Dec. 26, 1961 D. W. LAVIANA 3,015,002

SWITCH ASSEMBLY

Filed Jan. 15, 1959

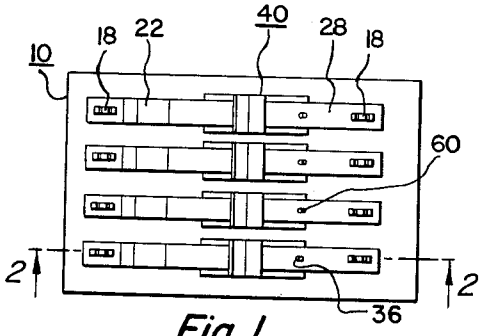


Fig. 1

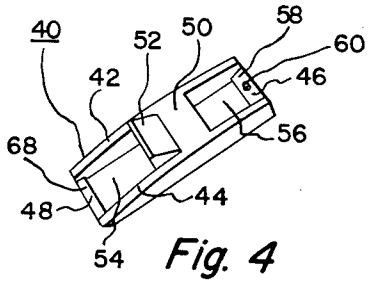


Fig. 4

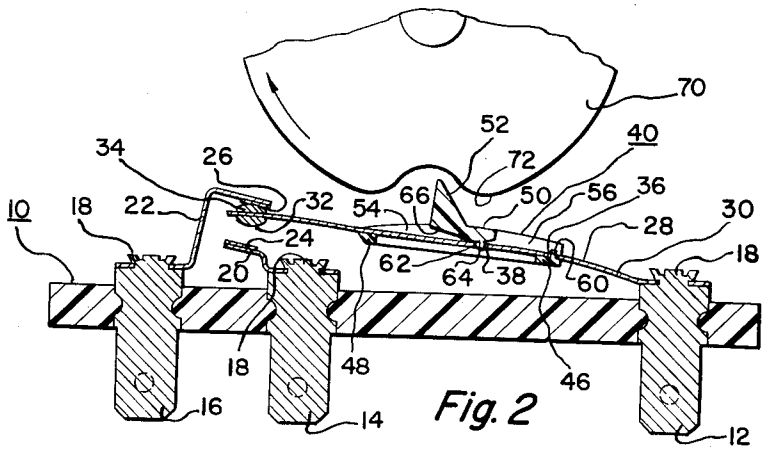


Fig. 2

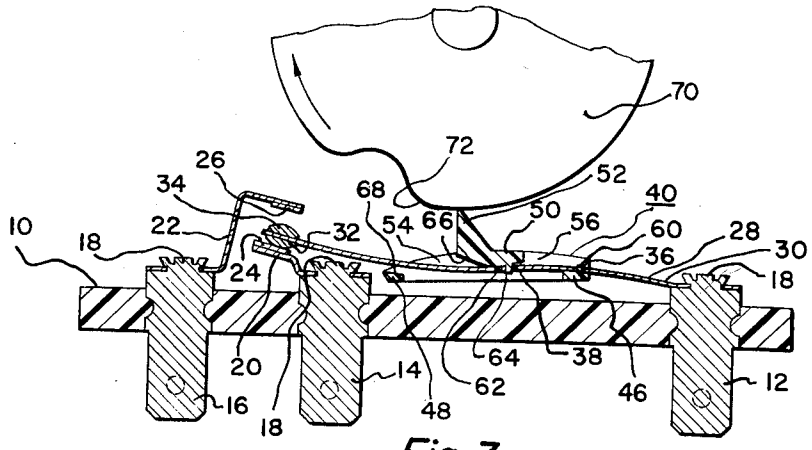


Fig. 3

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SWITCH ASSEMBLY

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This invention pertains to switches, and particularly to an improved switch assembly of the cam operated type.

Heretofore, the majority of cam operated sequence switches used in timers for controlling appliances, such as washing machines, have embodied an integral leaf spring contact and cam follower assembly. Since it is well recognized that due to manufacturing tolerances, the rotating cam assembly for actuating sequence switches are frequently misaligned during assembly, in some instances the leaf spring switches are permanently deformed due to overtravel, and as a result thereof the leaf spring switch blades do not engage the set of fixed contacts against which the blades are prestressed with the requisite contact pressure. The present invention relates to an improved switch assembly for timers, wherein overtravel of the leaf spring switch assembly due to misalignment of the cams does not result in permanent deformation of the leaf spring contacts. Accordingly, among my objects are the provision of an improved leaf spring switch assembly for timers; the further provision of a leaf spring switch assembly having a separate cam follower attached thereto in such a manner as to bend the intermediate portion of the leaf spring; and the still further provision of a switch assembly particularly designed for timers including a base and a movable leaf spring contact mounted thereon having a separate cam follower wherein overtravel of the leaf spring switch is taken up between the cam follower and the switch base.

The aforementioned and other objects are accomplished in the present invention by threading the leaf spring contact through spaced openings in the cam follower so as to bend the medial portion of the leaf spring contact. Specifically, the switch assembly includes a base, or terminal block, having a plurality of terminals attached thereto. The terminal block construction, per se, constitutes no part of the present invention and is more particularly disclosed in my copending application Serial No. 786,986, filed of even date herewith.

One end of each leaf spring blade is staked, or otherwise rigidly attached, to a terminal, and the other end of each leaf spring carries a contact on each side thereof. One set of blade contacts are engageable with a first set of fixed contacts attached to one set of terminals and the other set of blade contacts are engageable with a second set of fixed contacts attached to another set of terminals and spaced from the first set of fixed contacts. A cam follower, or saddle, is attached to the intermediate portion of each leaf spring.

The saddle is composed of insulating material and comprises a generally rectangular member having a tooth type cam follower projecting from the upper side thereof. The saddle is formed with a pair of openings on opposite sides of the cam follower through which the leaf spring can be threaded. Each leaf spring has an elongated slot and a circular hole formed in the intermediate portion thereof for receiving integral nubs, or studs, formed on the saddle. The elongated slot receives an upstanding nub formed on the inner end rail of the saddle and the circular hole receives a downwardly projecting stud formed on the lower side of the cam follower. The surfaces on which the nubs are formed are substantially coplanar, but inclined downwardly relative to the upper surface of the outer end rail, such that the

leaf spring will be bent as it is threaded through the openings and attached to the saddle by the projection of the nubs through the spaced slot and hole thereof.

By bending the intermediate portion of each leaf spring, the contact pressure between each leaf spring contact and upper fixed contact closest to the cam can be controlled so as to obtain substantially uniform contact pressure between all of the leaf springs and these contacts. Since the lower surface of the saddle is normally spaced from the terminal block, any overtravel of the cam follower due to misalignment of the cams will be taken up between the saddle and the terminal block without permanently deforming the leaf spring blade by bending the blade between its ends.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

FIGURE 1 is a plan view of a switch assembly constructed according to the present invention.

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1 showing a fragment of an actuating cam with the leaf spring contact engaging the fixed contact closest to the cam.

FIGURE 3 is a view similar to FIGURE 2 showing the leaf spring contact engaging the fixed contact farthest from the cam.

FIGURE 4 is a perspective view of a novel cam follower, or saddle.

With particular reference to FIGURES 1 through 3, the switch assembly includes a base, or terminal block, **10** of insulating material having spaced sets of spade type terminals **12**, **14** and **16** molded therein. The sets of terminals **12**, **14** and **16** project from both sides of the base **10** and have staking lugs **18** located on the upper side of the base. As depicted in FIGURES 2 and 3, a set of substantially S-shaped Phosphor bronze strips **20** are staked to the set of terminals **14**, and a set of substantially S-shaped Phosphor bronze strips **22** are staked to the set of terminals **16**. The set of strips **20** carry fixed contacts **24** which are located in a plane inclined upwardly relative to the base **10**, and the set of strips **22** carry fixed contacts **26** which are located in a plane substantially parallel to and spaced from the plane of the contacts **24**. It will be appreciated that the terminal blocks can also be located above and on the side of a cam **70**, and accordingly the fixed contacts **26** can be referred to as being closest to the cam while the fixed contacts **24** are farthest from the cam.

The switch assembly also includes a plurality of Phosphor bronze leaf spring blades **28**. One end of each leaf spring is staked to one of the terminals **12** and is transversely bent along a line indicated generally by numeral **30** so that the free end of each leaf spring **28** is inherently resiliently biased, or prestressed, upwardly into engagement with the contact **26** of the strip **22**. The outer end of each leaf spring **28** carries a pair of contacts **32** and **34**, engageable respectively with contacts **24** and **26**.

The intermediate portion of each leaf spring **28**, as shown particularly in FIGURES 2 and 3, has an elongated slot or hole **36** and a circular hole **38** formed therein. A cam follower **40** in the form of a saddle member, such as depicted in FIGURE 4, is assembled with each leaf spring **28** and is attached to the medial portion thereof. The saddle members **40** are composed of molded insulating material, such as a phenolic condensation product and comprise side rails **42** and **44**, end rails **46** and **48** and an intermediate web **50** having

an upstanding tooth type cam follower lug 52. A generally rectangular opening 54 is formed between the end rail 46 and the web 50, and a second generally rectangular opening 56 is formed between the cam follower tooth 52 and the end rail 48.

As seen particularly in FIGURES 2 and 3, the upper surface 58 of the end rail 46 is inclined downwardly relative to the lower surface of the side rails 42 and 44 and has an integral upstanding nub, or stud, 60. The lower surface 62 of the web 50 is substantially coplanar with the surface 58, and thus also is inclined slightly downward with respect ot the lower surface of the side rails 42 and 44 and is formed with an integral downwardly extending nub, or stud 64. The lower surface 66 of the cam follower 52 is inclined upwardly relative to the lower surface of the side rails 42 and 44, and the upper surface 68 of the end rail 48 is in a plane substantially parallel to the lower surfaces of side rails 42 and 44 and spaced above the upper surface 58 of the end rail 46.

The saddle member 40 is assembled with the leaf spring 28 by threading the contact end thereof through the opening 54 and through the opening 56 so that the stud 60 projects through the elongated slot 36 and the stud 64 projects through the circular hole 38. The diameter of the circular hole 38 is substantially equal to the diameter of the stud 64 so as to securely retain the saddle 40 in assembled relation with the leaf spring 28. In threading the leaf spring through the holes 54 and 56 such that the lower surface of the leaf spring engages the surface 58 of the end rail 46, the upper surface of the leaf spring engages the lower surface 62 of the web 44, and the lower surface of the leaf spring 28 engages the upper surface 68 of the end rail 48, the medial portion of the leaf spring 28 is bent intermediate its ends towards the cam 70, or in the same direction as the prestress of the leaf springs caused by the bend 30, as indicated in FIGURE 2. The cam follower tooth 52 is adapted to be engaged by a rotating cam 70, a fragmentary portion of which is depicted in FIGURES 2 and 3. The cam 70 may include a plurality of rises such as indicated by numeral 72 and dwells such as indicated by numeral 74 whereby when the follower 52 is aligned with a dwell 74, the contact 34 will engage the fixed contact 26 and when the dwell 52 is engaged by a rise 72, the leaf spring 28 will be deflected so that the contact 32 engages the fixed contact 24.

The cam and cam follower transmit force to the leaf spring 28 at the intermediate web 44 of the saddle member 40. As is clearly seen in FIGURE 3, if the cam 70 is properly assembled and aligned, the saddle member 40 is spaced from the surface of the base 10 when the contact 32 engages the fixed contact 24. This space between the base 10 can accommodate a substantial amount of overtravel of the cam and cam follower by bending the spring 28 between its ends in the same direction as the bend 30, without permanent deformation of the leaf spring 28. If the leaf spring 28 were to be deformed by overtravel of the cam and cam follower, the prestressing of the leaf spring by its attachment to the terminal 12 would be altered thereby varying the requisite contact pressure between the contact 34 and the fixed contact 26 when the follower is aligned with a dwell on the cam. However, with the construction as disclosed herein, any overtravel of the cam and cam follower merely results in additional movement of the saddle member 40 towards the surface of the base 10 without permanently deforming the leaf spring 28. During overtravel, the lower surface of the leaf spring 28 will be disengaged from the upper surface 68 of the rail 48, since the free end of the leaf spring is supported by the fixed contact 24 at this time. Since the upper surface of the leaf spring 28 is not confined adjacent the outer rail 48, the leaf spring is merely flexed in its medial portion during overtravel, and thus is not permanently deformed.

While the embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A leaf spring switch assembly including, a first terminal member attached to said base and carrying a first fixed contact spaced from said base, a second terminal member attached to said base and carrying a second contact spaced from said base and from said first fixed contact, a leaf spring having one end attached to said base and movable contact means at the other end thereof disposed between said fixed contacts, said leaf spring being attached so that the movable contact means thereof is inherently biased into engagement with the first fixed contact, and a saddle member having end rails, an intermediate cam follower and spaced openings between said cam follower and said end rails, said leaf spring being threaded through said openings so as to be bent in the medial portion thereof towards said first fixed contact.

2. The switch assembly set forth in claim 1 wherein said leaf spring has an elongated slot and a circular hole in the medial portion thereof.

3. The switch assembly set forth in claim 2 wherein said saddle member is formed with projecting studs on one of said end rails and said intermediate cam follower, and wherein said studs extend through the elongated slot and hole in said leaf spring.

4. The switch assembly set forth in claim 1 wherein the lower surface of said leaf spring normally engages the upper surface of one of said end rails, and wherein the upper surface of said leaf spring engages the lower surface of said intermediate cam follower.

5. The switch assembly set forth in claim 4 wherein the upper surface of one of said end rails and the lower surface of said cam follower are inclined with respect to the upper surface of the other end rail so that the medial portion of said leaf spring member will be reversely curved by said saddle member.

6. A leaf spring switch assembly including, a base of insulating material, a member attached to said base and having a fixed contact spaced therefrom, a leaf spring having one end attached to said base and prestressed adjacent its attachment in a direction towards said fixed contact, said leaf spring having a movable contact at its other end, and cam follower means attached to said leaf spring between the ends thereof, said leaf spring having its medial portion bent towards said fixed contact by the attachment of said cam follower means.

7. A leaf spring switch assembly including, a base of insulating material, a pair of members attached to said base and having fixed contacts spaced from each other and spaced from said base, a leaf spring having one end attached to said base and prestressed adjacent its attachment towards one of said fixed contacts, said leaf spring having movable contact means at its other end disposed between said fixed contacts, and cam follower means attached to said leaf spring between the ends thereof, said leaf spring having its medial portion bent towards said one fixed contact by the attachment of said cam follower means.

8. A leaf spring switch assembly including, a base of insulating material, a first terminal member attached to said base and carrying a first fixed contact spaced from said base, a second terminal member attached to said base carrying a second fixed contact spaced from said base and from said first fixed contact, a leaf spring having one end attached to said base and movable contact means at the other end thereof disposed between said fixed contacts, said leaf spring being prestressed adjacent its attachment to the base towards one of said fixed contacts, and cam follower means attached to the leaf spring between the ends thereof, said leaf spring

having its medial portion bent towards said one fixed contact by the attachment of said cam follower means, said cam follower means normally being spaced from said base when the movable contact means of said leaf spring is moved into engagement with the second fixed contact whereby said leaf spring will be bent towards said one fixed contact due to overtravel of said cam follower means.

9. A leaf spring switch assembly including, a base of insulating material, a first terminal member attached to said base and carrying a first fixed contact spaced from said base, a second terminal member attached to said base and carrying a second fixed contact spaced from said base and from said first fixed contact, a leaf spring having one end attached to said base and movable contact means at the other end thereof disposed between said fixed contacts, said leaf spring being prestressed adjacent its attachment to said base towards one of said fixed contacts, and a saddle member having a pair of spaced openings through which said leaf spring extends, said leaf spring having its medial portion bent toward said one fixed contact by the attachment of said saddle member.

10. A leaf spring switch assembly including, a base, a leaf spring having one end attached to said base and prestressed adjacent its attachment in one direction, and a saddle member having end rails, an intermediate cam follower and spaced openings between said cam follower and said end rails, said leaf spring being threaded through said openings and having its medial portion bent in said one direction by the attachment of said saddle member.

11. A leaf spring switch assembly including, a base, a fixed contact supported on said base in spaced relation thereto, a leaf spring having one end attached to said base and prestressed adjacent its attachment towards said fixed contact, and a saddle member having end rails, an intermediate cam follower and spaced openings between said cam follower and said end rails, said leaf spring being threaded through said openings and having its medial portion bent towards said fixed contact by the attachment of said saddle member.

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