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SWITCH MECHANISM

Filed Sept. 8, 1954

3 Sheets-Sheet 1

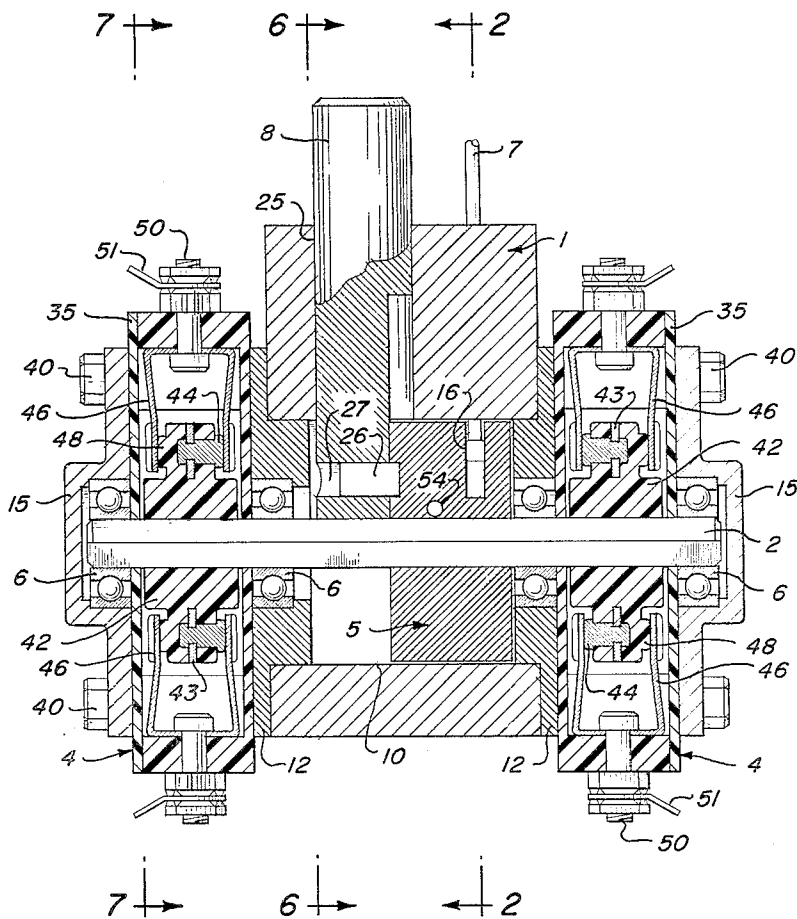


Fig. 1

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3 Sheets-Sheet 2

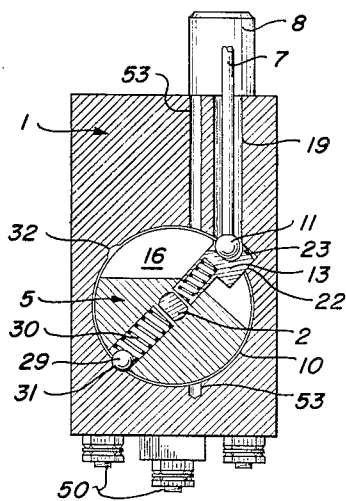


Fig. 2

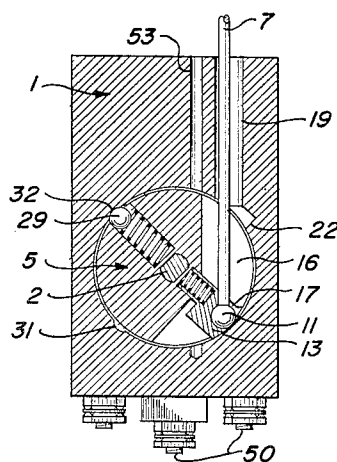


Fig. 3

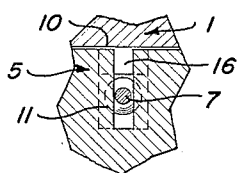


Fig. 4

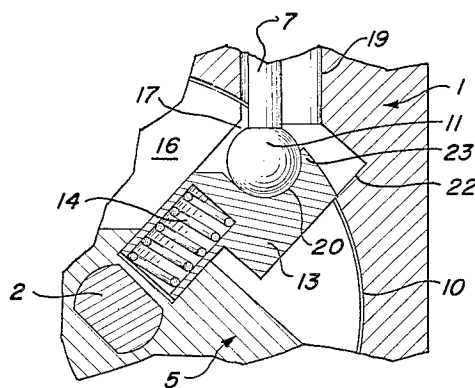


Fig. 5

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3 Sheets-Sheet 3

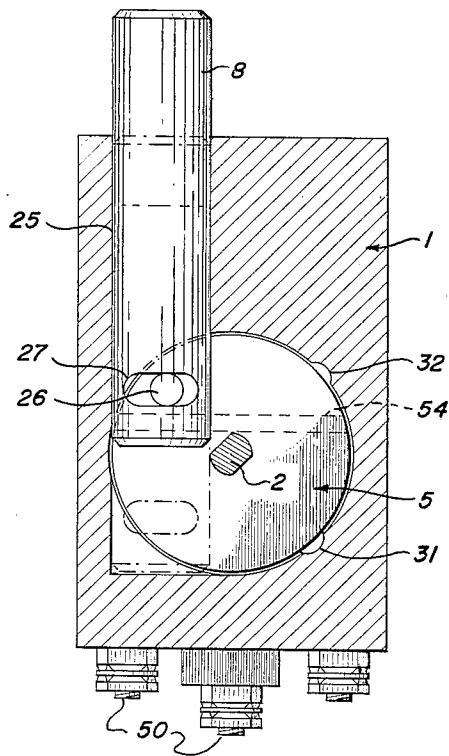


Fig. 6

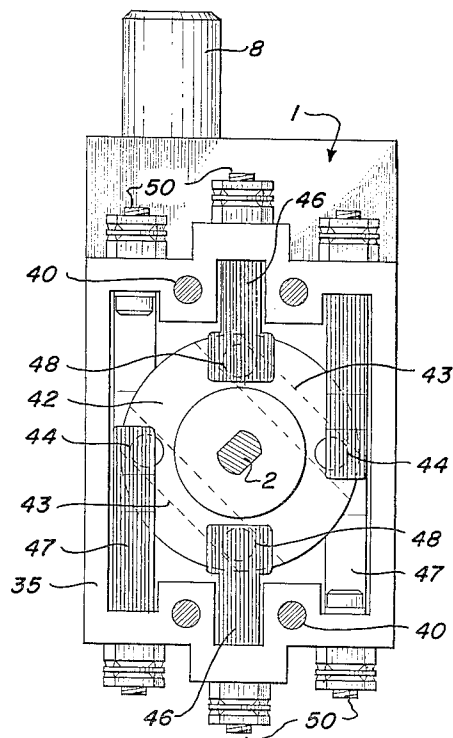


Fig. 7

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SWITCH MECHANISM

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12 Claims. (Cl. 200—17)

The present invention relates generally to switch mechanisms and more particularly to an improved switch mechanism that may be positively actuated by a pull pin or wire.

For some uses it is highly desirable to employ a switch mechanism that does not depend upon springs, levers, or the like to control establishment or interruption of an electric circuit, as it has been found that such elements give rise to serious drawbacks or difficulties. Some of these drawbacks are absence of positive actuation with switch mechanisms that embody springs or other yieldable elements as part of their main operating trains, lack of simplicity, and not sufficiently foolproof.

The present invention aims to overcome the above and other difficulties or disadvantages by providing a new and improved switch mechanism which is of positive construction and operation as well as relatively simple in construction and substantially foolproof in operation.

An object of the present invention is to provide a new and improved switch mechanism.

Another object of the invention is to provide an improved switch mechanism that is positive in both construction and operation.

Another object of the invention is to provide an improved switch mechanism of relatively simple construction which may be readily manufactured at relatively low cost.

Another object of the invention is to provide an improved switch mechanism which embodies a minimum of parts.

A further object of the invention is to provide an improved switch mechanism that includes means for readily indicating whether a circuit controlled by the device is in "closed" or "open" condition.

A still further object of the invention is to provide an improved switch mechanism that includes means for facilitating resetting the device to an initial condition after it has been actuated.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention and various modifications thereof have been chosen for purposes of illustration and description. The preferred embodiment and the modifications are not intended to be exhaustive nor to limit the invention to the precise forms disclosed. They are chosen and described in order to best explain the principles of the invention and their application in practical use to thereby enable others skilled in the art to best utilize the invention in various embodiments and modifications as are best adapted to the particular use contemplated.

In the accompanying drawings,

Fig. 1 is a longitudinal sectional view showing a preferred embodiment of the present invention;

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Fig. 2 is a sectional view taken generally along line 2—2 of Fig. 1 showing features of an operating rotor;

Fig. 3 is a sectional view similar to that of Fig. 2, but showing the elements in a different relationship;

Fig. 4 is a fragmentary view showing the manner in which a switch control member engages the operating rotor when the elements are disposed as in Fig. 3;

Fig. 5 is a fragmentary view illustrating the manner in which positive confinement of a switch control member is obtained with the present device;

Fig. 6 is a sectional view taken generally along line 6—6 of Fig. 1 illustrating an indicator and switch setting rod that is connected with the operating rotor; and

Fig. 7 is a view taken generally along line 7—7 of Fig. 1 illustrating features of a circuit controlling portion of the device.

Described generally the device of the present invention comprises a housing 1 containing a rotatable shaft 2 which turns one or more electric circuit controlling means 4, an operating rotor 5 secured to the shaft 2 for rotating it in one direction in response to movement of a control member 7 to correspondingly rotate the circuit controlling means 4, and a rod 8 connected with the rotor 5 for facilitating rotor and shaft rotation in an opposite direction and for indicating the position of the circuit controlling means 4. The components are shown in Fig. 1 in the relationship which exists when the control member 7 has been actuated to turn the operating rotor 5 and put the mechanism in a condition that, for purposes of convenience, will be referred to as an unlocked or circuit-closed condition. The construction and operation of the device will now be described in greater detail.

As shown, the operating rotor or member 5 is contained within a bore 10 of suitably shaped housing 1 and is fixedly secured to the shaft 2 which is supported by roller bearings 6 carried by plate members 12 and 15. Rotor rotation correspondingly turns the shaft. The rotor 5 may normally occupy a circuit-open or locked position depicted in Fig. 3, with an enlargement or ball 11 at the end of the elongated control member 7 held captive by cooperating portions of the housing 1, rotor 5 and reciprocable plunger or piston 13 that is urged toward an outer periphery of rotor 5 by a spring 14. A shank portion of the elongated control member 7 extends through a generally segmentally disposed recess or slot 16 of the rotor 5, which recess communicates with a socket 17 that houses the plunger 13 and with the control member aperture 19 in the housing, and through the aperture 19 to some convenient location from which it is desired to actuate the switch mechanism. When pull is exerted on the control member 7, or the switch housing is moved in a direction away from an anchored control member 7, applied force turns the rotor from the relationship shown in Fig. 3 to that shown in Fig. 2 (counterclockwise turning as illustrated in these two figures). The enlargement or ball 11 on control member 7 projects beyond adjacent edges of the rotor recess or slot 16 (Fig. 4) and hence cannot escape therethrough but must turn the rotor.

Rotation of the operating rotor 5 as above described correspondingly turns the shaft 2 and the circuit controlling means 4 shown secured to the shaft, so that the circuit controlling means may establish or disestablish an appropriate electric circuit or circuits.

The control member 7 is shown disposed in the housing recess 19 in Fig. 2 to facilitate description of switch construction and operation, but actuation of the device by pull exerted on the control member 7 will usually result in complete withdrawal of the control member 7 from the housing recess 19.

When it is desired to change the device from the relationship depicted in Figs. 1 and 2 to that depicted in Fig. 3, control member 7 may be inserted into housing

aperture 19 to seat its enlarged end 11 within a generally complementary opening 20 of the plunger 13 and then pushed downwardly or inwardly in opposition to supporting spring 14 until the outmost edge of plunger 13 clears an adjacent shoulder 22 of the housing 1. When the plunger has reached such an inward position the distance between the end of a retaining toe 23 thereon and an oppositely disposed wall portion of the housing aperture 19 is less than the dimension across the enlargement or ball 11 and the control member 7 cannot be removed but is held captive as the rotor 5 turns clockwise from the relationship indicated in Fig. 2 to that indicated in Fig. 3. This feature is highly desirable as when the rotor 5 and plunger 13 are freed from interlocking relationship with the housing 1 the elongated control member 7 should not be separable from the rotor; the plunger toe 23 insures against such withdrawal.

As the rotor 5 turns from the relationship shown in Fig. 2 to that shown in Fig. 3, control member 7 moves downwardly with the rotor and the rotor walls that form the peripherally disposed recess or slot 16 encompass the shank of the control member 7. Rotor rotation toward the position shown in Fig. 3 is facilitated by pressing inwardly against the end of an indicator rod 8 which is connected with the rotor 5 and reciprocable through a rod guiding aperture 25 in the housing 1.

The indicator rod 8, which may be of any desired length, is connected adjacent its inner end to the rotor 5 by a pin and slot construction. As shown in Figs. 1 and 6, a pin or projection 26 extends from the rotor 5 into a transverse slot 27 adjacent the lower end of the indicator rod 8. When the rotor controlling member 7 is removed or in an outward position (Fig. 2) a portion of the indicator rod 8 projects beyond the housing 1 and when the rotor controlling member 7 is disposed in an inward position (Fig. 3), the indicator rod may be contained substantially entirely within the housing, as indicated by the dot-dash lines of Fig. 6. As previously described, turning of the rotor 5 in one direction may be facilitated by pressing against the end of the indicator rod to thereby apply a turning force against the connecting pin 26 and swing the rotor about its rotational axis. The end portion of the indicator rod may be brilliantly colored so that protrusion from the housing may be readily observed to thereby inform an observer of the condition of an electric circuit controlled by the circuit controlling means 5.

Retention of the rotor 5 and the shaft 2 in their terminal positions may be assisted by a locking ball 29 housed within the rotor 5 and normally urged outwardly by a spring 30, the ball projecting into one or the other of a pair of appropriately spaced depressions 31, 32 in the housing 1.

The circuit controlling means which is actuated by the shaft 2 may comprise (Figs. 1 and 7) a nonconducting switch frame or frames 35 held between the frame plate 12 and end bearing plate 15 with these parts secured to the housing 1 by bolts 40. Each of the illustrated switch frames contains a switch rotor 42 of non-conducting material having embedded therein conducting bars 43 that join with projecting conducting contacts 44. The conducting contacts 44 move into and out of contact with appropriately spaced spring contacts 46 and 47. The spring contacts 46 are preferably of generally U-shape to minimize endwise movement of the switch rotor 42 and shaft 2 and the switch rotor is also preferably provided with nonconducting projections 48 disposed opposite the conducting contacts 44 to maintain substantially uniform spring tension against the switch rotor 42 at all times; this substantially uniform pressure on the switch rotor is further facilitated by employing pairs of oppositely disposed spring contacts 47. The conducting bars 43 and contacts 44 may be molded into the switch rotor 42 to form a rigid unit.

The various conducting spring contacts 46 and 47 may electrically connect with conducting studs 50 and through

the latter with terminals 51. The latter terminals may electrically connect with appropriate circuitry (not shown); for example, when the switch rotor 42 is placed in one position by shaft 2 and rotor 5, the conducting bars 43 may electrically interconnect the upper and right hand spring contacts of Fig. 7 and also electrically interconnect the lowermost and left hand spring contacts of this same figure to establish desired circuits. When the rotor 5 and shaft 2 are rotated ninety degrees from the positions shown in Fig. 7, the contact bars 43 may disestablish the referred to circuits, or establish additional circuits. The particular circuitry referred to is merely for illustrative purposes and it will be understood that any other may be activated or deactivated in response to different positioning of the switching rotor 42.

In order to prevent accidental or unintentional actuation of the switch mechanism the housing 1 and rotor 5 may be provided with holes 53 and 54, respectively, for receiving a "safing" wire (not shown), so that when the rotor 5 is so disposed as to place the switching rotor or rotors 42 in one position, a "safing" wire or pin in the then aligned holes 53 and 54 prevents operating and switching rotors turning with respect to the housing, and control member 7 cannot be removed prior to withdrawal of the safing wire or pin.

The described switch mechanism may be bolted or otherwise secured to any appropriate foundation or equipment which is to be controlled. For clarity and convenience of description only a single switching "unit" has been described in detail, but it will be understood that any number of units may be combined to control any desired number of circuits.

It will be seen that the present invention provides a new and improved switch mechanism which is of positive construction and which is actuable and functions in positive manner. It is substantially foolproof in both construction and operation, of relatively simple and sturdy construction and well adapted to withstand any rough usage to which it may be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. A device of the character described comprising the combination of a rotatable shaft, means movable with the shaft for controlling an electric circuit, means for rotating the shaft comprising a member secured thereto having a socket with open end disposed adjacent a peripheral portion of said member and a generally segmentally disposed recess communicating with the socket, a plunger in the socket, means for normally urging the plunger toward the open end of the socket, a housing containing said member having an aperture with inner end terminating adjacent said peripheral portion of the member, and an elongated control member extending through the aperture and resting against the plunger to urge it into the rotor in opposition to the effect of the urging means.

2. A device as claimed in claim 1 in which the elongated control member has an enlarged end portion, and the plunger is provided with a toe portion for retaining said enlarged end portion with the rotor when the plunger is disposed substantially entirely within the periphery of the rotor.

3. A device as claimed in claim 2 in which the enlarged end portion of the elongated control member is of greater width than the generally segmentally disposed recess for positively engaging the first mentioned member and facilitating rotation thereof upon movement of the control member in a direction away from said housing.

4. A device as claimed in claim 1 in which the elon-

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gated control member has an enlarged end portion, and the plunger is provided with a recess for receiving said enlarged end portion and with a toe portion for retaining said enlarged end portion with the rotor when the plunger is disposed substantially entirely within the periphery of the rotor.

5. A device as claimed in claim 1 in which said housing and first mentioned member is each provided with a locking pin recess and said locking pin recesses are in alignment with each other when the elongated control member is in said aperture and rests against said plunger.

6. A device of the class described comprising the combination of a rotatable shaft, means movable with the shaft for controlling an electric circuit, means for rotating the shaft comprising a member secured thereto having a socket with open end disposed adjacent a peripheral portion of said member, a plunger in the socket, means for normally urging the plunger toward the open end of the socket, and a housing containing said member having an aperture with inner end terminating adjacent said peripheral portion of the member and adapted to communicate with the socket at one position of said member.

7. A device as claimed in claim 6, in which the plunger is provided with a toe portion adopted to project over a portion of a control member.

8. The invention as claimed in claim 6 in which the socket extends generally radially of said member.

9. A device as claimed in claim 6 in which said member comprises a disc having a generally peripherally disposed recess for receiving a portion of a rod inserted into said aperture to rotate said disc.

10. A device as claimed in claim 6 in which detent means is provided for retaining the member in an adjusted position.

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11. A device of the class described comprising the combination of a rotatable shaft, means movable with the shaft for controlling an electric circuit, means for rotating the shaft comprising a rotor having a socket with open end disposed adjacent a peripheral portion of said rotor, a plunger in the socket, means for normally urging the plunger toward the open end of the socket, a housing containing said rotor having an aperture with inner end terminating adjacent said peripheral portion of the rotor adapted to communicate with said socket at one position of said rotor and having a rod-guiding opening therethrough, a reciprocable rod in said rod-guiding opening having a portion located adjacent the rotor, and means operatively interconnecting the rod and rotor to effect projection of a rod portion beyond the housing at one rotor position and disposition of the rod portion within the housing at another rotor position.

12. A device as claimed in claim 11 in which the means that operatively interconnects the reciprocable rod and rotor comprises a pin secured to and projecting from the rotor at a location spaced from the rotatable shaft and a slot in the rod into which said pin projects.

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