

[54] **ROTARY WAFER SWITCH WITH
FLANGED ROTOR**

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[52] U.S. Cl. 200/11 D

[51] Int. Cl. H01h 19/58

[58] Field of Search 200/11 D, 11 DA

[56] **References Cited**

UNITED STATES PATENTS

3,594,898	7/1971	Lewandowski	200/11 D X
2,631,211	3/1953	Klay	200/11 D UX
3,013,231	12/1961	Meadows et al.	200/11 D UX
3,177,308	4/1965	Stengl	200/11 D
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3,248,488	4/1966	Stephan	200/11 D
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FOREIGN PATENTS OR APPLICATIONS

318,306 12/1956 Switzerland 200/11 D

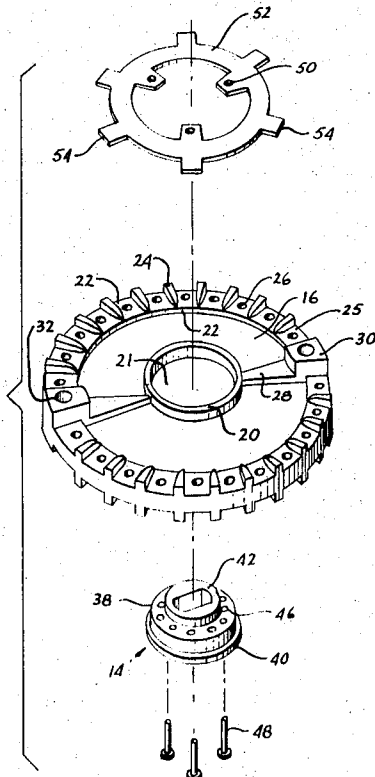
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[57] **ABSTRACT**

A rotary electrical switch comprises a stator supporting conventional stator contacts and having a central aperture to receive a rotor supporting at least one rotor blade of conventional design. The stator has an annular rib encircling said rotor and projecting axially from only one of its faces to axially locate said rotor blade. The rotor has a collar overlapping the opposite face of said stator and having a thickness substantially equal to the axial projection of said rib. Said collar and said rotor blade cooperate to clasp the central portion of said stator therebetween, and said collar adapted to support one or more additional rotor blades.

7 Claims, 7 Drawing Figures



SHEET 1 OF 3

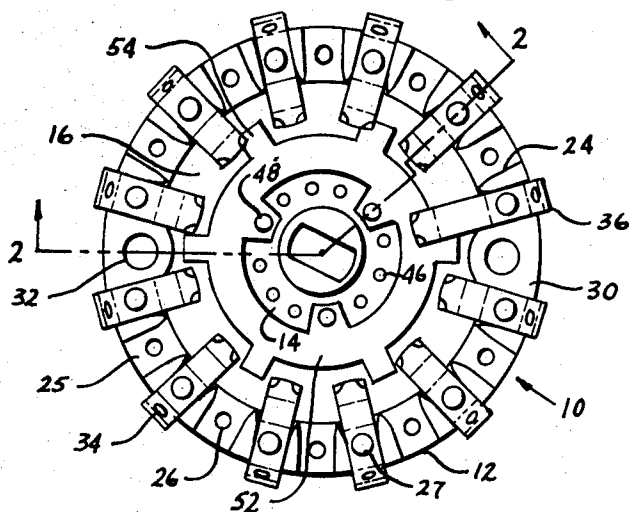


FIG. 1

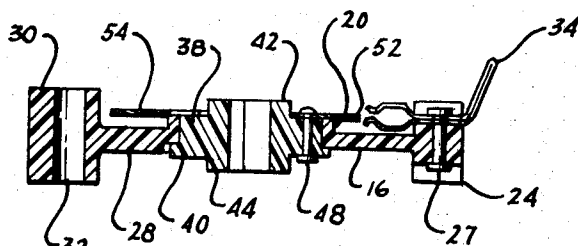


FIG. 2

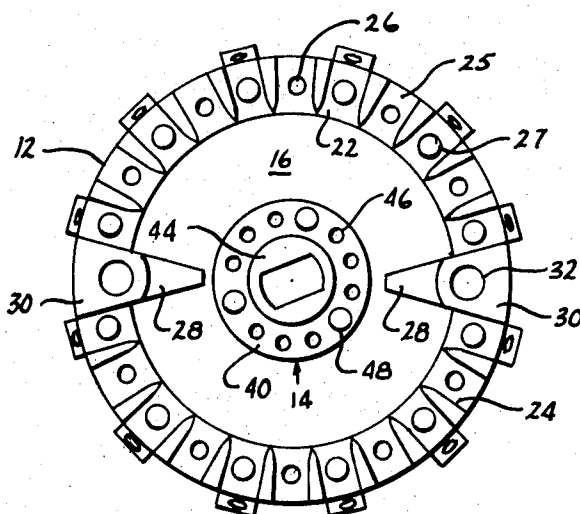
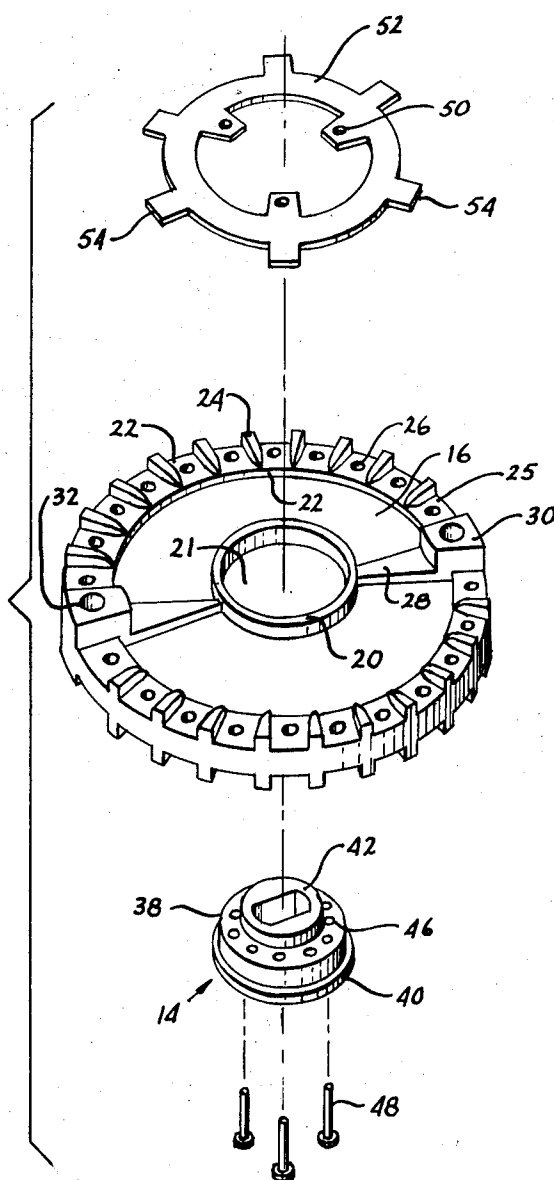


FIG. 3

FIG. 4



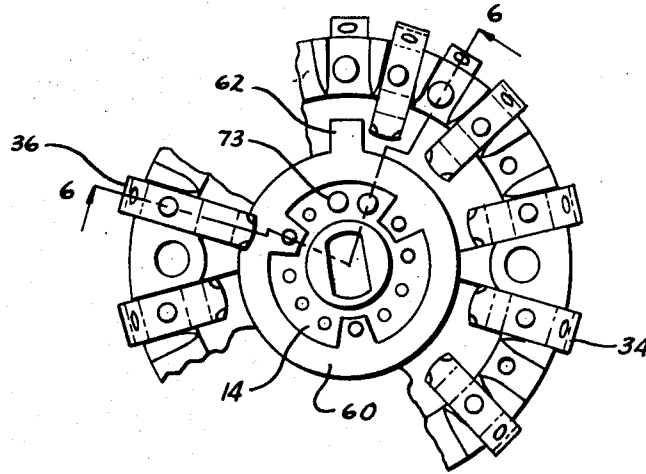


FIG. 5

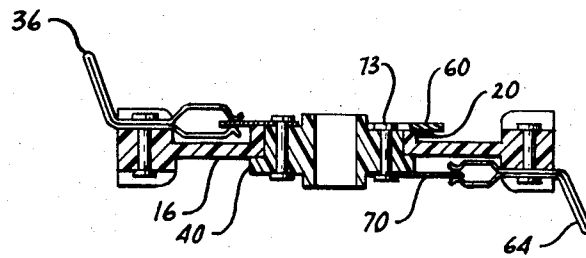


FIG. 6

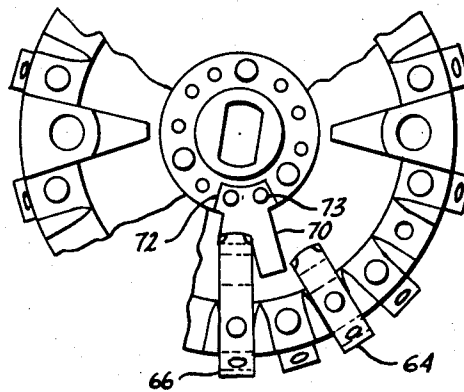


FIG. 7

ROTARY WAFER SWITCH WITH FLANGED ROTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a rotary switch having a rotor movable relative to a counterpart stator to selectively complete electrical circuits and, more particularly, to a means for supporting the rotor against axial separation from its counterpart stator.

2. Description of the Prior Art

The present invention is concerned with miniaturized rotary switches. As the switch parts become smaller in size, the contact elements become proportionately smaller and therefore relatively fragile. Rotor contact blades, especially, are commonly used to secure the rotor against axial displacement from the stator. An example appears in U.S. Pat. No. 3,389,235.

As the size of the switch parts is reduced, however, the security with which the rotor can be retained against axial movement within the stator is reduced due to the comparative frailty of the rotor contact blades. In the past, various techniques have been used to overcome this problem.

As one example, U.S. Pat. No. 3,213,211 shows a two piece rotor in which each piece has an outwardly projecting collar and the two pieces, being presented to opposite faces of the stator, are riveted together so that the two collars clasp the interior margin of the stator therebetween. This secures the rotor against axial movement relative to the stator but complicates switch assembly since it becomes necessary to handle two initially separate rotor parts and take precautions to establish a proper rotational alignment between the rotor parts.

Another technique is disclosed in U.S. Pat. No. 3,177,306, in which a rotor is retained to a stator by a rotor blade engaging one face of the stator and by an enlarged insulating disk riveted to the rotor and engaging to the opposite face of the stator. The rotor blade and the aforementioned insulating disk cooperate to clasp the inner margin of the stator therebetween.

SUMMARY OF THE INVENTION

In the present invention, the stator is a molded body having a relatively thin central flange and a wall upstanding from each face of the flange at the outer periphery thereof, the wall providing mounting stations which allow stator contacts to be mounted on both faces of the stator. A rotor having blades as desired to wipe the stator contacts is fitted within a central aperture in the stator flange. To axially position the rotor blade or blades which will wipe the stator contacts on one side of the stator, the stator has an upstanding rib projecting axially from said one face. To allow axial support for the rotor against the opposite side of the stator, the rotor has a radially outwardly extending collar lapping said opposite face to aid in securing the rotor against axial movement within the stator and also provide a support for one or more rotor blades that may be riveted thereto. This switch construction affords the advantages that the stator flange isolates the contacts on one side of the stator from those on the opposite side, that the collar on the rotor secures the rotor against axial travel in one direction, and that only the peripherally largest and therefore strongest of the

rotor blades is needed to restrain axial travel of the rotor in the opposite direction.

It is accordingly an object of the present invention to provide a new and improved rotary switch assembly. Another object of the present invention is to provide improved means for securing the rotor of a rotary switch deck against axial movement with respect to its counterpart stator.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a switch deck constructed in accordance with the present invention.

FIG. 2 is a section view taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is a bottom plan view of the switch deck illustrated in FIG. 1.

FIG. 4 is an exploded perspective view illustrating rotor parts exploded away from a stator member.

FIG. 5 is a fragmentary top plan view of a modification.

FIG. 6 is a section view taken substantially along the line 6—6 of FIG. 5.

FIG. 7 is a fragmentary bottom plan view of the modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the rotary switch art it has become conventional to refer to the assembly of a single rotor element within a single stator element as comprising a single switch deck. In typical applications a plurality of switch decks are ganged in axially spaced relation along the length of an operator shaft and assembled into a unitary switch structure by means of struts passing through aligned apertures in the stator elements and cooperating with end fittings which journal the shaft for rotation. The present invention is concerned primarily with the means for rotatably mounting a single rotor element to a single stator element so as to produce a single switch deck and accordingly the conventional struts, end fittings, operating shaft and the like have been omitted from the drawing.

The switch deck 10 illustrated in FIGS. 1, 2, and 3 comprises an annular stator 12 rotatably supporting a rotor 14. As best seen in FIG. 4, the stator 12 is a molded wafer which comprises an annular flange portion 16 bounded at its outer margin by a thickened wall 22. Bounding the inner margin is a rib 20 which is elevated from only one face of the stator and which encircles a central aperture 21.

The thickened wall 22 has spaced partitions 24 projecting axially therefrom to separate a plurality of circumferentially disposed mounting stations or pads 25 for supporting stator contact clips. Each of the pads 25 is pierced by an aperture 26 adapted to receive a rivet 27 for securing a stator contact clip.

Both faces of the stator 12 are substantially identical except that the upper face, as the stator appears in FIG. 4, has the axially projecting rib 20 thereon whereas the opposite face, as best shown in FIG. 2, has no corresponding rib thereon. The flange portion 16 on said opposite face thus provides a smooth surface extending uninterruptedly, except as hereinafter noted, from the

thickened wall 22 inwardly to the margin for the aperture 21. The relatively smooth annular surface provided by the flange portion 16 is interrupted on both faces of the stator 12 by diametrically opposed thickened spokes 28 which serve to strengthen the flange portion 16 so that the rib 20 on one face of the stator will be supported against axial movement relative to the thickened wall 22. As appears in FIG. 3, the spokes 28 on the opposite face of the stator 12 terminate a distance away from the aperture 21 to accept a collar, to be described, which is located on the rotor 14.

At the junctures between the spokes 28 and the thickened wall 22, the stator 12 is provided with integrally formed axially extended spacers 30, there being diametrically disposed spacers 30 formed on both faces of the stator 12. The spacers 30 are pierced by apertures 32 sized to receive mounting struts, not shown in the drawings. The combined axial thickness of the spacers 30 rising axially from both faces of the stator 12 is predetermined so that a single switch deck, as shown in FIG. 1, can be mounted between similar switch decks by means of mounting struts passing through their respective apertures 32 without the conductive parts of one switch deck engaging conductive parts of an adjacent switch deck.

As best appears in FIG. 4, the rotor 14 includes a cylindrically shaped portion 38 sized to closely fit within the stator aperture 21. Disposed on one end of the portion 38 is a radially enlarged collar 40 sized to fit inside the spokes 28 so as to bear against the face of the flange portion 16 which lacks the rib 20. The axial thickness of the collar 40 is substantially equal to the axial height of the rib 20 and the axial length of the cylindrical portion 38 is substantially equal to the thickness of the flange portion 16 together with the added thickness of the rib 20. Thus, when the rotor 14 is seated in the aperture 21, the upper end of the cylindrical portion 38 will be substantially flush with the upper surface of the rib 20, as viewed in FIG. 4, and the collar 40 will project downwardly from the flange portion 16 a distance substantially equal to the upward projection of the rib 20.

In the embodiment being described, the rotor 14 is secured against axial movement relative to the stator 12 by means of an annular conductor 52 having perforations 50 sized to receive rivets 48 which pass axially through selected apertures 46 located in the body of the rotor 14. During assembly of the rotor 14 to the conductor 52, the upper ends of the rivets 48, as they appear in FIG. 4, are upset to securely affix the conductor 52 to the rotor 14.

The conductor 52 has a plurality of outwardly projecting blades 54 adapted to wipe between the jaws of various stator contacts 34 mounted upon the aforementioned mounting pads 25.

It will be noted that FIG. 1 illustrates a plurality of stator contacts 34 which are relatively short in radial length and a single stator contact 36 which is relatively long in radial length. The contact 36 is sized to make continuous contact with the conductor 52. The contacts 34 are sized to make contact only with the blades 54 at selected rotary positions of the rotor 14.

Since the contact 36 is sized to contact the conductor 52 and the conductor 52 is a continuous ring, any voltage supplied to the contact 36 will be continuously available at the conductor 52. It has become conventional in the art to refer to a contact functioning such

as the contact 36 as a feeder contact and a conductor such as the continuous ring conductor 52 as a feeder ring or conductor, the term "feeder" in this context being suggestive of the ability of the contact 36 to feed an operating voltage to or from the conductor 52.

It will also be noted in FIG. 2 that the axial elevation of the rib 20 from the flange portion 16 is approximately equal to the axial elevation of each of the mounting pads 25 with the result that the stator contacts 34 and 36 may be of the conventional symmetrically formed shape, with confronting jaws which meet in the plane occupied by the feeder conductor 52.

To allow an adequate transmission of torque to the rotor 14 from an operating shaft passing therethrough and also to assure that the rotor 14 will not tilt so as to twist the conductor 52 out of its normal operating plane, the rotor 14 is provided with extensions 42 and 44 at the opposite ends thereof, these extensions increasing the load bearing area between the operating shaft, not shown, and the rotor 14.

The modification of FIGS. 5, 6, and 7 illustrates a switch assembly in which stator contacts are provided at selected mounting stations on both faces of the stator. In lieu of a feeder conductor 52 having a plurality of blades 54, FIG. 5 shows a feeder conductor 60 which continuously wipes a feeder contact 36 and which has a single outwardly projecting blade 62 adapted to selectively wipe plural contacts 34 mounted on one face of the stator. Contacts 64 and 66 mounted on the opposite face of the stator are wiped with a relatively small blade member 70 projecting outwardly from an arcuate conductor segment 72. The segment 72 is secured by rivets 73 which pass through the rotor element but do not engage the feeder conductor 60.

Those skilled in the art will recognize the design of the segment 72 and blade 70 together with the contacts 64 and 66 as a means to transfer whatever voltage is being fed to the contact 66 to the contact 64 at only a selected rotary position of the rotor element 14.

This special type of switch is uniquely accommodated by the rotor structure of the present invention. Absent the collar 40 on the rotor 14, the conductor segment 72 may be too fragile to secure the rotor against axial movement with respect to the stator. However, by reason of the present invention, the collar 40 relieves the conductor segment 72 of all axial stresses.

As shown in FIGS. 1 and 5, it is preferred in the practice of this invention that the rotor blade which will ride on the rib 20 have a substantial circumferential extent. It is not required, however, that the rotor blade which rides on the rib 20 be a complete ring such as shown at 52 in FIG. 1 or at 60 in FIG. 5. Various circuit constructions require that the feeder conductor or conductors be formed of two or more electrically isolated parts such that there will be radial gaps between the isolated parts. This is not an inadmissible construction in the practice of the present invention. It is sufficient if the rotor blade elements, usually feeder conductors, which will ride on the rib 20 occupy a substantial portion of the entire circumference of rib 20 so as to have an adequate mechanical strength to restrain the rotor 14 against axial movement within the stator 12 and so as to provide a relatively uniform bearing surface in contact with the rib 20.

In the preferred construction of the rotor 14 and its counterpart stator 12 both elements are molded from an insulating plastic material such as diallyl phthalate.

Although the preferred embodiments of the device have been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. In a rotary switch assembly comprising a one piece rotor having opposite sides rotatably mounted in a stator having opposite sides, a contact blade affixed to one side of said rotor, said stator having rib means axially elevated from one side thereof and disposed around said rotor, said contact blade lapping said rib means, said rotor having a collar lapping the opposite side of said stator.

2. The switch assembly of claim 1 wherein said contact blade projects radially outwardly from said rotor across and beyond said rib means, the portion of said blade projecting beyond said rib means spaced from said one side of said stator, and including stator contact means affixed to said stator, said contact means having a portion projecting into the space between said blade and said one side for wiping said blade.

3. The rotary switch of claim 1 including a second contact blade affixed to said collar.

4. The rotary switch of claim 3 in which said second contact blade projects outwardly from said collar in spaced relation to said opposite side of said stator, and including second stator contact means affixed to said stator, said second contact means having a portion projecting into the space between said second blade and said opposite side of said stator for wiping said second blade.

5. The rotary switch of claim 4 in which said collar supports said second rotor blade a distance from the opposite side of said stator which is substantially equal to the axial elevation of said rib means from said one side of said stator.

6. In a rotary switch assembly comprising a one piece rotor having opposite sides rotatably mounted in a stator having opposite sides, a feeder conductor affixed to one side of said rotor, feeder contact means affixed to a first side of said stator to wipe said conductor, said stator having rib means axially elevated from said first side and surrounding said rotor, said feeder conductor lapping said rib means, said rotor having a collar lapping the side of said stator opposite said first side.

7. The rotary switch assembly of claim 6 wherein said collar has an axial thickness substantially equal in magnitude to the axial elevation of said rib means from said first side of said stator.

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