March 27, 1934. W. LEYHAUSEN 1,952,997

OVERLOAD SWITCH

Filed Feb. 16, 1931

Fig. 1

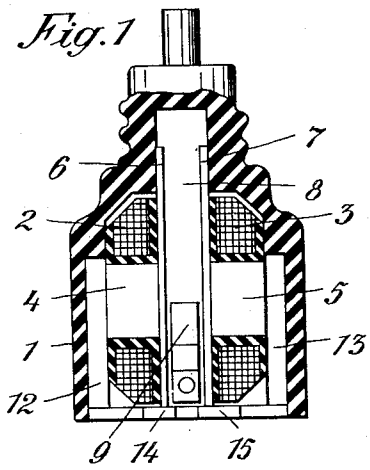


Fig. 3

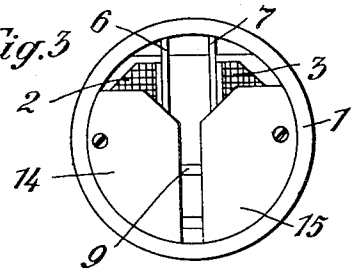


Fig. 2

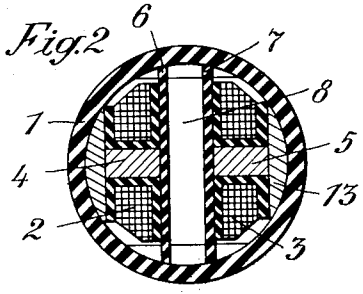


Fig. 4

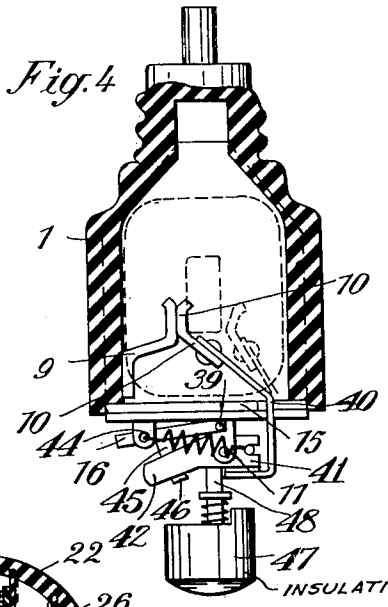


Fig. 7

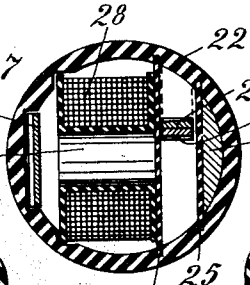


Fig. 5

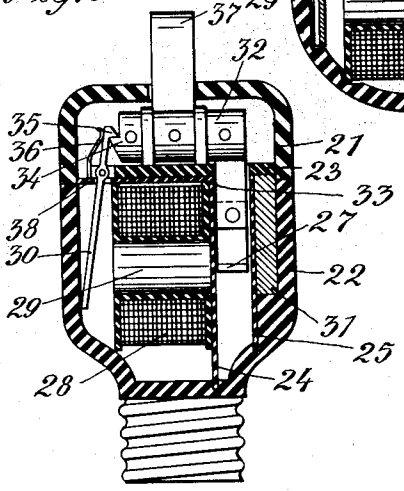
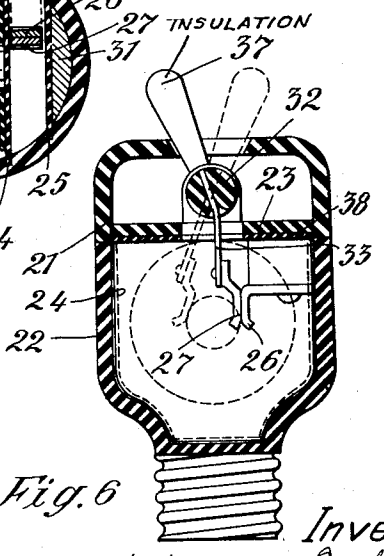


Fig. 6



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UNITED STATES PATENT OFFICE

1,952,997

OVERLOAD SWITCH

Wilhelm Leyhausen, Nuremberg, Germany

Application February 16, 1931, Serial No. 516,190
In Germany February 28, 1930

6 Claims. (Cl. 200—87)

Applications have been filed in Germany Feb. 28, 1930, and Oct. 16, 1930.

This invention relates to an overload switch with a pair of magnets, the poles of which control the release armature, and serve also to establish a magnetic field for extinguishing the cut-out arc. The invention has for its object to produce a more effective magnetic spark extinguishing than is the case in the known switches of the type mentioned. In these known switches, the magnet coils extend around the longitudinal sides of the magnet arms so that the axes of the coils are parallel to the arms. According to the invention, the axes of the magnet coils are arranged at right angles to the arms of the magnet. Thus, it becomes possible to place the break contact between the ends of the two coils, whereby a considerably stronger blow-out effect is obtained than heretofore.

It may be sufficient to arrange only one of the two magnet coils in the manner described, the other coil being placed parallel to the magnet arm as heretofore. For the second coil, a magnetizable body may be substituted which is positioned opposite the iron core of the coil.

The invention relates further to the particular construction of the switch.

Two embodiments of the invention are illustrated by way of example in the accompanying drawing in which—

Figures 1 to 4 show an overload switch in the form of a plug switch with two electromagnets, and particularly

Figure 1 is a vertical section of this form in the plane of the coil axes;

Figure 2 is a cross section thereof;

Figure 3 is a bottom plan view thereof with the switching mechanism omitted;

Figure 4 is a vertical section at right angles to that shown in Figure 1;

Figures 5 to 7 show a switch in which a magnetizable body is arranged opposite a magnet coil, and particularly

Figure 5 is a vertical central section of the second form;

Figure 6 is a vertical section at right angles to Figure 5; and

Figure 7 is a cross section transversely of Figure 5 on the axes of the magnet core.

In the casing 1 (Figures 1 to 4) magnet coils 2 and 3 with their iron cores 4 and 5 are arranged at right angles to the axis of the casing. A spark gap 8 is formed between these coils by the partitions 6 and 7. In this spark gap, that is between the ends of the magnet coils 2 and 3, contacts 9 and 10 are arranged. The iron cores are connected by iron arms 12 and 13 with pole pieces 14 and 15 which act on an armature 16. The armature 16 is pivoted at 39. The contact 10 is carried by the upper end of an arm 40 which is fixed to the arm 41 of a lever pivoted intermediate its ends at 11 and having its remaining arm 42 extending from the pivot in a direction opposite to the arm 41. A spring 45 has one end secured to the arm 41 and its other end secured to a lug 44 and this spring normally urges the lever arms 41 and 42 to rotate in a clockwise direction. However, the armature 16 carries a stirrup 46 and limits movement of the lever in this direction. Upon the circuit being overloaded, the armature is lifted at its free end and, by means of the stirrup, starts movement of the lever arms in a clockwise direction (see Fig. 4) and this causes the axis of the spring to move downwardly across the pivot axis 11 so that the spring urges the arm 41 downwardly and the lever is snapped into full clockwise position, thus quickly moving contact 10 to the dotted line position. The magnets act to blow out the electric arc between the contacts 9 and 10. As the breaking occurs in an extremely dense magnetic field and the magnetic lines of force intersect the arc at right angles, the blowing effect of the switch is particularly strong. In order to reset the switch, a stem 48 projects from the end closure of the device and carries a spring-pressed push button 47 which, when the switch is open and the button is pressed upward, will engage the arm 41 and cause it to move in an anti-clockwise direction until the contact 10 closes on the contact 9.

Figures 2 and 3 show the advantageous utilization of space of the switch. The coils and iron parts are adapted to the curvature of the switch casing. The spark gap is larger than in other switches. In order to obtain the largest possible blowing field, the coils and iron cores are substantially rectangular and their longitudinal sides lie in the longitudinal direction of the switch. A plurality of contacts may also be provided and the switching mechanism constructed in any desired manner. The end faces of the iron cores may be enlarged in known manner by flanges.

The construction illustrated with the cores 4 and 5 situated close together and with the coils surrounding the iron parts 12, 13, 14, 15 and 16 presents the further advantage that the device acts as a choking coil in the case of strong short circuits and limits the intensity of the short circuit current.

In the switch shown in Figures 5 to 7, the lower part 22 of the switch casing 21, 22 is covered by an insulating plate 38 and subdivided into three compartments of different size by two vertical insulating walls 24 and 25 which engage in the outer wall. In the middle, narrow compartment, limited by the walls 24 and 25, contacts 26 and 27 are arranged, the contact 26 being stationary and the contact 27 movable. In the larger of the lateral compartments, a magnet coil 28 with its iron core 29 is arranged transversely to the

axis of the switch and on the outer side an armature 30 is positioned opposite the iron core. The other lateral compartment contains a magnetizable body 31 which is connected to a plate 23 also composed of magnetizable material.

The release device is arranged above the plate 23. It consists substantially of a cylinder 32, mounted in two bearings. A spring (not shown) tends to rotate this cylinder in a certain direction. In one end of the cylinder 32 a blade spring 33 is clamped and carries the movable contact 27. The other end of the cylinder is provided on its end face with a tooth 34 which, in the normal position of the switch is overlapped by a hook 35 mounted on the upper end of the two armed armature 30 mounted in the plate 23. A spring 36, pressing against the hook arm, tends to hold the armature in this position. When the cylinder 32 is in the position illustrated, which is caused by the hook 35 holding it against the action of the spring (not shown) the contacts 27 and 26 are in closed position. A hand lever 37 is mounted on the middle portion of the cylinder 32.

If excess current occurs, the armature plate 30 is attracted by the iron core 29. The hook, sliding off the tooth 34, liberates the cylinder 32 which rotates under the action of the spring (not shown) so that the movable contact 27 and the handle 37 jump into the position shown in dotted lines.

The releasing device and the contacts may be of any desired construction. The breaking may be effected at several points, and the movement of the contacts may be carried out parallel to the axis of the switch instead of transversely thereto.

I claim:

1. The combination with a casing having one end shaped like a screw plug and through which the magnets are energized, of a pair of spaced electro-magnets having their magnetic axes alined transversely of the casing and having the remote ends of their cores magnetically connected, a fixed contact supported by the casing and extending between said magnets at one side of the magnetic axis thereof, a movable contact supported to move into and out of engagement with the fixed contact across the magnetic axis of the said magnets, said movable contact normally engaging the fixed contact, an overload device carried by the casing and arranged to effect movement of the movable contact away from the fixed contact, and insulating walls between said magnets and contacts.

2. The combination with a casing having one end shaped like a screw plug and through which the magnets are energized, of a pair of spaced electro-magnets having their magnetic axes alined transversely of the casing and having the remote ends of their cores magnetically connected, a fixed contact supported by the casing and extending between the said magnets at one side of the magnetic axis thereof, a movable contact supported to move into and out of engagement with said fixed contact across the magnetic axis of said magnets, said movable contact normally engaging the fixed contact, an overload device carried by the casing and arranged to effect movement of the movable contact away from the fixed contact and including an actuating armature controlled by the field of said magnets.

3. The combination with a casing having one end shaped like a screw plug and through which the magnets are energized, of a pair of spaced electro-magnets having their magnetic axes alined transversely of the casing and having the remote ends of their cores magnetically connected, a fixed contact supported by the casing and extending between the said magnets at one side of the magnetic axis thereof, a movable contact supported to move into and out of engagement with said fixed contact across the magnetic axis of the said magnets, said movable contact normally engaging the fixed contact, an overload device carried by the casing and arranged to effect movement of the movable contact away from the fixed contact including an actuating armature controlled by the field of said magnets, and insulating walls between said magnets and contacts.

4. The combination with a casing having one end shaped like a screw plug to fit an electric socket and through which the magnets are energized, of a pair of spaced electro-magnets having their magnetic axis alined transversely of the casing, and having the remote ends of their cores magnetically connected, a fixed contact supported by the casing and extending between said magnets at one side of the magnetic axis thereof, a movable contact supported to move into and out of engagement with said fixed contact across the magnetic axis of said magnets, said movable contact normally engaging the fixed contact, and an overload device carried by the casing and arranged to effect movement of the movable contact away from the fixed contact.

5. The combination with a casing, of a pair of spaced electro-magnets having their magnetic axes alined transversely of the casing, a fixed contact supported by the casing and extending between said magnets at one side of the movable axis thereof, a movable contact supported to move into and out of engagement with said fixed contact across the magnetic axis of said magnets, said movable contact normally engaging the fixed contact, a lever pivoted intermediate its ends and having the movable contact fixed to one arm, an armature pivoted at one end and movable under excessive magnetization of said magnets, a stirrup carried by the armature and engaging the remaining arm of said lever, said armature and stirrup being arranged to move the lever in a direction to separate the contacts, and a snap spring arranged to snap the lever to the extremity of its movement in each direction.

6. The combination with a casing, of a pair of spaced electro-magnets having their magnetic axes alined transversely of the casing, a fixed contact supported by the casing and extending between said magnets at one side of the movable axis thereof, a movable contact supported to move into and out of engagement with said fixed contact across the magnetic axis of said magnets, said movable contact normally engaging the fixed contact, a lever pivoted intermediate its ends and having the movable contact fixed to one arm, an armature pivoted at one end and movable under excessive magnetization of said magnets, a stirrup carried by the armature and engaging the remaining arm of said lever, said armature and stirrup being arranged to move the lever in a direction to separate the contacts, a snap spring arranged to snap the lever to the extremity of its movement in each direction, and insulating walls between said magnets and contacts.

WILHELM LEYHAUSEN.