April 9, 1935. C. A. TURNER 1,997,090

DELAYED ACTION ELECTRIC SWITCH

Filed June 6, 1931

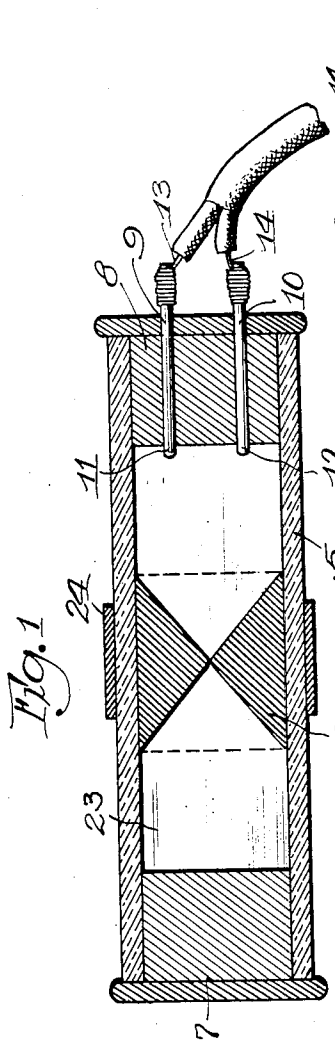


Fig. 1

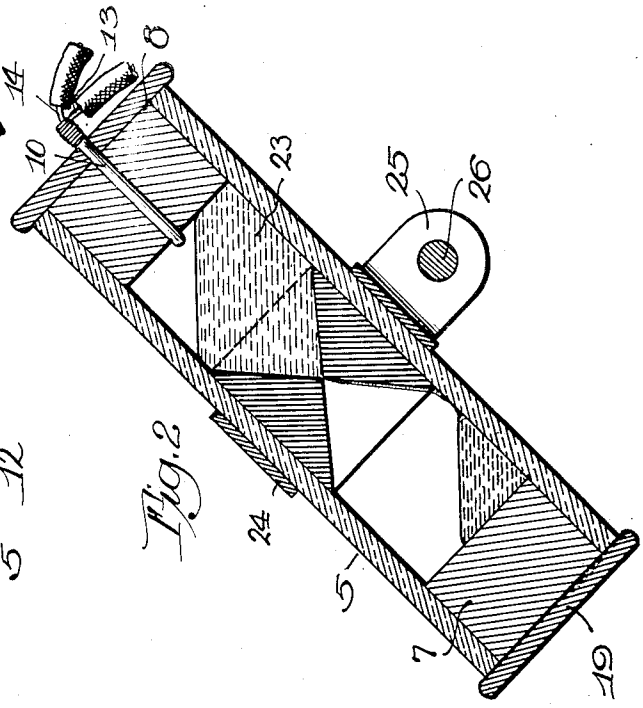


Fig. 2

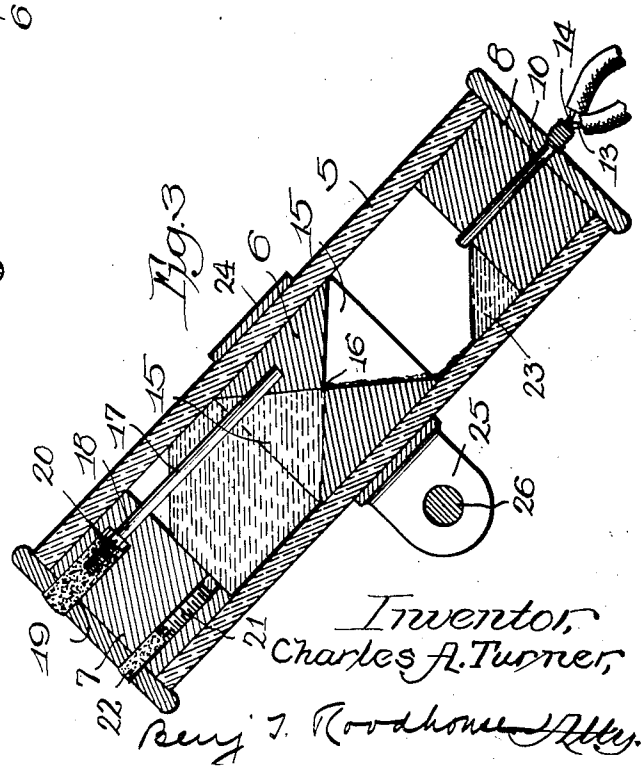


Fig. 3

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Patented Apr. 9, 1935

1,997,090

UNITED STATES PATENT OFFICE

1,997,090

DELAYED ACTION ELECTRIC SWITCH

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Application June 6, 1931, Serial No. 542,526

3 Claims. (Cl. 200—33)

My present invention relates to the provision of a delayed action electric switch. In designing and organizing electrically operated supervising and control mechanism it is often necessary or desirable to delay the occurrence of one or more operations of a necessary sequence or series of operations, and my present invention has for its object the provision of simple, dependable and economical means for delaying the opening or closing of a circuit a definite time after the switch is thrown.

I am aware that electric switches employing mercury in an air evacuated tube for opening closing circuits is not new, but I believe that my construction, as will hereafter be seen, which permits the securing of an air evacuated mercury containing switch tube without special evacuating machinery secures substantial economies in the construction of such apparatus.

I attain the foregoing objects and results by means of the structure illustrated in the accompanying drawing, in which—

Fig. 1 is a horizontal central section of a switch embodying my invention.

Fig. 2 is a vertical central section of the structure shown in Fig. 1 in off or open position; and

Fig. 3 is a view similar to that shown in Fig 2 except that the switch is shown in on position but not yet closed.

Similar reference characters refer to similar parts throughout the respective views.

The construction of the switch involves the employment of a length of tubing 5, preferably made of glass so that the operation of the switch may be observed, together with an intermediate plug 6 and two end plugs 7 and 8. The plugs 6, 7 and the inner end of plug 8 are made to have a smooth friction fit in the bore of the tube 5. The plugs are made from electric insulating material, preferably of bakelite or some other-condensite product which is inert in the presence of mercury. In the plug 8 are embedded metallic conductors 9 and 10 which project upon the inside of the plug in spaced relation to provide terminals or contacts 11 and 12, and which also project upon the outside of the plug to permit of the securing thereto conductors 13 and 14. The intermediate plug 6 has provided in its opposite ends conical recesses 15—15, which preferably extend from its end edges, as a base, to the center or axis of the plug as an apex. A short bore or passageway 16 connects the apexes of the recesses 15—15. The angle of the walls of the conical recesses 15—15 are preferably such as to secure the draining of the mercury from one side of the plug to the other when the switch is put in either on or off position. Embedded in the plug 6 is or are one or more rods 17, preferably of or covered with bakelite, extending in the direction of the plug 7. The inner face of the plug 7 is perforated, as at 18, to receive and provide a close fit for the rod or rods 17. The outer face of the plug 7 is bored to produce an enlarged bore 19. The bores 18 and 19 communicate and the bore 19 is of such size as to accommodate the rod 17 provided with a nut 20. In the plug 7 an additional bore 21, tapped to receive a sealing screw 22, may be provided.

The method of assembly of the above described parts is as follows: The bore of the tube 5 at the end for the reception of plug 8, is coated with a solution of cellulose acetate, or some other suitable sealing composition, and the plug 8 is inserted therein. Mercury 23 is then poured into the tube until the same is filled. The plugs 6 and 7 are next inserted and forced down in the tube until all three plugs are in contact and until excess mercury exudes through the bore 21. Sealing solution is then placed in the bores 19 and 21 in the plug 7 and in the bore of the tube 5 outside of the plug 7. The sealing screw 22 is screwed into the bore 21 and the plug 7 is withdrawn to the end of the tube. The withdrawal of plug 7 to the end of the tube 5, through the operation of the rod 17, secures the withdrawal of the plug 6 from its contact with the plug 8 and a spacing of plug 6 between plugs 7 and 8.

Another mode of assembling the apparatus consists in seating and sealing the plug 8 in the end of the tube 5, as hereinbefore described. Place a sufficient amount of mercury in a tube so that when the plug 6 is forced into and sealed in its final position in the center of the tube, the chamber between the plug 6 and the plug 8 will be completely filled with mercury. The other end of the tube is then filled with mercury and the plug 7 is pressed and sealed into its position. The end of the tube containing the plug 7 is then capsized in a bath of mercury with the end of the tube containing the plug 8 withdrawn from the bath of mercury sufficiently far to permit the mercury to drain from the portion of the tube beween plugs 6 and 8, at which time the screw 22 is inserted and sealed in the bore 21. When the method of assembly last described is employed, the rod or rods 17 will be unnecessary.

Either of the above described series of operations secures the evacuation of air from the in-

terior of the tube 5 without any special evacuating or pumping apparatus.

I have illustrated the tube 5 supported in a ring or annulus 24 from which extends a perforated ear 25, through the perforation of which is an axle 26 operated by a tilting mechanism which may be employed for throwing the switch into on or off position. It is obvious, however, that the tube may be equally well supported and tipped in a number of other ways.

When the tube is thrown into off position the mercury drains away from the portion of the bore of the tube between plugs 6 and 8 through the passage or bore 16 into the space between the plugs 6 and 7 until either of the contacts 11 or 12 is free from the mercury, when the switch is open. When the tube 5 is in on position, as shown in Fig. 3, the mercury drains from the space between plugs 6 and 7 through the passage 16 in plug 6 and into the space between the plugs 6 and 8 accumulating in the lowest portion thereof until the terminals 11 and 12 are submerged, when the circuit is closed. The amount of delay secured in this way may be varied by increasing or decreasing the size of the tube 5 and the capacity of the bore 16, or by changing the vertical relation of the contacts 11 and 12 and their spacing or separation. I do not thing it is desirable to have the bore 16 very long, but the other factors may be changed between quite large limits so that the closing or opening of the circuit after the switch is thrown, may be delayed for a predetermined time from a few seconds up to a minute or more.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A delayed action switch comprising a tiltable tube, a partition intermediate the ends of said tube having conical recesses in its opposite faces and a channel connecting the apexes of said recesses, end plugs for said tube, a quantity of mercury enclosed within said tube and said end plugs and spaced conductors extending through and protruding from the faces of one of said end plugs.

2. A delayed action switch comprising a tiltable tube, a partition intermediate the ends of said tube having conical recesses in its opposite faces and a channel connecting the apexes of said recesses, end plugs for said tube, a quantity of mercury enclosed within said tube and said end plugs, spaced conductors extending through and protruding from the faces of one of said end plugs and means co-acting between said intermediate partition and one of said end plugs for securing the spacing of said elements upon the withdrawal of said end plug to the end of said tube.

3. A delayed action switch comprising a tiltable tube having spaced electric contacts in one end thereof, a quantity of mercury and an intermediate partition within said tube, said partition having conical recesses in opposite faces thereof and a passageway connecting the apexes of said recesses, whereby said mercury will drain from one side to the other of said partition upon the tilting of said tube.

CHARLES A. TURNER.