2 a longitudinal section on line A—B of Fig. 1,

Fig. 3 a side elevation seen from the right in Fig. 1 and

Fig. 4 a side elevation seen from the left.

The switch 1 controlled in the known manner by a weight or a spring, is locked in the closed position by a releasing member 2 which, in this position, projects in front of a cross bar 3 between the levers 4 of the switch. The upper end of the releasing member, provided with a roller 6, is forced by a helical spring 5 against the circumference of a disk 8 secured to a horizontal spindle 7. The spindle 7 is rotatably supported in two plates 9 and 10 of the frame or casing; on the spindle 7 is mounted a lever 11, the free end of which engages with a hook 14 of a spring-controlled pawl 13 which prevents the lever 11 from being drawn back by a spring 15. When the pawl 13 is lifted in a manner hereinafter referred to, the lever 11, under the action of the spring 15, will swing out, so that the spindle 7 will be rotated, and the disk 8 brought into such a position that a recess 16 of the same will be opposite the roller 6 at the upper end of the releasing member. The latter will be pressed by the spring 5 into the said recess 16, so that the switch 1 will be released.

The drawing back of the spring-controlled pawl is brought about by the energizing of the electromagnet (time switch magnet) 17 which, on being connected up, attracts a core 18 adjustable in the central bore of the magnet, the said core being suspended by means of a cord 19, chain or the like, to the circumference of a pulley 20 provided at its

circumference with a groove 21 for the cord 19. The pulley 20 is mounted on a horizontal spindle 22 supported in the side plates 9 and 10. On the same spindle is further mounted a ratchet wheel 23 of an escapement. The anchor 24 of the escapement is mounted on a separate spindle 25 on which is also mounted a pendulum 26 with an adjustable weight 27. On the spindle 22 is further mounted a pinion 28 which transmits rotation of the spindle 22 to a larger toothed wheel 29 rotatable on the spindle 30 and provided with a laterally projecting pin 31 with which engages a connecting link 32 (see also Fig. 3). The latter is provided with a longitudinal slot 33 engaging a pin 34 at the rear end of the pawl 13. The pawl is rotatable on a pin 35, and in the normal position holds the lever 11 fast by means of the hook 14.

The dimensions are calculated so that approximately at the moment when the core 18 in its movement reaches the end position (attracted position) the spindle 22, and accordingly also the toothed wheel 29, will have been turned so far that the spring-controlled pawl 13 will have been completely raised by the link 32, and will release the lever 11. The object of the slot 33 is to enable the toothed wheel 29 to be brought back to the original position after the apparatus has become operative owing to the maximum strength of current having been exceeded for a certain time; the pawl 13 can be raised only owing to the arrangement of the slot 33 in the link 32. A balance weight 36 has the tendency to turn the spindle 22 in the direction opposite to that of the core 18. To that end it is suspended by a core 37 or the like to a grooved pulley 38 and secured to the spindle 22. This balance weight 36 which could also be replaced by a spring, has for its object to bring about the return of the core 18 to its normal position, in the event of the overload failing to last so long that the core 18 reaches its end (attracted) position. As in that case the time switch magnet 17 is again cut out, and accordingly deënergized, the core will be no longer attracted. The balance weight 36 will then rotate the spindle 22 and raise the core 18 to the position which it originally occupied.

As during this turning back of the spindle 22, the ratchet wheel 23 of the device must not participate in the return movement, it is mounted on the spindle in a loosely rotatable manner, and coupled to it only during the direction of rotation which is given to the spindle by the attracted core 18. This coupling is effected by a spring controlled locking pawl 39 provided on the ratchet wheel of the escapement and engaging with the teeth of a ratchet wheel 40 secured to the spindle 22. When the spindle is turned back by the balance weight 36, the pawl 39 will glide loosely over the ratchet teeth, the ratchet wheel 23 of the escapement remaining stationary.

The energizing of the magnet 17 takes place in the following manner:

Into the main circuit is switched a magnet coil 41 which, on being energized, has the tendency to attract a core or an armature 43 in opposition to the action of a spring 42. On the core 43 is provided a contact bridge 44 which short-circuits two contacts 45 and 46 as long as the tension of the spring 42 remains greater than the force with which the core is attracted by the magnet 41. The tension of the spring 42 can be regulated by means of a nut 47, for the purpose of altering the strength of current at which the core 43 opens the short-circuit between the contacts 45 and 46. The core 43 is provided with a stop pin 48 which, in the attracted position of the core, engages with fixed stops 49 and is guided in slots provided in the said stops (Figs. 1 and 4).

In the construction shown in the drawing, one pole of an electric conductor *a* leading to the electric installation, is connected to the terminal *b*; current passes through the magnet coil 41, terminal *c*, wire *d*, contact 45, contact bridge 44, contact 46, wire *g*, contact fork *h* and thence further on through the switch 1. In case of an overland, the short circuit 45, 46, 44 is destroyed, and the current passes over the wire *e*, magnet coil 17, contact piece 46, then over *g* and *h* to the switch. The main current will pass accordingly over the magnet 17, so that the core 18 will be attracted, and the spindle 22 rotated with a speed determined by the escapement device now coupled to the spindle. In the event of the overload disappearing in time, the magnet 17 will become deënergized even before the core 18 has reached its lowest position, that is to say, before the switch is released in the manner described; as the action of the weight 36 is greater than that exercised by the weight of the core 18, the former will prevail, and will turn the spindle 22 with the parts connected to it, back to the original position.

This return movement does not however depend on the escapement device alone, as during the turning back of the spindle 22 by the weight 36, the coupling 39, 40 will not be operative and the movement will not be transmitted to the escapement device. The return to the position of rest takes place therefore with a considerable speed, so that the apparatus is automatically brought back and is ready to work again, immediately after each overload.

If the overload lasts longer than the time admissible for the purpose, the cut out will operate. In order to connect the switch again, the bar 2 is pulled down with one hand, after the cross-bar 3 of the switch has

been moved into a position to engage behind it, while with the other the lever 11 is turned back. The spring-controlled pawl is during that time slightly raised and engages with its hook 14 behind the upper end of the lever 11. The switch 1 is thus closed.

What I claim is:—

1. In an over-load electric switch or cut-out of the type having a magnet and a core coöperating therewith, the combination of a spindle connected to said core so that when the core is attracted the spindle is rotated in one direction, means connected to said spindle for effecting rotation thereof in a reverse direction, an escapement, means for connecting said spindle and the escapement during movement of the spindle in one direction, a switch releasing member, and means operative by the travel of the core for releasing said member.

2. In an over-load electric switch or cut-out of the type having a magnet and a core coöperative therewith, the combination of a spindle connected to said core so that when the core is attracted the spindle is rotated in one direction, means connected to said spindle for effecting rotation thereof in a reverse direction, an escapement, means for connecting the spindle and the escapement during movement of the spindle in one direction, a spring actuated member for releasing the switch, a notched disk for releasing said member, a spring-operated lever for turning said disk, and a pawl for retaining said lever, a link connected to said pawl, and a wheel revolved by the spindle and arranged to operate said link.

3. In an over-load electric switch or cut-out of the type having a magnet to govern the mechanism of the switch, a magnet in the main circuit to govern the operation of the first magnet, and cores in the magnets, the combination of a spindle connected to one of said cores so that when the latter is attracted the spindle is rotated in one direction, means connected to said spindle for effecting rotation thereof in a reverse direction, an escapement, means for connecting the spindle and the escapement during movement of the spindle in one direction, a member for releasing the switch, and means operated by the travel of the core connected to said spindle for releasing said member.

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

PIETER GERRIT VAN WIJK.

Witnesses:

THOMAS H. VERBAL,

AL. BUNTA.

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