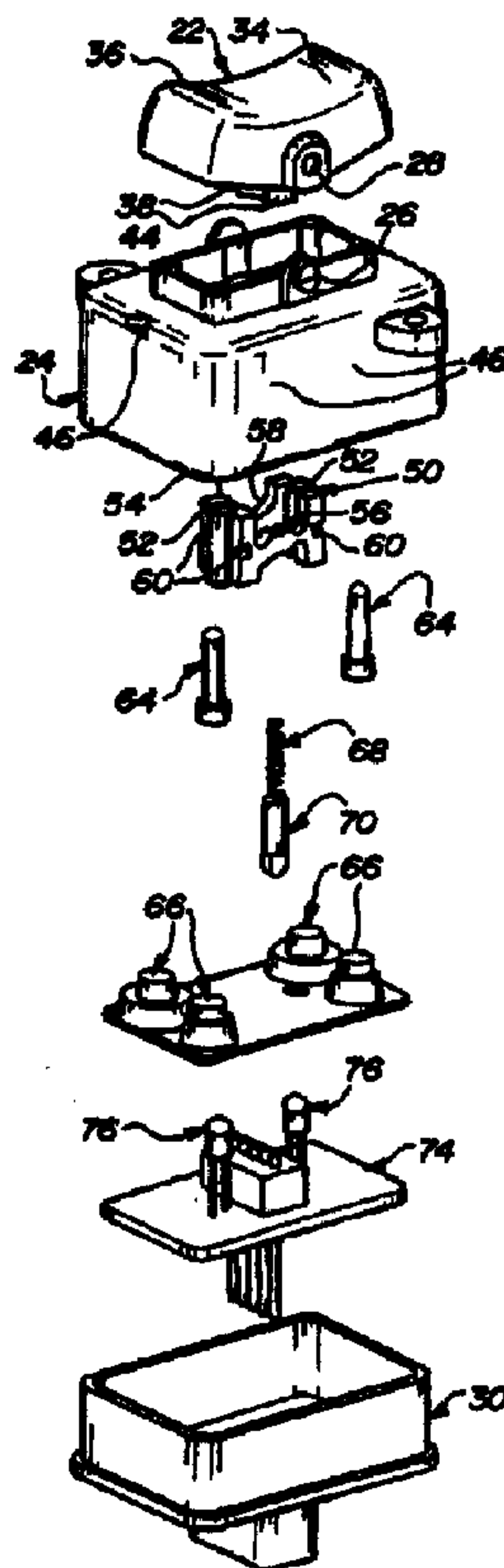




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(54) **INTERRUPTEUR UNIVERSEL**  
(54) **UNIVERSAL SWITCH**



(57) L'invention porte sur un interrupteur universel commandé par l'utilisateur muni d'un bouton monté pivotant sur un boîtier, et comportant un poussoir pouvant se placer sélectivement en l'un de plusieurs emplacements, entre le bouton et une came. Ladite came présente plusieurs surfaces pouvant être sélectionnées en fonction de l'orientation de la came et/ou de l'emplacement du poussoir.

(57) A user-activated switch assembly includes a knob pivotally mounted in a housing. A plunger is selectably mountable in any one of a plurality of locations between the knob and a cam. The cam includes a plurality of cam surfaces, any one of which can be selected based upon the orientation of the cam and/or the location of the plunger.

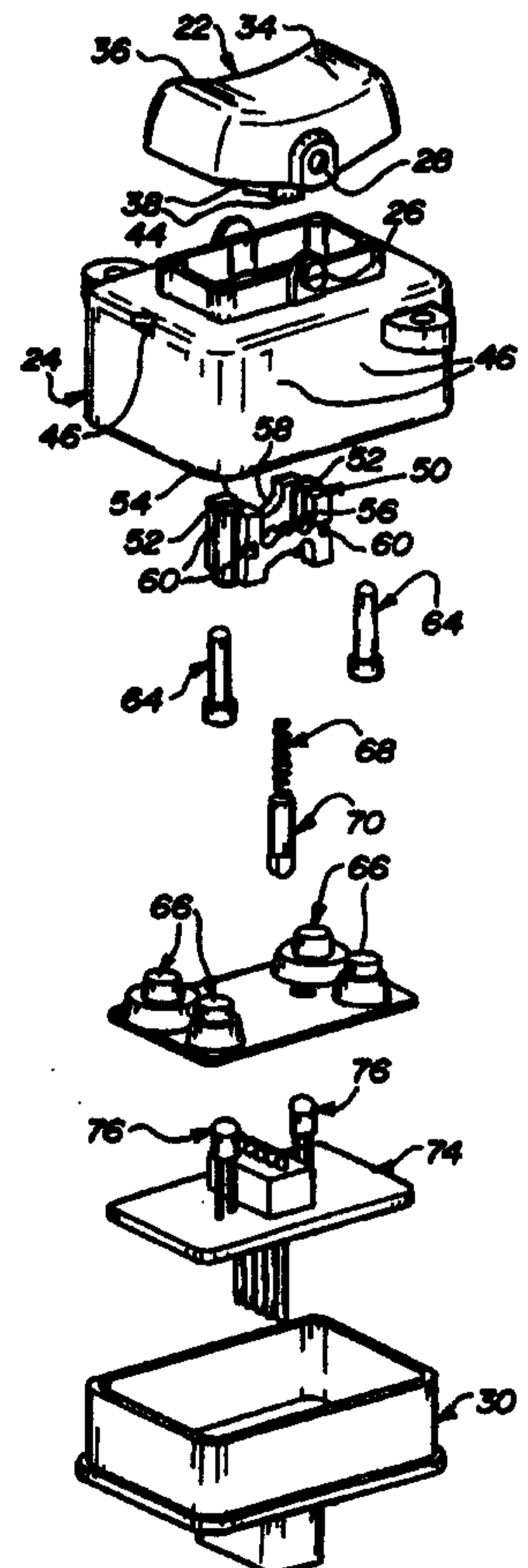
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US98/14094</p> <p>(22) International Filing Date: 8 July 1998 (08.07.98)</p> <p>(30) Priority Data: 08/898,137 22 July 1997 (22.07.97) US</p> <p>(71) Applicant: UT AUTOMOTIVE DEARBORN, INC. [US/US]; 5200 Auto Club Drive, Dearborn, MI 48126-2659 (US).</p> <p>(72) Inventor: KARASIK, Boris; 450 Woodland Hills Drive, Walled Lake, MI 48390 (US).</p> <p>(74) Agents: CARLSON, John, E. et al.; Howard &amp; Howard Attorneys, P.C., Suite 101, 1400 North Woodward Avenue, Bloomfield Hills, MI 48304 (US).</p>		<p>(81) Designated States: CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> <i>With international search report.</i></p>

**(54) Title: UNIVERSAL SWITCH****(57) Abstract**

A user-activated switch assembly includes a knob pivotally mounted in a housing. A plunger is selectably mountable in any one of a plurality of locations between the knob and a cam. The cam includes a plurality of cam surfaces, any one of which can be selected based upon the orientation of the cam and/or the location of the plunger.



## UNIVERSAL SWITCH

### BACKGROUND OF THE INVENTION

5           The present invention relates generally to a user-activated switch and more particularly to a user-activated switch assembly which can be assembled in different configurations to provide any one of a plurality of switch camming features.

10           Current switch assemblies generally comprise a rocker knob pivotally mounted to a housing and pivotally moveable, typically among three positions, from a neutral center position to either a rearward position or a forward position. A first set of contacts are closed when the knob is in the forward position and a second set of contacts are closed when the knob is in the rearward position. Typically, one of a plurality of known return features are provided. For example, the knob may be provided with appropriate hardware to provide a spring return from either the forward position or rearward position to the neutral position or to latch the switch in either the forward or rearward position until selectively moved to the other position. Further, combinations of these known return functions can be provided, such that the knob will automatically return from the forward position to the neutral position but latch when moved to the rearward position or vice versa.

15           In order to provide each of the desired return features, a separate set of hardware is required to be assembled into the switch assembly. This increases tooling costs for the hardware, the amount of inventory which must be maintained, the assembly time required to select, retrieve and install the proper hardware and the overall cost.

25

### SUMMARY OF THE INVENTION

The present invention provides a universal switch assembly which, by being assembled in one of a plurality of configurations, provides one of a plurality of available return features. The switch assembly generally comprises a rocker-type knob, selectably pivotable among a forward position, a neutral position and a rearward position in a housing. A plurality of different cam surfaces each having a different cam profile are provided in the housing. A plunger is mounted between the knob and one of the cam surfaces in the housing. One of the cam surfaces is selected in one of two ways. First, the plunger may be mounted in one of a plurality of locations relative to the knob, such that it is adjacent either the first cam surface or the second cam surface. Second, the cam surfaces may be positioned and oriented in different positions such that the selected one is adjacent the plunger. In this manner, a selected one of a plurality of available cam profiles can be provided to the knob.

Preferably, the plurality of cam surfaces are provided on a cam. A first cam surface is mounted along a first lateral side of the cam, while the second cam surface is mounted along a second lateral side of the cam. The cam can then be mounted in the housing in one of two orientations in order to locate a selected one of either the first cam surface or second cam surface adjacent the plunger.

Most preferably, the cam is also provided with a third cam surface and fourth cam surface on an opposite face of the cam to the first and second cam surfaces, respectively. Thus, any of the cam surfaces can be mounted adjacent the plunger.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light  
5 of the accompanying drawings in which:

Figure 1 is a perspective view of the switch assembly of the present invention;

Figure 2 is an exploded view of the switch assembly of Figure 1;

10 Figure 3 is a perspective view of the cam of Figure 2; and

Figure 4 is a perspective view of the cam of Figure 3, rotated 180 degrees.

### **DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT**

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A switch assembly 20 according to the present invention as shown in Figure 1. A rocker-style knob 22 is pivotally mounted on an upper housing 24. Preferably, pivot pins 26 in the upper housing 24 are snap-fit into apertures 28 in the knob 22 to form a pivot axis. The knob 22 and upper  
20 housing 24 are mounted onto a lower housing 30. The knob 22 includes a forward surface 34 forward of the pivot pins 26 and a rearward surface 36 rearwardly of the pivot pins 26 and apertures 28. Typically, a first electrical function is activated when a user presses the forward surface 34, thereby causing the knob 22 to pivot forwardly and a second electrical function is  
25 activated when a user presses the rearward surface 36, causing the knob 22 to pivot rearwardly. Of course, the terms "forward" and "rearward" are utilized herein only for convenience. It should be apparent that the switch assembly 20 could be mounted in any orientation.

An exploded view of the switch assembly 20 is shown in Figure 2. As  
30 can be seen in Figure 2, the knob 22 includes a pair of laterally spaced cylindrical sleeves 38 extending downwardly, generally perpendicular to the

axis defined by the apertures 28. The upper housing 24 includes an upper orifice 44 leading into the upper housing 24. A plurality of tabs 46, preferably four, (three shown) extend inwardly from the housing 30.

5 The switch assembly further includes a cam 50 having a pair of cylindrical passages 52, one at each axial end. An upper face 54 of the cam 50 includes a first cam surface 56 and a laterally spaced second cam surface 58. A plurality of notches 60 complementary to tabs 46 are disposed about the periphery of the cam 50.

10 A plurality of fingers 64 (two shown) such as are typically utilized in rocker-style switches are adapted to engage the knob 22 below the forward surface 34 and the rearward surface 36. Opposite ends of the fingers 64 are adapted to engage elastomeric switch pad 66 which, as is known, each contain a pair of electrical contacts which are opened or closed by pressure on the elastomeric switch pad 66. A spring 68 is provided for biasing a plunger 70  
15 downwardly. The spring 68 and plunger 70 are selected to fit within cylindrical sleeves 38. The switch assembly 20 further includes a PCB assembly 74 from which a pair of LEDs 76 extend upwardly.

Figure 3 is an enlarged view of the cam 50, showing the upper face 54, which includes the first cam surface 56 and second cam surface 58. It should  
20 be apparent that any cam profiles could be utilized in the plurality of cam surfaces provided on cam 50. Those skilled in the art will recognize the operation of the cam profiles illustrated herein and will know of numerous other cam profiles which could also be utilized with the present invention. The cam surfaces on cam 50 will be briefly described only to illustrate how  
25 different cam surfaces with different cam profiles can be provided to the knob 22 simply by assembling the components of switch assembly 20 in different configurations. As can be seen in Figure 3, the first cam surface 56 includes a forward recess 88 which will latch the plunger 70 (not shown) in the forward position. The first cam surface 56 further includes a neutral recess 90 which  
30 will retain the knob 22 in the neutral position until the knob 22 is pressed. The first cam surface 56 further includes a rearward recess 92 identical to

-5-

forward recess 88. The second cam surface 58, on the other hand, is provided with a forward ramp 96, which will always return the plunger 70 from the forward position to the neutral position as soon as pressure on knob 22 is released. Second cam surface 58 further includes a neutral recess 98 retaining knob 22 in the neutral position when no pressure is applied and a rearward ramp 100 identical to forward ramp 96.

The cam 50 further includes a third cam surface 104 on a lower face 106 opposite upper face 54. The third cam surface 104 provides a combination of the features described with respect to first cam surface 56 and second cam surface 58. Third cam surface 104 includes a forward recess 108 providing a latching feature, and a neutral recess 110. Third cam surface 104 further provides a rearward ramp 112, which will always return the plunger 70 from the rearward position to the neutral position when pressure is released. Again, it should be apparent that the terms "forward" and "rearward" are utilized only with respect to the drawings. It is a feature of the present invention that the cam 50 as shown in Figure 4 could be rotated about an axis parallel to cylindrical passages 52, such that "forward" and "rearward" would be interchanged. Although first cam surface 56 and second cam surface 58 are symmetrical, this would provide different features with respect to third cam surface 104, which provides different features for the "forward" and "rearward" positions.

The cam 50 is shown in Figure 4 rotated 180 degrees about an axis parallel to cylindrical passages 52 relative to Figure 3, in order that a fourth cam surface 116 can be shown. The fourth cam surface 116 provides a cam profile providing a double action profile typically utilized to activate a vehicle window lift function. The fourth cam surface 116 provides a neutral recess 118, from which extends a first forward ramp 120, for activating a window manually, and a second forward ramp 122 for activating a window in express mode. A first rearward ramp 124 extends rearwardly from the neutral recess 118. A second rearward ramp 126 extends rearwardly from first rearward ramp 124.

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The assembly steps required to selectively provide a selected cam profile to the knob 22 will be described with respect to Figure 2. First, the cam 50 can be installed into the upper housing 24 in any one of four orientations. The cam 50 can be installed with the upper face 54 or lower face 106 oriented toward knob 22. Further, for each of these two orientations, the cam 50 can also be rotated about an axis parallel to cylindrical passages 52, thus providing a total of four available orientations in which cam 50 can be installed into upper housing 24. The cam 50 is installed in upper housing 24 by shapping the tabs 46 into the notches 60. Further, the spring 68 and plunger 70 can be located in either of the two laterally spaced cylindrical sleeves 38, such that the plunger 70 will contact either of the two laterally spaced cam surfaces 56, 58 (or 104, 116). In total, this provides a total of eight possible cam profiles which can be provided to the knob 22. However, in the example shown, some of the cam surfaces are symmetrical and therefore, would not provide different cam profiles in some orientations.

Operation of switch assembly 20 will be described assuming the switch assembly 20 is assembled with the cam 50 oriented as shown in Figure 2 and the spring 68 and plunger 70 located in the knob 22 such that the plunger engages the first cam surface 56. The knob 22 will be provided with a cam profile provided by cam surface 56. As forward surface 34 is pressed, the knob 22 pivots forwardly, thereby causing the plunger 70 to move out of the neutral recess 90 into the rearward recess 92 into which it is latched and causing one of the fingers 64 to depress one of elastomeric switch pads 66 to activate a first electrical function. When the rearward surface 36 of knob 22 is pressed, the knob 22 pivots rearwardly, causing plunger 70 to move out of rearward recess 92 into neutral recess 90. If the rearward surface 36 of knob 22 is further pressed, the knob 22 continues to pivot rearwardly, thereby causing plunger 70 to move out of neutral recess 90 into forward recess 88 and causing one of the fingers 64 to depress one of elastomeric switch pads 66, thereby activating a second electrical function.



It should also be apparent that two springs 68 and plungers 70 could be inserted into both cylindrical sleeves 38 in order to provide multiple cam followers. Multiple elastomeric pads can provide a double pull/double throw switch version.

5           The switch assembly 20 of the present invention thus provides a possibility of eight cam profiles which can be provided to knob 22 all utilizing the same parts. Simply by selecting the location of spring 68 and plunger 70 in either of the cylindrical sleeves 38 and orienting the cam 50 in one of its four orientations, a selected one of eight possible cam profiles can be provided  
10 without the necessity of keeping inventory hardware for each of the eight profiles.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent a preferred embodiment. However, it should be noted that the invention can be  
15 practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.

1. A user-activated switch assembly comprising:  
a knob selectively moveable between a first position and a second  
position on a housing;  
said housing including a cam having a first pair of cam surfaces  
5 on one side of the cam and a second pair of cam surfaces on an opposite side  
of the cam;  
said housing, said cam and said knob being assembleable in  
either a first configuration or a second configuration, and said plunger being  
assembleable in either a first or second location for selectively contacting one  
10 of said first pair of cam surfaces in said first configuration and one of said  
second pair of cam surfaces in said second configuration; and  
wherein the plunger is biased between the knob and the  
selectively contacted cam surface, and the plunger is movable in contact with  
the selectively contacted cam surface as the knob is pivoted between the first  
15 and second positions.
2. The user-activated switch assembly of Claim 1 wherein  
said cam is mountable into said housing in at least two different orientations.
- 20 3. The user-activated switch assembly of Claim 1 wherein  
each of said first and second pairs of cam surfaces comprise different cam  
profiles.
4. The user-activated switch assembly of Claim 3 wherein  
25 said cam is mountable into said housing in at least four different orientations.
5. The user-activated switch assembly of claim 1, wherein  
said cam forms a pair of cylindrical passages which receive a corresponding  
pair of fingers which abut the knob for selectively activating one of a pair of  
30 electrical contacts as the knob is moved between the first and second positions.

6. A method of assembling a user-activated switch assembly including the steps of:

5 forming a first pair of cam surfaces on one side of a cam and a second pair of cam surfaces on an opposite side of the cam, wherein each said cam surface has a different profile;

positioning the cam in a housing, said cam being selectively positionable in at least four orientations with respect to the housing;

10 mounting a knob to the housing such that the knob is selectively movable between a first position and a second position;

positioning a cam follower between said knob and one of said first and second pairs of cam surfaces, said cam follower being selectively positionable adjacent either one of said first pair of cam surfaces or either one of said second pair of cam surfaces, depending upon the selected orientation of the cam.

7. The method of claim 6, further comprising:

forming a pair of cylindrical passages in the cam;

20 positioning a corresponding pair of fingers in the cylindrical passages for selectively activating one of a pair of electrical contacts as the knob is moved between the first and second positions.

AMENDED SHEET

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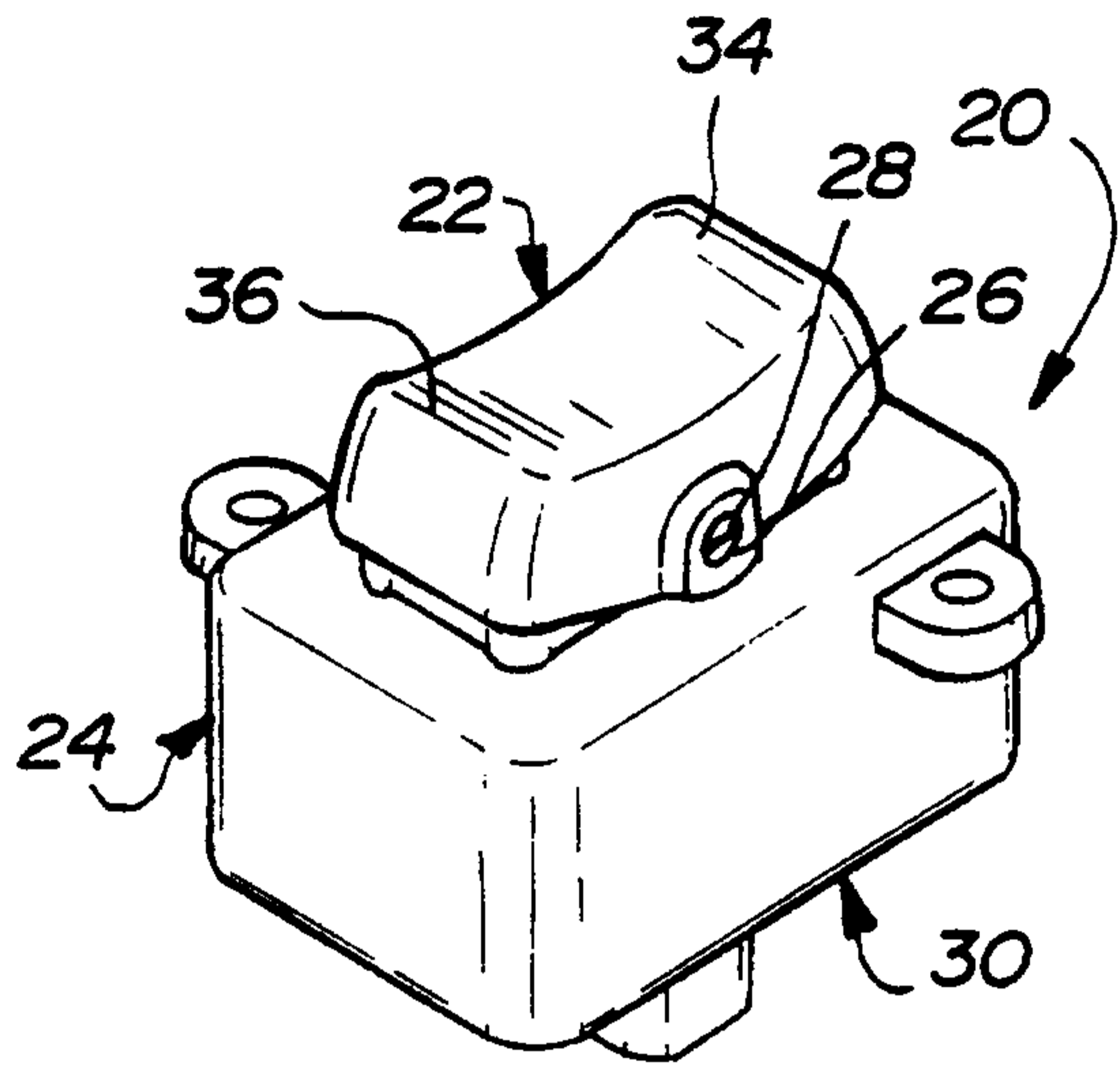


Fig-1

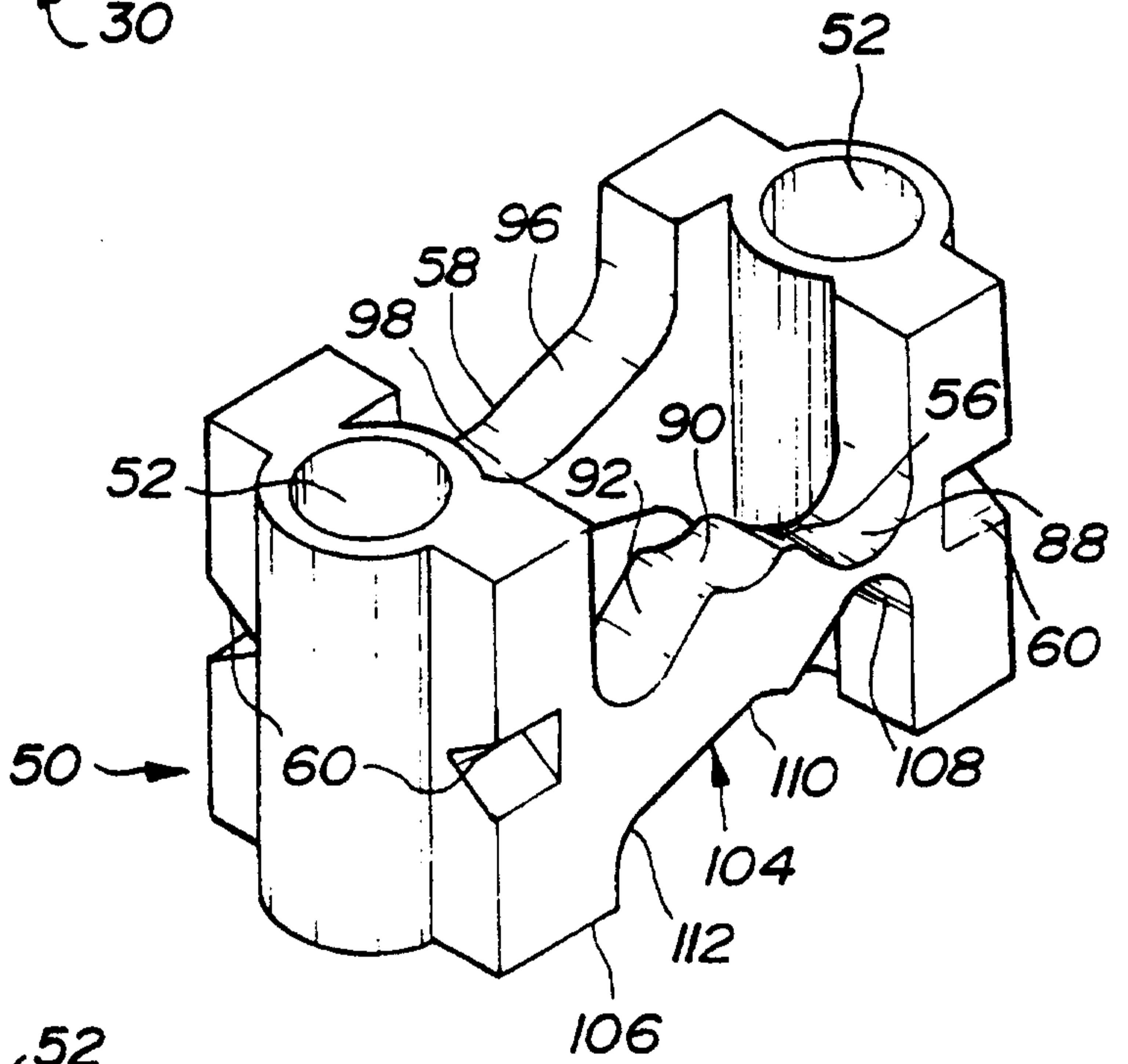


Fig-3

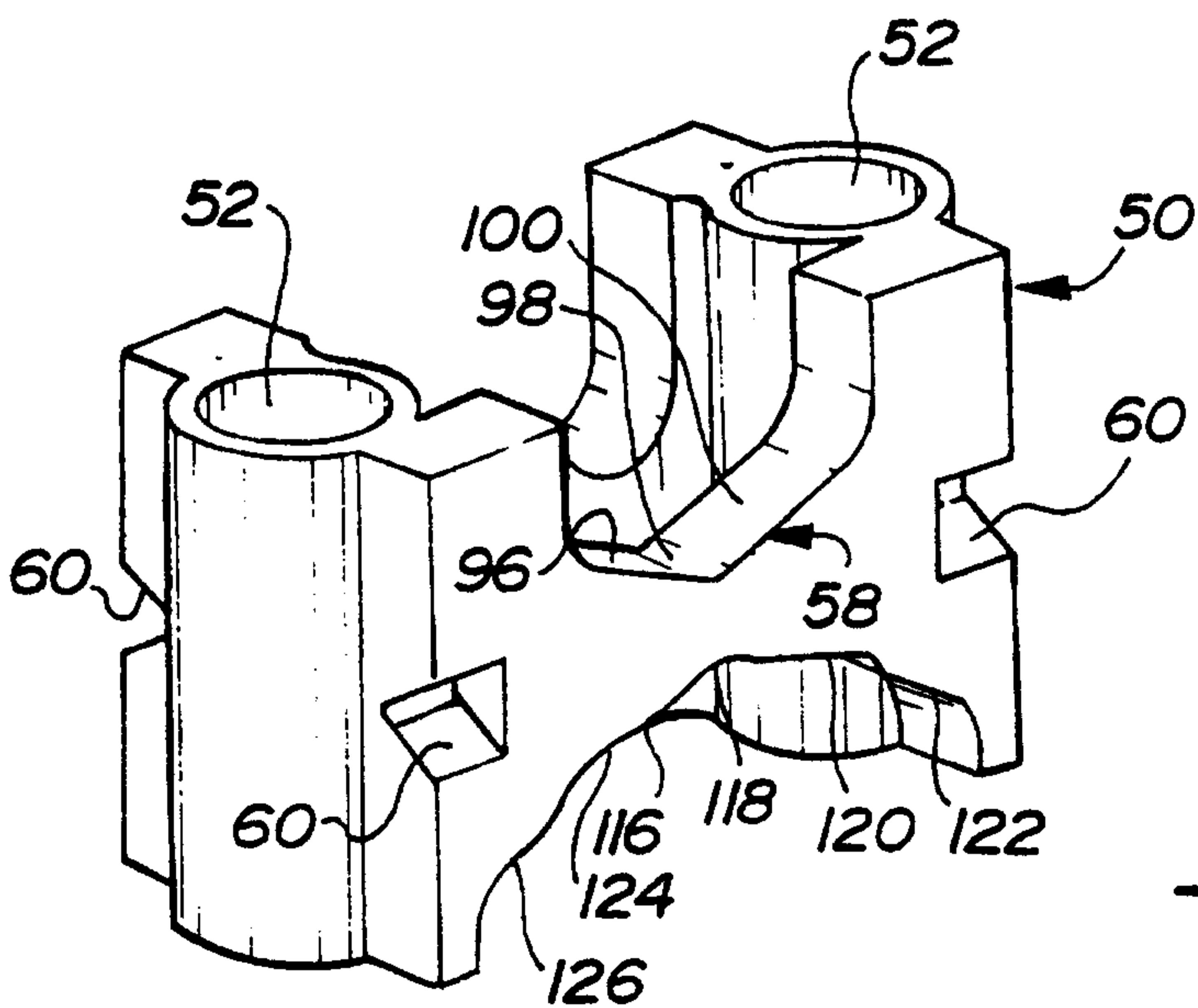


Fig-4

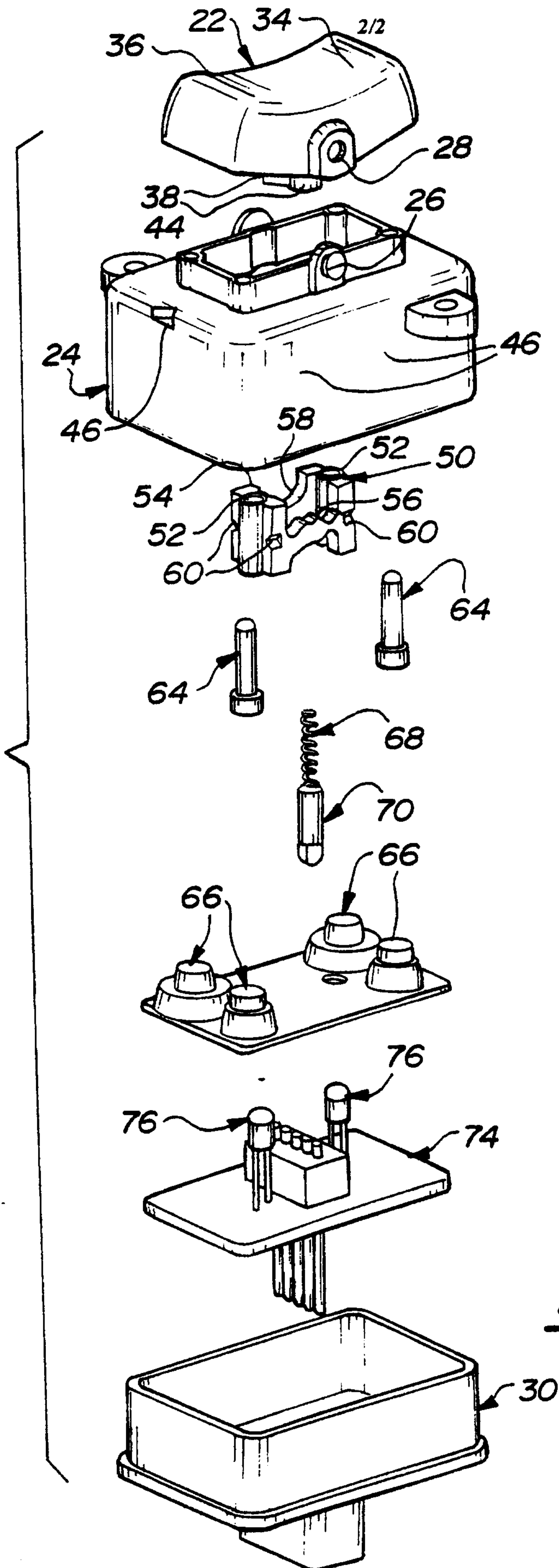


Fig-2