Sept. 30, 1941. E. W. RICKMEYER 2,257,348

SWITCH

Filed Feb. 27, 1939

Fig. 1

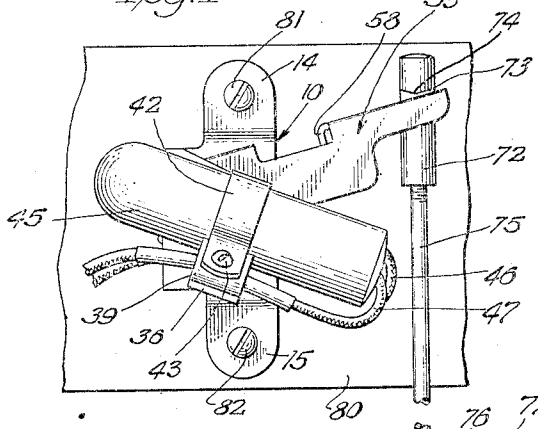


Fig. 5

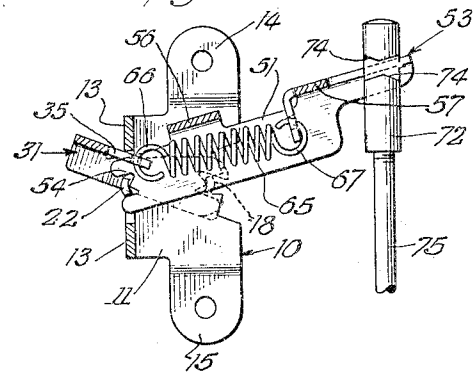
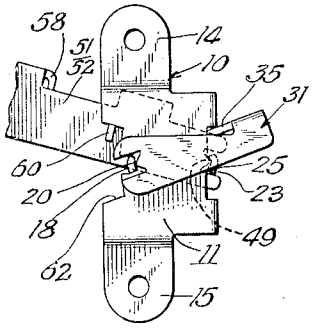


Fig. 2



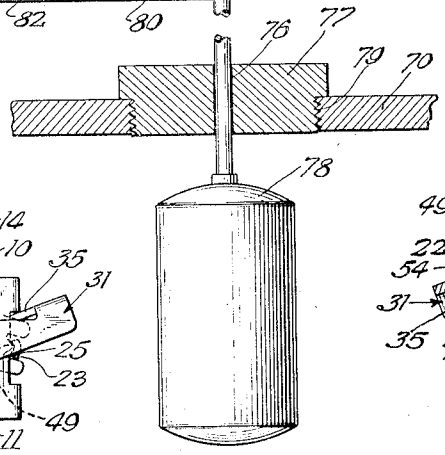


Fig. 6

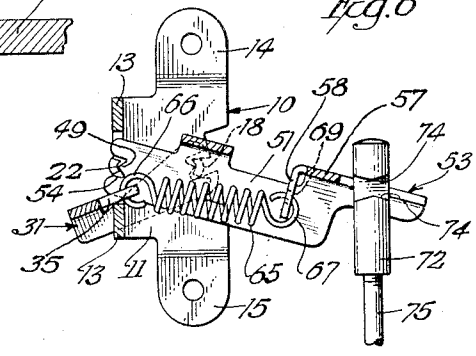


Fig. 3

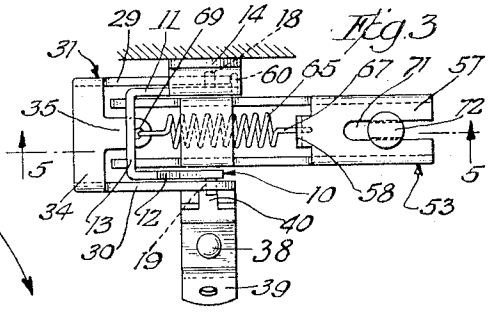
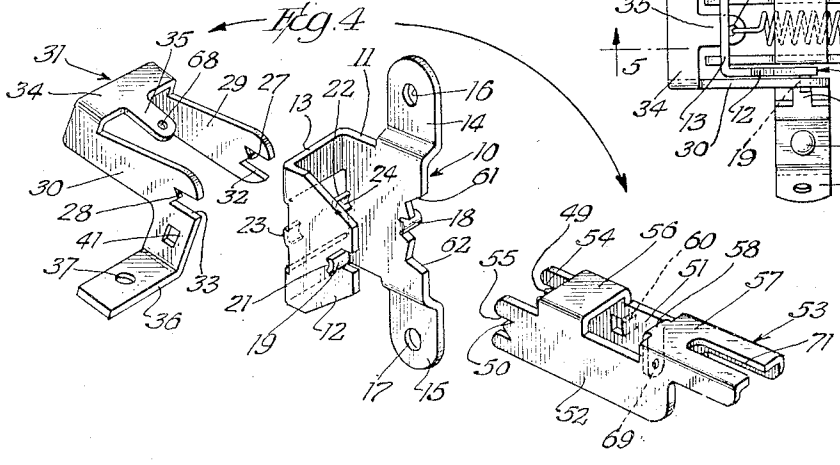


Fig. 4



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UNITED STATES PATENT OFFICE

2,257,348

SWITCH

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Application February 27, 1939, Serial No. 258,635

3 Claims. (Cl. 200—84)

This invention relates to switches and more particularly to switches for controlling electrical circuits that operate with a quick or snap action in making or breaking the electrical circuits.

Although there are many types and varieties of switches for controlling electrical circuits that make and break the circuit with a quick or snap action, most of them have many parts and are difficult to assemble as well as expensive. Furthermore, most of such switches embody mechanical contacts, as distinguished from liquid or mercury switch or contact elements, and are consequently not at all adapted to effecting quick or snap control of a liquid or mercury switch or contact element.

It is therefore an object of my invention to provide a switch mechanism for actuating a mercury switch or contact element to make or break an electrical circuit with a quick or snap action upon slow or uniform movement of the switch operating member.

Another object of my invention is to provide a switch operating mechanism having only a small number of separate parts and which is easily assembled.

Another object of my invention is to provide a switch operating mechanism adapted to be actuated by a float responsive to liquid level and which effects quick or snap make or break of the contact element.

Another object of my invention is to provide a switch operating mechanism which has a small number of parts, and which operates with low frictional resistance to movement.

Another object of my invention is to provide a switch operating mechanism for actuating a switch element with snap action which is compact and durable.

Other objects and advantages of my invention include the novel combinations and arrangement of elements as set forth by way of illustration in the disclosure herein and will become apparent as the description proceeds with reference to the accompanying drawing in which:

Fig. 1 is a front elevation of a switch embodying a preferred form of my invention;

Fig. 2 is a fragmentary back view of a part of the switch shown in Fig. 1;

Fig. 3 is a top view of the switch shown in Fig. 1 with parts thereof removed;

Fig. 4 is an exploded view of some of the essential parts of the switch shown in Fig. 1; and

Figs. 5 and 6 are sectional views, both of which are taken substantially on the line 5—5 of Fig. 3, and which each illustrate an operating position of the switch.

With particular reference to the drawing, a bracket or support member 10 is preferably substantially U-shaped, having sides 11 and 12 and connecting portions 13. The side 11 preferably has ears or lugs 14 and 15 integral therewith, which ears or lugs have openings 16 and 17 therethrough for the accommodation of mounting screws or other suitable fastening means. Lugs 18 and 19 are integral with and bent outwardly from the sides 11 and 12, respectively, and are preferably located near the mid-portion of the outer ends of the sides 11 and 12 of the U-shaped bracket or support member 10. These lugs 18 and 19 are deformed or recessed as at 20 and 21 so as to provide recessed or indented sides. The lugs 18 and 19 are substantially in alignment and provide a pair of bearings. A second pair of lugs 22 and 23 are also integral with the sides 11 and 12, but are preferably bent inwardly from the sides. These lugs 22 and 23 are in alignment to provide a second pair of bearings and have recessed or indented sides such as 24 and 25. The lugs 22 and 23 are preferably located near the mid-portion of the substantially U-shaped bracket or support member 10 and near the connecting portion or closed end of the U.

The indented or recessed sides 20 and 21 of the lugs 18 and 19, respectively, preferably face toward the closed end of the U and provide bearing surfaces for knife edges 27 and 28, respectively, that are integral with substantially parallel legs 29 and 30 of a switch part or operated member 31; the knife edges 27 and 28 being located in bifurcations or recesses 32 and 33 at the ends of the legs 29 and 30. The legs 29 and 30 are joined at their other ends by an integral cross-piece 34 which has a lug 35 integral therewith and extending in the direction of the legs 29 and 30, intermediate those legs. A bracket 36 having an opening 37 therein is integral with the leg 30 and is preferably located near the axis of pivotal movement of the part or operated member 31, which axis of pivotal movement is at the line of the knife edges 27 and 28. Another bracket 39 has a lug 40 on one end thereof that extends into an opening 41 in the bracket 36 and is secured to the bracket 36 by a rivet 38 or other suitable fastening means. A strap 42 has an opening therein through which the lug 40 extends to secure one end thereof. The other end of the strap 42 is secured to the

other end of the bracket 39 by a screw 43 or other suitable fastening means.

The bracket 39 and strap 42 provide a clamp for securing a liquid or mercury switch element to the operated member 31 of the switch. This liquid or mercury switch element may be any one of the well known types of such elements having contacts therein and a quantity of liquid, such as mercury, for making and breaking a circuit between the contacts, and within a housing that is preferably sealed. Suitable insulated lead wires such as 46 and 47 are utilized for making connections to the mercury switch element 45 and these lead wires may preferably be anchored between the mercury switch element 45 and the bracket 39.

The indented or depressed sides 24 and 25 of the lugs 22 and 23 provide bearing surfaces for knife edges 49 and 50, respectively, that are integral with substantially parallel legs 51 and 52 of a switch operating member 53. The knife edges 49 and 50 are preferably located in recesses or bifurcations 54 and 55 at the ends of the substantially parallel legs 51 and 52. The legs 51 and 52 are joined by integral cross-pieces or joining portions 56 and 57. The cross-piece or adjoining portion 57 has an integral lug 58 thereon which extends between the legs 51 and 52. A lug 60 that is integral with and projects from the side of the leg 51 cooperates with shoulders 61 and 62 on the side 11 of the substantially U-shaped member 10 to provide stops for limiting the movement of the switch operating member 53 about the pivotal axis therefor which is provided by the knife edges 49 and 50 and the lugs 22 and 23. Stops are provided for limiting the movement of the switch part or operated member 31 by engagement of the lug 35 with the connecting portions 13 of the substantially U-shaped member 10.

As the parts comprising the substantially U-shaped support member 10, the switch part or operated member 31, and the switch operating member 53 are assembled, the sides 11 and 12 of the substantially U-shaped support member 10 straddle the legs 51 and 52 of the switch operating member and the legs 29 and 30 of the switch part or operated member 31 straddle the sides 11 and 12 of the substantially U-shaped support member 10. The parts are held in this assembled position by a tension spring 65 having hooked end portions 66 and 67 that extend through openings 68 and 69 in the lugs 35 and 58, respectively. With the parts thus assembled and with proper alignment of the axes provided by the pairs of lugs 18 and 19, and 22 and 23, as well as proper displacement of the axes of the lugs 18 and 19, and 22 and 23, movement of the operating member 53 about its pivotal axis moves the action line of the spring 53 across the pivotal axis of the switch part or operated member 31 to effect snap action or quick movement of the switch part or operated member 31 about its pivotal axis. Such rotary or rocking movement of the switch part or operated member 31 about its pivotal axis changes the angular position or slope of the mercury switch element 45 to make and break an electrical circuit.

As one adaptation of this switch mechanism and as disclosed herein, it may be utilized to control the fluid or liquid level within a tank or boiler indicated at 70. In this adaptation the adjoining portion 57 at the end of the operating member 53, opposite the knife edges 49 and 50, is preferably bifurcated as at 71 to provide a slot in which an actuating instrumentality 72 that is notched at 73 is mounted. The actuating instrumentality 72 preferably has notches 73 so shaped as to provide sharp edges such as 74 that engage the operating member 53 adjacent the bifurcation or slot 71 to effect relative movement between the actuating instrumentality 72 and the operating member 53. The actuating instrumentality 72 is preferably threaded onto a rod 75 that extends through an opening 76 in a suitable plug 77 and is connected or secured to a float 78. The plug 77 is screwed into a suitable opening 79 in the boiler or tank 70 and the rod 75 is freely movable through the opening 76 therein to control the switch responsive to movements of the float 78. In this or other similar or suitable adaptations the switch is mounted on a support 80 and secured thereto by screws 81 and 82 or other suitable fastening means that extend through the openings 16 and 17 respectively.

From this description of the switch and its operating mechanism it will be understood that the number of separate parts has been minimized by the elimination of separate shafts or pins to provide bearings and by forming the bearing parts and stops integrally with the support member and operating and operated parts of the switch. By providing substantially knife edge bearings for the moving parts of the switch it has been made practically frictionless in operation. It will also be noted that the same tension spring that effects snap or quick movement of the operated member responsive to movement of the operating member holds the parts of the switch operating mechanism comprising the support and the operating and operated members in their assembled relation. In the actual assembly of the switch the spring 65 is connected to either the lug 35 or the lug 58 before the operating and operated members are put in their assembled positions with respect to the support member, and then all that remains to be done to complete the assembly of the operating mechanism is to connect the spring to the other of the lugs 35 or 58.

While I have illustrated and described herein a preferred embodiment of my invention, many modifications may be made without departing from the spirit and scope of the invention and I do not desire or intend to be limited to the precise details set forth, but do desire to avail myself of all changes within the scope of the appended claims.

I claim:

1. A switch comprising, in combination, a substantially U-shaped support bracket having pairs of oppositely projecting grooved lugs integral therewith, said pairs of lugs projecting in opposite directions from the sides of the U-shaped support bracket, a pair of switch operating members each having a pair of substantially parallel projecting legs, said legs having bifurcated ends and integral knife edges, the knife edges of one of the switch operating members engaging one pair of grooved lugs and the knife edges of the other switch member engaging the other pair of grooved lugs to provide pivotal supports for both of the switch operating members, a tension spring connected to each of the switch operating members and urging each toward the pivotal support therefor, stops integral with each of the switch operating members and adapted to engage cooperating parts of the support bracket for limiting movement of the switch operating members about their respective pivotal supports, a mercury switch element, means securing the mercury

switch element to one of the switch operating members for movement therewith, a float, and means providing a double oppositely disposed knife edge engagement with the other of said switch operating members and connected to the float for actuating said other switch operating member in response to movement of the float.

2. A switch comprising, in combination, a substantially U-shaped support bracket having pairs of oppositely projecting grooved lugs integral therewith, said pairs of lugs projecting in opposite directions from the sides of the U-shaped support bracket, a pair of switch operating members each having a pair of substantially parallel projecting legs, said legs having bifurcated ends and integral knife edges, the knife edges of one of the switch operating members engaging one pair of grooved lugs and the knife edges of the other switch member engaging the other pair of grooved lugs to provide pivotal supports for both of the switch operating members, a tension spring connected to each of the switch operating members and urging each toward the pivotal support therefor, stops integral with each of the switch operating members and adapted to engage cooperating parts of the support bracket for limiting movement of the switch operating members about their respective pivotal supports, and switch contact means controlled by the movement of one of the switch operating members about its pivotal supports, the other of said switch operating members providing an actuating arm for the switch.

3. A switch comprising, in combination, a substantially U-shaped support bracket having pairs of oppositely projecting grooved lugs integral therewith, said pairs of lugs projecting in opposite directions from the sides of the U-shaped support bracket, a pair of switch operating members each having a pair of substantially parallel projecting legs, said legs having bifurcated ends and integral knife edges, the knife edges of one of the switch operating members engaging one pair of grooved lugs and the knife edges of the other switch member engaging the other pair of grooved lugs to provide pivotal supports for both of the switch operating members, a tension spring connected to each of the switch operating members and urging each toward the pivotal support therefor, stops for limiting movement of the switch operating members about their respective pivotal supports, a mercury switch element, means securing the mercury switch element to one of the switch operating members for movement therewith, a float, and means providing a double knife edge engagement with the other of said switch operating members and connected to the float for actuating said other switch operating member in response to movement of the float.

ERNST WALTER RICKMEYER.