United States Patent [19]

Heide

[11] **3,852,554**

[45] **Dec. 3, 1974**

[54] **BIDIRECTIONAL ROTARY PUSH-BUTTON SWITCH**

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[73] Assignee: **Chicago Dynamics Industries, Inc.,** Chicago, Ill.

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[52] **U.S. Cl.** **200/156,** 74/435

[51] **Int. Cl.** **H01h 13/58**

[58] **Field of Search** 200/156; 74/435, 575, 578, 74/576, 577; 335/140

[56] **References Cited**

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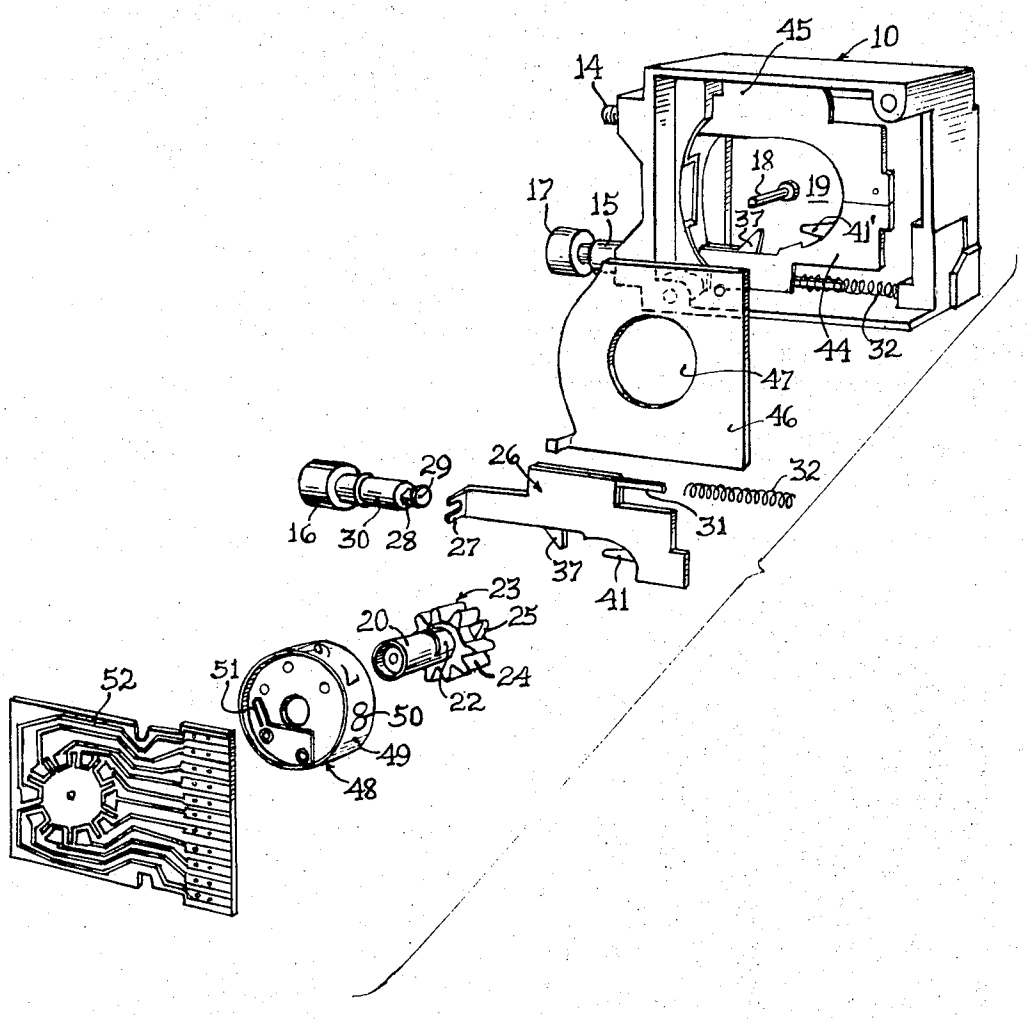
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Assistant Examiner—William J. Smith
Attorney, Agent, or Firm—Edward C. Threedy

[57] **ABSTRACT**

A multiposition push-button switch having limited bidirectional rotary movement provided by a gear member rotatable in either direction by a pair of independent reciprocally operating push buttons having actuating elements engageable at diametrically opposed tangents to the gear-rotating member.

6 Claims, 6 Drawing Figures



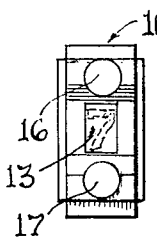


Fig. 1.

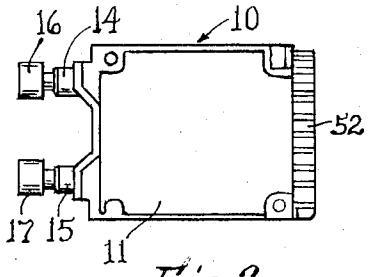


Fig. 2.

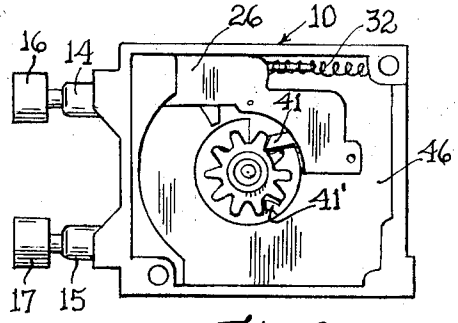


Fig. 3.

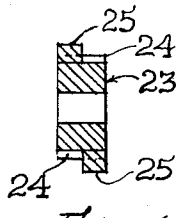


Fig. 6.

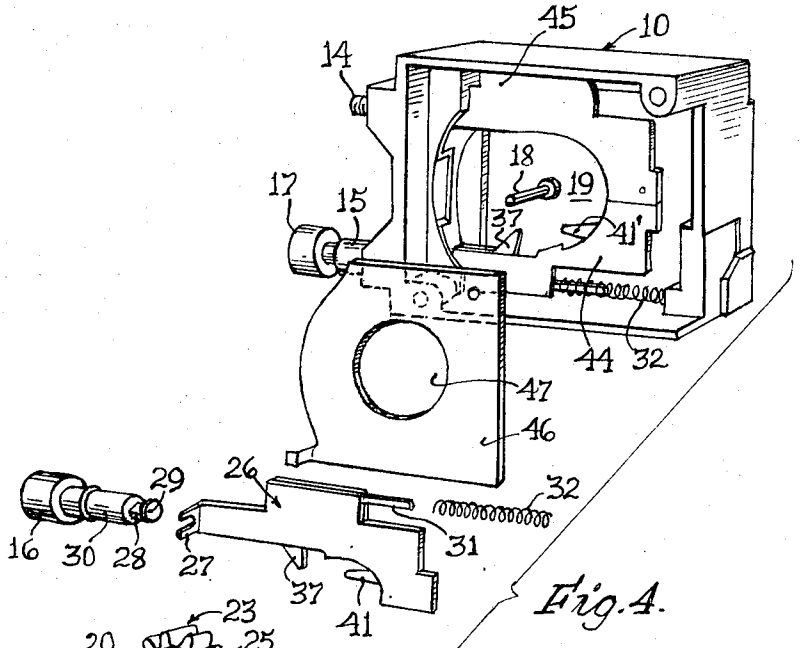
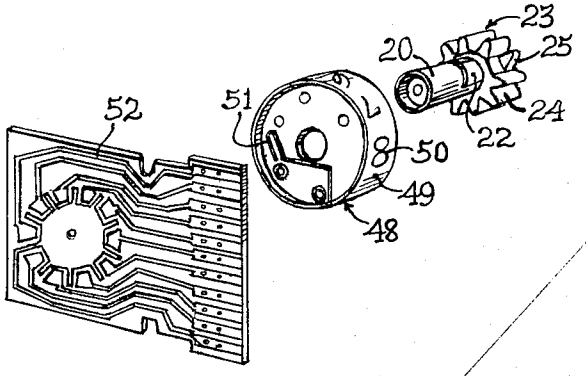


Fig. 4.



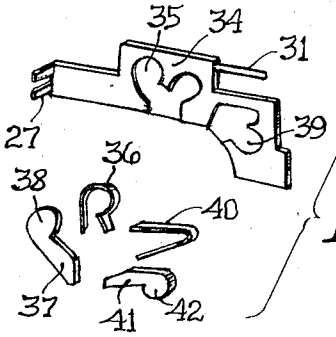


Fig. 5

BIDIRECTIONAL ROTARY PUSH-BUTTON SWITCH

SUMMARY OF THE INVENTION

It is an object of this invention to provide a multiposition push-button switch having limited bidirectional movement resulting from a gear rotated by a pair of independent push-button actuating levers, with said gear being preformed to provide a pair of missing half teeth diametrically opposed and in relation to the actuating levers of the independent push buttons to function as a limiting means for rotatable movement of the gear in either direction after a predetermined degree of rotation.

The actuating gear, being operatively positioned with respect to the actuating levers of the push buttons so that any desired degree of rotation in either direction may be achieved, results in limited switching function of the switch without replacement, modification, or substitution of any of the remaining components of the switch.

GENERAL DESCRIPTION

The invention will be best understood by reference to the accompanying drawing, which shows the preferred embodiment of the invention, and in which:

FIG. 1 is a front elevational view of the switch;

FIG. 2 is a side elevational view of the switch;

FIG. 3 is an enlarged side elevational view with certain components removed;

FIG. 4 is a perspective view of all of the switch components in exploded relation one to another;

FIG. 5 is a perspective view of the actuating elements of the switch;

FIG. 6 is a sectional detail view of the rotatable gear taken through the diameter thereof. As shown in the drawings, the switch comprises a hollow casing **10** and includes a removable side cover **11** permitting ready access to the interior of the casing **10.** The front wall **12** of the casing **10** provides a window **13,** through which a switch-position indicator is visible, as well as a pair of hollow bushings **14** and **15** through which the stem portion of suitable push buttons **16** and **17** project.

Within the hollow casing **10** there is a center pin **18** projecting laterally from the side wall **19** and upon which is adapted to be rotatably journalled a hollow shaft **20.** The shaft **20** is formed to provide adjacent one end axially extending flat surface portions **22** which project into a like formed center aperture of a gear **23.**

The gear **23** provides a plurality of radially extending teeth **24.** A selected pair of these teeth, one of which is shown at **25,** is formed of a lesser width than the remaining teeth **24,** for a purpose hereinafter made apparent. These half teeth **25** are formed to lie on the diameter of the gear **23** and are formed to be laterally offset with respect to each other as shown in FIG. **6** and, as such, are diametrically opposed to each other.

Within the hollow casing **10** there is mounted an actuating lever **26.** This lever **26** (see exploded perspective view, FIG. **4**) provides at one end a forked yoke **27** which is adapted to be projected into a cirumferentially extending groove **28** formed adjacent the inner end **29** of the stem portion **30** of the push button **16.** The actuating lever **26** also provides an axially extending post **31** which is adapted to be projected into a coil spring **32.**

The coil spring **32** has one end seated upon the rear wall **33** of the casing **10** and thus effects longitudinal projection of the actuating lever **26** and its associated push button **16** outwardly of the casing **10.** The actuating lever **26** provides an inner plate **34** which in turn has formed therein a recess **35** which is adapted to house a substantially U-shaped spring **36** as well as a trip finger **37.** The trip finger **37** is provided with a semicircular base portion **38** which is adapted to sit in a like semicircular portion of the recess **35.** A second recess **39** formed in the plate **34,** houses another U-shaped spring **40** and stop pin **41.** The stop pin **41** provides a semicircular end portion **42** which is adapted to sit in a similarly formed portion of the recess **39.**

To retain the springs **36** and **40** as well as the trip finger **37** and stop pin **41,** respectively, in their recesses **35** and **39,** a cover sheet **43** is placed over the entire side wall of the plate **34,** as shown.

A second actuating lever **44** is connected to the push button **17** and is disposed tangentially to the opposite side of the gear **23,** as viewed in FIG. **4.** To maintain the actuating lever **44** in place within the hollow casing **10,** there is provided a half plate **45** which, together with the actuating lever **44,** is disposed in spaced relation with respect to the side wall **19.**

A separating plate **46** having a center opening **47** formed therein which is of a size slightly greater than the circumference of the gear **23,** is placed within the hollow casing **10** so as to separate the actuating lever **26** from the actuating lever **44,** as seen in FIG. **3,** and to define a degree of horizontal offset between the lever **26** and the lever **44.**

Mounted on the shaft **20** is a switch-positioning drum **48** which provides a peripheral flange **49** upon which there appear the switch-position indicia **50.** On one side of the drum **48** there are mounted the switch contact fingers or brushes **51,** which are caused to move over circuitry contained on the printed circuit plate **52** (shown in its reverse position in FIG. **4,** so that the circuitry is visible).

When the actuating levers **26** and **44** are positioned within the hollow casing **10** of the switch and are connected to their respective push buttons **16** and **17,** they will assume the position shown in FIG. **3.** As shown, the stop pin **41** is engaged with one of the teeth **24** of the gear **23** and prevents rotation of the gear **23** together with the shaft **20,** in a clockwise direction, while the stop pin **41'** engages one of the teeth of the gear **23** and prevents rotation thereof in an anticlockwise direction.

If the push button **16** was forcibly moved inwardly of the casing **10,** the actuating lever **26** would move in a linear path against the action of the spring **32,** causing the trip finger **37** to engage one of the teeth **24** of the gear **23** and effect rotation of the gear in a clockwise direction. At the same time, the stop pin **41'** of the actuating lever **44** will, against the action of its retaining spring, ride over the crest of the gear teeth **24** as the gear **23** is rotated in a clockwise direction.

In operation, if the operator wishes to advance the switching components, he would depress the push button **16.** This will cause rotation of the gear **23** as well as the drum **48,** with resultant movement of the switch fingers **51** over the printed circuits of the plate **52.** If the operator wishes to retract from the indicated switch position, he would depress the push button **17,** causing

counterclockwise rotation of the gear **23** as well as the drum **48.**

This function is available in many multipositon rotary switches. However, upon installation of the switch of this invention into an associated device, the requirement may be that there is limited bidirectional movement. For example, if the user of this switch desires only a four-position movement in either direction of the drum **48** and switch fingers **51,** he would journal the shaft **20** on the pin **18** such that the half tooth **25** of the gear **23** is displaced five positions away (counterclockwise) from rotational contact by the trip finger **37.** Thus, when the actuating lever **26** is moved tangentially with respect to the gear **23,** its trip finger **37** will engage the first full tooth **24** of the gear **23** and rotate so as to angularly displace the gear **23** through a single switch position. Upon the fifth actuation of the lever **26,** its trip finger **37** will pass beyond the half tooth **25,** thus limiting the rotation of the gear **23** in that direction.

Such rotation of the gear **23** results in the positioning of the other half tooth **25** of the gear **23** which was disposed diametrically opposite the half tooth **25** with respect to its actuating lever **44,** such that the other half tooth **25** has now been displaced five positions and upon the actuation of the lever **44** to reverse the gear **23,** the lever **44** will engage four teeth before bypassing the other half tooth **25.** By this arrangement, the switch can be advanced through four positions and retracted through four positions.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a bidirectional rotary push-button switch having switch contacts rotatable in either direction through a plurality of switch positions and housed within an open-sided hollow case, and a removable side cover therefor, the combination comprising

a. a rotatable gear member having teeth of a predetermined width for rotating said switch contacts in either direction within the case,

b. a pair of operating members diametrically disposed on opposite sides of the axis of said gear member and laterally offset with respect to each other and mounted for independent reciprocal linear movement tangentially with respect to said gear member,

c. gear-rotating means carried by each of said operating members independently and alternately engageable with the teeth of said gear member to rotate said switch contacts step-by-step in either direction, and

d. means on said gear member limiting the continuous rotation of the switch contacts in either direction beyond a selected number of switch positions.

2. In a bidirectional rotary push-button switch as defined by claim **1,** wherein said means on said gear member limiting the continuous rotation of the switch contacts comprises selected teeth on said gear member having a width less than that of the remaining teeth so as to be half teeth laterally offset with respect to each other and said offset operating means so as to be out of the line of movement of said gear-rotating means at predetermined switch positions.

3. In a bidirectional rotary push-button switch as defined by claim **1** wherein said gear-rotating means carried by each of said operating members comprises a trip finger yieldably disposed so as to contact one gear tooth of said gear member during its linear movement tangentially with respect thereto and rotate said gear member a predetermined angular distance.

4. In a bidirectional rotary push-button switch as defined by claim **3,** wherein said means on said gear member limiting the continuous rotation of the switch contacts, comprises selected teeth on said gear member having a width less than that of the remaining teeth so as to be half teeth laterally offset with respect to each other and to said offset operating means so as to be out of the line of movement of said trip finger of either operating member at predetermined switch positions.

5. In a bidirectional rotary push-button switch as defined by claim **1** including means for supporting said gear member for rotation in either direction, said gear member being removably supported on said supporting means, whereby said limiting means thereon may be positioned relative to said gear-rotating means so that said gear-rotating means can only engage and rotate said gear member and the switch contacts thereon through a limited degree of rotation into and out of a selected number of switch positions.

6. In a bidirectional rotary push-button switch as defined by claim **4** including means for supporting said gear member for rotation in either direction, said gear member being removably supported on said supporting means, whereby said half teeth thereon may be positioned relative to said gear-rotating means so that said trip finger of either operating member can only engage and rotate said gear member and the switch contacts thereon through a limited degree of rotation into and out of a selected number of switch positions.

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