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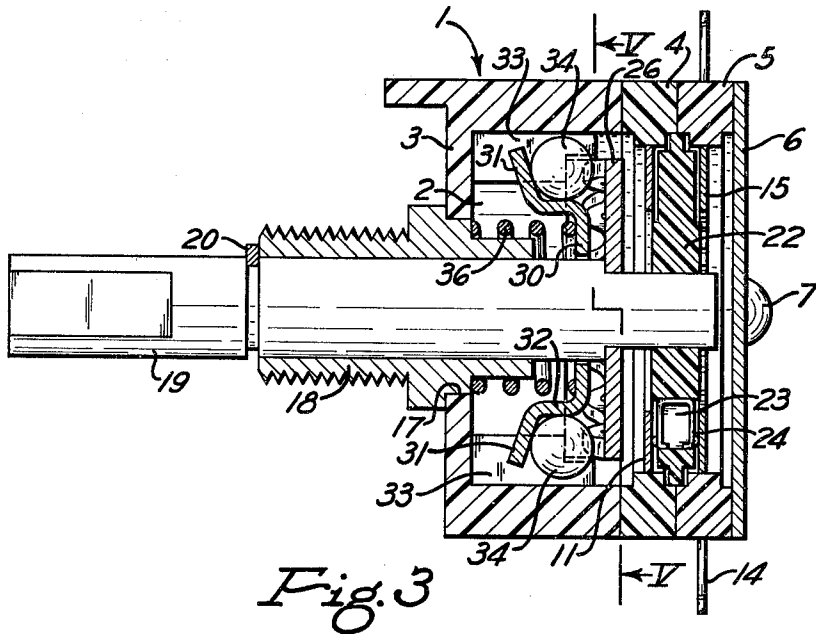
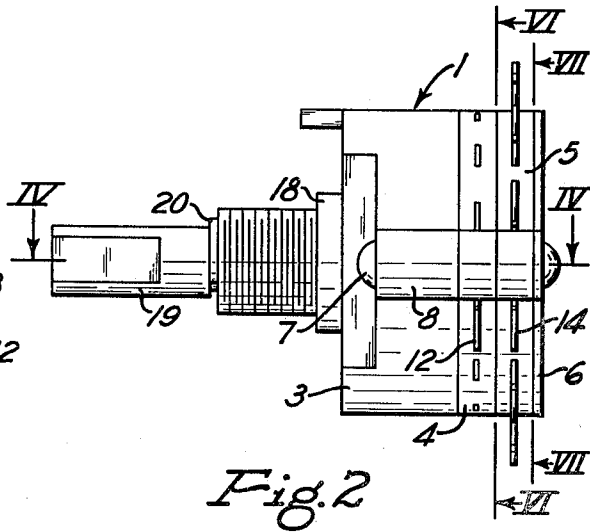
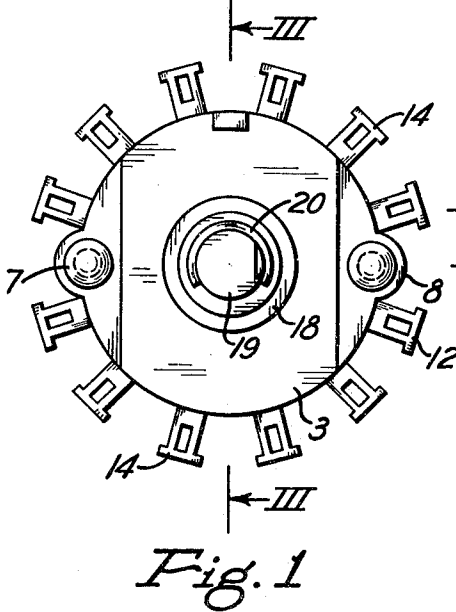
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3,499,133

ROTARY SWITCH WITH INDEXING MECHANISM

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2 Sheets-Sheet 1



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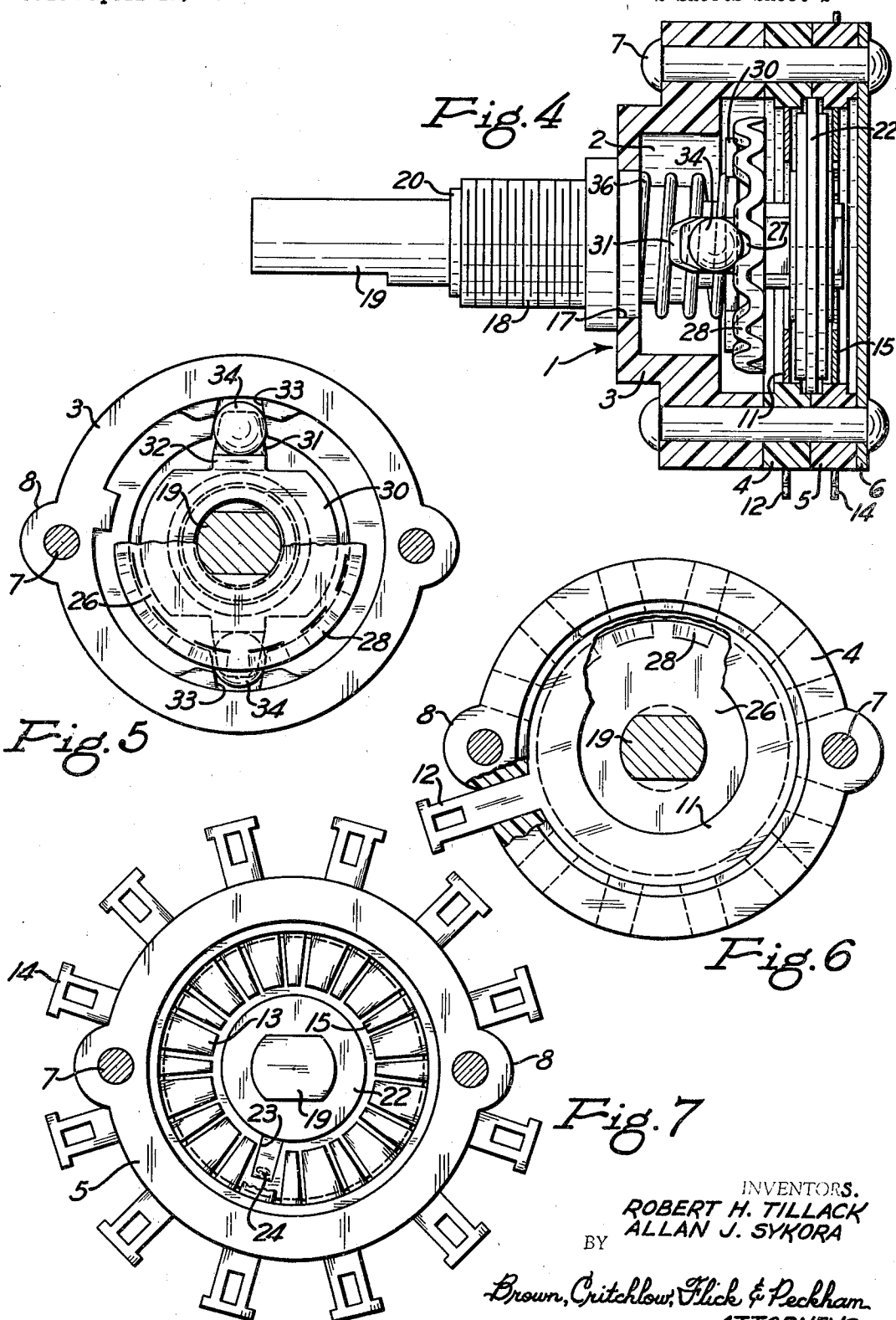
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2 Sheets-Sheet 2



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3,499,133

ROTARY SWITCH WITH INDEXING MECHANISM
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6 Claims

ABSTRACT OF THE DISCLOSURE

An index plate rigidly mounted on the shaft of a rotary switch is provided with circumferentially spaced indexing recesses. A pressure plate, slidably mounted on the shaft, has at least one ear projecting laterally into a radial slot in the side of the switch housing. A ball is disposed in the slot between the ear therein and the index plate. A coil spring urges the pressure plate toward the index plate to cause the ear to press the ball into an adjoining indexing recess.

It is among the objects of this invention to provide a rotary switch, which includes an indexing mechanism of inexpensive construction having a long life, a substantially constant torque, and means for automatically compensating for wear.

In accordance with this invention, the front wall of a rotary switch housing is provided with a central opening in which a shaft is rotatably mounted. A movable contact carried by the inner end of the shaft is engageable, when the shaft is turned, with fixed contacts mounted in the housing. Rigidly mounted on the shaft between the movable contact and the front wall of the housing is an index plate that is provided with circumferentially spaced indexing recesses. Slidably mounted on the shaft between the index plate and the front wall is a pressure plate spaced from the index plate and provided with at least one ear that projects laterally into a radial slot, with which the inside of the housing is provided. Preferably, there are two or more of these ears and slots. The slots extend lengthwise of the housing and have open rear ends. A ball is disposed in each slot between the ear therein and the index plate. Compressed between the front wall of the housing and the pressure plate there is a coil spring that causes the ears to press the balls into the adjoining index plate recesses. Consequently, when the index plate is turned by the shaft, the portions of that plate between adjacent indexing recesses will push the balls toward the front wall of the housing until the balls are received in the next recesses.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a front view of the switch;

FIG. 2 is a side view thereof;

FIG. 3 is an enlarged longitudinal section taken on the line III—III of FIG. 1;

FIG. 4 is an enlarged longitudinal section taken on the line IV—IV of FIG. 2;

FIG. 5 is a cross section taken on the line V—V of FIG. 3; and

FIGS. 6 and 7 are enlarged cross sections taken on the lines VI—VI and VII—VII, respectively, of FIG. 2.

Referring to the drawings, the switch may be any type of rotary switch in which a movable contact carried by a rotatable shaft is moved into and out of engagement with fixed contacts by turning the shaft. For the purpose of illustration only, the switch that is shown is similar to the one disclosed in Patent 3,258,547. Thus, a switch housing 1 has front and rear end walls connected by a side wall. The inside of the housing is a

cylindrical chamber 2. The housing shown is made from four parts. The front part of the housing is a cup-like member 3, while the back part of the housing is formed from two rings 4 and 5 of plastic and a separate end wall 6. These four parts are rigidly secured together by rivets 7 extending through perforated bosses 8 projecting from their outer surfaces at diametrically opposite points. Another ring can be added, if desired, without changing the length of the rivets by simply removing material from the front ends of the bosses on front member 3.

Molded in one of the plastic rings is a metal ring that projects into the housing chamber to form an annular collector 11 as shown in FIG. 6. Integral with this ring and projecting out of the housing from it is a terminal 12. Molded in the other plastic ring, as shown in FIG. 7, are the central portions of a plurality of circumferentially spaced metal strips that project into the housing chamber to form uniformly spaced fixed contacts 13. The strips also project radially from the ring to form electrical terminals 14. The fixed contacts can be spaced farther apart if desired, without interfering with smooth operation of the switch, if metal tabs 15 are molded into the ring between the contacts to partially span the space between them.

Rigidly mounted in a central opening 17 in the front wall of the housing is a bushing 18 that extends in both directions from the opening. The outer end portion of the bushing is threaded so that the switch can be mounted on a panel in the customary manner by inserting the bushing in an opening in the panel and then screwing a nut on the bushing. Rotatably mounted in the bushing is a shaft 19 that extends through the housing to a point near its rear end wall 6. The outer end of the shaft likewise projects from the bushing and is adapted to receive a knob for turning it. If movement of the shaft into the housing is not intended to be limited by the rear wall of the housing, it can be limited by a stop ring 20 mounted in a circumferential groove in the shaft and engaging the outer end of the bushing.

To connect the annular collector 11 with any fixed contact, an insulating rotor disc 22 is mounted on the flattened inner end portion of the shaft for rotation by the shaft. The rotor extends radially outward between the collector and the fixed contacts but it is spaced from both. As shown in FIG. 3, this rotor is provided with one or more openings 23 through it near its periphery, with at least the outer end portions of the openings located between the collector and the fixed contacts. Disposed in at least one of these openings is a movable contact 24 that bridges the space between the collector and the fixed contacts. The movable contact preferably is a generally U-shaped tiny strip of spring metal, the spaced outer ends of which engage the collector and one of the fixed contacts. When the shaft is rotated, the movable contact or contacts will be carried around the inside of the housing from one fixed contact to another.

It is a feature of this invention that the switch includes an indexing mechanism so that the movable contact can be held against any fixed contact desired without moving away from its until the shaft is turned manually. Accordingly, an index plate 26 is rigidly mounted on the shaft at the rear end of the front member 3 of the housing a short distance away from the fixed contacts. The plate also is spaced from the inner end of the bushing. This plate is provided with a plurality of circumferentially spaced indexing recesses 27. There are as many recesses as there are fixed contacts. Although these recesses could take the form of small openings in the index plate, it is preferred to form them by bending the marginal portion of the plate toward the front wall of the housing at circumferentially spaced intervals to produce spaced pro-

jections 28 that form the sides of the recesses. The bending operation is such that it gives the edge of the index plate a scalloped appearance as shown in FIG. 4 so that the recesses are concave and the ends of projections 28 are convex.

Between the index plate and the inner end of the bushing, and spaced from both, there is a pressure plate 30 that is slidably mounted on the shaft. This plate has a central body parallel to the index plate and circumferentially spaced, laterally projecting ears 31. Two diametrically opposite ears are sufficient as shown in FIG. 5. For best results, the ears are integrally connected to the central body by portions 32 of the pressure plate that extend from the body toward the front end of the housing substantially parallel to the shaft. These connecting portions may be about the same width as the ears themselves. The ears project into a pair of radial slots 33, with which the inside of the front member of the housing is provided. These slots extend lengthwise of the housing and have open rear ends. The ears fit loosely enough in the slots to permit the ears to move freely lengthwise of the slots. Disposed in each slot between the ear and the index plate is a metal ball 34 that engages the side walls of the slot. Connecting portions 32 of the pressure plate help to hold the balls in the slots, especially while the switch is being assembled.

A coil spring 36 encircles the shaft between the front wall of the housing and pressure plate 30. The spring is under compression and therefore it urges the pressure plate toward the index plate, so ears 31 press the balls into two of the index plate recesses 27 to prevent the index plate and shaft from turning unless sufficient torque is applied manually to the outer end of the shaft to turn it. When that happens, projections 28 on the index plate ride over the balls, pushing them toward the front ends of the housing slots, which is permitted because the coil spring will compress further. As soon as the projections pass the balls, the spring will force the balls back into the next pair of indexing recesses. In this way the movable contact can be indexed into any desired position to electrically connect the collector with any of the fixed contacts. In some cases it may be desirable to use only a single ball. In such a case it is desirable to insert a spacing washer between the index plate and the pressure plate to prevent the latter from tilting excessively when the ball is in a recess 27.

Another feature of this invention is that wear of the balls or the side walls of the slots containing them is automatically compensated for by tapering the slots radially outward in cross section as shown in FIG. 5 and by having the ears 31 diverge toward the front end of the housing so that they are inclined to the axis of the shaft. The inclined ears therefore urge the balls radially outward in the slots so that the balls always remain in engagement with both side walls of each slot even though the slots may become wider during use, or the balls become smaller.

The indexing mechanism disclosed herein has a long life compared to other rotary switch indexing mechanisms. Due to the use of a coil spring, a greater torque range can be provided than with conventional flat springs, and no appreciable change in torque is evident over the extended life of the indexing mechanism. The use of two balls provides a balanced, positive, detent action. The front member of the switch housing can be a metal die

casting which permits it to be grounded if desired, or it can be molded from a plastic, which of course will insulate it from grounding.

We claim:

1. A rotary switch comprising a housing having front and rear end walls, the front wall provided with a central opening therethrough, a shaft rotatably mounted in said opening, means limiting axial movement of the shaft rearwardly into the housing, a movable contact carried by the inner end of the shaft, fixed contacts mounted in the housing for engagement by said movable contact when the shaft is turned, an index plate rigidly mounted on the shaft between the movable contact and said front wall and provided with a plurality of circumferentially spaced indexing recesses, a pressure plate slidably mounted on the shaft between the index plate and said front wall, the pressure plate spaced from the index plate and provided with a laterally projecting ear, the inside of the housing provided with a radial slot extending lengthwise of the housing for receiving said ear and having an open rear end, a ball disposed in said slot between the ear therein and the index plate, and a spring in the housing urging the pressure plate toward the index plate to cause said ear to press the ball into the adjoining index plate recess, whereby when the index plate is turned by the shaft the portions of that plate between adjacent indexing recesses will push the ball toward said front wall until the ball is received in the next recess.

2. A rotary switch according to claim 1, in which said index plate recesses are formed between circumferentially spaced peripheral portions of the index plate projecting toward said front wall of the housing.

3. A rotary switch according to claim 1, in which said ear is inclined toward said front wall, said slot tapers radially outward, and the ball engages the opposite side walls of the slot containing it.

4. A rotary switch according to claim 1, in which said pressure plate has a central body substantially parallel to the index plate, and said ear is integrally connected to said body by a portion of the pressure plate that extends from said body toward said front wall and is substantially parallel to the shaft.

5. A rotary switch according to claim 4, in which said ear is inclined toward said front wall, said slot tapers radially outward, and the ball engages the opposite side walls of the slot containing it.

6. A rotary switch according to claim 1, including a plurality of said ears circumferentially spaced around the pressure plate, a plurality of said slots receiving said ears, and a ball in each slot.

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U.S. Cl. X.R.