United States Patent

Lewis

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[54] **ROTARY ELECTRICAL SWITCH ASSEMBLY HAVING A ROTOR AND AN ECCENTRICALLY MOUNTED CONTACT MEMBER**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **200/61.88,** 200/153 N

[51] **Int. Cl.** **H01h 9/06**

[58] **Field of Search** ..... 200/61.58, 61.85, 61.88, 61.39, 200/153.15, 17, 156, 153 N

[56] **References Cited**

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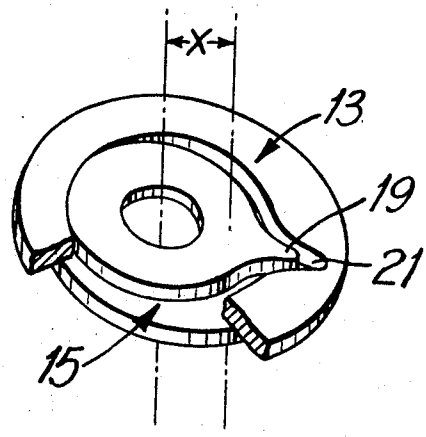
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[57] **ABSTRACT**

A switch for use with an automatic transmission drive selector lever of a road vehicle in which the contacts of the switch are arranged with sufficient clearance therebetween to avoid arcing between the contacts and permit physical mounting of the contacts while allowing the switch to be operated by a small angular movement. Thus, the switch may be mounted in the very small space available since the moving contact moves through a larger angular distance than the input member or shaft thereby enabling the fixed contacts to be easily accommodated.

4 Claims, 5 Drawing Figures



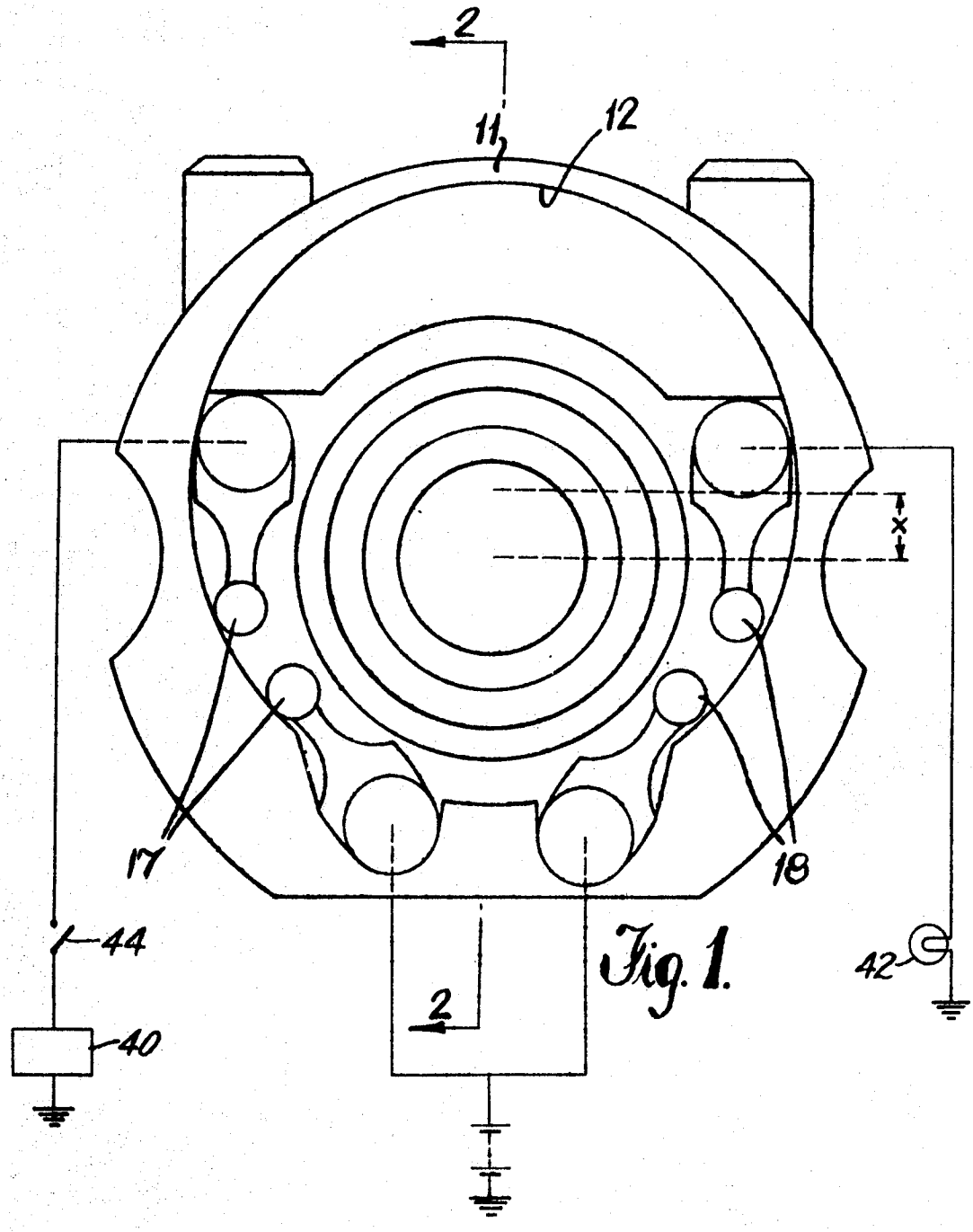


Fig. 1.

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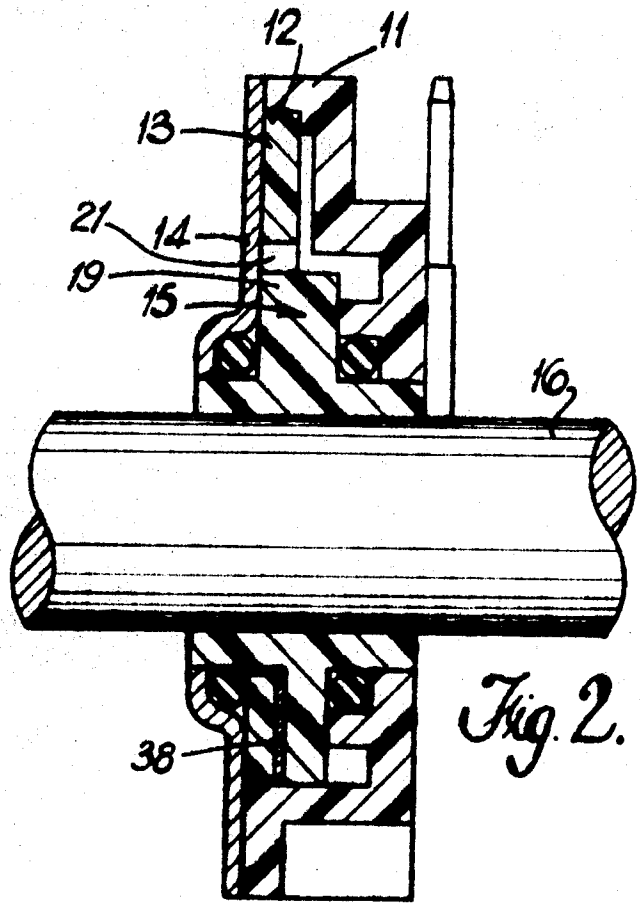


Fig. 2.

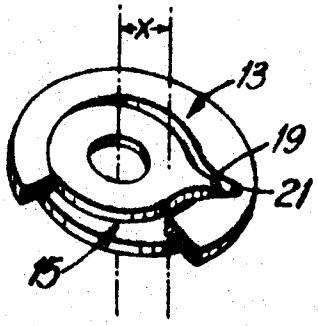


Fig. 2A.

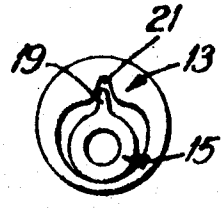


Fig. 2B.

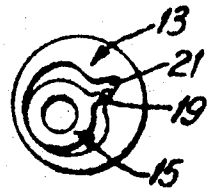


Fig. 2C.

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ROTARY ELECTRICAL SWITCH ASSEMBLY HAVING A ROTOR AND AN ECCENTRICALLY MOUNTED CONTACT MEMBER

This invention relates to electrical switches.

The salient object of the present invention is to provide a switch which includes a body, a shaft mounted in the body for rotation about a first axis relative to the body, a movable contact member mounted for rotation relative to the body about a second axis parallel to, but spaced from, said first axis, means coupling said shaft to said movable contact member so that said member is rotated relative to the body when said shaft is rotated, and fixed contacts carried by said body and engageable by movable contacts carried by said member.

Further objects and advantages of the invention will become more readily apparent from the following detailed description and annexed drawings and in which drawings;

FIG. 1 is a plan view of an electric switch with the cover, the rotor and the drive shaft being removed;

FIG. 2 is a view taken along the line 2—2 of FIG. 1 of the assembled switch;

FIG. 2A is a perspective illustration of the rotor and the printed circuit board for movable contact member of the novel switch;

FIG. 2B is a plan view of the assembly of FIG. 2A in one position; and

FIG. 2C is a top plan view of the assembly of FIG. 2A in another position rotated in the clockwise direction.

Referring to the drawings the switch includes a body **11** molded in a phenolic resin, or other synthetic resin materials. The body **11** is formed with a cylindrical recess **12** within which is rotatably mounted a circular printed circuit board **13**, the outer diameter of the printed circuit board **13** being substantially equal to the inner diameter of the recess **12**. The printed circuit board **13** constitutes a movable substantially ring-like contact carrier and includes a plurality of exposed conductive areas, constituting movable contacts. The body **11** has associated therewith a pressed steel cover **14** which defines with the body **11** the switch casing. The printed circuit board **13** is annular and is disposed about a shaft **16**. Specifically, extending through the central hole in the printed circuit board is a molded synthetic resin rotor **15** which is journalled for rotation in the body **11** and the cover **14**. The rotor **15** is hollow and is adapted to be drivingly engaged with a shaft **16**. The axis about which the rotor **15** is rotatable relative to the casing is parallel to the axis about which the printed circuit board **13** is rotatable relative to the casing, but the axes of rotation are spaced apart by a predetermined amount X as indicated in FIG. **1**, with the central hole in the printed circuit board **13** being sufficiently large to accommodate the rotor **15** with the axis of the rotor **15** offset from the axis of rotation of the printed circuit board **13**.

The printed circuit board **13** is drivingly engaged with the rotor **15** through the intermediary of a radially extending rib or post **19** integral with the rotor **15** with the post extending parallel to the axis of rotation of the rotor into engagement with a radially extending slot **21** in the printed circuit board **13**. Thus, the printed circuit board **13** can be moved through a limited angular distance with respect to the casing by rotating the shaft **16** engaged with the rotor. The body **11** carries two pairs of fixed contacts **17**, **18** and each contact is in the form of a flexible finger electrically connected to a terminal blade on the exterior of the body **11**. The contacts **17**, **18** are engageable by respective exposed conductive areas **38** of the printed circuit board, in predetermined angular positions of the printed circuit board, so that circuits between the contacts of each pair are made or broken by rotation of the printed circuit board **13** relative to the body **11**.

The arrangement of the switch is such that within the permitted range of movement of the printed circuit board, by virtue of the spacing of the axes of rotation of the rotor **15** and the printed circuit board **13**, the printed circuit board **13** is moved through a greater angular distance than is rotor **15** which is driving the printed circuit board. Thus, for a given angular movement of the rotor **15** such as from the position shown in FIG. **2B** to the position shown in FIG. **2C** the printed circuit board **13** will be moved through a distance greater than that through which the rotor **15** moves and so the contacts **17**,**18**, can be spaced apart by an amount greater than that by which they could be spaced if there were no difference in the degree of movement of the rotor and the printed circuit board. Such an arrangement is particularly useful in am embodiment wherein the angular movement of the rotor is such that in a conventional rotary switch the contacts would have to be so close to one another that there would be a severe risk of arcing between the contacts. Further, since such an arrangement provides greater angular movement between operative positions of the switch, it is possible to employ only a small angular movement of the shaft and obtain reasonable tolerances allowable in the construction of the switch. Attention is herein directed to FIGS. **2A**, **2B** and **2C** of the drawings wherein the angular movement as above-described is illustrated.

In one practical embodiment of the switch, the switch is used to control the starter motor circuit **40** and the reversing light circuit **42** of a road vehicle equipped with an automatic transmission. The shaft **16** is the selector shaft of the automatic transmission which is moved manually to select the settings of the automatic transmission. Clearly, the reversing light circuit of the vehicle must only be completed when the reverse position of the automatic transmission is selected and similarly the engine starting circuit of the vehicle should only be capable of being completed, through the starter switch of the vehicle, in the park, neutral positions of the automatic transmission. The contacts **18** are connected in the reversing light circuit of the vehicle and the contacts **17** are connected in the starter motor circuit of the vehicle, it being appreciated that the starter motor circuit also includes a manually operable starter switch **44**. The printed circuit board **13** is so designed that the circuit between the contacts **18** is only completed when the printed circuit board is moved to a position corresponding to the reverse position of the automatic transmission, and the circuit between the contacts **17** is completed only in the positions of the printed circuit board **13** corresponding to the park and neutral positions of the automatic transmission. Thus, upon moving the selector shaft **16** of the automatic transmission to the reverse position, to engage the reverse gear of the vehicle, the printed circuit board **13** is moved by the rotor **15** to a position wherein the circuit between the contacts **18** is completed, thereby energizing the reversing lamps of the vehicle, and upon moving the selector shaft **16** to a position wherein the automatic transmission is in the park or neutral condition, the circuit between the contacts **17** is completed, so that the starter motor of the vehicle can be energized by closing the starter motor switch. In positions of the selector shaft **16** other than those corresponding to the park, neutral or reverse positions of the automatic transmission, neither the circuit between the contacts **18**, nor the circuit between the contacts **17** is completed, and hence the reversing lights are not energized, and the starter motor of the vehicle cannot be energized by closing the starter switch.

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

1. An electrical switch including a body, a shaft mounted in the body for rotation about a first axis relative to the body, a movable substantially ring-like member disposed about said first axis and mounted for rotation relative to the body about a second axis parallel to, but spaced from, said first axis, contacts carried by said movable member, means coupling said shaft to said movable member so that said member is rotated relative to the body when said shaft is rotated, the angular direction of rotation of said member being the same as that of said shaft, and fixed contacts carried by said body and engagable by the contacts carried by said movable member.

2. The switch as claimed in claim 1 wherein the means coupling said shaft to said movable member includes a rotor movable with said shaft, said rotor including a post which engages a radially extending slot in said movable member.

3. The switch as claimed in claim 1 wherein said movable member is a printed circuit board having a plurality of exposed conductive areas thereon.

4. The switch as claimed in claim 1 wherein said shaft is adapted to comprise a selector shaft of an automatic transmission of a road vehicle and said fixed contacts carried by said body are adapted to be connected in a reversing light circuit and a starter motor circuit of the vehicle respectively, with said reversing light circuit being completed when said selector shaft is in the reverse drive position, and said starter motor circuit being completed when said selector shaft is in the park and neutral positions.

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