

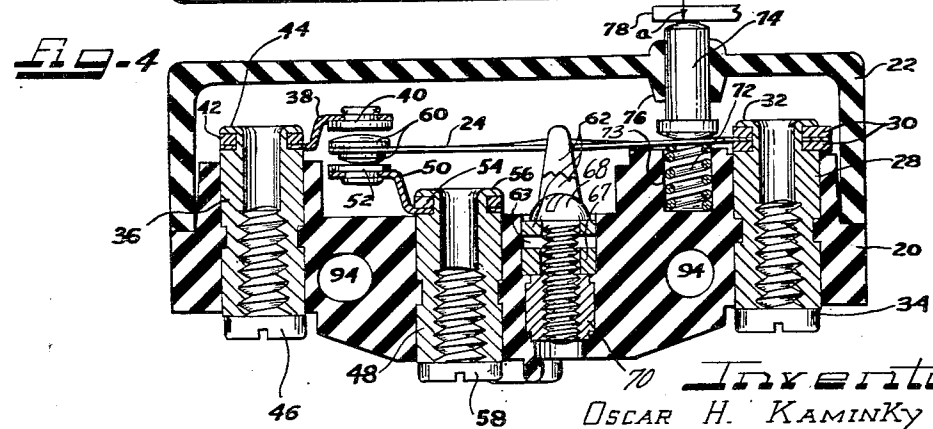
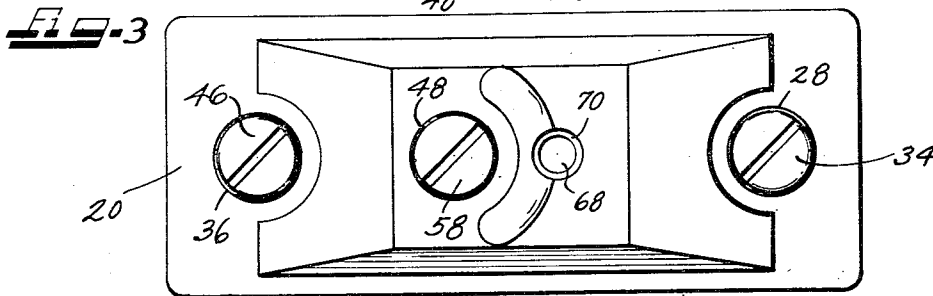
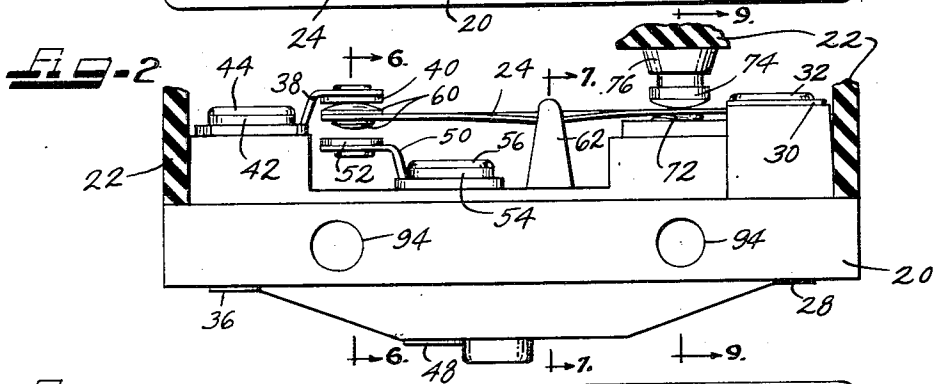
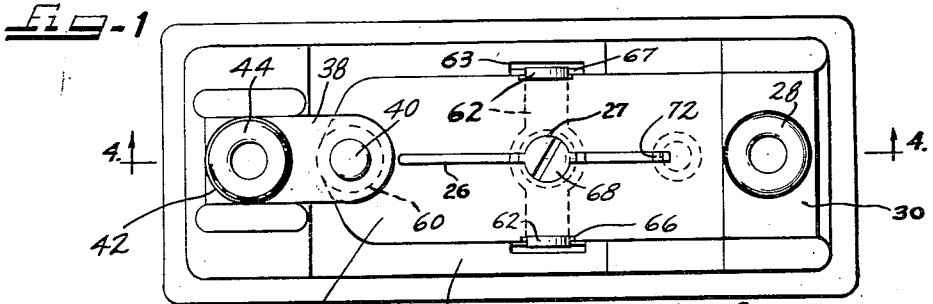
April 16, 1957

O. H. KAMINKY  
SNAP ACTING MECHANISM

2,789,173

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2 Sheets-Sheet 1



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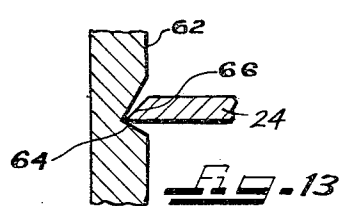
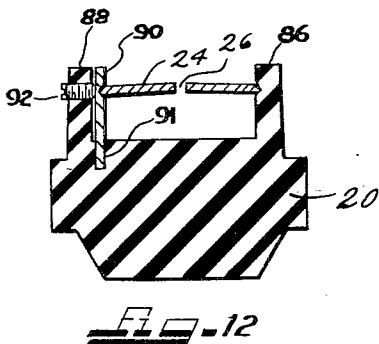
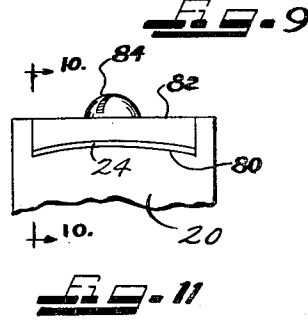
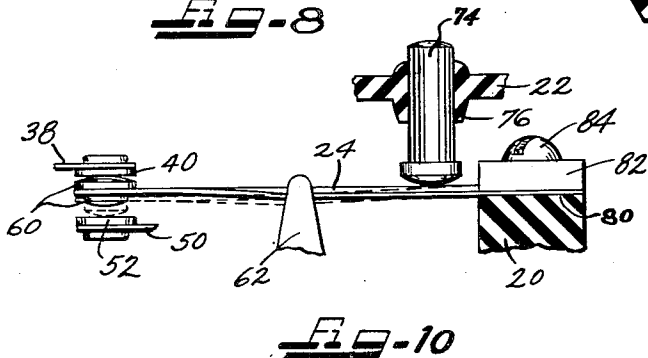
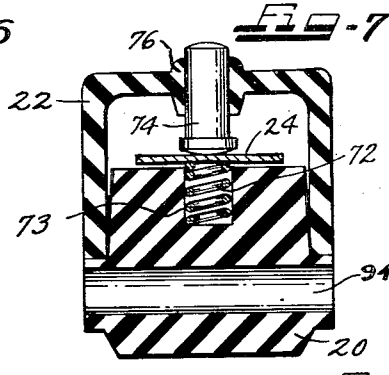
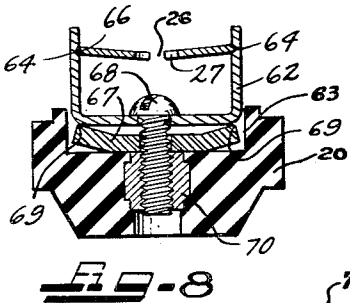
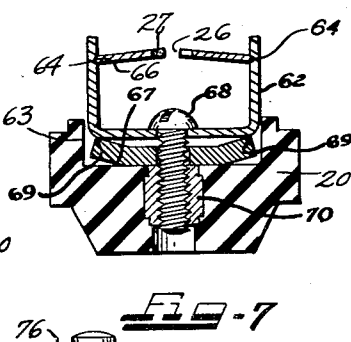
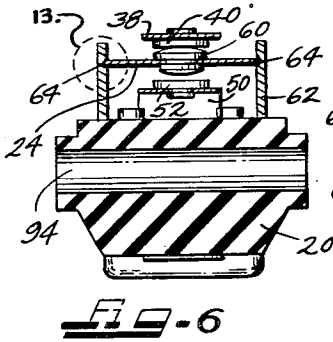
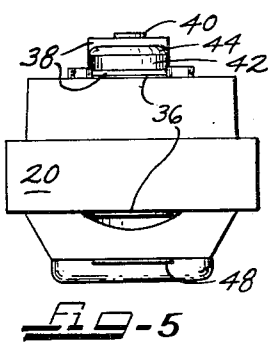
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2 Sheets-Sheet 2



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2,789,173

**SNAP ACTING MECHANISM**

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Application August 1, 1955, Serial No. 525,694

13 Claims. (Cl. 200-67)

My present invention relates to a snap acting mechanism adapted to be interposed between an actuating device and an actuated device whereby the actuating device, upon movement in one direction, will tend to move the snap acting mechanism, and at a certain point will cause it to snap over center from one position to another and in so doing to actuate the actuated device.

One of the objects of my invention is to provide a snap acting mechanism in the form of a leaf spring blade anchored at one end and having its opposite end arranged to function as an actuator for an actuated device such as a circuit controller, the intermediate portion of the blade being so stressed as to effect snap action thereof when an actuating device contacts the blade at a point located between its anchored end and such intermediate portion and moves such point.

Another object is to provide means to stress the blade in the form of abutments engaging the side edges thereof intermediate the ends of the blade, the blade having a longitudinal slot between said side edges.

Another object is to provide an improved snap acting mechanism which may be used for controlling switch contacts or the like so that the contacts are operated with quick make-and-break action, the mechanism being relatively sensitive in its response to slight travel of its actuating device.

Still another object is to provide a leaf spring blade which is relatively flat when relaxed, but which when subjected to stress imposed by the abutments above mentioned will be moved in a manner by the actuating device such that distortion of the blade through and beyond a central position occurs, the movement of such distorted portion being translated and multiplied to impart relatively quick, wide movement to the actuating end of the blade to open or close contacts at a predetermined critical point in the travel of the actuating device.

A further object is to provide a snap acting mechanism which is very simple, inexpensive, compact in construction and reliable in operation, and which does not require critical initial deformation or "pre-formed" blades as in previous types of snap acting mechanisms which, in mass production, have been found difficult to hold to desirable tolerances.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my snap acting mechanism, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in detail on the accompanying drawing, wherein:

Fig. 1 is a plan view of a snap acting mechanism with the cover removed and illustrating its application to a switch unit of the type that can be mounted in automatic control switches and the like, the device being shown on an enlarged scale;

Fig. 2 is a side elevation thereof with portions of the cover present and shown in section;

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Fig. 3 is a bottom plan view of Fig. 1;

Fig. 4 is a vertical sectional view on the line 4-4 of Fig. 1;

Fig. 5 is an end view from the left hand end of Fig. 2;

Fig. 6 is a vertical sectional view on the line 6-6 of Fig. 2 showing the contacts of the switch;

Fig. 7 is a vertical sectional view on the line 7-7 of Fig. 2 showing the portion of a snap acting blade at the section line in normal position;

Fig. 8 is a similar sectional view showing said portion of the snap acting blade in actuated position;

Fig. 9 is a vertical sectional view on the line 9-9 of Fig. 2 showing an actuating pin and a return spring which cooperate with the snap acting blade;

Fig. 10 is a sectional view similar to a portion of Fig. 4 showing a modified form of my snap acting mechanism;

Fig. 11 is an end elevation thereof from the right hand end of Fig. 10, Fig. 10 being taken on the line 10-10 of Fig. 11;

Fig. 12 is a sectional view somewhat similar to Fig. 7 showing a further modification; and

Fig. 13 is an enlargement of the portion of Fig. 6 shown within the circle 13.

On the accompanying drawings I have used the reference numeral 20 to indicate a base which may be molded of insulating material and 22 a cover therefor, which may likewise be molded of insulating material, the two being normally associated as in Fig. 4.

The main element of my snap acting mechanism is a snap acting blade 24 which is provided with a slot 26. One end of the blade is secured to a blade mounting sleeve 28 by means of rectangular washers 30 and a riveted flange 32 of the sleeve. The sleeve 28 is imbedded in the base 20. A terminal screw 34 is adapted to be screwed into the sleeve 28 for connection of an electric circuit to the blade 24.

A second contact sleeve 36 is embedded in the base 20 at the opposite end thereof as shown in Fig. 4 to support a contact blade 38. A contact 40 is riveted to the blade 36 and the blade, in turn, is secured to the sleeve 36 by a washer 42 and a riveted flange 44. At the lower end of the sleeve a terminal screw 46 (see Fig. 4) is provided for connecting the contact 40 to another circuit wire.

A third contact sleeve 48 is embedded in the base 20 and supports a contact blade 50 on which is mounted a second contact 52. The blade 50 is mounted to the sleeve 48 by means of a washer 54 and a riveted flange 56. The terminal screw for the sleeve 48 is shown at 58.

A third contact 60 is mounted on the snap acting blade 24 and this contact is adapted to selectively coast with the contacts 40 and 52 as illustrated in Figs. 2 and 4, respectively.

I provide a blade clamp 62 in the form of a U-shaped strip of spring metal, as shown in Fig. 7, which is mounted in a socket 63 of the base 20 and its arms are provided with V-notches 64. The side edges of the blade 24 may be provided with knife edges 66 as best shown in Fig. 13 and these are adapted to seat in the V-notches 64 as in Figs. 7 and 8. A clamp seat 67 underlies the cross member of the blade clamp 62 and is provided with seating corners 69 engaging this cross member, a clamp adjusting screw 68 being provided and threaded into a clamp sleeve 70 embedded in the base 20.

Obviously, the relationship of parts in Fig. 7 is such that the snap acting blade 24 is being stressed so that the two halves thereof on opposite sides of the slot 26 are buckled upwardly. The degree of such buckling can be increased by further tightening of the clamp adjusting screw 68. The blade 24 is normally unstressed when mounted on the blade mounting sleeve 28 and before the blade clamp 62 is assembled as in Fig. 7, and thereafter a screw driver thrust through an enlargement 27 of the

slot 26 (see Fig. 1) may be used to adjust the stressing of the blade as required.

When the snap acting blade 24 is stressed as just described, it will stay in either the elevated position of Fig. 2 or the depressed position of Fig. 4. In order to make the device suitable as a control switch unit to be substituted for other snap acting units now on the market, I provide a return spring 72 in a socket 73 of the base 20 to normally elevate the blade to the position shown in Fig. 2.

To actuate the blade to the depressed position of Fig. 4, I provide an actuating pin 74 slidably mounted in a boss 76 of the cover 22. This pin may be pressed downward manually, or automatically by some condition responsive device for example, such as one that has a lever 78 (see Fig. 4) actuated by a temperature responsive bellows or the like (not shown). When the lever 78 is depressed as indicated by the arrow *a* the portion of the blade 24 intermediate its supported end and the blade clamp 62 is likewise depressed against the action of the spring 72 and the blade will move from the position of Fig. 2 to the position of Fig. 4 with snap action.

Fig. 7 shows the elevated position of Fig. 2 with the two halves of the blade on opposite sides of the slot 26 elevated, whereas the depressed position is shown in Figs. 4 and 8 and a comparison of these figures shows what happens to the blade in passing with snap action from one position to the other. The snap action is a function of a normally unstressed slotted blade and means to stress it comprising the blade clamp 62 engaging its opposite side edges and, since the blade clamp is resilient, biasing these edges toward each other.

A modification is shown in Fig. 10 wherein an arcuate seat 80 is provided for the snap acting blade 24 and a blade clamp bar 82 of comparable shape is held against the blade by a blade clamp screw 84, thus making the normal position of the blade the same as shown in Fig. 7 so that it will normally return to this position. Then when the actuating pin 74 of Fig. 10 is depressed, the blade will snap to the dotted position, but when the pressure on 74 is released, the blade will return to the full line position.

The snap acting blade 24 is preferably made of resilient material such as spring steel or bronze and thus has some inherent resiliency. It is therefore possible to provide relatively rigid abutments 86 and 88—90 as shown in the modification, Fig. 12, in place of the somewhat resilient element 62 of the previous figures. As long as the V-seats in the abutments are closer together than the normal width of the blade 24 they will stress it for snap action. An adjustment can be provided in the form of the spring blade 90 in a socket 91 of the base 20 and an adjusting screw 92 of the set screw type and threaded through the abutment 88. This adjustment, and likewise the adjustment provided by the clamp adjusting screw 68 in Fig. 7, permits some variation in manufacturing tolerances which can be corrected by the adjustment and further from switch unit to switch unit the adjustment can be changed to make the snap action softer or greater as desired to suit the particular installation for the switch.

From the foregoing specification it will be obvious that I have provided a relatively simple structure to serve as a snap acting mechanism wherein the snap acting blade 24 may be initially formed by punch press operation and the snap acting characteristics are thereafter added without distorting the blade and giving it a permanent set as in many types of prior snap acting blades. On the other hand, I merely bias the opposite side edges of a normally unstressed slotted blade toward each other to introduce the stressing that results in snap action. The degree of stressing can be readily varied in a very simple manner and thus the parts are less critical when manufactured than former types of snap acting mechanisms.

Some changes may be made in the construction and arrangement of the parts of my snap acting mechanism without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims

any modified forms of structure or use of mechanical equivalents which may reasonably be included within their scope.

I claim as my invention:

1. Snap acting mechanism comprising a leaf spring blade provided with a longitudinal slot terminating short of the ends thereof, means for anchoring one end of said blade leaving the other end free to be moved with a snap action, a pair of resilient elements pivotally engaging the side edges of said blade in the vicinity of the central portion of said slot, means for adjusting the spacing between said elements, and means for imparting movement to said blade intermediate its anchored end and said pair of resilient elements in opposite directions to cause the unanchored end thereof to move with snap action in opposite directions.

2. In a snap acting mechanism, a snap acting blade of spring material anchored at one end, and means to move the other end thereof with snap action when a portion of the blade adjacent the anchored end is moved comprising said blade having a longitudinal slot terminating short of the blade ends and dividing a portion of the blade into two separated halves, means for stressing said halves toward each other to cause them to assume a buckled position, said means comprising a resilient blade clamp, and means for adjusting the degree of pressure of said blade clamp on the side edges of said snap acting blade.

3. Snap acting mechanism comprising a resilient blade anchored at one end, and means to move the other end thereof with snap action when a portion of the blade adjacent the anchored end is moved comprising said blade having a longitudinal slot terminating short of the blade ends and dividing a portion of the blade into two separated halves, and a pair of abutments for stressing said halves toward each other to cause them to assume a buckled position.

4. Snap acting mechanism comprising a resilient blade anchored at one end, and means to move the other end thereof with snap action when a portion of the blade adjacent the anchored end is moved comprising said blade having a longitudinal slot terminating short of the blade ends and dividing a portion of the blade into two separated halves, and a pair of abutments for stressing said halves toward each other to cause them to assume a buckled position, and means for adjusting the spacing between said abutments.

5. In a snap acting mechanism of the character disclosed, a leaf spring, means fixing said spring at one end, said spring having a slot positioned longitudinally and wholly within said spring, resilient means cooperating with the side edges of said spring in the vicinity of the central portion of said slot for biasing said side edges toward each other whereby movement of the slotted portion of said spring out of the plane of the spring in one direction or the other will cause the free end of the spring to magnify such movement and to move with snap action in the same direction, and means for adjusting the pressure of said resilient means on the side edges of said spring.

6. A snap acting device comprising a snap acting blade having a longitudinal slot therein, and means cooperating with said blade for buckling the blade to cause it to move with snap action comprising a U-shaped blade clamp having a cross-member and two arms resiliently engaging the side edges of the blade intermediate the ends of said slot, means for anchoring one end of said blade whereby the opposite end may move with snap action when a point on the blade adjacent the anchored end thereof is moved in one direction or the other, a return spring for said blade, an actuating pin for moving said blade against the action of said return spring, a support for said blade clamp adjacent the ends of its cross member, and an adjusting screw through the central portion thereof for bending the cross member and thereby varying the compressive force exerted by the

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arms thereof against the side edges of said snap acting blade.

7. A snap acting device comprising a blade having a slot therein extending longitudinally thereof and wholly within said blade, and means cooperating with said blade for buckling the blade to cause it to move with snap action comprising a U-shaped blade clamp having its arms engaging the side edges of the blade intermediate the ends of said slot, means for anchoring one end of said blade whereby the opposite end may move with snap action when a point on the blade adjacent the anchored end thereof is moved in one direction or the other, a return spring for said point, an actuating pin opposite said return spring for moving the blade against the action of the return spring, a support for said blade clamp adjacent the ends of its cross member, and an adjusting screw through the central portion thereof for bending the cross member and thereby varying the pressure of the arms thereof against the side edges of said blade.

8. Snap acting mechanism of the type described comprising a spring leaf element, mounting means clamping said spring leaf element at one end and leaving the other end free, said leaf intermediate its ends being slotted lengthwise, clamping means engaging the side edges of said spring leaf element to exert a pressure on said leaf element against said side edges and tending to reduce the width of said slot whereby said free end moves in one direction or the other out of the normal plane of the spring leaf element, and means for moving said spring leaf element intermediate said clamping means and said fixed end in opposite directions to cause snap acting movement of said free end in the same direction out of the plane of the element.

9. Snap acting mechanism including an elongated resilient blade having a single generally longitudinally extending slot therein terminating short of the ends thereof, and adjustable means for biasing the opposite side edges of said blade in the vicinity of said slot toward each other to produce snap action of the blade as a portion thereof is moved to one side or the other of the plane of the blade.

10. Snap acting mechanism comprising an elongated anchored at one end and having a single generally longitudinally extending slot therein terminating short of the ends thereof, adjustable means for resiliently biasing the

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opposite side edges of said blade in the vicinity of said slot toward each other, and means to move a portion thereof to one side or the other of the plane of the blade to produce snap action at the opposite end of said blade.

11. Snap acting mechanism comprising a base, a spring blade having one end anchored thereto and its other end adapted to move with snap action, a slot longitudinally of said blade intermediate the sides thereof, a blade clamp comprising a U-shaped member having a cross member anchored to said base and its arms resiliently engaging the side edges of said blade on opposite sides of said slot, and means extending through said cross member for moving the central portion thereof toward or away from said base for varying the spring tension of said blade clamp on the side edges of said blade.

12. Snap acting mechanism comprising a base, a metallic blade having one end anchored thereto and its other end adapted to move with snap action, a slot longitudinally of said blade intermediate the sides thereof, a metallic blade clamp comprising a U-shaped member having a cross member seated in a socket of said base and its arms engaging the side edges of said blade on opposite sides of said slot, and means for moving the central portion of said cross member toward or away from said base for varying the spring tension of said blade clamp on the side edges of said blade.

13. A snap acting mechanism comprising a base, a resilient blade having one end rigidly mounted thereon with its other end free to move with a snap action, the intermediate portion of said blade being weakened in resistance to lateral compressive stress, and means external to said blade for applying to said intermediate portion at the outer margin thereof a lateral compressive force sufficient to buckle said blade laterally.

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