

[54] **PAWL AND RATCHET SWITCH WITH FLEXIBLE U-SHAPED PAWL MEMBER**

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[51] Int. Cl. **H01h 13/58, H01h 3/34**

[58] Field of Search. **200/156; 74/578, 74/577 SF**

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

An electric switch embodying a housing having a rotatable ratchet wheel element therein, with an elongated actuator slidably mounted in the housing and projecting outwardly therefrom for rotating the element. The actuator element has a rectangular section that is guided by three walls of the casing, and a U-shaped flexible pawl member above the body portion of the actuator, with each leg of the U-parallel to a guide rod extending from the actuator member. The flexible pawl rotates the ratchet wheel to make and break the circuit.

2 Claims, 4 Drawing Figures

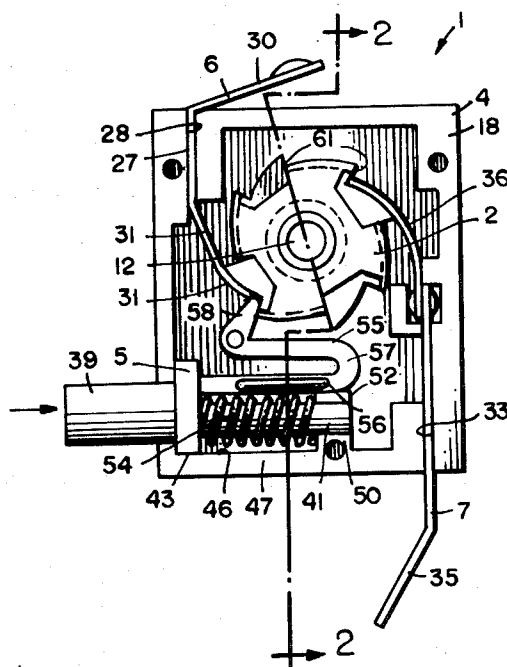


FIG. 1

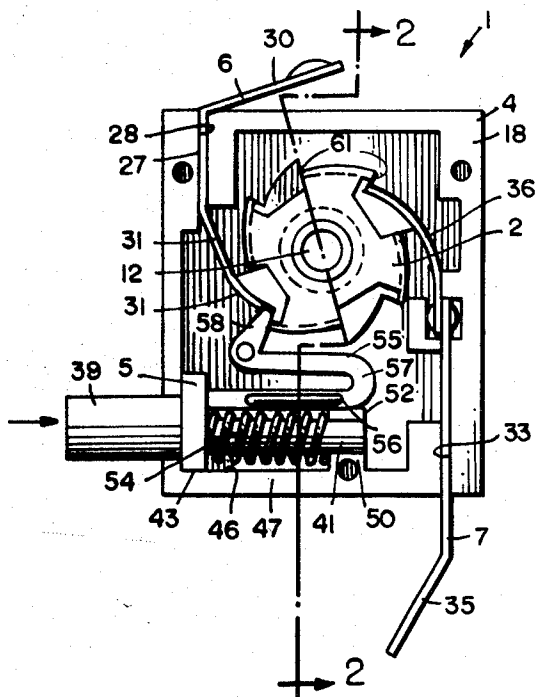


FIG. 2

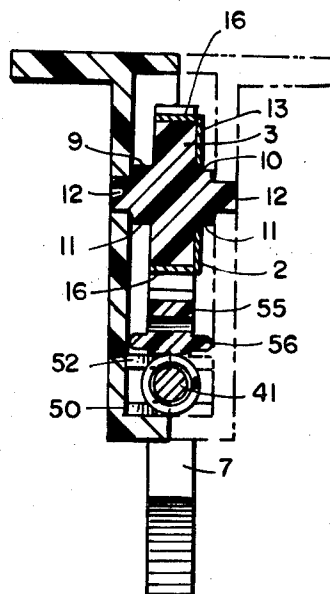


FIG. 3

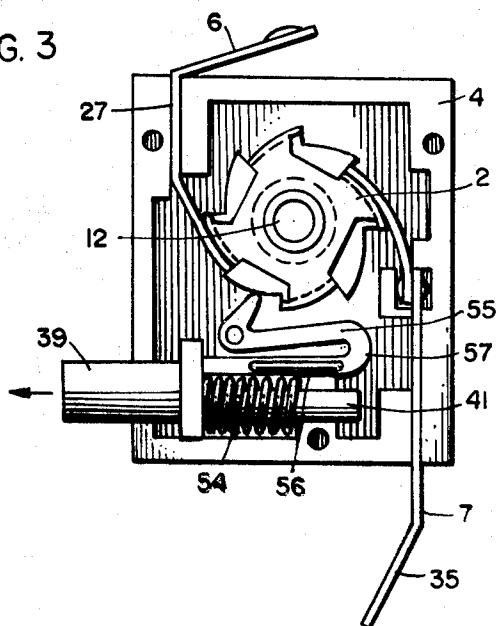
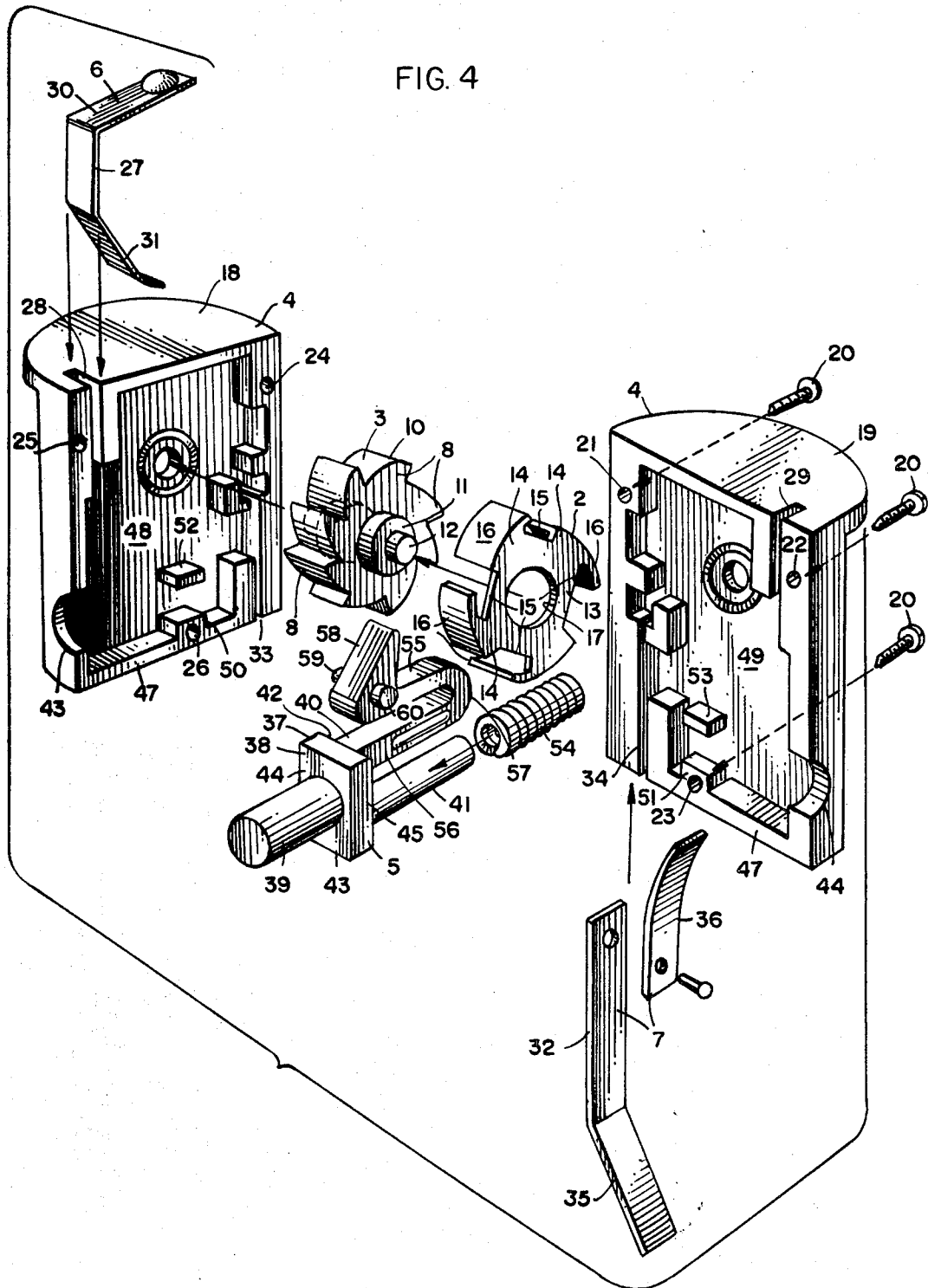


FIG. 4



PAWL AND RATCHET SWITCH WITH FLEXIBLE U-SHAPED PAWL MEMBER

BACKGROUND OF THE INVENTION

The present invention relates to electric switches and, more particularly, to electric switches embodying an element which is rotatable for opening and closing the switch.

It is a primary object of the present invention to afford a novel electric switch.

Another object of the present invention is to afford a novel electric switch embodying a novel actuating mechanism constituted and arranged in a novel and expeditious manner.

A further object of the present invention is to afford a novel electric switch of the type embodying a rotatable element therein for opening and closing the switch.

Electric switches embodying rotatable elements therein have been heretofore known in the art, such as, for example switches of the type disclosed in the following U.S. letters Pat., namely, No. 1,280,547, issued Oct. 1, 1918, to A. E. Read; No. 1,544,832, issued July 7, 1925, to W. B. Goddard; No. 2,451,150, issued Oct. 12, 1948, to H. C. Macnamara; No. 2,933,578, issued Apr. 16, 1960, to H. Hubbell, et al; and No. 3,084,239, issued Apr. 2, 1963, to J. C. Horvath, et al. However electric switches of such a type, which have been heretofore known in the art, commonly have had several inherent disadvantages such as, for example, embodying actuating mechanisms which did not afford effective protection against an operator receiving an electric shock; being complicated in construction; being difficult or expensive to manufacture; being readily broken during operation thereof; or being unreliable in operation, and the like. It is an important object of the present invention to overcome such disadvantages.

Another object of the present invention is to afford a novel electric switch which is practical and efficient in operation and which may be readily and economically produced commercially.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompany drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what we now consider to be the best mode in which we have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a side elevational view of a switch embodying the principles of the present invention, with a portion of the housing removed;

FIG. 2 is a longitudinal sectional view taken substantially along the line 2—2 in FIG. 1, with the portion of the housing, which is removed from FIG. 1, being shown in broken lines;

FIG. 3 is a view similar to FIG. 1, but showing the parts of the switch in different operative position; and

FIG. 4 is an exploded, perspective view of the switch shown in FIG. 1.

DESCRIPTION OF THE EMBODIMENT

Shown Herein

An electric switch 1, embodying the principles of the present invention, is shown in the drawings to illustrate the presently preferred embodiment of the present invention.

The switch 1 embodies, in general, a rotatable electric contact member 2 mounted on and carried by a ratchet wheel 3 which is rotatably mounted in a housing 4, the ratchet wheel 3 and the housing 4 preferably being made of a suitable dielectric material, such as, for example, polyethylene. An actuator 5 is mounted in the housing 4 for rotating the contact member 2 into and out of engagement with two electrical contact members 6 and 7. The switch 1, with the exception of the actuator 5, and the manner in which it is mounted in the housing 4, is of a construction which is well known in the art.

The ratchet wheel 3 embodies a plurality of teeth 8, equally spaced around and projecting outwardly from the periphery thereof. Two hubs 9 and 10 project outwardly from opposite side faces of the ratchet wheel 3 in longitudinal alignment with each other, and each embodies an enlarged inner end portion 11 and a reduced outer or free end portion 12, FIG. 2.

The rotatable contact member 2 is in the form of a wheel or spider, and may be made of any suitable electrically conductive material, such as, for example, copper. It embodies a side wall 13, FIG. 4, having a plurality of ribs 14 projecting radially outwardly from the periphery thereof. The ribs 14 preferably are equally spaced around the periphery of the contact member 2, and are separated from each other by notches 15. Each of the ribs 14 terminates at its outer end portion in a leg 16 which extends perpendicularly to the side wall 13 of the contact member 2.

The contact member 2 has an opening 17 therethrough, FIG. 4, which is complementary in size and shape to the enlarged portions 11 of the hubs 9 and 10 on the ratchet wheel 3, and in the assembled switch 4, the enlarged portion 11 of the hub 10 is disposed in the opening 17, with the side wall 13 of the contact member 2 disposed in juxtaposition to the adjacent side face of the ratchet wheel 3, FIG. 2. The legs 16 of the ribs 14 are the same size and shape as the outer peripheral surfaces of the teeth 8 on the ratchet wheel 3, and are spaced from each other around the periphery of the contact member 2 a distance equal to twice the spacing of the teeth 8. The ribs 14 are so disposed on the side wall 13 that, when the contact member 2 is disposed in operative position on the ratchet wheel 3, the legs 16 are disposed in covering relation to the outer peripheral surfaces of alternate ones of the teeth 8 on the ratchet wheel 3, FIGS. 1 and 3.

The housing 4 embodies two separate halves 18 and 19, FIG. 4, which are identical in construction except that they are mirror images of each other, and in the assembled switch 1, the two portions 18 and 19 of the housing 4 may be secured together by suitable means such as bolts 20 extending through openings 21, 22 and 23 in the housing portion 19 and threaded into openings 24, 25 and 26, respectively, in the housing portion 18.

The contact member 6 may be made of any suitable material such as, for example, copper, and preferably is of the leaf-spring type of construction. The contact

6 has an intermediate portion 27, and in the assembled switch 1, the intermediate portion 27 is disposed in a slot afforded by two aligned slots 28 and 29 in the housing portions 18 and 19, respectively, with one end portion 30 of the contact 6 projecting outwardly from the housing 4, and the other end portion 31 thereof being disposed in position to engage the outer periphery of the assembly afforded by the ratchet wheel 3 and the contact member 2, as shown in FIGS. 1 and 3.

The other contact element 7, like the contact element 6, may be made of any suitable material such as, for example, copper, and preferably is of a leaf-spring type of construction. It embodies an intermediate portion 32, which, in the assembled switch 1, is disposed in a slot afforded by aligned slots 33 and 34 in the housing portions 18 and 19, respectively, with one end portion 35 projecting outwardly from the housing 4, and the other end portion 36 disposed in overlying engagement with the outer periphery of the assembly afforded by the ratchet wheel 3 and the contact member 2, as shown in FIGS. 1 and 3.

The novel actuator 5, in the preferred form of the present invention, is made of a suitable resilient flexible dielectric material such as, for example, polyethylene, and includes a substantially rectangular shaped body portion 37 from one face 38 of which an elongated, substantially cylindrical-shaped front end portion 39 projects, FIG. 4. Two elongated, laterally spaced end portions 40 and 41 project rearwardly from the face 42 of the body portion 37, disposed opposite to the face 38, for purposes which will be discussed in greater detail hereinafter.

The front end portion 39 of the actuator 5 affords a push button which, in the assembled switch 1, is disposed in an opening afforded by two complementary recesses 43 and 44 in the housing portions 18 and 19, respectively, FIG. 4, the push button 39 preferably being disposed in the opening 43-44 with a relatively snug, but freely slidable fit, and projecting outwardly in a forward direction from the housing 4, FIGS. 1 and 3.

The body portion 37 of the actuator 5 includes a substantially flat bottom wall 43 and two substantially flat side walls 44 and 45 disposed in parallel spaced relation to each other, and projecting upwardly from the bottom wall 43 in substantially perpendicular relation thereto, FIG. 4. In the assembled switch 1, the bottom 43 of the body portion 37 rests on a substantially flat upper face 46 of the bottom wall 47 of the housing 4, FIGS. 1 and 3, and is slidable therealong. The sides 44 and 45 of the body portion 37, in the assembled switch 1, are disposed in engagement with the substantially flat inner faces of the side walls 48 and 49, respectively, of the housing 4.

Two bosses 50 and 51 project upwardly from the portions of the bottom wall 47 in the body portions 18 and 19, respectively, and two other bosses 52 and 53 project inwardly from the side walls 48 and 49 of the housing portions 18 and 19 in upwardly spaced, substantially parallel relation to the bosses 50 and 51, respectively. The rear end portion 41 of the actuator 5 comprises a substantially cylindrical shaped rod, and, in the assembled switch 1, the rod 41 is disposed in the opening defined by the lower bosses 50 and 51 and the upper bosses 52 and 53 with a relatively snug, but freely slidable fit. A compression coil spring 54 is disposed around the rod 41, and is abuttingly engaged at one end with the rear face 42 of the body portion 37,

and at the other end with the bosses 50-53, FIGS. 1 and 3, to thereby yieldingly urge the actuator 5 toward fully forwardly disposed position, as shown in FIG. 1.

The other rear end portion 40 of the actuator 5 comprises a substantially U-shaped member having an upper leg 55 and a lower leg 56 connected at their rear end portions by a bight portion 57. A pawl 58 projects upwardly and rearwardly from the front, free end portion of the leg 55 for a purpose which will be discussed in greater detail presently.

The leg 55 terminates at its front end portion in rearwardly spaced relation to the body portion of the actuator 5, and two ears 59 and 60 project laterally outwardly in opposite directions from the junction of the pawl 58 with the leg 55 in position to engage the inner faces of the side walls 48 and 49 of the housing 4 in the assembled switch 1.

With this construction, it will be seen that the engagement of the push button 39 of the front wall of the housing 4, and the engagement of the rod 41 between the lower bosses 50 and 51 and the upper bosses 52 and 53 affords supporting engagement of longitudinally spaced portions of the actuator 5 with the housing 4 for preventing upward and downward movement of the actuator 5; and the engagement of the body portion 37 and the ears 59 and 60 with the side walls 48 and 49 of the housing 4 affords a similarly longitudinally spaced support for the actuator 5 against lateral movement in the housing 4, so that reciprocation of the actuator 5 forwardly and rearwardly in the housing 4, between the full forward position thereof, as shown in FIG. 1, and a rearwardly disposed position, such as shown in FIG. 3, is a substantially straight-line movement, longitudinally of the actuator 5.

In the assembled switch 1, the assembly afforded by the ratchet wheel 3 and the rotatable contact member 2 is adapted to be rotated in a counterclockwise direction, as viewed in FIGS. 1 and 3. The end portions 31 and 36 of the contacts 6 and 7, respectively, are disposed in frictional engagement with the outer periphery of this assembly, in position to yieldingly restrain such counterclockwise rotation thereof, and to engage the trailing faces 61 of the teeth 8 on the ratchet wheel 3 to thereby limit rearward or clockwise rotation of the ratchet wheel 3 and the rotatable contact member 2.

The rear end portion 40 of the actuator 5 is resilient and flexible, and in the assembled switch 1 the pawl 58 is yieldingly held in abutting engagement with the outer peripheral surface of the assembled members 2 and 3 in such position that during each full reciprocation of the actuator 5, it is effective, through its engagement with the trailing ends 61 of the teeth 8 to rotate the ratchet wheel 3, and, therefore, the rotatable contact member 2 a distance sufficient to cause the contact members 6 and 7 to ride onto the next adjacent tooth 8 on the ratchet wheel 3. It will be remembered that alternate teeth 8 on the ratchet wheel 3 are covered by respective legs 16 of the rotatable contact member 2, so that such rotation of the ratchet wheel 3 is effective to alternately cause the contacts 6 and 7 to be engaged with and disengaged from the legs 16 of the rotatable contact member 2, and thereby alternately make and break electrical connection between the contacts 6 and 7 through the rotatable contact member 2 and, thus, alternately close and open the switch 1, respectively.

It will be remembered that the actuator 5 is made of a suitable dielectric material such as, for example, poly-

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ethylene, and the like, so that the push button 39 is effectively electrically insulated from the internally disposed electrical conductors afforded by the contacts 6 and 7 and the rotatable contact member 2. With this construction, an operator actuating the push button 39 is effectively protected against electric shock during operation of the switch 1.

Also, it will be seen that the present invention affords a novel switch embodying a novel actuator therefor, and wherein the actuator is constituted and arranged in a novel and expeditious manner in the switch.

Also, it will be seen that the present invention affords a novel electric switch, which is practical and efficient in construction and operation, and which may be readily and economically produced commercially.

Thus, while we have illustrated and described the preferred embodiment of our invention, it is to be understood that this is capable of variation and modification and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. An electric switch comprising a dielectric housing having parallel wide walls, end walls, a top wall and a bottom wall, a ratchet wheel rotatably mounted on said side walls in said housing, said ratchet wheel having on its periphery a plurality of teeth, a conductive switch contact mounted on said wheel and having conductively connected switch contact members positioned on alternating teeth about the periphery of said wheel, two switch contact blades mounted in said housing and having springable ends riding on the periphery of said teeth and the switch contact members thereon, and a dielectric, reciprocable push button actuator located beneath

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said ratchet wheel and embodying (a) a rectangular body portion slidable in said housing and having its opposite sides in sliding contact with said side walls, (b) a push button extending from one side of said body portion through an aperture in one of said end walls, (c) a rod extending from the opposite side of said body portion and a helical spring about said rod, said spring urging said body portion against said one of said end walls, and (d) a resilient, U-shaped pawl-bearing member above said rod and having its upper and lower legs parallel with said rod and a bight portion remote from said body portion, the end of the lower leg extending from said body portion and the upper leg having a free end remote from said bight portion, said free end having an upwardly projecting pawl thereon positioned to contact the teeth of the ratchet wheel and rotate said wheel when said push button actuator is pushed in a direction against the compressive force of said spring.

2. An electrical switch as claimed in claim 1, upper and lower bosses in said housing forming a rectangular passage and slidably supporting said rod only on its upper and lower sides, the free end of said upper leg having a pair of ears projecting laterally from opposite sides thereof in sliding contact with the side walls of said housing, said ears and said opposite sides of said rectangular body portion in respective sliding contact with the side walls of said housing providing the support for the push button actuator against lateral movement in the housing during reciprocation of the actuator and said bosses and said aperture in the end wall of said housing preventing the upward and downward movement of said actuator during reciprocal movement thereof.

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