July 17, 1956 C. H. SILVERS 2,755,349

TIME DELAY MECHANISM

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Fig. 1.

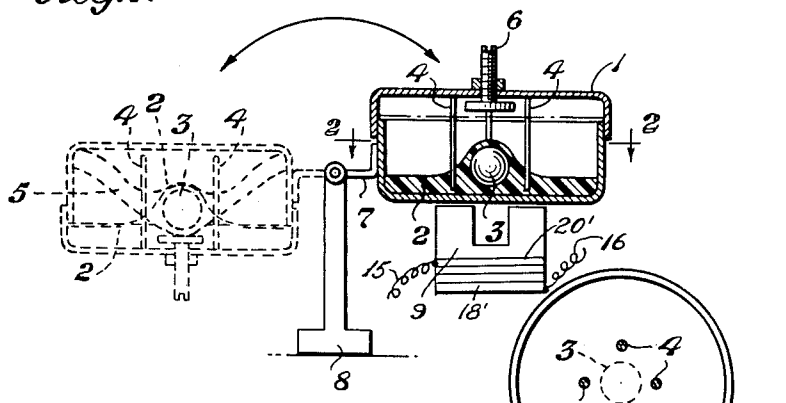
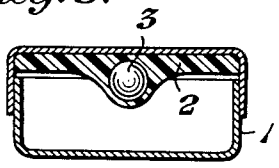


Fig. 2.

Fig. 3.



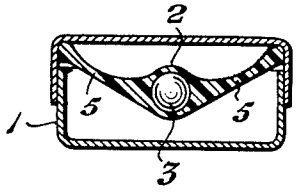


Fig. 4.

Fig. 5.

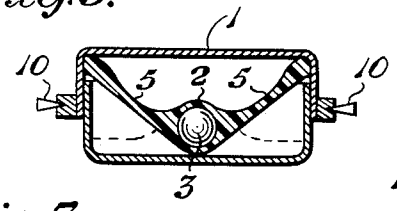


Fig. 7.

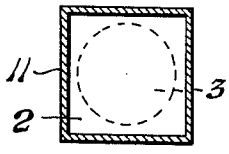
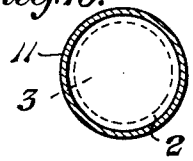
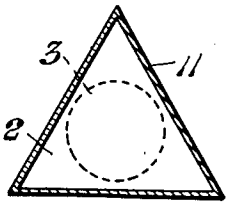


Fig. 10.





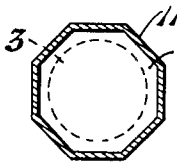


Fig. 9.

Fig. 8.

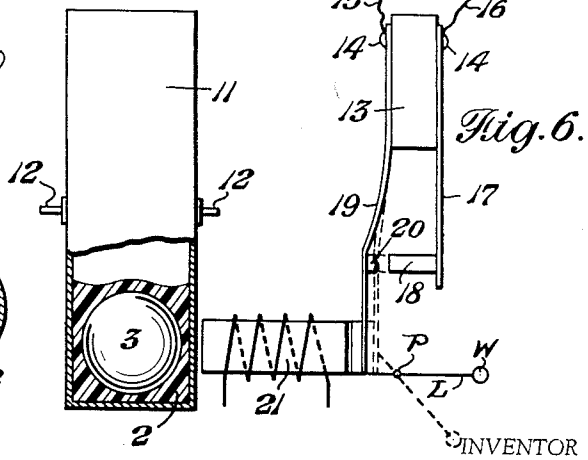


Fig. 6.

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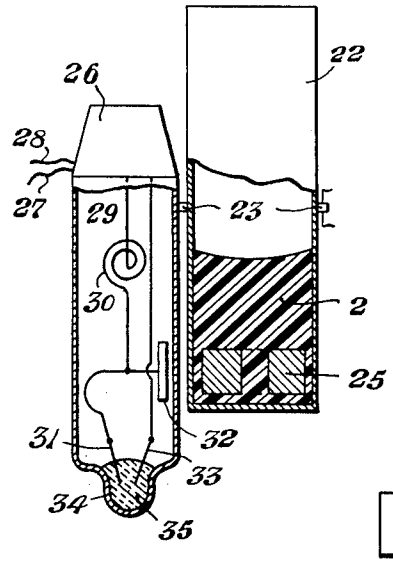
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Fig. 11.



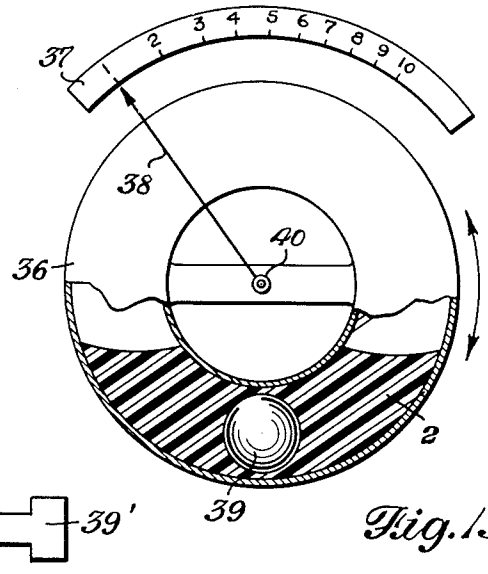


Fig. 13.

Fig. 14.

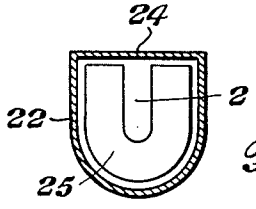
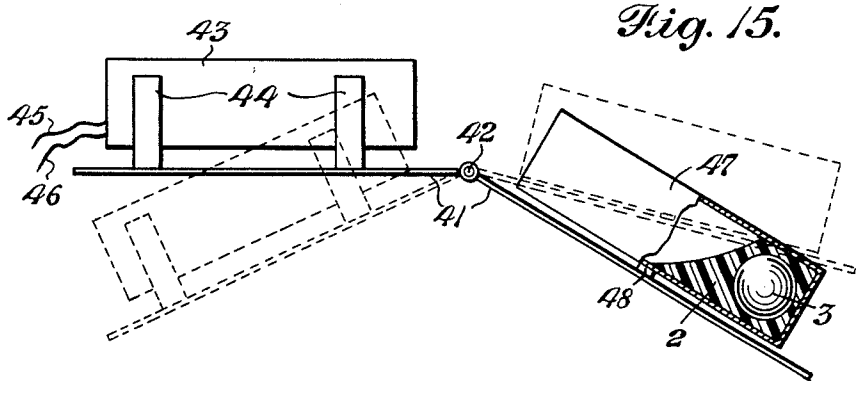


Fig. 12.

Fig. 15.



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2,755,349

Patented July 17, 1956

2,755,349

TIME DELAY MECHANISM

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Application April 10, 1952, Serial No. 281,511

2 Claims. (Cl. 200—33)

This invention relates to improvements in time delay mechanisms particularly adapted for use in connection with various devices or release means to be actuated, such as switches, relays, parking meters or other mechanisms. An object thereof is to provide a novel time delay means which employs and depends for its delaying action and effective operation and adjustment of the timing thereof on the use of a heavier solid object or weighted body embedded and moving in, with, or through and in timed relation or relative to a slow flowing stable plastic or silicone rubber compound, partially filling a cartridge or container. The weight, which may be a ball, cylinder, roller or other shaped object being of any suitable material, magnetic or otherwise, such as steel or iron, lead or otherwise, loosely fits in the container to allow slow flow or flow-by of the silicone material as it moves downwardly by gravity from an upper to a lower portion of the container so as to finally mechanically actuate or release a mechanism, close or open a circuit to an electromagnet, be magnetically attracted, cause overbalancing, or otherwise operate a movable device or switch to open or close the same and thus an electrical circuit controlled thereby, or release a mechanical latch connected to other devices.

Other objects and advantages will be apparent as the description proceeds, but it is to be understood that changes and modifications in the details of construction, combinations and arrangements of the parts may be resorted to without departing from the spirit and scope of the invention as long as the same is embodied within the scope of the device as claimed.

In the accompanying drawing:

Figure 1 is a sectional elevation of one form of my time delay mechanism or switch, showing the same in operative and inoperative positions.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figures 3, 4 and 5 are vertical sectional views, showing the time control means in the starting, intermediate and completed mechanism or switch operating positions, the latter showing another form of pivoting arrangement for resetting to starting position.

Figure 6 is a sectional elevation of another form of time delay mechanism or switch and latch release.

Figures 7 to 10 inclusive are sectional views showing different cross-sections for flow-by of the silicone material to operate the mechanism or switch.

Figure 11 is a vertical section of another form of time delay mechanism or switch, employing mercury and the silicone material.

Figure 12 is a horizontal sectional view of the container and magnet body shown in Figure 11.

Figure 13 is a section elevation of another time delay mechanism or form of switch.

Figure 14 is an elevation of a roller for use in Figure 13, and

Figure 15 is an elevation of another form of time delay mechanism or switch.

Referring to the drawings in detail in which like reference characters refer to corresponding parts throughout the several views, and more particularly to Figures 1 to 5 inclusive, the switch includes a cartridge or container 1 which may be of two sections or otherwise, assembled and held together as shown. Before assembly, a mass, quantity or body 2 of silicone plastic material or rubber-like compound is placed in container 1, in which a preponderantly heavier solid body 3, magnetically affected weighted metal object or body of steel or iron 3 of suitable geometrical form, preferably a ball or cylinder but not limited thereto, is suspended with a clearance between the container and the body or ball so that the ball will be loosely fitting in the container. This allows slow flow or flow-by of the silicone material as it flows downwardly by gravity from an upper position, where it is held temporarily by adherence to the wall of the container, to the bottom of the container with the heavier ball moving or fighting its way partially through the silicone material. The material between the weight or ball and the wall of the container to which the material is adhered, is stretched into a web until the weight is at rest in the bottom of the container to operate suitable mechanism such as a switch by magnetic attraction of the weight or ball, overbalancing of a lever or mercury switch, latch or other action. The cartridge or container is of non-magnetic metal or material such as plastic, glass, brass or the like so that in case of a magnetic action it will only act on the weight when in a predetermined lower or bottom position, as when the material is at rest.

In order to guide the weight, slug or ball in its movement, a series of guide supports or pins 4 may be provided around the weight in the direction of movement thereof and these supports or rods will keep the weight centrally located so that the bouncing putty will move and stretch uniformly all around and produce a thin web 5 between the lateral wall of the container and the ball and mass of material constantly surrounding the same. The amount of movement, and thus, the time delay or movement of the ball and material to regulate the time interval, may be adjusted by regulating the clearance or flow space or distance of travel by means of a headed adjustment screw 6 threaded through one end of the container within the guide supports or rods 4.

The reversing of the action and flow direction of the silicone material may be accomplished by supporting the container on a pivot axis whereby it may be inverted as by means of a rigid projecting arm 7 pivoted to a support 8 to permit the container 1 to be turned over or inverted to reverse its position and direction of flow of the silicone material 2 as seen in solid and dotted lines in Figure 1 after the material is at rest at the bottom of the container, so that in either relative position a mechanism or latch may be operated or released, or a switch or circuit may be opened or closed. As shown, in the solid line position, a magnet 9, which may be a permanent or electromagnet, is movably supported in position beneath the container 1 to overcome its own weight and magnetically attract or pull itself to the weight or ball 3 when the latter has moved to the bottom or downwardly sufficiently to place itself within the sphere of magnetic influence of the magnet 9, to operate a mechanism, open or close an electrical circuit or switch controlling the same. This may be done through line or lead wires 15 and 16 and contacts 18′ and 20′ similar to contacts 18 and 20 as described in connection with Figure 6, or otherwise.

In the operation of the device as shown in Figures 1–5 inclusive of the drawings, upon raising and turning the container 1 over on its pivot axis to reverse its position from the solid line position to the dotted line position, the silicone material 2 and the magnetically influenced weight

3 having moved to its lower position as seen in solid lines, will then be in the upper position and will move downwardly to the lower part of the container in the at-rest position. Then, by reversing the position of the container by swinging it back to the solid line position, the material 2 and ball 3 will initially be in the position shown in Figure 3 and move downwardly during the desired time interval depending upon the various proportions, fluidity, viscosity and other factors controlling such time interval and upon the purpose of the device. Thus, the silicone material and ball will successively move downwardly as previously described through the stages shown in Figures 4 and 5 until the position shown in solid lines in Figure 1 is reached. Therefore, when the position shown in Figures 5 or 1 are reached, the weight or ball 3 will be in the sphere or zone of magnetic influence of the magnet 9 which will overcome its own weight and attract or pull itself to the magnetically affected weight or ball 3 and lift the contact 20' from the contact 18' to separate them and open the circuit through the line or lead wires 15 and 16 to the mechanism controlled thereby.

In this action, the slow downward flow of the material 2 by gravity to the bottom of the container 1 is assisted by the weight 3 so that the material stretches entirely around the weight to form the thin web 5 between the weight and wall of the container while maintaining the weight in suspension entirely surrounded or enveloped by the material at all times without parting, separating or breaking in two irrespective of the thinness of the stretched web 5. This is due to the very nature or physical properties of the material or its surface tension and molecular attraction, so that it constantly maintains its stability, inertness, dielectric properties and integral form and permits resetting of the mechanism or switch to reverse its action and direction of flow by inverting the container or cartridge by turning it over as described. However, the cartridge may be reversed in position by mounting the same on a diametrical pivot axis shown as diametrically opposed pivot axes 10 as seen in Figure 5, on which the container 1 may be turned over or reversed in position.

In Figure 6, the cartridge or container 11, which may be a cylinder or of any other cross-sectional shape as per container 1, is shown vertically elongated and pivoted on axes 12 the same as axes 10 in Figure 5, and contains the mass 2 of silicone rubber compound and weight or ball 3 as previously described. The mechanism or switch controlled by the ball comprises an insulator support body or bar 13 having terminals 14 from which lead wires 15 and 16 extend to a source of electrical current and a motor or mechanism operated thereby in any suitable way. One terminal supports a conductor plate or arm 17 having a contact 18 and the other supports a spring plate or arm 19 having a contact 20 adjacent contact 18 and a magnet 21, which may be a permanent magnet or electromagnet as shown, extending adjacent ball 3 when down. Arm 19 is normally resiliently biased toward plate 17 with contact 20 engaging contact 18 to close the switch and circuit controlled thereby when ball 3 is at the top by inverting container 11 on its pivot axes 12. However, when the ball 3 has moved down with the silicone material 2 to the position shown, the magnetic attraction between the ball 3 and the magnet 21 causes the contact 20 to separate from the contact 18 and open the mechanism or switch and circuit controlled thereby. The circuit and switch action may be eliminated simply by omitting leads 15 and 16, plate 17, and contacts 18 and 20, but with spring arm 19 normally biased to the right, it extends over the adjacent free end portion of the short arm of a lever L forming a latch pivoted horizontally at P to swing vertically. Lever L carries a weight or weighted red flag W at the outer free end of the long arm thereof, which drops or swings down when the magnet 21 is attracted by the ball 3 when the latter reaches the low position, to release the lever or mechanical latch L to swing down as seen in dotted lines in Figure 6. Thus, the flag serves as an indicator as in a parking meter or other device, when a certain time interval has elapsed.

The cartridge or container 11 may be of any suitable cross-section such as a cylinder or round as shown in Figures 1 to 5, 6 and 10; rectangular or square as in Figure 7; triangular as in Figure 8; polysided of any number of sides such as octagonal as in Figure 9 or otherwise with a clearance or flow space of any desired width between the weight or ball and the interior of the container to regulate the time interval it takes for the weight and silicone material to move down to its lower position to operate the switch and thus, the time delay desired during which the circuit is closed or open and the motor or other mechanism operative or inoperative before being reversed in its operative position.

In Figures 11 and 12, the container 22 is similarly pivoted on axes 23 or otherwise arranged to be inverted and contains silicone material 2. This container has a flat side 24 so as to loosely receive a straight, bifurcated or horse shoe shaped bar or magnet 25 forming a weight. A mercury switch 26 is mounted adjacent the container and has circuit lead wires 27 and 28 leading therefrom, one wire extending to a spring arm 29 with a coil spring 30 and is connected to a spring arm 31 having an armature 32. Arm 31 and another arm 33 from the other lead wire extend into a mercury cup 34 containing mercury 35 so that when the mercury is in the cup it closes the circuit. When the magnet moves down as previously described, the armature 32 is attracted and the coil spring 30 is tightened to lift arm 31 from the mercury and thus open the circuit.

Figure 13 shows a time controlled switch in which an annular tubular container 36 is supported to turn relative to an arcuate concentric dial 37 shown calibrated from 1 to 10 and carrying a hand or pointer 38 cooperating with and movable over the dial 37. The silicone material 2 in the container 36 envelops the weight in the form of a ball 39 or annularly recessed roller 39' as shown in Figure 14 of the drawings so that when they move down as previously described, the pointer 38 moves over the dial indicating the time interval for operating a switch at the axis 40 of the container, to open or close the switch as desired.

In Figure 15, an obtuse angled lever 41 is pivoted at 42 and on one arm carries a mercury switch 43 in clips 44. Lead wires 45 and 46 extend to the switch 43 to control a motor or suitable mechanism operated thereby. The other arm of the lever carries a container or cylinder cartridge 47 mounted to turn on a pivot axis 48. The silicone material 2 and weight 3 in the container when turned to an upper position or 180 degrees, the weight of the mercury switch overbalances the same as indicated in the dotted line position to open or close the circuit controlled by the mercury switch 43. As the slow flowing silicone compound and weight move down, the lever will be unbalanced by the combined weight thereof and swing this end or arm down and the mercury switch up with its arm to reverse the action of the switch and circuit or operate a flag or indicator as in Figure 6.

The time delay mechanism or switch of this invention is of very simple and durable construction and capable of effective operation under widely different temperature conditions. The device makes new and effective use of the inherent properties of silicone plastic material in combination with a weighted body enveloped by and moving in suspension with or through it, so as to relatively accurately give the time delay or motion over a time interval as desired. The slow flow action is uniform over wide temperature ranges thereby rendering it and the mechanism or switch universally applicable for a variety of uses.

Having thus described my invention, what I claim is:

1. A time delay mechanism comprising a container, a mass of silicone plastic material in said container, a

weighted body in said container and embedded in said plastic material, said material being slowly flowable in the container between the walls of the container to which it is adapted to releasably adhere under the influence of said body at a time interval determined by the flow space therebetween and to stretch without parting, said container being mounted to reverse its position to dispose the material and said body uppermost on one end of said container when at rest, a switch having a movable element to open and close the same, and means on said movable element to be magnetically attracted by the weight in its lowermost position to reverse said switch and circuit controlled thereby.

2. A time delay mechanism comprising a switch having a part movable into and out of operative and inoperative positions and connected to a source of current supply, a container, a slow flowing plastic rubber compound in said container, a weight movable in said container by gravity while in suspension in the compound with the clearance between the weight and container controlling

the time interval taken for the compound and weight to move between the limits of their flow and movement respectively, said compound stretching to form a web without parting while maintaining the weight enveloped thereby, means for changing the position of the container to reverse the flow of the compound and movement of the weight therein, and means to actuate the movable part of said switch to cause the switch operation upon the downward limit of flow and movement of the compound and weight, respectively, and to reverse the switch upon changing the position of the container by reversing it.

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