Jan. 5, 1937. L. D. LOVEKIN ET AL 2,066,632

TEMPERATURE RESPONSIVE EMERGENCY CIRCUIT BREAKER FOR ELECTRIC FLUID HEATERS

Filed Dec. 29, 1934 2 Sheets-Sheet 1

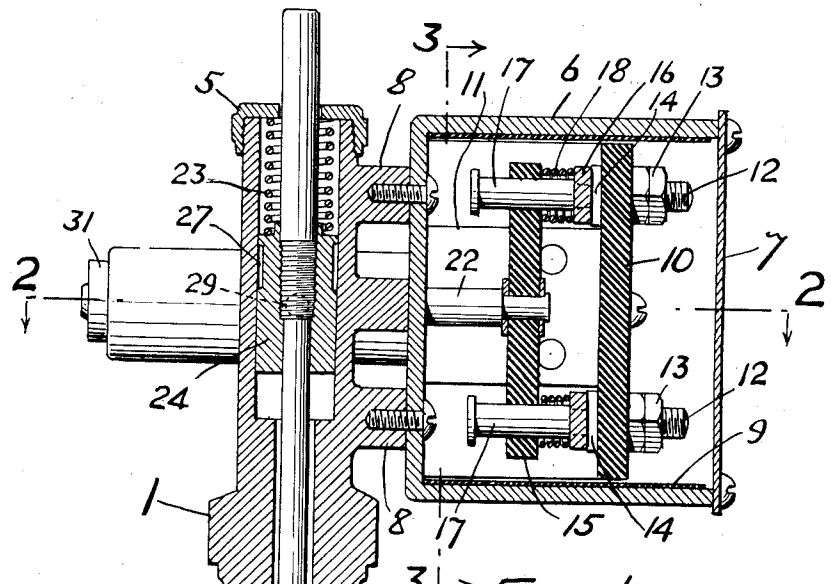


FIG. 1.

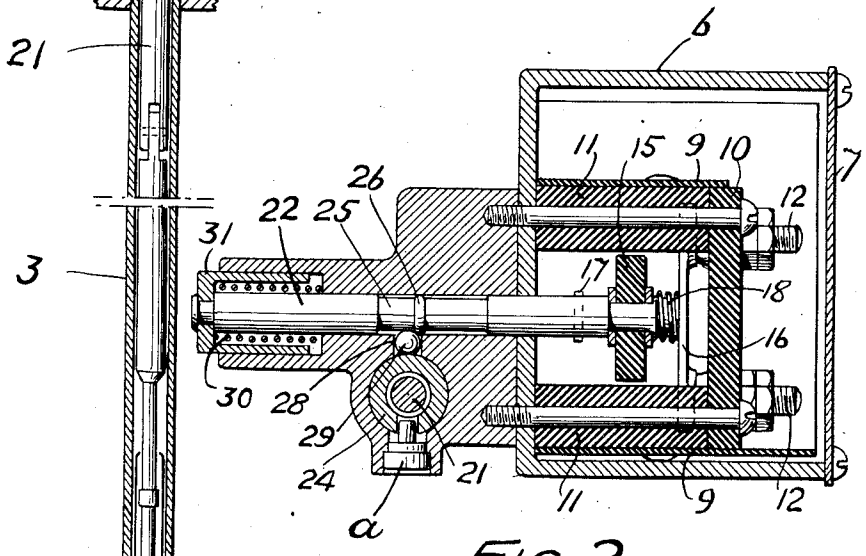


FIG. 2.

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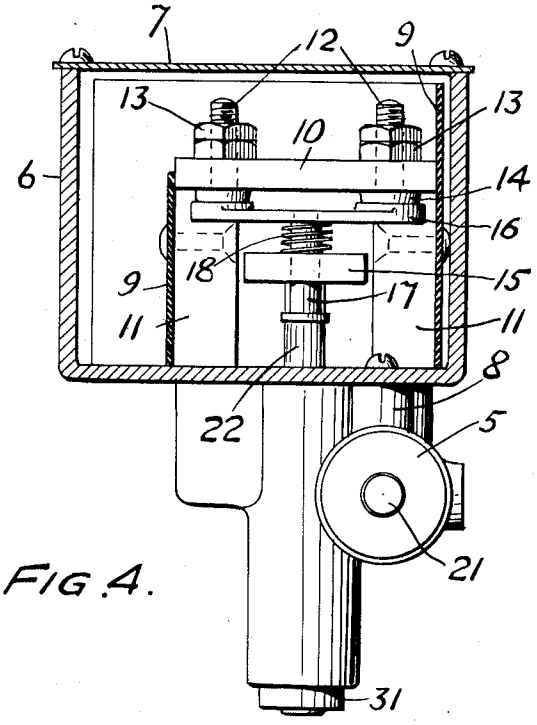


FIG. 4.

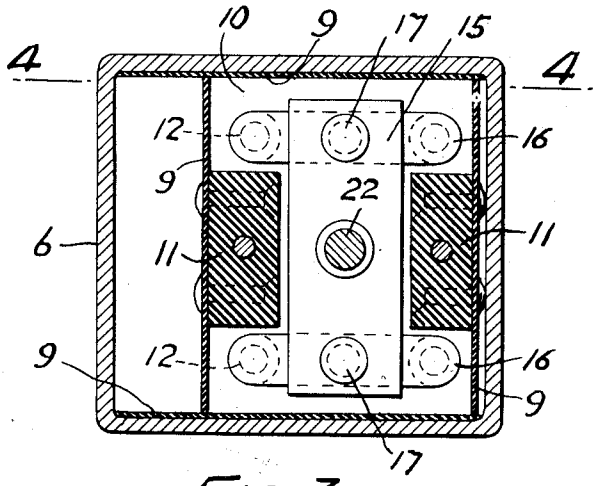


FIG. 3.

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Patented Jan. 5, 1937 2,066,632

UNITED STATES PATENT OFFICE

2,066,632

TEMPERATURE RESPONSIVE EMERGENCY CIRCUIT BREAKER FOR ELECTRIC FLUID HEATERS

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Application December 29, 1934, Serial No. 759,656

5 Claims. (Cl. 200—142)

Objects of the present invention are: to eliminate burning or fusing together of the electrical contacts; to provide for maintaining pressure on the contacts until a break occurs; to provide for a quick break; and, in general, to provide a simple, comparatively inexpensive, sensitive and efficient temperature responsive emergency circuit breaker especially adapted for use with boilers or tanks containing water which has been electrically heated.

Other objects of the invention will appear from the following description at the end of which the invention will be claimed.

To these and other ends hereinafter set forth, the invention, generally stated, comprises a circuit breaker of which the contacts are spring-pressed and which, when freed or released, opens the circuit that heats the water, a fuse which softens under heat, a pair of crossed rods of which one is connected with the movable part of the circuit breaker and of which the other is spring-pressed and restrained by the fuse, and a ball and its complemental grooves or pits provided on the rods and constituting therewith an interlocking mechanism.

The invention also comprises the improvements to be presently described and finally claimed.

In the following description, reference may be had to the accompanying drawings forming part hereof and in which:

Fig. 1 is an elevational view, partly in section, of a device embodying features of the invention and showing the parts in normal positions with the circuit closed;

Fig. 2 is a section on line 2—2, Fig. 1;

Fig. 3 is a section on line 3—3, Fig. 1; and

Fig. 4 is a section on line 4—4, Fig. 3.

Referring to the drawings, there is a casing shown to be made up of two parts. One part, in general, comprises a tubular fitting 1 having a nipple 2, by which it is mounted through the wall of a tank or boiler of a domestic hot water supply, and also comprises a well 3 adapted to dip into the hot water supply and depending from the fitting 1 and closed by a cap 4, and further comprises a removable cover 5. The other part comprises a generally rectangular housing 6 having a removable cover plate 7 and mounted upon suitable lugs 8 projecting from the fitting 1. 9 indicates sheets of insulating material arranged in the housing 6.

The circuit breaker comprises a fixed block 10 attached to fixed supports 11, to which two of the insulating sheets are riveted as indicated in the drawings. The fixed block 10 is provided with binding screws 12 and 13, to which the ends of the wire, constituting one side of the circuit, are attached, and the binding posts are provided with contacts 14. The movable switch block 15 is arranged between, and prevented from turning by, the supports 11. The movable switch block 15 is provided with bridge contacts 16, carried by headed studs 17 which are movable through openings in the element 15. Between the element 15 and the bridge contacts 16 are coil-springs 18 which, when the block is held in position to close the switch, continue to exert their pressure on the bridge contacts, pressing them against the fixed contacts 14 throughout a considerable range of motion of the element 15. Inasmuch as the bridge contacts and the fixed contacts are thus pressed together, danger of the contacts becoming fused or welded together is avoided.

In the well there is mounted a fuse 19, which softens or melts when subjected to a predetermined rise in temperature. The fuse is shown as mounted in a carrier 20, which is a matter of convenience in replacing it. There are two rods 21 and 22 mounted in cross-wise relation for relative endwise movement in the casing. The rod 22 is connected with the movable element 15 of the switch and is therefore, when the switch is closed, pressed toward the left in the drawings. The rod 21 bears at its lower end on the thermal fuse 19 and is spring-pressed by the spring 23, acting upon what amounts to a head or nut 24, through which the rod 21 is spring-pressed toward the fuse 19. *a* is a groove-and-feather device for opposing the rotary motion of the element 24. The rod 22 is provided with an annular portion 25 of reduced diameter and, at about the middle of this reduced portion, there is a collar 26. Through the intervention of the part 24, the rod 21 is also provided with an annular portion 27 of reduced diameter. Mounted in port 28 in the fitting 1 is a ball 29. The proportions of the ball and of the parts of reduced diameter are such that, when the ball is on the full diameter of the part 24, it is in the part of reduced diameter of the rod 22 to one side of the collar 26. In this position, the rod 22 may not move towards the left in Fig. 2 until the reduced portion 27 of the element 24 comes opposite the port 28 and frees the ball 29. The rod 21 is shown as made of two parts hinged together, which is a matter of convenience in withdrawing it from the casing when there is little overhead room.

The mode of operation may be described as fol-

lows: It will be assumed that the parts are in the positions shown in the drawings, which are the positions that they occupy when the heating circuit is closed and the temperature of the water in the tank or boiler is below the limiting temperature of the fuse 19. In these positions, the springs 18 are exerting pressure upon the contacts. The ball 29 rests upon the part of the nut 24 (which is a part of the rod 21) of full diameter, and it is opposite the part 25 of small diameter of the rod 22 and engages the collar 26, thus preventing movement of the rods and resisting the force of the springs 18 and 30. If the temperature of the water, in which the well 3 is immersed, rises to the temperature at which the fuse 19 is set to melt or soften, it is required that the circuit be broken, so that the water may not be overheated. When the water rises to that temperature, the fuse 19 melts or softens, and the spring 23 pushes the rod 21 downward until its portion of small diameter comes opposite to and receives the ball 29, thus permitting the ball to recede and clear the collar 26. Under these circumstances, the rod 22 is driven quickly by the springs which act upon it, separating the contacts and breaking the circuit.

To re-set the device, the rod 21 is screwed out through the nut or head 24 and withdrawn, carrying with it the spent fuse which is replaced by a new fuse, and the rod is again mounted in the position shown; prior to that, the rod 22 is pushed, by means of its head 31, toward the switch so that the contacts are closed, and thus, when the rod 21 is inserted, the ball 29 lies against the collar 26 and detains the rod 22 with the switch in closed position.

The fuse 19 may well be of the organic type, and to adapt it for use it should be in a condition resulting from the simultaneous application of both heat and pressure, which operates to free it from included moisture and causes it to spend within very narrow limits to any desired temperature.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement in matters of mere form without departing from the spirit of the invention which is not limited in respect to such matters or otherwise than as the prior art and the appended claims may require.

We claim:

1. A device of the type specified comprising in combination, a casing, two spring-pressed elements mounted in the casing and disposed in crosswise relation and adapted for endwise movement and each having a portion of reduced diameter and one having a collar thereon midway of the portion of reduced diameter of said element, a ball movably mounted in the casing and arranged between said elements and of such diameter that it engages the collar when it rests upon a full diameter part of the first-mentioned element and releases the collar when it rests upon a reduced diameter part of the first-mentioned element, a temperature responsive fuse for detaining the first-mentioned element to cause the ball to engage the collar and for releasing said element to cause the ball to disengage the collar, a switch block carried by the second-mentioned element and provided with spring-pressed electric switch contacts movable in respect to said block, and fixed electric switch contacts against which the movable switch contacts are spring-pressed when the ball is in engagement with the collar.

2. In a device of the type specified, the combination of, a casing, two spring-pressed elements of which one is a locked rod and of which the other is a locking rod and both of which are mounted in crosswise relation for endwise motion in the casing and each provided with a portion of reduced diameter, a ball mounted for movement in the casing between said elements and of such diameter that it normally confronts the part of reduced diameter of the locked element and locks it when the ball is seated upon a part of full diameter of the locking element which when moved to position with its part of reduced diameter confronting the ball frees the locked element, a heat responsive fuse for restraining the locking element, and electric switch contacts carried by the locked element.

3. In a device of the type specified, the combination of a casing having a well and equipped with an electric switch housing, a pair of spring-pressed rods mounted in crosswise relation for endwise movement and of which one projects into the housing and out of the casing and of which the other extends into the well, interlocking mechanism interposed between said rods and comprising a ball and movably mounted in the casing, complemental grooves provided on the rods, a thermally responsive fuse mounted in the well and upon which the adjacent rod end bears, fixed switch contacts arranged in the housing, and switch contacts carried by the end of the rod that projects into the housing.

4. In a device of the type specified, the combination of a casing having a well and equipped with an electric switch housing, a pair of spring-pressed rods mounted in crosswise relation for endwise movement and of which one projects into the housing and out of the casing and of which the other extends into the well, interlocking mechanism interposed between said rods and comprising a ball and movably mounted in the casing, complemental grooves provided on the rods, a thermally responsive fuse mounted in the well and upon which the adjacent rod end bears, fixed switch contacts arranged in the housing, a switch block carried by the end of the rod that projects into the housing, and spring-pressed switch contacts movably mounted through the block.

5. In a device of the type specified, the combination of a casing having a well and equipped with an electric switch housing, a pair of spring-pressed rods mounted in crosswise relation for endwise movement and of which one projects into the housing and out of the casing and of which the other extends into the well, interlocking mechanism interposed between said rods and comprising a ball and movably mounted in the casing, complemental grooves provided on the rods, a thermally responsive fuse mounted in the well and upon which the adjacent rod end bears, a pair of supports in the housing, a switch element having contacts and fixed to said supports, and a switch block having movable spring-pressed contacts and carried by the end of the rod that projects into the housing and guided between said blocks.

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