March 2, 1948. C. B. IVESTER 2,437,197

TIME DELAY SWITCH

Filed May 12, 1945

Fig. 1.

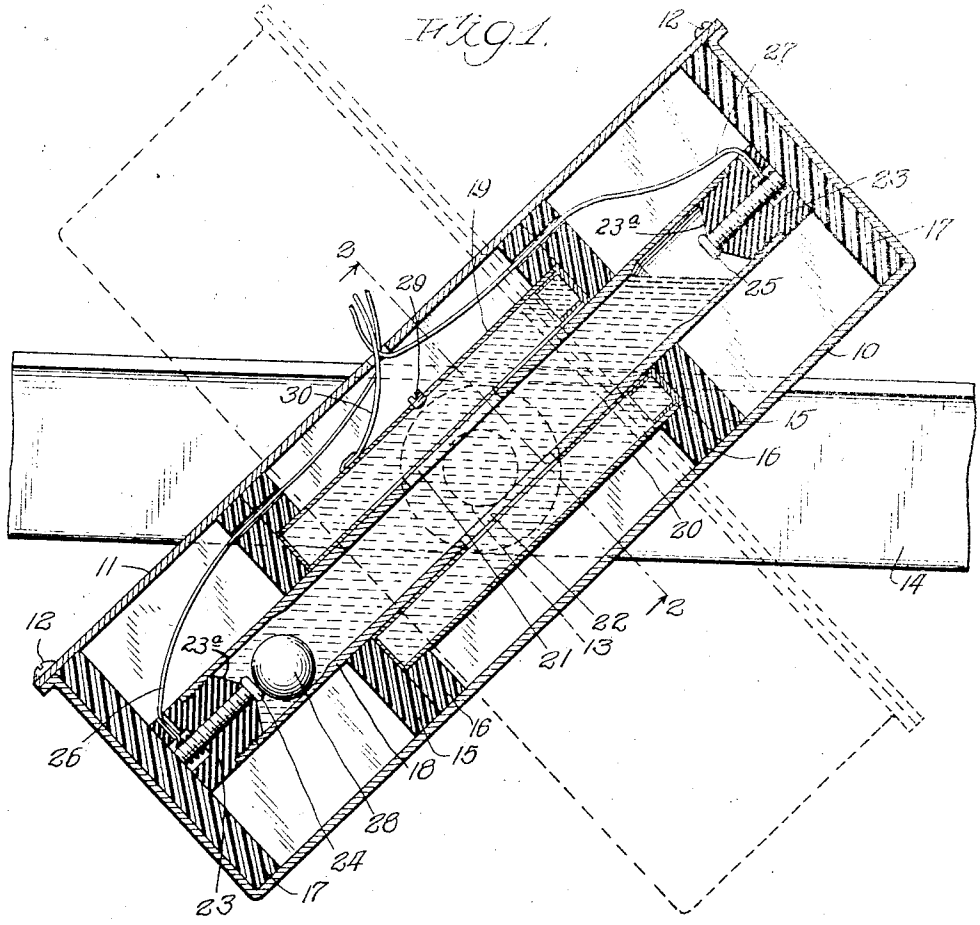


Fig. 3.

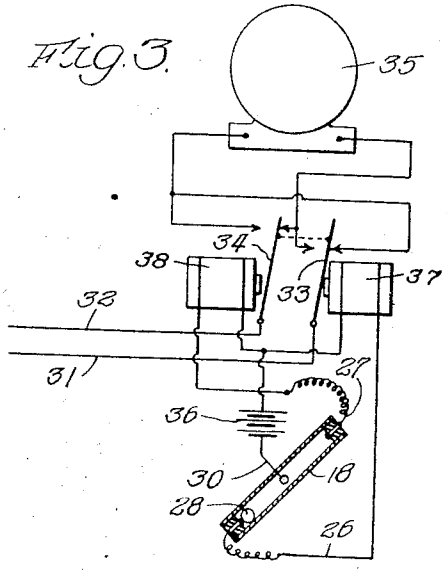
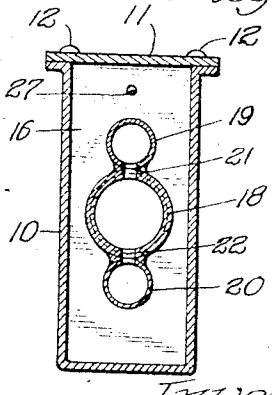


Fig. 2.



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TIME-DELAY SWITCH

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7 Claims. (Cl. 200—33)

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This invention relates to a time delay switch for reversing mechanism, and more particularly to an improved switch for reversing a motor effecting reciprocation of heavy movable bodies such as channels used in carbon manufacturing plants.

One feature of this invention is that it provides an improved time delay relay; another feature of this invention is that it provides reversing means which cuts off driving current to a motor a substantial period before supplying current for reverse movement thereof; yet another feature is that where heavy parts are being reciprocated reversal may be achieved with a much lower current consumption than with conventional reversing devices; another feature of this invention is that it is particularly adapted for reversing heavy slowly moving elements, as the channels used in the manufacture of carbon.

The invention comprises a relay tube adapted to be reversibly tilted at desired points. The tube is filled with a fluid such as oil, and has contacts at each of its ends. A ball in the tube rolls from one end to the other as the tube is tilted, and alternately engages the two contacts, the current being disconnected during the run from one contact to the other. Features of the invention are auxiliary tubes above and below the main tube. The upper tube provides an expansion chamber to correct difficulties arising from expansion and contraction of the oil caused by variations in temperature. The lower tube provides a sediment chamber where heavy particles such as carbon formed in the tube and which might impede the ball will be collected and hence moved out of the ball's path.

Another feature is the provision of tapered removable contacts which permit cleaning of the tube and insure contact with the ball.

Other features and advantages of this invention will be apparent from the following specifications and the drawings, in which:

Fig. 1 is a view principally in section of the time delay switch.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, and

Fig. 3 is a schematic diagram illustrative of the circuit connections which may be employed.

One use of the invention is in connection with the manufacture of carbon wherein a plain metal surface, generally in the form of an eight-inch channel bar, is caused to move or travel slowly over a flame giving off carbon, as a gas flame. The carbon is deposited on the relatively cold surface, and subsequently scraped off. These

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channels are usually mounted in gangs or groups on tables or carriages adapted to facilitate reciprocation thereof over the flames. The elements being reciprocated are thus quite heavy, and they are caused to travel at a relatively slow speed, as about one foot per minute, usually through a distance of six or eight feet.

The driving means for the reciprocating elements or channel bars consists of an electrical motor appropriately connected to effect driving through gears, shafts, rack bars, and the like. If conventional reversing methods are used the reversing current reaches very high values.

This invention provides reversing mechanism which breaks the circuit to the motor and then provides a relatively long delay before current is supplied for reverse movement thereof. This delay enables the mechanical friction in the various parts to cause the heavy reciprocating element to stop; and even causes the motor to reverse its direction of rotation as the result of the torques or strains existing in the driving connections between it and the reciprocating element, before current is supplied thereto. The result is that reverse motion is accomplished with overload currents of only about fifteen percent, as compared with overloads of one hundred to one hundred fifty percent when conventional relatively instantaneously reversing mechanisms are used.

In the particular embodiment of the invention illustrated herewith the time delay switch is housed in a steel box 10, the bottom ends and sides of which are preferebly integral and the top 11 is tightly secured thereto by means of screws 12 extending through flanges formed on the top of the sides and ends. This box is mounted upon a shaft 13 journaled in support 14 and adapted to permit oscillation or reciprocation of the box from the position shown in full lines in Fig. 1, for example, to that shown in dotted lines therein. Suitable means (not shown) are provided to cause this oscillation or reciprocation at the desired time, such as the end of movement in one direction of the moving element.

Mounted in the box on spaced washers 15, 15, 16, 16, and with its ends supported by blocks 17, is the switch or relay tube comprising a main tube 18, upper tube 19, and lower tube 20 secured together as by soldering (see Fig. 2) and connecting with each other by narrow complementary slots in adjacent walls forming channels or passageways 21 and 22. The ends of tubes 19 and 20 are permanently sealed as by soldering a plug therein. The interior of the main tube 18 is threaded at each end to receive plugs 23 of insu-

lating material and carrying contacts 24, 25 connected to wires 26, 27 respectively extending through an opening in the plug outside the tube. The internal ends 23a of the plugs are tapered as shown in Fig. 1 to insure that the ball 28 in the tube will contact the contacts 24 or 25, as the tube is tilted one way of the other.

The upper tube 19 has an opening therein to permit filling the tube with a fluid such as an oil of the type commonly used in transformers. This opening is closed by a one way pop valve 29 (details of which are not shown on the drawing) and which will prevent leakage of the fluid under normal operating pressures but will permit the release of gases or excess fluid resulting from excess pressure or expansion due to high temperatures.

The ball is of only slightly less diameter than the internal diameter of the tube 18, and is here described as of steel, both the ball and the contacts being silver plated to provide better electrical connection. The bore of the tube is expanded adjacent the contacts to increase the speed of movement of the ball at each end of the tube, and thus provide relatively instantaneous making and breaking of the contacts when the tube is tilted.

When the tube is in the position illustrated in solid lines in Figure 1, a circuit is completed through the ball between the contact 24 and the shell or tube 18, through the wire 30 on tube 19. When the tube is tilted to the position shown in dotted lines, however, the ball 28 relatively rapidly breaks away from the contact 24, thus opening this circuit. It then moves relatively slowly down the tube (preferably taking about four seconds), before it approaches the contact 25; thereupon the expanded bore of the tube immediately adjacent this contact enables it to speed up and to make a rather rapid or instantaneous connection between the contact 25 and the tube 18.

The wires 26, 27 and 30 lead to an electrical circuit through an opening 31 in the top of the box. If it is desired to make the box fluid tight this opening may have a rubber cable enclosing the wires suitably secured in it.

Referring more particularly to Fig. 3, a simplified diagram is shown illustrating an operative circuit including the tube and the motor for the apparatus with which it is used. A line or source of power comprising wires 31, 32 are here shown as supplying current through one of the locked together switches 33, 34, to the motor 35. The wire 30 from the time delay switch leads through a battery 36 to two electro-magnets 37 and 38, adapted to contact the switches 33 and 34. When the switch 18 is in the position shown in Figs. 1 and 3, current flows through the wire 31 to the switch 33, then to the motor 35 and back through the switch 34 and wire 32, the switch 33 being held in position by magnet 37, which has been energized by the battery through the contact 24 of the switch 18. When the switch 18 is tilted to the position shown in dotted lines in Fig. 1 the ball is immediately disconnected from the contact 24 and a spring (not shown) removes the switches 33, 34 from the contacts shown in Fig. 9 to a neutral position away from all contacts and the current to the motor is cut off. When the ball engages contact 25 the magnet 38 is energized to pull the switch 34 toward it and completes the circuit to supply the motor with current for reverse movement.

Usually excessive heat is encountered in the devices with which the delay switch is used. This

heat tends to expand the fluid in the tube 18 which impedes and might even prevent the movement of the ball. To maintain a constant fluid pressure against the ball is the function of the expansion chamber 19 which intially is not filled to capacity. When the tubes are tilted there is therefore an air space as shown in Fig. 1 which is sufficiently large under most circumstances to provide for the expansion of the fluid and therefore maintain an even pressure against the ball. Should greater heat develop, or should gas be formed by the heat the pop valve will permit escape of the excess fluid or the gas. The chamber also acts as a reservoir to insure filling of the main tube upon contraction of the oil.

This heat also results in the formation of carbon and other impurities in the tubes, which, if allowed to accumulate, will act to retard or impede the ball. These impurities, being heavier than the oil, will fall to the floor of the tubes and, as the tube is tilted, will eventually drop through the slot or channel 22 to the sediment tube or chamber 20. The top of the box and the ends of the tube 18 being removable, the tubes may be removed from the box and cleaned as it becomes necessary.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. In a time delay switch having a reciprocable metal tube, a fluid therein, contacts in said tube, and a metal ball adapted to move through said tube to engage a contact and complete a circuit between the contact and the tube; means for maintaining a constant supply of liquid in said tube comprising an expansion chamber having an opening leading to said tube.

2. In a time delay switch having a reciprocable metal tube, a fluid therein, contacts in said tube, and a metal ball adapted to move through said tube to engage a contact and complete a circuit between the contact and the tube; means for removing foreign matter from the path of said ball comprising a sediment chamber connected with the floor of said tube and a passageway between said tube and chamber through which said foreign matter will drop.

3. In a time delay switch having a reciprocable metal tube, a fluid therein, contacts in said tube, and a metal ball adapted to move through said tube to engage a contact and complete a circuit between the contact and the tube; an expansion chamber above said tube; a sediment chamber below said tube, and passageways connecting said tube and chambers.

4. In a time delay switch having a reciprocable metal tube, a fluid therein, contacts in said tube, and a metal ball adapted to move through said tube to engage a contact and complete a circuit between the contact and the tube; an expansion chamber above said tube; a sediment chamber below said tube, and passageways connecting said tube and chambers; and a removable member on said tube to permit cleaning of the switch.

5. The device claimed in claim 4 wherein the removable member is a plug containing a contact.

6. In a time delay switch having a reciprocable metal tube, a fluid therein, contacts in said tube, and a metal ball adapted to move through said

tube to engage a contact and complete a circuit between the contact and the tube; means for maintaining a constant supply of liquid in said tube comprising an expansion chamber having an opening leading to said tube; and a valve for releasing pressure in said expansion chamber.

7. The device claimed in claim 4 wherein the removable member is a plug at one end of the tube containing a contact in its inner face, said face tapering away from said contact.

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REFERENCES CITED

The following references are of record in the file of this patent:

FOREIGN PATENTS

Number	Country	Date
429,384	Germany	May 26, 1926