United States Patent [19]

Glaser

[11] **3,883,706**

[45] **May 13, 1975**

[54] **MULTIPLE ROTARY WAFER TYPE SWITCH WITH AXIAL BRIDGING CONTACTS AND MULTIPLE WAFER CONNECTING RING**

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[22] Filed: **Dec. 6, 1973**

[21] Appl. No.: **422,135**

[30] **Foreign Application Priority Data**

Dec. 7, 1972 Germany 2260018

[52] **U.S. Cl.** ..... **200/11 A;** 200/252; 200/303

[51] **Int. Cl.** **H01h 19/04**

[58] **Field of Search** .. 200/11 R, 11 A, 11 D, 168 R, 200/168 G, 168 K, 252, 254, 274, 275, 295, 303

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[57] **ABSTRACT**

Multiple rotary changeover switch comprising at least two circular insulating members each having central opening, said members being assembled with end faces thereof being in contact and their openings in registry, radially inwardly extending contact tongues embedded in said insulating members for cooperation with a rotor having contact bridges arranged in said central openings, and an elastically deformable connecting ring disposed in said central openings and axially overlapping said insulating members, and complimentary projections and grooves provided on said connecting ring and insulating members, whereby said connecting ring resiliently engages said insulating members and holds them coaxially towards one another in said assembled relationship.

10 Claims, 3 Drawing Figures

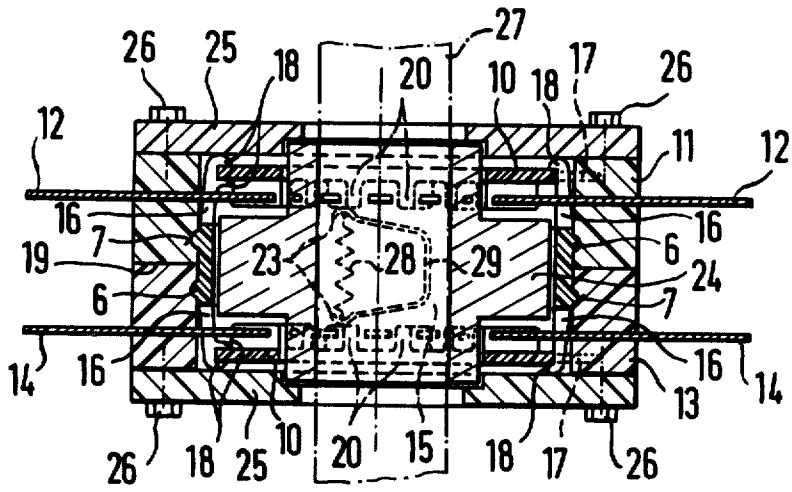


Fig.1

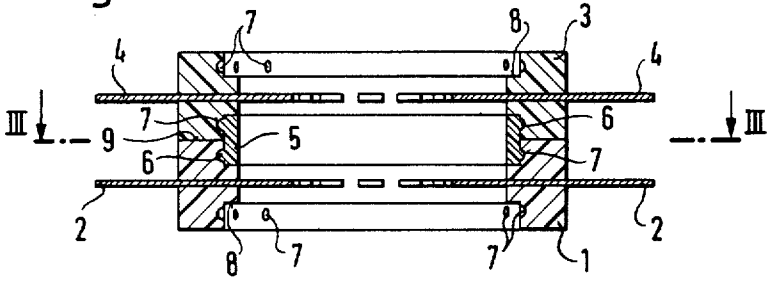


Fig.2

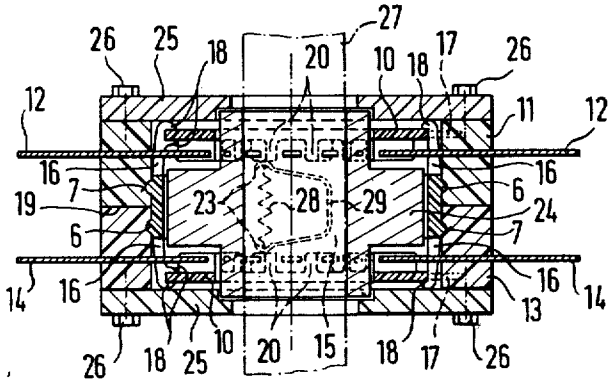
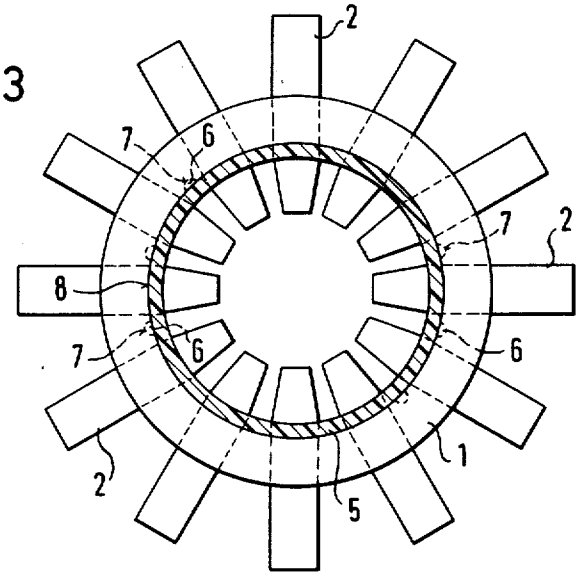


Fig.3



MULTIPLE ROTARY WAFER TYPE SWITCH WITH AXIAL BRIDGING CONTACTS AND MULTIPLE WAFER CONNECTING RING

The invention relates to a multiple rotary changeover switch with at least two insulating members having a central opening wherein in each case are embedded a plurality of contact tongues forming a contact plane which on the fronts are juxtaposed and firmly interconnected, whereby a switch rotor is arranged inside the insulating members.

In general the two insulating members form the stator of the rotary changeover switch, wherein is also arranged the rotor with the spring changeover contacts. In the two insulating members the contact tongues are located radially and concentrically to the switch axis, being in each case arranged in planes. Particular contact tongues of the two contact planes can for example be interconnected in an electrically conductive manner by a contact bridge, in each case according to the angular position of the rotor.

Such multiple rotary changeover switches may also comprise more than two insulating members in order to obtain larger and more universally usable switching units, as are for example used in measuring and control systems.

The individual insulating members are generally connected together to form a structural unit by bolts or pins but this is also possible by means of the switch axis passing through the complete arrangement. To obtain a dust-proof sealing of the inner area of switches produced in this way the junction points of the insulating members are generally cemented over

The problem of the invention is to provide a multiple rotary changeover switch of the type described hereinbefore, wherein the individual insulating members carrying the contact tongues are assembled in a simple but completely satisfactory manner to form larger units. It should also be superfluous to provide any special dust-proofing of the inner area.

According to the invention this problem is solved in that between adjacent insulating members is arranged an elastically deformable connecting ring, axially overlapping the said two members, engaging said insulating members in elastic manner and holding them coaxially towards one another and axially against one another by means of complementary projections and grooves provided on the one hand in the connecting ring and on the other in the two insulating members which it overlaps. The inner ring is preferably made from a thermoplastic material. As such a ring is also located above the separating gap between two insulating members it also seals the said separating gap against the entry of dust or moisture. Preferably the insulating members and the central openings therein have a circular or rectangular cross-section.

Preferably the connecting ring is positioned within the insulating member and to permit insertion it can be cross-slotted. Preferably however it is closed but resiliently deformable to such an extent that insertion is possible at the desired point. Therefore in this case besides the rigidity required for holding together the two insulating members the connecting ring must also be sufficiently resiliently deformable to permit its insertion from the outside between the two insulating members.

According to a preferred embodiment the connecting ring must externally have lug-like projections which engage in corresponding grooves in both insulating members. This not only brings about a reliable holding together of the insulating members in the axial direction but also a clearly defined relative positioning in the peripheral direction.

According to a further special embodiment the two insulating members constructed as rings have on their adjacent inner faces identical annular shoulders whose axial length is equal to half the ring thickness. Radially the annular shoulders are appropriately dimensioned so that the introduced connecting ring is on the inside flush with the inner surface of the insulating member. Thus, an inwardly completely smooth cylindrical structure is obtained and the annular separating gap between the two insulating members is completely sealed from the inside

It is particularly advantageous if identical annular shoulders are provided on both end faces of the insulating member. With such an arrangement a random number of insulating members can be juxtaposed and combined into a unit by means of connecting rings. According to a particularly preferred embodiment on the connecting ring are arranged arms which extend axially between the contact tongues having on their inner ends arresting projections for holding insulating rings and can be pressed elastically outwards. This construction is particularly suitable for a switch comprising only two insulating members with two facing contact planes between which a rotor operates. A complete switch can thus be obtained by simply pressing together the components. The insulating rings are then appropriately arranged at a limited distance from the contact tongues and have ribs positioned between the contact tongues at a limited distance therefrom. The changeover contacts on the rotor are thus prevented from dropping between the contact tongues and short-circuiting the latter. The ribs are advantageously flush with the contact side of the contact tongues or project somewhat in the direction of the changeover contacts of the rotor. Due to the spacing of the ribs and the insulating rings relative to the contact tongues overheating of the insulating rings during the soldering of terminals is prevented.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what are now considered to be the best modes contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the scope of the appended claims

FIG. 1 shows a schematic axial section of a first embodiment of a multiple rotary changeover switch according to the invention

FIG. 2 shows a schematic cross-section of a further advantageous embodiment

FIG. 3 shows a section along line III—III of FIG. 1.

According to FIGS. 1 and 3 two identical circular insulating members 1, 3 have on their front surfaces annular shoulders 8 provided on the inner surfaces of both insulating members. Between the annular shoul-

ders 8 contact tongues 2, 4 are embedded in the circular insulating members 1, 3 which project towards the inside and the outside in the manner shown particularly in FIG. 3. The inwardly projecting ends serve as contact banks for the contact bridge or bridges 23 (shown by dotted lines) of a rotor as shown in FIG. 2 whilst terminals can be soldered to the outwardly projecting ends of the contact tongues. As seen in FIG. 2, rotor 24 is mounted on shaft 27. Contact bridges 23 are assembled on the rotor 24 and are part of a single spring sheet metal 29. A biasing means in the form of spring 28 presses the contact bridges 23 against the contact tongues 12,14.

As a result of the frontal engagement of the two insulating members 1, 3 according to FIG. 1 an annular slot is formed on the inner surface of the thus formed cylindrical arrangement. According to the invention in said slot is placed a resiliently deformable connecting ring 5 either by means of a not shown transverse slot provided therein or by producing the same from a suitable resilient thermoplastic material. On the outer periphery of the ring are also injection moulded lug-like projections 6 facing which are also injection moulded lug-like projections 6 facing which are provided matching grooves 7 in the insulating members 1, 3 The lugs 6 only project to such an extent that both an adequate fitting of the ring 5 in the slot is ensured and an adequate resiliency on pressing the two insulating members 1, 3 onto ring 5, due to the two insulating members 1, 3 being frontally engaged with one another, whereby projections 6 snap into grooves 7. The separating gap between the two insulating members 1, 3 is sealed from within by connecting ring, so that at this point no dust can enter the switch

In the embodiment of FIG. 2 onto connecting ring 15 which interconnects the two circular insulating members 11, 13 are also injection moulded axial arms 16 which starting from ring 15 move further and further away from the inner wall of the insulating member so that they can resiliently yield in an outward direction. Preferably two of the arms 16 are provided on either side on diametrically opposite points of the periphery, they extend between contact tongues 12, 14 and have at their ends grooves or projections 18 which are tapered at the top and whose radial extension is such that when arms 16 resiliently yield insulating rings 10 can be axially pressed on from the outside. According to the embodiment shown in the right-hand half of FIG. 2 on the insulating rings 10 peripherally displaced relative to arms 16 are provided two to four radial noses 17 which fit into matching grooves of insulating rings 10 open at the front, in order to be peripherally secured and kept at a limited distance from contact tongues 12, 14

According to the invention from the insulating rings 10 ribs 20 extend axially inwardly into the gaps between the individual contact tongues 12, 14, whereby on the inside said ribs 20 project slightly above the contact tongues. Ribs 20 ensure an intermittent switching of contact bridges 23 from one contact tongue to the next.

Separating gap 19 between the two circular insulating members 11, 13 is sealed outwardly by connecting ring 15. Two end plates 25 are fixed to numbers 11, 13 by screws 26.

In a simplified embodiment shown in the left-hand half of FIG. 2 there are no radial noses 17 and instead arms 16 provided with suitable projections 18 retain insulating rings 10 provided with appropriate radial recesses not only axially but also peripherally. Thus, in a very simple manner a clearly defined positioning of ribs 20 relative to contact tongues 12, 14 is ensured. In this embodiment three arms 16 are preferably distributed over the periphery on each side.

If prior to assembly of the insulating members a rotor is placed between the insulating members 11, 13 a compact, sturdy and sealed unit is obtained after assembly.

While there has been described and illustrated the preferred embodiments of the invention, it is to be understood that these are capable of variation and modification, and it is therefore not desired to be limited to the precise details set forth, but to include such modifications and alterations as fall within the scope of the appended claims.

What is claimed is:

1. Multiple rotary changeover switch comprising at least two circular insulating members each having a central opening, said members being assembled with end faces thereof being in contact and their openings in registry, radially inwardly extending contact tongues embedded in said insulating members for cooperation with a rotor having contact bridges arranged in said central openings, and an elastically deformable connecting ring disposed in said central openings and axially overlapping said insulating members, and complimentary projections and grooves provided on said connecting ring and insulating members, whereby said connecting ring resiliently engages said insulating members and holds them coaxially towards one another in said assembled relationship.

2. Multiple rotary changeover switch according to claim 1, wherein the connecting ring has external lug-like projections which engage in corresponding grooves in both insulating members

3. Multiple rotary changeover switch according to claim 1, wherein the two insulating members are in the form of rings and have on the inside adjacent their contacting end faces identical annular shoulders whose axial length is equal to half the ring thickness.

4. Multiple rotary changeover switch according to claim 3, wherein radially the annular shoulders are so dimensioned that the connecting ring on the inside is flush with the inner surface of the insulating members

5. Multiple rotary changeover switch according to claim 3, wherein identical annular shoulders are provided on adjacent both end surfaces of each insulating member

6. Multiple rotary changeover switch according to claim 1, wherein on the connecting ring are arranged arms extending axially between the contact tongues, said arms having on the inside of their ends arresting projections, and insulating rings held by said arresting projections, said arms being adapted to be elastically pressed outwards.

7. Multiple rotary changeover switch according to claim 6, wherein the insulating rings are arranged at a limited axial distance from the contact tongues and have radially outwardly extending noses which engage in matching grooves in the insulating members

8. Multiple rotary changeover switch according to claim 6, wherein the insulating rings have ribs extending between the contact tongues at a limited distance therefrom, said ribs projecting slightly beyond the

contact tongues in the direction towards the contact briges of the rotor.

9. Multiple rotary changeover switch according to claim **6**, wherein the arresting projections cooperate with matching grooves on the outer periphery of the insulating rings in such a way that they alone fix the positions of the insulating rings in all directions

10. Multiple rotary changeover switch according to claim **6**, wherein two to four arms are provided on opposite sides of the connecting ring, each extending between two adjacent contact tongues.

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