Sept. 16, 1969 K. C. ALLISON 3,467,792

ROTARY ELECTRIC SWITCH ROTOR CONSTRUCTION

Filed March 8, 1968

Fig. 1.

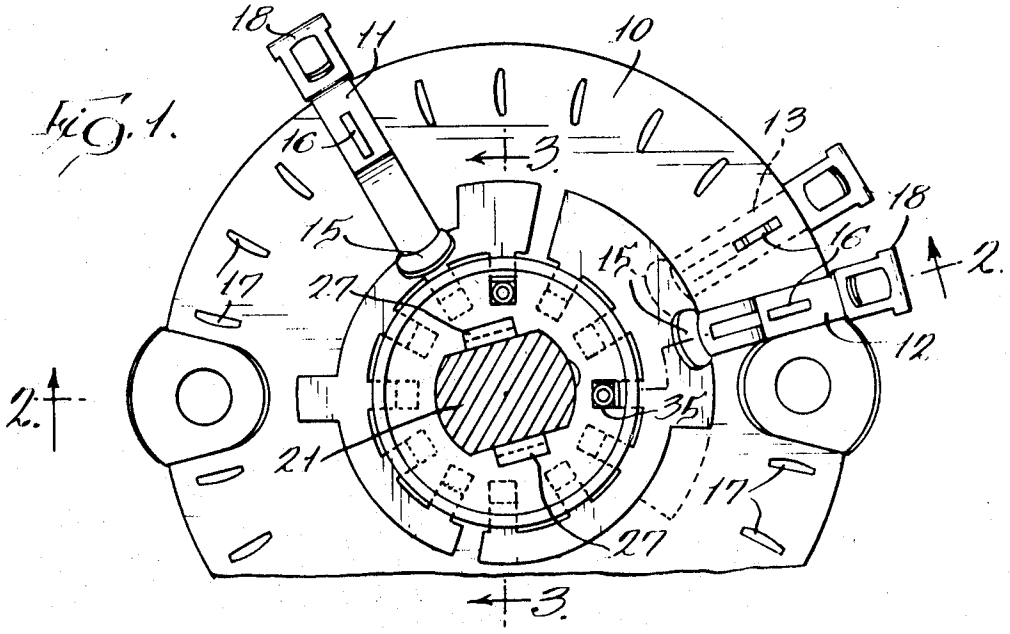


Fig. 2.

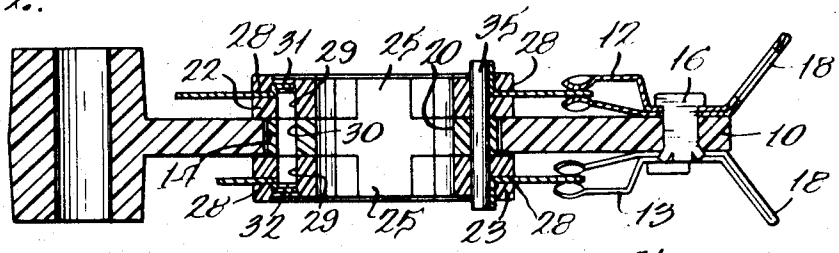


Fig. 3.

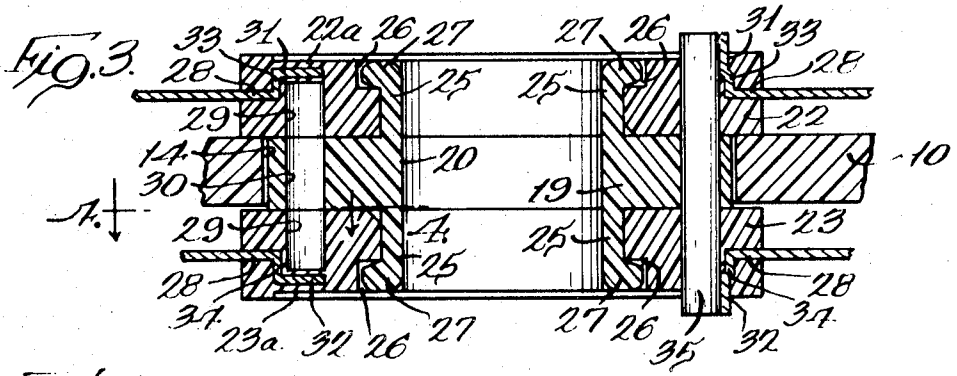
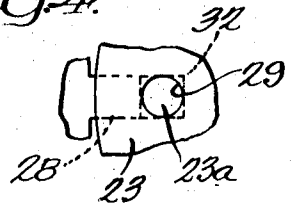


Fig. 4.



Inventor:
Kenneth C. Allison
By Stanley Hoods
Atty

United States Patent Office 3,467,792
Patented Sept. 16, 1969

3,467,792

ROTARY ELECTRIC SWITCH ROTOR CONSTRUCTION

Kenneth C. Allison, 1546 S. Shore Drive, Crystal Lake, Ill. 60014

Filed Mar. 8, 1968, Ser. No. 711,706
Int. Cl. H01h *19/54, 21/76*
U.S. Cl. 200—11 6 Claims

ABSTRACT OF THE DISCLOSURE

An improved rotor construction for a multi-contact rotary switch as disclosed herein includes a molded rotor body having a rotor contact blade supporting portion in which the shank portion of each rotor contact blade is embedded and the area between the opening in the rotor for occupancy by the rotor operating shaft and the area containing said shank portions of the contact blades is provided with an axially extending recess in which radially extending inner ends or terminals of said rotor contact blades are available for welded or soldered connection with a bridge member in said recess when said terminals are upended into axially extending position. Each terminal is offset from the shank portion of the contact blade associated therewith in a direction away from the terminal in axially paired relation thereto so as to bring said terminal, when upended, closer to the surface of the rotor and accordingly more accessible for the production of a soldered or welded connection with the surface of a bridge member facing said terminals.

This invention relates to improvements in the design and construction of multiple contact rotary switch units.

More particularly it is concerned with rotary switch units of the type wherein contact fingers having portions embedded in a molded rotor body and which occupy aligned positions in separate planes spaced apart axially of the rotor body are provided with inner terminal portions or lugs which are joined by a soldered or welded connection to a conductive bridge member which occupies an open clearway coextensive with the axial dimension of the rotor to establish an electrical link between contact members secured to axially opposed sides of a stator via said bridge member and the terminals or lugs of the axially aligned rotor contact fingers to which the bridge member is joined. In switch units of this type the rotor body is initially formed with a cavity or recess which defines an open clearway intersecting both faces of the rotor except for radially extending terminals or lugs of the axially aligned rotor contact fingers and a break away or rupturable section of the opposite face portions of the rotor body in which said radially extending terminals or lugs are contained pending upending of the terminals in the direction of the face of the rotor body nearest said terminal and rupture of the breakaway section incident to such upending action. Such disposition of the terminals in axially extending relation is required to afford access to the terminal in the production of a soldered or welded connection with the surface of the bridge member facing said terminal. Since the region occupied by the bridge member is necessarily confined to the area of the rotor surrounding the opening in the rotor which receives the rotor operating shaft, the use of such bridge members in miniaturized rotary switch units consequently restricts the radial dimension of the area available for occupancy by the rotor contact terminals while in radially extending position with the result that the terminal when upended does not provide exposure of the terminal as needed to obtain a reliable soldered or welded connection between the terminal and the bridge member associated therewith.

In a rotor construction embodying the features of this invention, it is an object to provide rotor contact fingers having portions embedded in a molded rotor body and terminals forming inner extensions of said fingers which are extendable axially of the rotor a distance greater than the radial dimension of the area occupied by said terminals while in radially extending position so as to assure ample access to the terminals as needed for the production of a soldered or welded connection between a bridge member and the surface of the upended terminals of the rotor contact fingers facing said bridge member.

Other and further objects, features and advantages of the present invention will be apparent to one skilled in the art from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary plan view of a rotary switch unit embodying the features of this invention.

FIG. 2 is an axial section taken along line **2—2** of FIG. 1.

FIG. 3 is an enlarged fragmentary section taken along line **3—3** of FIG. 1.

FIG. 4 is a fragmentary plan view of a portion of the rotor containing the contact terminal as it appears in the break away section of the rotor face preparatory to rupture of said section and the step of upending the contact terminal into an axially extending position as shown in FIGS. 2 and 3.

As shown in the drawings, the stator of a rotary switch unit exemplifying this invention is in the form of an annular wafer **10** of suitable insulating material. Stator contact members **11**, **12** and **13**, each consist of a metal strip arranged radially of the central opening **14** of the stator and is formed with a spoon-shaped inner end **15** to engage with corresponding contacts carried by a rotor. Each of the stator contact members is fixed to the stator by means of a rivet **16** which fits a rectangular shaped opening in the stator contact as well as a selected rivet accepting opening **17** in the stator in registry therewith. An illustrated in FIG. 1, the stator contact members **11** and **12** are thus secured to the front or exposed face of the stator while the stator contact member **13** is secured to the rear or opposite face of the stator. Each of the stator contact members is also provided with an outer soldering terminal lug **18**.

The rotor, which is bent shown in FIGS. 2 and 3, includes a hub member **19** of molded insulating material such as nylon, Delrin or other relatively friction free material. The hub member **19** is provided with a rotor operating shaft opening **20** which when brought into coincidence provides a passage in which the flattened sides of a rotor operating shaft **21** has engagement to cause the hub member to be driven or rotated in response to rotation of the shaft **21** about its longitudinal axis. The hub member **19** is of such size as to be accommodated within the confines of the opening **14** in the stator. The edges of the opening **14** furnish a bearing surface against which the hub member rides when the shaft **21** is operated to rotate the hub member while the hub member occupies an operative position within the stator opening and the surfaces of the rotor hub facing in opposite directions axially of the shaft **21** are within the confines of planes containing opposite face portions of the stator bordering said stator opening.

A pair of disks **22** and **23**, each provided with a rotor operating shaft opening **24** to form a passage in which the flattened sides of the shaft **21** has non-rotative engagement accordingly have driven connection with the shaft in unison with rotation of the rotor hub member **19**. These disks **22** and **23**, as shown in the drawings, occupy

positions in flanking relation to the rotor hub member **19** and said disks are of such radial dimension as to provide border portions which overlap opposite face portions of the stator surrounding the stator opening occupied by the hub member **19**. Means for securing the disks and the rotor hub member in rigidly joined relation and thereby operative to retain the rotor hub member within the confines of the stator opening **14** include coupling fingers **25** which are defined by axial extensions of the rotor hub member along opposite edge portions of the shaft receiving opening **20** in said hub member. The coupling fingers **25** which extend in one axial direction from the hub member have entry to pockets **26** formed in opposite edge portions of the shaft receiving opening in the disk **22** while the coupling fingers extending in the direction of disk **23** have entry to corresponding pockets formed in opposite edge portions of the shaft receiving opening in the disk **23**. It will be noted that the coupling fingers provide a surface with which the shaft **21** has close engagement to restrain withdrawal of the fingers from the pocket associated therein in directions inwardly of the area containing the shaft while tab portions **27** at the axially outermost ends of the fingers **25** have overlapping engagement with surfaces of the disks associated therewith along areas bordering said pockets containing the fingers which are thereby effective to lock the disks against separation from the rotor hub member without the use of additional fastening means.

The disks **22** and **23** are preferably formed of molding material having superior dielectric characteristics such as glass alkyd or diallyl phthalate or compositions of substantially equal insulating quality so as to provide a molded insulating support for the shank portions **28** of rotor contact fingers which have blade sections extending radially beyond the edges of the disks for selective engagement with the stator contact members. The area of each of the rotor disks **22** and **23** between the shaft opening **24** of the disks and the shank portions **28** of the rotor contact fingers embedded in said disks is provided with an axially extending recess **29** which in conjunction with a corresponding opening **30** provided in the hub member **19** in axial alignment with each recess **29** in the disks defines a clearway coextensive with the axial dimension of the rotor assembly except for an inner terminal **31** defined by an extension of the shank of each rotor contact finger secured to rotor disk **22** which terminal **31** is attached to or embedded within the confines of an end wall **22a** defined by an integral breakaway section of the outermost face of rotor disk **22** and an inner terminal **32** defined by an extension of the shank of each rotor contact finger secured in rotor disk **23** which terminal **32** is attached to or embedded within the confines of an end wall **23a** defined by an integral breakaway section of the outermost face of rotor disk **23**. Thus each inner terminal **31** of the contact fingers secured to disk **22** is in axial alignment with a corresponding terminal **32** of the contact fingers in disk **23** as well as the recess **29** in each disk **22** and **23** and the opening **30** in hub member **19** axially aligned with said recess **29**. As shown in FIGS. 2 and 3, the inner terminal **31** of the contact fingers in disk **22** while embedded in the break-away section of disk **22** occupies a radially extending position in offset relation to the shank portion of its associated contact fingers in a direction away from the inner terminal **32** of the contact finger in disk **23** axially aligned therewith. Each terminal **31** is thus annexed to its associated contact finger by means of a relatively short junction **33** extending axially of the rotor body. Likewise the inner terminal **32** of the contact fingers in disk **23** while embedded in the break-away section of disk **23** is annexed to its associated contact fingers by means of a similar short junction **34** extending axially of the rotor body whereby the terminal **32** of each finger in disk **23** is offset axially of its shank portion in a direction away from the inner terminal **31** of the contact finger in disk **22** axially aligned therewith.

The junctions thus provided between the terminals **31** and **32** respectively and the shank portions of the contact fingers associated therewith provide an axial extension of the terminals **31** and **32** when said terminals are upended for the purpose of establishing an electrical connection with a selected set of axially paired terminals **31** and **32** by means of a conductive bridging member **35** as shown in FIG. 2 and in FIG. 3, upon rupture of the break-away sections containing or attached to said terminals so as to provide the clearway for the reception of said bridge member **35**. Due to the projection of the terminals **31** and **32** outside the confines of the clearway thus formed to accommodate the bridge member, there is ample exposure of the terminals for producing a soldered or welded connection between the opposite ends of the bridge member **35** and the surfaces of the terminals **31** and **32** facing said bridge member.

As shown in FIG. 2, the bridge member **35** and the terminals **31** and **32** conductively joined to said bridge member **35** in conjunction with the rotor contact fingers with which said terminals are associated provide an electrical connection between the stator contact member **12** on one side of the stator and the stator contact member **13** on the opposite side of the stator.

It is important to observe that a rotor assembly embodying the features of this invention as illustrated in FIG. 1 eliminates the use of fastening means requiring areas of the rotor which coincide with a continuous circular band containing the embedded portions of the rotor contact fingers and the inner terminals thereof. Accordingly, no switching position is lost to accommodate such fastening means.

What is claimed is:

1. A rotary switch including a stator, a rotor of molded insulating material having opposed first and second faces and a non-circular opening connecting said faces for engagement with an operating shaft, a central opening in said stator ocuppied by said rotor, first and second rotor contact blades, each having a shank portion, said rotor having contact blade supporting portions between said faces in which the shank portion of said contact blades are embedded in radially extending aligned spaced apart relation axially of said rotor and each of said blades having an exposed end portion extending radially beyond the edge of said rotor, an axially extending recess provided in said rotor within an area radially inwardly of the area occupied by said shank portions of said contact blades, said recess defining a clearway between said first and second faces of the rotor except for a radially projecting extension of the shank of said first rotor contact blade defining an inner terminal of said first rotor contact blade, and except for a similar radially projecting extension of the shank of said second rotor contact blade defining an inner terminal of said second rotor contact blade, each of said terminals occupying a position in offset relation to the shank portion of the rotor contact blade associated therewith in an axial direction away from the terminal of the rotor contact blade axially paired therewith pending upending of said terminals into a position extending axially of said clearway in a direction away from the terminal in axially paired relation thereto, each of said terminals being dimensioned to project outside the confines of said clearway when in such axially extended position whereby a conductive bridge member extending axially of said clearway and conductively joined to said terminals at said projecting ends cooperate to establish an electrical connection with a stator contact blade engaging the first rotor contact blade and a stator contact blade engaging the second rotor contact blade.

2. A rotary switch according to claim **1** wherein the rotor contact blade supporting portion containing said first rotor contact blade is defined by a first rotor disk, and the rotor contact blade supporting portion containing

said second rotor contact blade is defined by a second rotor disk, and said disks are joined in rigid assembly by a separate hub member sandwiched between said first and second rotor disks.

3. A rotary switch according to claim 2 wherein said first and second rotor disks and said hub member are joined by fastening means remote from an area coincident with a continuous circular band containing the embedded portions of the rotor contact blades.

4. A rotary switch according to claim 2 wherein said first and second rotor disks and said hub member are joined by fingers formed integrally with said hub member and confined to areas of the disks and the hub member adjoining the operating shaft opening in said rotor.

5. A rotary switch according to claim 1 wherein the terminal of said first rotor contact blade is embedded an integral breakaway section of the first face of said rotor when the terminal of said first rotor contact blade is in radially extending position and wherein the terminal of said second rotor contact blade is embedded in an integral breakaway section of the second face of said rotor when the terminal of said first rotor contact blade is is in radially extending position.

6. A rotary switch according to claim 1 wherein the terminal of said first rotor contact blade is attached to an integral breakaway section of the first face of said rotor when the terminal of said first rotor contact blade is in radially extending position and wherein the terminal of said second rotor contact blade is attached to an integral breakaway section of the second face of said rotor when the terminal of said second rotor contact blade is in radially extending position.

References Cited

UNITED STATES PATENTS

3,213,211 10/1965 Allison.
3,308,248 3/1967 Stephan et al.

ROBERT K. SCHAEFER, Primary Examiner

J. R. SCOTT, Assistant Examiner

U.S. Cl. X.R.

200—166