May 23, 1950 J. O. THORSHEIM 2,509,194

SNAP SWITCH

Filed Dec. 13, 1947

Fig. 1.

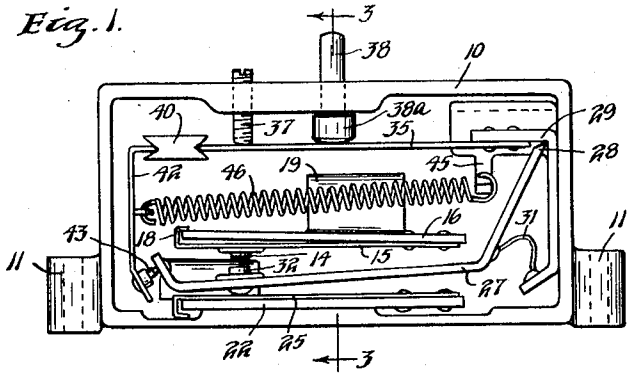


Fig. 2.

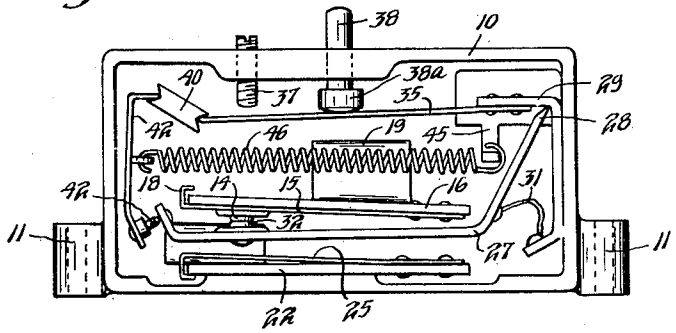


Fig. 3

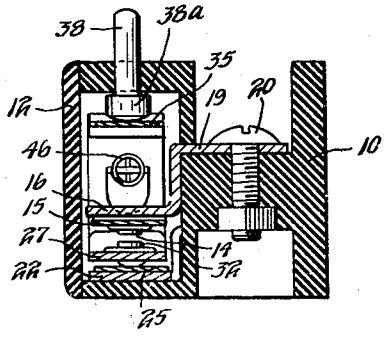
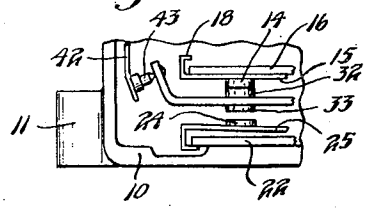


Fig. 4.



Inventor
JOSEPH O. THORSHEIM

By George H. Fisher
Attorney

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SNAP SWITCH

Joseph O. Thorsheim, Minneapolis, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

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13 Claims. (Cl. 200—67)

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This invention pertains to snap acting mechanism particularly of the type adapted to open and close electrical contacts in a rapid and positive manner.

An object of the invention is to provide a snap acting contact actuating mechanism that may be constructed to occupy a small space, which is positive in action and does not require critical adjustment.

An object is also to provide a snap switch adapted for actuation by an extremely small effort and yet capable of handling substantial current.

Other objects will appear from the written description and claims, and from the drawing, in which

Figure 1 is a front view of a switch embodying my invention, with the cover removed,

Figure 2 is a view similar to Figure 1 but with the switch actuated to another position,

Figure 3 is a section taken on line 3—3 of Figure 1, and with the cover in place, and

Figure 4 is a fragmentary view of a modified contact structure that may be incorporated in the switch of Figure 1.

A housing 10 of electrical insulating material is provided with mounting extensions 11 and serves as a base for carrying the various operating parts of the mechanism. A cover 12, seen in Figure 3, is provided to protect the mechanism against accumulation of dust and other foreign material, and to protect the parts electrically.

A stationary contact 14 is carried on a press back blade 15 that is supported at a point remote from the contact 14 on a conducting bracket 16. The blade 15 is formed normally to hold the contact 14 away from the bracket 16 a distance determined by a stop 18 formed on the free end of the blade. The bracket 16 is suitably secured to the housing 10 and has an extension 19 which is provided with a terminal screw 20 for providing an electrical connection with the contact 14. A bracket 22 similar to the bracket 16 is attached to the housing 10 in a manner similar to that by which the bracket 16 is attached. The bracket 22 is spaced from the bracket 16 and may carry a second stationary contact 24, as seen in Figure 4, on a press back blade 25. The second stationary contact may be omitted as shown in the devices of Figures 1, 2 and 3, in which case the bracket 22 and the blade 25 merely serve as a stop for the movable contact arm, to be described below.

A pivoted contact actuating arm 27 has a knife

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edge 28 formed in one end thereof to engage a complementary V-shaped portion in a bracket 29. The bracket 29 is secured to the housing 10 in a manner similar to the brackets 16 and 22. The bracket 29 also has a downwardly extending portion 30 to which a flexible conductor 31 is attached. The conductor 31 is also attached to the arm 27 to provide a low resistance path to the arm 27 from the bracket 29. The pivoted arm 27 carries a movable contact 32 which cooperates with the stationary contact 14, and may also carry a second movable contact 33 to cooperate with the contact 24 shown in the modification of Figure 4.

The bracket 29 also carries a blade 35 which serves as a driving or actuating member as will hereinafter appear. The blade 35 is formed to bias its free end upwardly against an adjustable abutment 37. A push button 38 extending to the outside of the housing 10 serves to position the blade 35 to actuate the switch. A link 40 has a V-shaped portion that cooperates with a knife edge in the free end of the blade 35 to form a pivot between these two members. The link 40 also has a V-shaped portion that cooperates with a knife edge in the upper end of a bridging member 42. The lower end of the bridging member 42 is provided with a cone pivot 43 that engages a suitable crater in the free end of the contact arm 27. The parts are formed so that the axis of the cone pivot 43 is substantially in line with the knife edge pivot 28 of the arm 27.

The bracket 29 is also provided with an extension 45 to which one end of a coil tension spring 46 is attached. The other end of the spring 46 is connected to the bridging member 42 at a point which, in the illustrative embodiment, is approximately midway between the pivots of the member 42 in the link 40 and in the arm 27 but may be connected at any point intermediate these pivots that will produce the required forces on these pivots. It will be seen that the bias of the spring 46 is such as to hold the bridging member in engagement with the link 40 and the link 40 in engagement with the blade 35. The spring 46 also holds the bridging member in engagement with the arm 27 and holds the knife edge 28 of the arm 27 in engagement with the bracket 29.

It will be noted that the contact arm 27 is bent at an angle intermediate its ends. The shape of the arm 27 enables the brackets 16 and 22 to be mounted at an angle with respect to a path of movement of the movable contacts 32

and 33 so that a certain amount of wiping action is provided between the movable and stationary contacts as they are engaged and disengaged. This is desirable in preventing sticking of the contacts and also in maintaining clean contact surfaces. The bent shape of the arm 27 also provides room for a relatively long tension spring 46 which may therefore be of relatively low spring rate and which is therefore not critical as to the distance between the extension 45 of the bracket 29 and the bridging member 42.

While the driving member for the link 40 has been described as a flexible blade 35, a rigid actuating member could be substituted therefore, in which case the pin 38 would be modified to be capable of actuating the blade 35 in an upward as well as in a downwardly direction. The blade 35 is not required to act as a resilient drive in obtaining a snap action. Also, the adjustable stop 37 may be omitted if other suitable means is provided to prevent excessive upward travel of the blade 35, for example, an enlargement 38*a* on the lower end of the push button 38 of suitable dimension to engage the housing 10. While the link 40 is shown as being horizontal in the operative position of Figure 1, this is not essential in obtaining the desired snap action.

Operation

If no downward force is exerted on the push button 38 the parts will be in the position shown in Figure 1, since the bias of the blade 35 has positioned its free end against the abutment 37 and the tension spring 46 is exerting a force on the bridging member 42 in a line that passes below the knife edge pivot 28 of the arm 27 Thus, the spring 46 exerts a force component urging the arm 27 in a counterclockwise direction. As the push button 38 is depressed, the free end of the blade 35 actuates the right hand end of the link 40 in a downward direction until the link 40 assumes an angular relation with respect to the bridging member 42 in which the tension spring 46 exerts a component of force due to the angular relationship in an upward direction equal to the downward component of force of the spring 46 due to the location of the knife edge pivot 28 of the arm 27. It should be noted that the press back blade 25 also exerts an upward force on the arm 27. When the forces tending to move the arm 27 in a clockwise direction slightly exceed the downward component of the spring 46 the parts will move suddenly to the position shown in Figure 2. This snap action effect is due to the continually increasing upward component of force acting on the bridging member 42 as the angle of the link 40 with respect to the bridging member 42 increases.

When the push button 38 is permitted to move upwardly from the position shown in Figure 2 the free end of the blade 35 will actuate the right hand end of the link 40 in an upwardly direction and the angle between the link 40 and the bridging member 42 will decrease until the downward component of the tension spring 46, and the downward effect of the press back blade 15, just balances the upward component due to the angularity of the link 40. Further upward movement of the right hand end of the link 40 will result in the parts snapping to the position shown in Figure 1.

It will be understood that the arm 27 could be stopped by other means than by engagement of the brackets 16 and 22 by the press back blades 15 and 25, and that various other modificatios could be made within the scope of the invention.

I claim as my invention:

1. A snap mechanism comprising a pivoted arm, a driving member adapted to oscillate between two positions, a link pivoted to said driving member, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member to place said link in compression.

2. A snap mechanism comprising a pivoted arm, a driving member adapted to oscillate between two positions, a link pivoted to said driving member, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member intermediate said link and said arm to place said link and said arm in compression.

3. A snap switch comprising a contact arm between a pair of contacts, a driving member adapted to oscillate between two positions, a link pivoted to said driving member, a bridging member pivoted to said link and to said contact arm, and a spring acting on said bridging member to bias said contact arm toward one of said contacts and to bias said link toward said driving member.

4. A snap switch comprising an insulating base, a conducting bracket attached to said base, a contact arm pivoted to said bracket, a pair of contacts adapted to engage and disengage on movement of said arm, a flexible blade secured to said bracket, a link pivoted to said blade, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member to place said arm, link and blade in compression, the arrangement being such that movement of said blade changes the angular relation between said link and said bridging member to change the component of the force produced by said spring tending to pivotally move said arm.

5. A snap switch comprising an insulating base, a conducting bracket attached to said base, a contact arm pivoted to said bracket, a pair of contacts adapted to engage and disengage on movement of said arm, a driving member pivotally secured to said bracket, a link pivoted to said blade, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member to place said arm, link and driving member in compression, the arrangement being such that movement of said driving member changes the angular relation between said link and said bridging member to change the component of the force produced by said spring tending to pivotally move said arm.

6. A snap switch comprising an insulating base, a conducting bracket attached to said base, a contact arm pivoted to said bracket, a pair of contacts adapted to engage and disengage on movement of said arm, a driving member pivotally secured to said bracket, a link pivoted to said blade, a bridging member pivoted to said link and to said arm, and a spring acting between said bracket and said bridging member to place said arm, link and driving member in compression, the arrangement being such that movement of said driving member changes the angular relation between said link and said bridging member to change the component of the force produced by said spring tending to pivotally move said arm.

7. A snap switch comprising a pivoted contact arm, a link, an abutment for said link, a bridging member between said link and said arm, a spring acting on said member, and means for positioning said abutment to change the direction of the component of force produced by said

spring tending to pivotally move said contact arm.

8. In a snap switch, a stationary contact and a cooperating movable contact, a pivoted arm adapted to actuate said movable contact, a driving member, a link pivoted to said driving member, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member in a direction normal to the movement of said arm to place said link in compression, the arrangement being such that movement of said driving member changes the angular relation between said link and said bridging member to change the component of the force produced by said spring tending to pivotally move said arm.

9. In a snap switch, a stationary contact and a cooperating movable contact, a pivoted arm adapted to actuate said movable contact into and out of engagement with said stationary contact, a driving member, a link pivoted to said driving member, a bridging member pivoted to said link and to said arm, and a spring acting on said bridging member to place said link in compression and to bias said arm toward one of its contact operating positions, the arrangement being such that movement of said driving member changes the angular relation between said link and said bridging member to change the component of the force produced by said spring to pivotally move said arm.

10. In a snap mechanism, an arm movable between first and second operative positions, a link, a bridging member pivoted to said link and to said arm, a spring acting on said bridging member, and an actuating member pivoted to said link and adapted to change the angular relationship between said link and said bridging member to change the direction of the component of force of said spring acting to move said arm between its two operative positions.

11. In a snap mechanism, an arm movable between first and second operative positions, a link, a bridging member pivoted to said link and to said arm, a spring acting on said bridging member, an actuating member pivoted to said link and adapted to change the angular relationship between said link and said bridging member to

change the direction of the component of force of said spring acting to move said arm between its two operative positions and resilient means acting on said actuating member biasing said member in one direction whereby said arm is normally moved to one of its operative positions.

12. In a snap mechanism, an arm movable between first and second operative positions, a link, a bridging member pivoted to said link and to said arm, a spring acting on said bridging member, and an actuating member pivoted to said link and adapted to change the angular relationship between said link and said bridging member between a position in which the pivots of said link are in a plane substantially parallel to the line of application of force of said spring on said bridging member with said arm in its first operative position and a position in which said spring tends to move said arm to its second operative position.

13. In a snap mechanism, a pivoted arm movable between first and second operative positions, a link, a bridging member pivoted to said link and to said arm, a spring acting on said bridging member and biasing said arm into its first operative position, and an actuating member pivoted to said link and adapted to change the angular relationship between said link and said bridging member between a normal position in which said link is substantially parallel to the line of force of said spring and a position in which said link produces a component of force of said spring in a direction to overcome the normal effect of said spring on said arm and to cause movement of said arm to its second operative position.

JOSEPH O. THORSHEIM.

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