

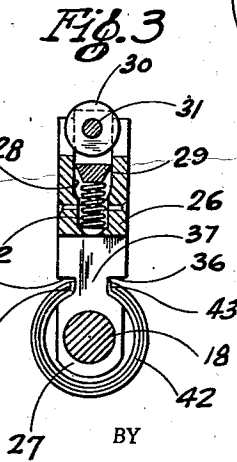
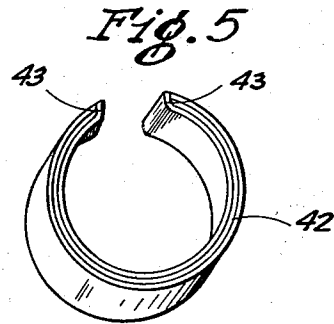
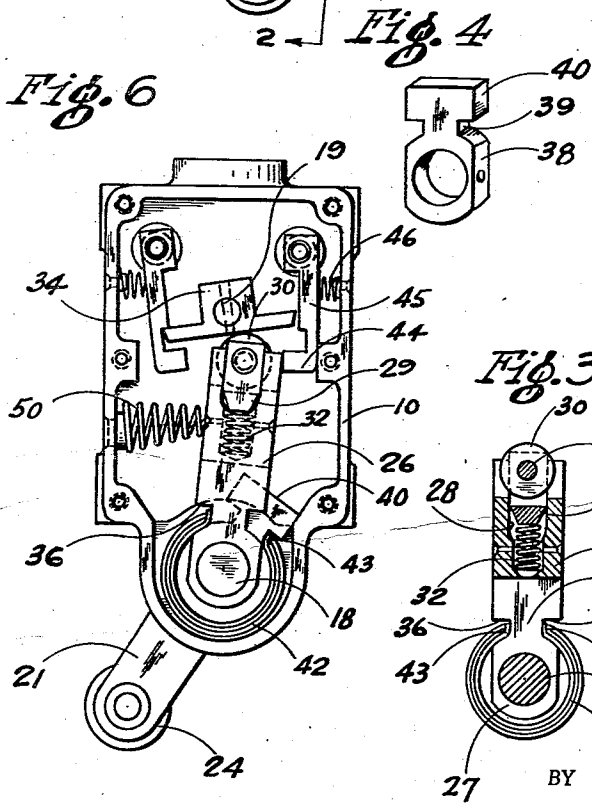
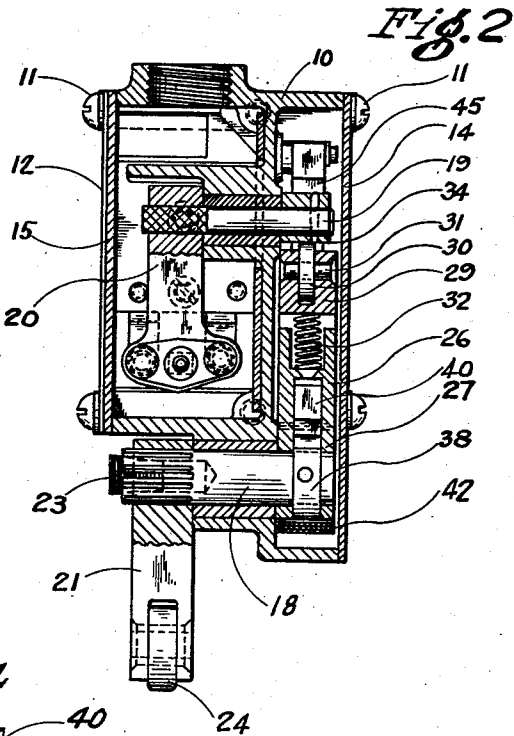
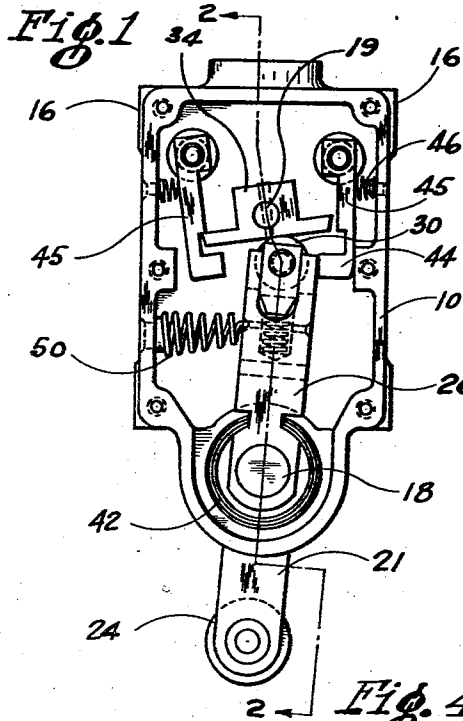
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M. L. JEFFREY

2,270,951

SWITCH

Filed April 25, 1941



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2,270,951

SWITCH

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Application April 25, 1941, Serial No. 390,311

8 Claims. (Cl. 74-97)

This invention relates broadly to switches and more specifically to improvements in snap action switches of the type wherein the contacts are quickly opened or closed.

The present application constitutes a continuation in part of my copending application filed July 26, 1938, Serial No. 221,274.

In the construction of switches for opening and/or closing electric circuits, particularly those disposed in circuits having a relatively heavy current, the actuating mechanism for the switches should be so designed as to facilitate the opening and closing of the contacts to eliminate arcing. Although snap action switches are old in the art there have been many disadvantages present in the prior devices, both in construction and operation, which it is the purpose of the present invention to overcome. For instance, switches that are capable of carrying high currents are relatively slow in their operation and the configuration and size of these switches is such as to materially limit their use.

One of the objects, therefore, of the present invention resides in the construction of a relatively small and compact switch having a suitable operating mechanism associated therewith which is capable of extended action without injury to the switch.

Another object of the invention is to provide a suitable operating mechanism which is capable of considerable over-travel to facilitate the ready operation of the switch without entailing adjustment of the parts thereof.

Further objects of the invention are to provide a switch operating mechanism which is simple of construction, economical of manufacture and efficient in operation.

Other objects and advantages more or less ancillary to the foregoing and the manner in which all the various objects are realized will appear in the following description, which considered in connection with the accompanying drawing, sets forth the preferred embodiment of the invention.

In the drawing:

Fig. 1 is an elevational view of the switch showing one of the cover plates removed therefrom to illustrate a portion of the actuating mechanism therefor;

Fig. 2 is a vertical sectional view of the switch, showing the actuating mechanism therefor, the view being taken on a plane indicated by the line 2-2 of Fig. 1;

Fig. 3 is a view partially in section and par-

tially in elevation of a portion of the actuating mechanism;

Fig. 4 is a perspective view of another portion of the switch actuating mechanism;

Fig. 5 is a perspective view of a spring which is adapted to transmit the movement of one portion of the actuating mechanism to a second portion thereof; and

Fig. 6 is an elevational view of the switch showing the actuating mechanism in one of its operative positions.

The switch illustrated herein is particularly adapted for opening and closing a circuit which comprises two subsidiary sections of the main circuit. However, it is readily apparent that the switch may be employed to open or close a circuit embodying a single section. The switch of the present disclosure embodies a plurality of contacts engageable by a contactor which is reciprocated with a snap action. The contactor is actuated by a shaft which in turn receives its movement through a lever. The actuation of the lever is derived from an arm, disposed outside of the switch housing, which is connected to the lever by an over-travel mechanism that enables the arm to be moved a greater distance than is actually necessary to facilitate the manipulation of the lever. Such an arrangement is designed to prevent injury to the several parts of the switch that might result from the excessive movement of the arm. The arm referred to herein may be actuated by any desired part of a machine with which the switch is associated, although it is to be understood that other types of arms of a particular design may be employed dependent upon the part of the machine with which the switch is associated.

As shown in Figs. 1 and 2, the housing comprises two compartments, one of which contains the switch contacts and contactor, while the other contains the switch actuating mechanism. Secured to the sides of the housing by screws 11 there are closure plates 12 and 14, with a sheet of insulating material 15 interposed between the switch compartment and the plate 12. Suitable bosses 16 are provided on the outer surface of the housing to facilitate the securement of the switch in any desired position upon a machine.

The contacts and contactor with its supporting lever and shaft employed herein are of the form disclosed in my copending application, Serial No. 221,274, filed July 26, 1938. A detailed description thereof is, therefore, deemed unnecessary apart from such general reference to the parts

thereof as may be necessary for a complete understanding of the invention.

Within a portion of the housing 10 subjacent the switch compartment there is journaled a shaft 18 in a plane parallel to the shaft 19 which supports the contactor lever 20. The outer end of the shaft 18 is drilled and tapped along its axis subsequent to which the drilled portion of the shaft is split to facilitate the attachment of the operating arm 21 thereto. Formed on the peripheral surface of the outer end portion of the shaft 18 there are serrations which are adapted to engage a complementary serrated surface formed in an aperture provided in the end of the arm 21. An Allen set screw 23 is threaded within the end of the shaft 18 for expanding the split portions thereof into locking engagement with the arm 21. Mounted within a yoke formed in the free end of the arm 21 there is a roller 24 which is adapted to engage a moving part of the particular machine to which the housing 10 may be attached.

Disposed within the switch actuating compartment of the housing 10 there is a lever 26 formed with a bifurcated end portion 27 which is loosely mounted upon the inner end of the shaft 18. The opposite end of the lever 26 is provided with a slideway 28 within which there is reciprocally mounted a yoke 29 having a roller 30 secured thereto by a pin 31. A portion of the lever 26 subjacent the slideway 28 is counterbored to receive a helical spring 32 which engages the lower end of the yoke 29 for urging the roller 30 into engagement with a rocking member 34. The rocking member 34 is secured to the end of the shaft 19 which projects into the switch actuating compartment of the housing 10. The movement of the lever 26 and roller 30 actuates the rocking member 34 causing the shaft 19 to rotate for moving the contact lever 20 in the manner as set forth in my copending application.

The lower end portion of the lever 26, Fig. 3, is formed with a pair of oppositely disposed, inwardly extending notches 36 which provide the lever with neck portions 37 spaced from the axis of the shaft 18. Mounted upon the shaft 18 within the bifurcated end 27 of the lever 26 there is a second lever 38, Fig. 4, which is formed with a neck portion 39 and head 40 of a configuration complementary to the lower end portion of the lever 26. The lever 38 is secured to the shaft 18 while the bifurcated end 27 of the lever 26 is loosely mounted thereon, thereby permitting the actuation of the shaft 18 and lever 38 without transmitting any movement to the lever 26. Encircling the shaft 18 and the ends of the levers 26 and 38 there is a spring member 42, Figs. 3 and 5, which has its ends 43 thereof disposed within the notches formed in the levers 26 and 38. The spring member 42 is composed of a number of flat leaf springs with the ends of the inner leaf being offset or flared outwardly to provide a seat for the ends of the remaining leaves. Thus any movement imparted to the lever 38 by the shaft 18 is transmitted to the lever 26 by the spring member 42. However, as shown in Fig. 1, the spring member 42 may be formed of a plurality of leaves with the several ends thereof being flush with one another and adapted to engage the notches provided in the levers 26 and 38.

In the operation of the switch disclosed herein it may be assumed for the purpose of explanation that a main circuit has two subsidiary cir-

cuits which are to be controlled, one being opened and the other closed. These subsidiary circuits are employed in conjunction with a machine having either a reciprocating, oscillating or rotary movement with the switch housing adapted to be mounted upon the machine in such a manner that the roller 24 of the arm 21 will be engaged upon the movement of a particular part of the machine. Upon the actuation of the arm 21 the shaft 18 and lever 38 will be rotated, which movement is transmitted to the lever 26 by the spring 42. Assuming that the lever 26 is moved in a counterclockwise movement, Figs. 1 and 2, the roller 30 moves across the lower face of the rocking member 34 until the lever 26 engages the enlarged end portion 44 of the latch 45 whereupon the continued movement of the lever 26 the action of the spring 46 is overcome, thereby disengaging the end of the rocking member from the latch 45. Immediately upon the disengagement of the end of the rocking member 34 from the latch 45 the spring 32 forces the roller upwardly, thus causing the rocking member to move with a snap action to engage the opposite end of the rocking member with the latch 45 disposed on the opposite side of the housing 10. The snap action of the rocking member 34 is transmitted through the shaft 19 to the lever 20 for actuating the contactor.

The levers 26 and 38 may be moved relative to each other, upon the actuation of the shaft 18, even if the lever 26 is held against movement and providing the force exerted upon the arm 21 is sufficient to spread the ends 43 of the spring member 42. As illustrated in Fig. 6, the lever 26 is in abutting relation with the enlarged end 44 of the latch 45, shown on the right hand side, and the operating arm 21 has been rotated approximately 29 degrees further than the lever 26. The lever 38 is shown as having been rotated from a juxtaposition within the bifurcated end of the lever 26 to a position where it engages the side of the housing 10 and the ends 43 of the spring member 42 have been forced apart. The reciprocation or movement of the arm 21 in the opposite direction will tend to reverse the above described operation.

In certain instances it may be desirable to employ the switch for making a momentary contact in which event the lever 26 is to be returned to its original position immediately upon the completion of the contact. A spring 50 is interposed between the housing 10 and the lever 26 so that upon the movement of the arm 21 the lever 26 will be actuated against the action of the spring so that upon the release or disengagement of the arm 21 with its cooperating machine part the spring will return the lever 26 to its original position. It is to be understood, however, that the spring 50 is not essential to the normal operation of the switch and may be omitted therefrom.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. In a lever mechanism for transmitting movement between separate machine elements, a shaft, means for rotating or oscillating said

shaft, a lever carried by said shaft and movable therewith and having a pair of oppositely disposed, transverse notches extending parallel to the axis of the shaft, a second lever having a bifurcated end rotatively journaled on said shaft with said first named lever disposed within said bifurcation and movable within the bifurcated end, the bifurcated end of said lever having a pair of oppositely disposed, transverse notches extending parallel to the axis of the shaft, a spring comprising a C-shaped member having the ends positioned in the oppositely disposed notches of said levers, said first lever adapted to transmit movement through said spring to said second lever, said spring adapted to open up to allow independent movement of said levers when one lever meets with sufficient resistance to overcome the inherent rigidity of said springs.

2. In a device of the class described, a housing, a shaft rotatably journaled in the base thereof and having an end portion extending therefrom, a lever within the housing and having a bifurcated end loosely mounted on the shaft, a second lever secured to said shaft within the bifurcated end of the first named lever, said levers formed with axially aligned, spaced notches in a plane parallel to the axis of the shaft, a spring comprising a plurality of C-shaped members partially encircling said shaft and the ends of said levers, the ends of said spring being positioned in oppositely disposed notches of the levers, for transmitting the movement of the shaft and second named lever to the first named lever.

3. In a device of the class described, a housing, a shaft rotatably journaled in the base thereof and having an end portion extending therefrom, a lever within the housing and having a bifurcated end loosely mounted on the shaft, a second lever secured to said shaft within the bifurcated end of the first named lever, said levers formed with axially aligned, spaced notches in a plane parallel to the axis of the shaft, a spring member composed of a plurality of C-shaped leaves, the ends of the inner leaf of said spring member being flared outwardly to provide a seat for the ends of the remaining leaves, the outwardly flared ends of the inner spring member engageable with oppositely disposed notches of said levers, the ends of said spring member being adapted to spread apart to permit independent movement of said levers upon one of said levers meeting with a resistance sufficient to overcome the inherent rigidity of said spring.

4. In an apparatus of the class described, a shaft, a lever embodying a pair of spaced members on said shaft and having spaced seats formed on their adjacent faces extending parallel to the axis of the shaft, a second lever on said shaft intermediate said spaced members, a pair of seats formed on said second lever parallel to the axis of the shaft and in alignment with the seats on said members, a spring comprising a C-shaped member having its ends positioned on said seats

for allowing independent movement of said levers upon one of said levers meeting with a resistance sufficient to overcome the inherent rigidity of the spring, one of said levers being secured to said shaft.

5. In a mechanism for transmitting movement between separate machine elements, a shaft, an actuator embodying spaced portions rotatably journaled on said shaft and having oppositely disposed transverse notches therein extending parallel to the axis of the shaft, a member mounted upon the shaft intermediate said spaced portions, said member having oppositely disposed transverse notches extending parallel to the axis of the shaft, a spring, the ends of said spring positioned in the notches of said actuator and member for transmitting movement between said shaft and actuator through said member.

6. In a mechanism for transmitting movement between separate machine elements, a shaft, a member embodying spaced portions rotatably journaled on said shaft and having oppositely disposed transverse notches therein extending parallel to the axis of the shaft, a second member secured to said shaft intermediate said spaced portions, said second member provided with oppositely disposed, transverse notches extending parallel to the axis of the shaft, a spring, the ends thereof positioned in oppositely disposed notches of said second member and spaced portions for transmitting movement between said shaft and spaced portions, said spring adapted to allow independent movement between said second member and spaced portions when said second member meets with sufficient resistance to overcome the inherent rigidity of the spring.

7. In an apparatus of the class described, a shaft, a lever embodying a pair of spaced members on said shaft and having spaced seats formed on their adjacent faces parallel to the axis of the shaft, a second lever slidably keyed to said shaft between said spaced members, a pair of seats formed on said second lever parallel to the axis of the shaft and in alignment with the seats on said members, spring means connected to said levers for transmitting swinging movement between said shaft and levers, said spring having its ends disposed in said seats and adapted to allow independent movement of one of said levers upon the other lever meeting with sufficient resistance to overcome the inherent rigidity of the spring.

8. In an apparatus of the class described, a shaft, a bifurcated lever mounted thereon, seats formed on said lever parallel to the axis of the shaft, a second lever mounted on said shaft within the plane of the first named lever, seats formed on the second lever parallel to the axis of the shaft and in alignment with the seats on said first lever, a spring, the ends of the spring engaging said seats to transmit movement between said levers, one of said levers being secured to said shaft.

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