Oct. 25, 1932. E. CHAPMAN 1,884,571

STARTING SWITCH

Filed Oct. 30, 1929

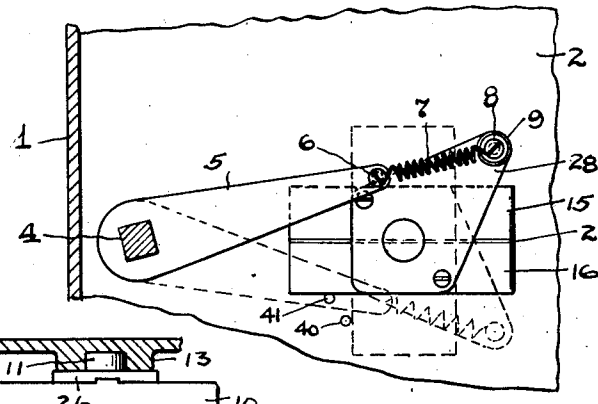


Fig. 1.

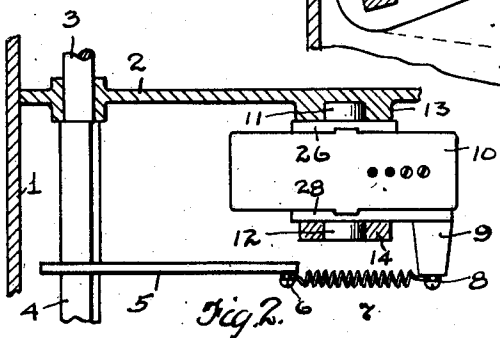


Fig. 2.

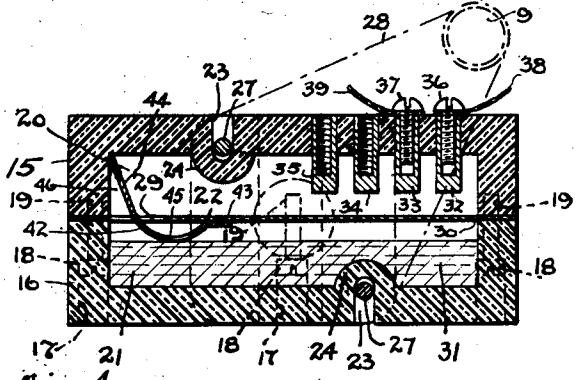


Fig. 4.

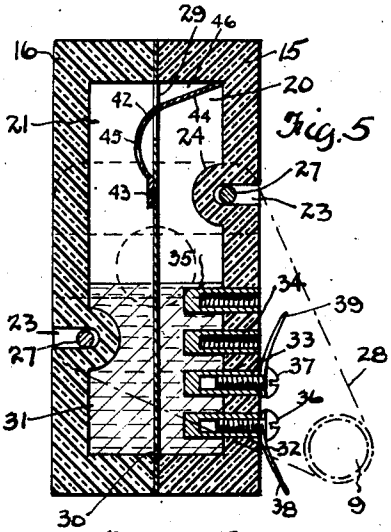


Fig. 5

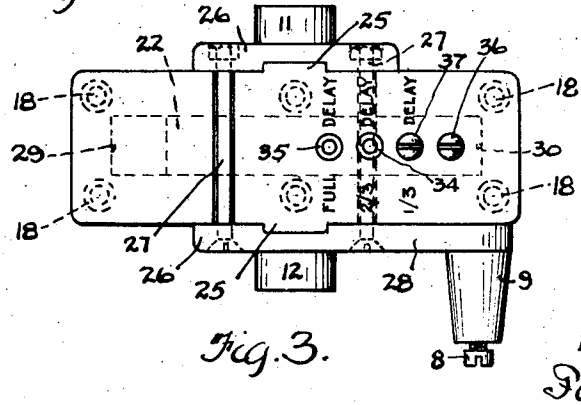


Fig. 3.

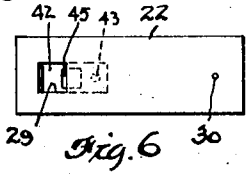


Fig. 6

INVENTOR.

Everett Chapman

BY

Foy, Oberlin & Foy

ATTORNEYS.

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UNITED STATES PATENT OFFICE

EVERETT CHAPMAN, OF CLEVELAND, OHIO, ASSIGNOR TO THE LINCOLN ELECTRIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

STARTING SWITCH

Application filed October 30, 1929. Serial No. 403,505.

This invention, as indicated, relates to starting switches and the like and has specific reference to time delay switches in which electrical contact is made or broken after the lapse of a predetermined time after the switch has been actuated. One of the objects of my invention is to provide a type of construction of the switch which shall have the desirable features of simplicity of construction, ease of assembly and relative low cost. Another object of my invention is to provide a novel means for actuating the switch, which shall have advantages hereinafter to be pointed out. Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawing and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is a fragmentary elevation of the device employing the principles of my invention; Fig. 2 is a fragmentary plan view of the device shown in Fig. 1; Fig. 3 is an elevation of the body of the switch shown in Figs. 1 and 2; Figs. 4 and 5 are sectional and part diagrammatic views of the switch body shown in Fig. 3; and Fig. 6 is an elevation of the partition member.

Referring more specifically to the drawing and more especially to Figs. 1 and 2, the arrangement of the various parts here shown consists of walls 1 and 2 which form part of the closure member for the switch mechanism, which may be of any suitable material for the proper protection of the various working parts, as well as supporting elements for the switch and its associated actuating shaft.

The shaft 3 by which the switch is actuated and which is connected to suitable actuating means, either manual, electrical, or otherwise (not shown), has its terminal portion 4 of substantial rectangular cross section, to which is rigidly secured the arm 5. The arm 5 has suitable means 6, here shown in the form of a screw, to which is connected one terminus of a resilient means 7 here shown in the form of a spring. The other terminus of the resilient means 7 is suitably connected at 8 to the arm 9 of the switch body 10. The switch body 10 is supported by means of gudgeons 11 and 12 which are journaled in supports 13 and 14, respectively.

The main switch body 10, as more clearly shown in Figs. 3, 4 and 5, will now be described. The switch body 10 is made up of two members 15 and 16, which, before the assembling operation occurs, are identical with respect to size and shape. The member 16, forming one-half of the main switch body 10, has apertures 17 formed therein which are adapted to receive the screws 18, which project into and engage the member 15 at 19, thereby rigidly securing together the members 15 and 16. After the screws 18 have been inserted and the members 15 and 16 properly united thereby, the apertures 17 may be filled by a suitable material, such as sealing wax, which effects a substantial seal for these screws.

The members 15 and 16 have their adjacent surfaces recessed to form the compartments 20 and 21, which are substantially separated from each other by means of the partition member 22 secured between the contiguous edges of the elements 15 and 16. The members 15 and 16 have transverse grooves 23 formed therein, which grooves may be suitably reinforced by the surrounding material at 24 which extends into the compartments 20 and 21 and in no way interferes with the operation of this device. The members 15 and 16 also have formed transversely thereof ridges 25 which lie on the sides not containing the grooves 23. These ridges 25 serve as lateral supports for the base 26 of the gudgeons 11 and 12, which are removably secured to the body 10 of the switch by means of the bolts 27 extending longitudinally through the grooves 23 formed in the sides of the members 15 and 16. The base 26 of the gudgeon 12 is provided with an extension 28, which has integrally united therewith the arm 9 by which the switch is actuated.

As hereinbefore stated, the interior of the switch body 10 is in the form of a closed compartment formed by the adjacent compartments 20 and 21 of the elements 15 and 16. These compartments 20 and 21 are substantially separated from each other by means of the partition member 22 which has a relatively large aperture 29 formed therein adjacent the left end of the inner compartment as shown in Fig. 4. The opposite end of the inner compartment is a relatively small aperture 30 formed in the partition member 22 for the purposes hereinafter to be fully explained. The compartments 20 and 21, which together form the large closed compartment on the interior of the switch body 10, have contained therein a predetermined quantity of a suitable conducting liquid 31, such as mercury.

One of the members 15 or 16, for the purposes of illustration here shown to be member 15, has projecting through the walls thereof conducting means 32, 33, 34 and 35. The number of these conducting means may vary from the four here shown, depending upon the particular construction of the switch desired. These conducting means 32, 33, 34 and 35 are adapted to removably secure screws 36 and 37, which removably secure the leads 38 and 39, respectively.

The operation of this device will now briefly be described. The type of construction selected for purposes of illustration is the type in which the electrical circuit is closed after the lapse of a predetermined time after the switch has been actuated. The position of the switch in which the circuit is broken is shown in full lines in Fig. 1 and the position of the switch in which the circuit is closed is shown in dotted outline in this figure. With the switch in the position shown in full lines in Fig. 1 and as illustrated in Fig. 4, the mercury contained in the closed chamber is entirely contained in the lower chamber 21. When the switch body is in this position no means of communication is afforded between the conducting means 32 and 33 and, therefore, no current can pass through the circuit. When the switch is sought to be closed the shaft 3 is rotated in a clockwise direction which rotates the arm 5 likewise carrying the terminal portion 6 of the arm 5 through the plane determined by the axis of rotation of the gudgeons on the switch body 10 and the point 8 at which the resilient means 7 is connected to the switch body 10. As the point 6 passes through this plane, the resilient means 7 will cause the switch body to rotate in a clockwise direction until it strikes the stop 40, which maintains the switch body in a substantially vertical position, as shown in Fig. 5. At the instant this vertical position is reached all the mercury will be on the left side of the partition member 22, that is, in compartment 21, and will then pass slowly through the small aperture 30 until the level of the mercury in chambers 20 and 21 is the same. The size of the aperture 30 will determine the time interval required for the mercury to successively contact with the conducting means 32, 33, 34 and 35.

When the switch body 10 is quickly rotated about the axis of the gudgeons 11 and 12 from the position illustrated in Fig. 4 to that illustrated in Fig. 5, the mercury in the left hand portion of the compartment 21 will tend to remain stationary, due to centrifugal force, until the switch body reaches the position illustrated in Fig. 5, that is, when such rotation is abruptly halted by the switch body 10 striking the stop 40. As the switch body 10 strikes the stop 40, the mercury which has been retained in the upper portion of the compartment 21, as illustrated in Fig. 5, will have a tendency to be projected toward the right or against the partition member 22. Some means must, therefore, be provided for preventing such mercury from passing through the aperture 29 in the partition member 22 and passing downwardly into the compartment 20 and thereby interfere with the time interval required for sufficient mercury to pass through the small aperture 30 to cause electrical contact between the conducting means projecting into the chamber 20. To prevent such mercury from passing through the aperture 29 I provide an auxiliary partition 42, which is rigidly united by welding or otherwise to the partition 22 at 43 and has a terminal portion 44 projecting through such aperture 29 and extending into the corner compartment 20. The partition 42 has an aperture 45 formed therein in that portion of the partition which is substantially parallel to the partition member 22 and which is disposed below the lower edge of the aperture 29.

With this partition member 42 in the position illustrated in Figs. 4 and 5 any mercury remaining in the upper portion of chamber 21, as illustrated in Fig. 5, when the switch body 10 strikes the top 40, will be either projected through the aperture 29 into the auxiliary chamber 46, from which it will be returned to the chamber 20 by the partition 42, or any of such mercury which may pass through the aperture 45 will strike the partition member 22 below the lower edge of the aperture 29 and, therefore, will be restrained from passing over into the compartment 20.

The aperture 45, of course, lying in that portion of the partition 42 which is substantially parallel to the partition member 22, will not permit any of the mercury to pass therethrough as it flows downwardly over the partition 42 from the auxiliary compartment 46 into the compartment 21. Such aperture 45, however, will permit the return of the

mercury from chamber 20 to chamber 21 as the switch body is brought back into the position illustrated in Fig. 4 after having been first positioned as illustrated in Fig. 5, in which substantially one-half of the mercury has passed chamber 20 through the small aperture 30.

A proper selectivity of the elapsed time interval by the tilting of the switch and the completion of the electrical circuit is afforded by connecting the lead 39 to either of the conducting means 33, 34 or 35, which conducting means being uniformly spaced offer time delay intervals in the proper proportional parts to the full delay which is secured by attaching the lead 39 to the conducting means 35. It will be understood that the conducting means 32, 33, 34 and 35 may have similar conducting means projecting into th compartment 20, which further conducting means, when arranged in staggered relation to the ones already present, will afford a further selectivity of the desired time interval.

When it is desired to break the electrical circuit, the shaft 3, with its associated end 4, is rotated in a counter clockwise direction from the position it occupies when the body 10 of the switch is in the vertical position, and then as soon as the point 6 again passes through the plane determined by the axis of the gudgeons 11 and 12 and the point 8, the switch will once more be brought to a substantially horizontal position and held in this position by the stop 41. It may be desirable to have this last-named position of the body 10 of the switch such that the partition member 22 is inclined slightly toward the aperture 29, thereby insuring that all of the mercury passes through such aperture and into the lower chamber 21.

It will be understood that by arranging the conducting means projecting through the wall of the switch body on the opposite side of the partition member 22 the switch can be used to afford a suitable time delay interval before the circuit is broken, instead of the arrangement here used for purposes of illustration, which shows the time delay interval occurring before the circuit is closed.

The conducting means 32, 33, 34 and 35 project for a substantial distance into the chamber 20, which arrangement insures making or breaking of the circuit with the meniscus of the mercury rising or falling in the compartment containing these conducting means. By making and breaking the contact with the meniscus of the mercury instead of the portion of the mercury adjacent the walls of the compartment prevents excessive arcing and consequently prevents damage to the walls of the compartment if such arcing were permitted to occur.

The resilient means 7 which connects the actuating lever arm 5 to the arm 9 of the body 10 of the switch, absorbs all of the sharp movements of the actuating arm 5 to which it is necessarily subject, due to the positive action of the actuating means, whether it be manual, electrical, or otherwise. This resilient means 7 therefore prolongs the life of the mechanism and yet affords positive action and effects the desired result instantaneously.

A further advantage of the type of construction which I employ in forming the switch body 10 is that the elements 15 and 16, which are the main members from which the switch body is formed, are identical and interchangeable, thereby effecting considerable saving in production costs as well as facilitating the assembling operation. With the type of construction which I employ it is not necessary to have a left and a right member which would cause confusion in assembling, but any two of the preformed members 15 or 16 may be combined to effect the required structure. The arrangement of the gudgeons on their respective bases and the means by which such bases are rigidly secured to the body of the switch likewise presents points of novel simplicity which have heretofore never been achieved.

A further description of my invention is deemed unnecessary for those acquainted with the art. Suffice it to say that changes may be made in the contour and construction of the various elements comprising my invention without departing from the salient features thereof.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

In a device of the character described, the combination of a pair of similarly shaped members in juxtaposition, said members forming an enclosed chamber; a conducting liquid in said chamber; a partition member disposed between said similarly shaped members and dividing said chamber; a relatively large aperture in said partition near one end of said chamber for readily transferring said conducting liquid from one portion of said chamber to the other; a relatively small aperture in said partition near the other end of said chamber to permit a restricted flow therethrough of said conducting liquid; and means for preventing return flow of said liquid through said large aperture as said device is rotated.

Signed by me this 28th day of October, 1929.

EVERETT CHAPMAN.