Sept. 15, 1942. F. J. RUSSELL 2,295,691

OVERLOAD PROTECTIVE DEVICE

Filed June 24, 1941

Fig. 1

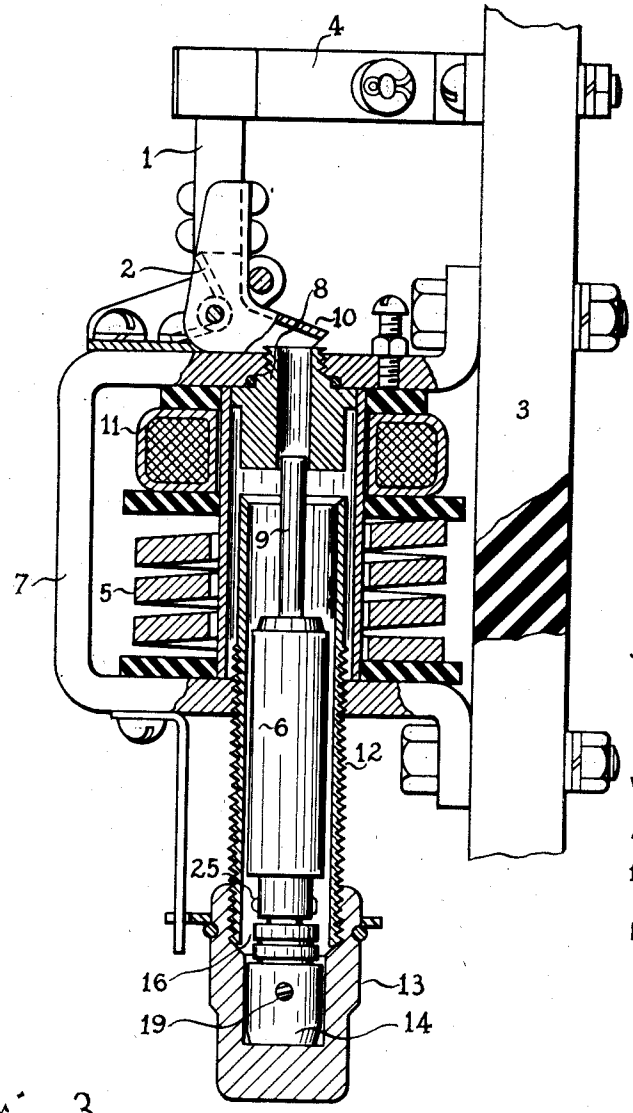


Fig. 2

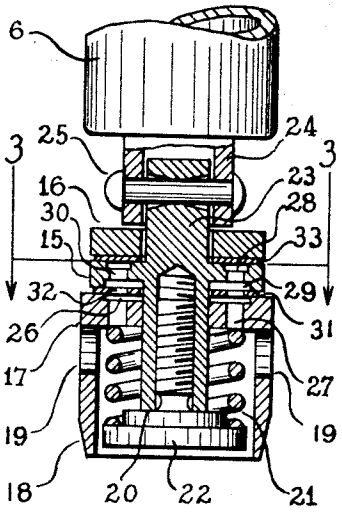
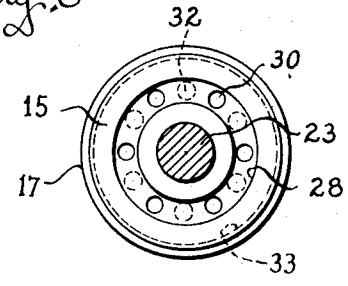


Fig. 3



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Patented Sept. 15, 1942 2,295,691

UNITED STATES PATENT OFFICE

2,295,691

OVERLOAD PROTECTIVE DEVICE

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Application June 24, 1941, Serial No. 399,558

5 Claims. (Cl. 200—97)

This invention relates to overload protective devices, and more particularly to electroresponsive overload relays of the dash pot type.

The invention has among its objects to provide an improved dash pot for use in connection with an overload relay which provides for retarded response of the relay to overloads up to a predetermined value and substantially instantaneous response to overloads in excess of such value.

Another object is to provide a dash pot of the aforesaid character having an improved valve mechanism associated therewith which is simple and rugged in construction, and positive and reliable in operation.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a side view partly in section of an overload relay embodying the invention;

Fig. 2 is an enlarged sectional view of a dash pot piston employed in the dash pot shown in Fig. 1, and

Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Referring to Fig. 1, the same illustrates an overload relay of a well known type having a dash pot embodying the invention associated therewith. Briefly described the relay shown includes a pivoted contact element 1 which is biased by a spring 2 to bridge a pair of stationary contacts mounted upon an insulating panel 3. One of the stationary contacts is illustrated at 4 in Fig. 1, and contact element 1 is movable out of engagement with said stationary contacts by a solenoid operating mechanism including an overload coil 5 and a plunger 6. Coil 5 is carried by a C-shaped magnet frame 7 mounted upon insulating panel 3, and plunger 6 is normally held by gravity in the position shown and is attracted upwardly out of normal position into engagement with a magnetic plug 8 mounted upon the upper leg of said magnet frame when the current in said coil exceeds a predetermined overload value. Plunger 6 has a pin extension 9 on the upper end thereof and during final movement of said plunger into its attracted position said pin engages an arm 10 associated with contact element 1 to move said contact element out of engagement with stationary contacts 4. The relay shown is also provided with a shunt holding coil 11, the purpose of which is to maintain the relay in tripped position after the same has operated.

In accordance with the present invention plunger 6 is loosely supported within a tubular sleeve 12 which is externally threaded to fit within a tapped opening in the lower leg of magnet frame 7. The lower end of sleeve 12 is closed by a cup-shaped dash pot 13 which contains a piston 14. The inner diameter of dash pot 14 is less than that of sleeve 12 and as shown in Fig. 2 piston 14 is operatively connected to the lower end of plunger 6 and is provided with a valve mechanism including valve disks 15 and 16.

More specifically piston 14 has its under side recessed to provide a top wall 17 and a depending skirt 18. Skirt 18 is provided with oppositely disposed openings 19—19 and the top wall 17 is provided with a center opening for receiving a centrally located stem projection 20 on the under side of valve disk 15. Piston 14 is biased to move toward valve disk 15 by a spring 21 which is held under compression between the top wall 17 of said piston and a headed screw 22 which is adjustable within a tapped opening in stem projection 20. Valve disk 16 is provided with a center opening for receiving a centrally located stem projection 23 on the upper side of valve disk 15. The upper end of stem projection 23 is attached to an extension 24 of reduced diameter on the lower end of plunger 6 by a pin 25.

The top face of piston wall 17 is provided with a circular recess 26 and said wall is also provided with a plurality of ports 27 which are located within said recess. The upper face of valve disk 15 is provided with a circular recess 28 and the lower face thereof is provided with a circular recess 29, and said valve disk has a plurality of ports 30 which are located within said recesses. A thin gasket 31 of annular form having openings 32 therein is associated with the under side of valve disk 15 and a thin gasket washer 33 of annular form is associated with the under side of valve disk 16.

The function and operation of the aforedescribed dash pot mechanism is as follows. Dash pot 13 and the lower end of sleeve 12 contain a fluid such as oil, and piston 14 is normally held against the bottom of said dash pot by the weight of plunger 6. The gasket 33 associated with valve disk 16 is normally seated against the upper face of valve disk 15 and the gasket 31 associated with valve disk 15 is normally

seated against the upper face of piston 14 under the action of spring 21. The ports 27 in piston 14 are therefore normally closed to prevent passage of the dash pot fluid therethrough upon upward movement of said piston within dash pot 13. Assuming that plunger 6 responds to a moderate overload current condition in coil 5, spring 21 acts to maintain piston 14 in seating engagement with gasket 31 and upward movement of said plunger is thus retarded by a slow passage of the dash pot fluid around the outer surface of said piston. Prior to full movement of plunger 6 into its attracted position the openings 19 in the piston skirt 14 are moved out of the bore in dash pot 13 and the dash pot fluid is then permitted to pass rapidly through said openings to provide for opening of contact element 1 by quick movement of plunger 6 into its attracted position.

Assuming that plunger 6 is moved out of normal position in response to a heavy overload current condition in coil 5, spring 21 is adapted to yield against the retarding action of dash pot 14 to permit upward movement of valve disk 15 with respect to piston 14. The piston ports 27 are thus opened to permit free passage of the dash pot fluid therethrough for substantially instantaneous response of plunger 6.

From the foregoing it is apparent that the above described dash pot mechanism provides for retarded response of the relay to overloads up to a predetermined value which is determined by the degree of compression of spring 21 and for substantially instantaneous response of the relay to overloads in excess of such value.

Upon downward movement of piston 14 valve disk 16 and its associated gasket washer 33 are lifted to permit free passage of the dash pot fluid from the under side of piston 14 through the ports 27 in said piston and the ports 29 in valve disk 15. Provision is thus made for permitting quick return of plunger 6 to normal position during resetting of the relay.

What I claim as new and desire to secure by Letters Patent is:

1. In a circuit breaker, in combination, a switch, an overload tripping solenoid therefor, and a dash pot mechanism associated with said solenoid including a fluid containing dash pot, a piston movable within said dash pot and having a spring operating connection between the same and said operating solenoid, and a valve mechanism associated with said piston and controlled by said spring operating connection to provide for delayed response of said solenoid under overload conditions below a predetermined value, and for substantially instantaneous response of said solenoid under overload conditions in excess of said value.

2. In a circuit breaker, in combination, a switch, an overload responsive tripping solenoid therefor, and a dash pot mechanism associated with said solenoid including a fluid containing dash pot, a piston movable within said dash pot, a valve member associated with said piston and movable by said tripping solenoid upon response thereof and a spring for normally maintaining said piston in engagement with said valve member to provide for delayed response of said solenoid under overload conditions below a predetermined value, said spring permitting disengagement of said piston and valve member for substantially instantaneous response of said solenoid under overload conditions in excess of said predetermined value.

3. In a circuit breaker, in combination, a switch, an overload responsive tripping solenoid therefor, and a dash pot mechanism associated with said solenoid including a fluid containing dash pot, a piston movable within said dash pot, a valve member associated with said piston and movable by said tripping solenoid upon response thereof, a spring for normally maintaining said piston in engagement with said valve member to provide for delayed response of said solenoid under overload conditions below a predetermined value, said spring permitting disengagement of said piston and valve member for substantially instantaneous response of said solenoid under overload conditions in excess of said predetermined value, and a second valve member associated with said former valve member for permitting quick resetting movement of said tripping solenoid.

4. In a circuit breaker, in combination, a switch, an electromagnetic overload responsive tripping device therefor, and a dash pot mechanism associated with said device including a cup-shaped fluid containing dash pot, a piston movable upwardly within said dash pot upon response of said device, said piston having ports therein for passage of the dash pot fluid therethrough, a valve mechanism movable by said tripping device and associated with the upper surface of said piston to effect closure of said ports, a spring for normally maintaining said piston in engagement with said valve mechanism to provide for closure of said ports upon response of said device to overload conditions below a predetermined value, said spring permitting disengagement of said piston from said valve mechanism for opening of said ports upon response of said device to overload conditions in excess of said predetermined value.

5. In a circuit breaker, in combination, a switch, an electromagnetic overload responsive tripping device therefor, a dash pot mechanism associated with said device including a cup-shaped fluid containing dash pot, a piston movable upwardly within said dash pot upon response of said device, said piston having ports therein for passage of the dash pot fluid therethrough, a valve member movable by said tripping device and associated with the upper surface of said piston to effect closure of said ports, a spring normally maintaining said piston in engagement with said valve member to provide for closure of said ports upon response of said device to overload conditions below a predetermined value, said spring permitting disengagement of said piston from said valve member for opening of said ports upon response of said device to overload conditions in excess of said predetermined value, and a second valve member associated with said former valve member for effecting opening of said piston ports during return movement of said tripping device to normal position.

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