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3,171,906

ROTOR FOR ROTARY WAFER SWITCH WITH EMBEDDED
CONTACT INTERCONNECTING MEANS

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3 Sheets-Sheet 1

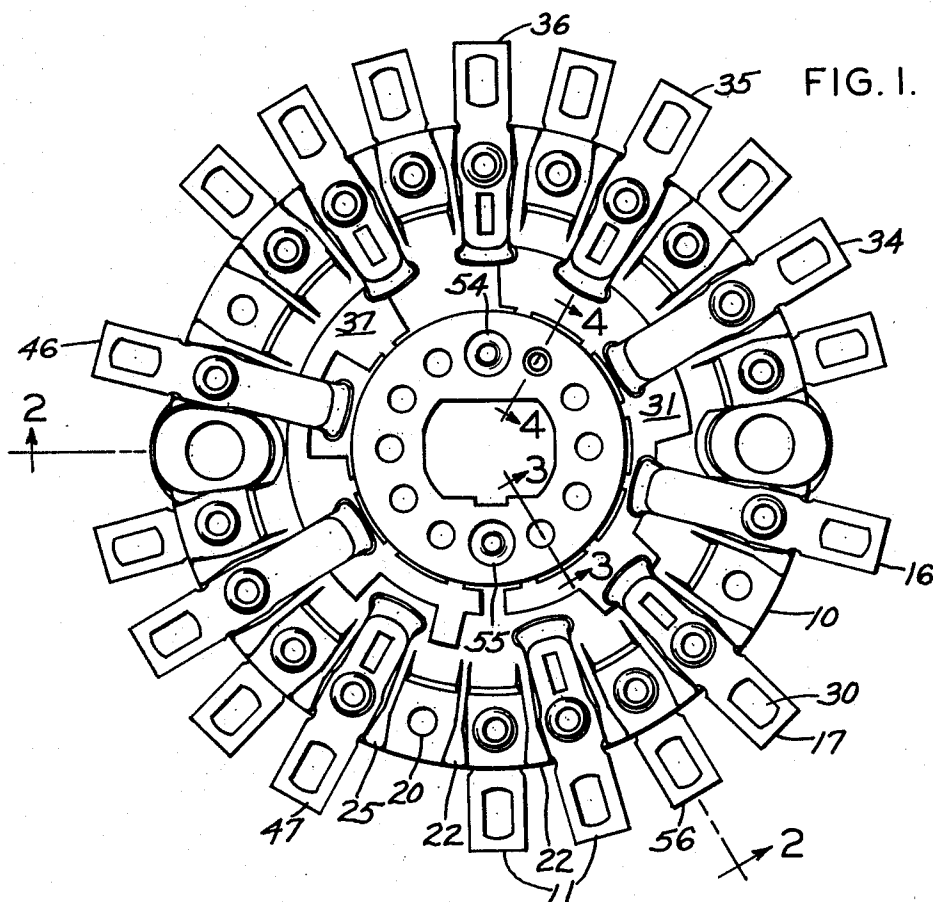
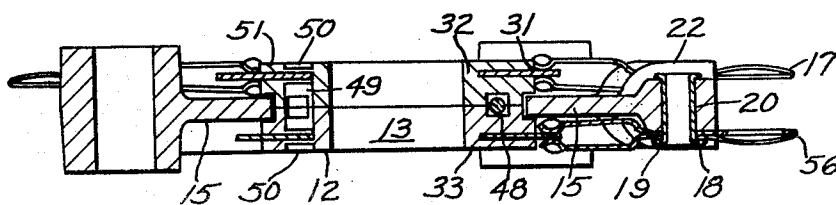


FIG. 2.

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3 Sheets-Sheet 2

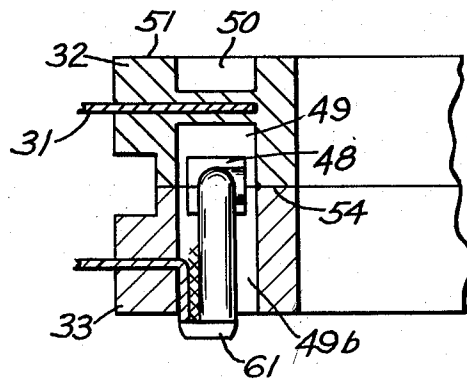


FIG. 3.

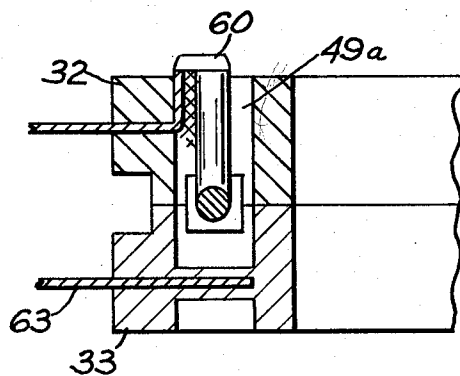


FIG. 4.

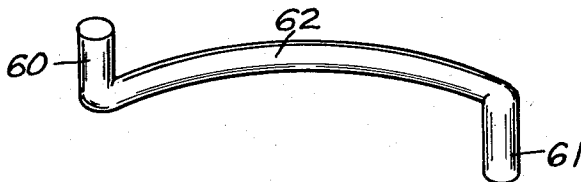


FIG. 5.

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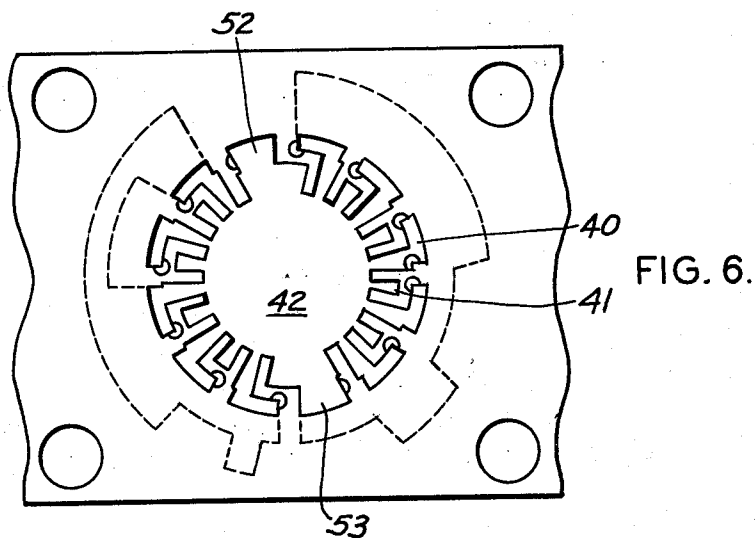
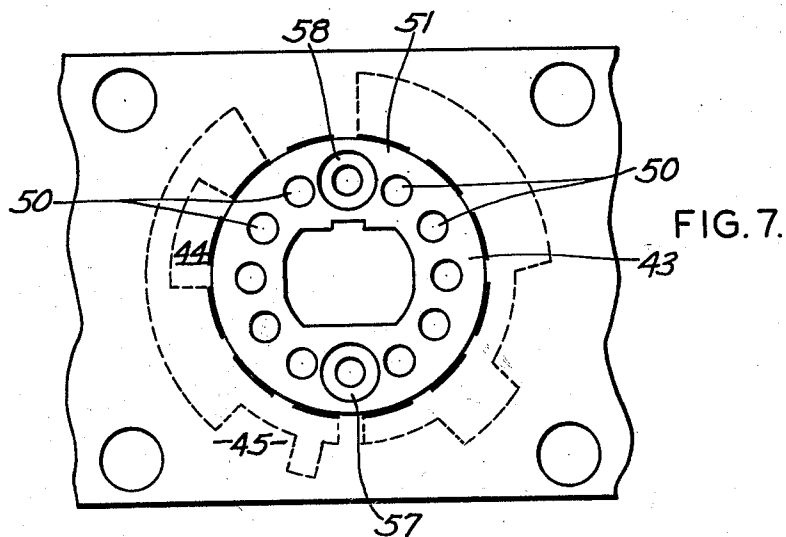
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3 Sheets-Sheet 3



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ROTOR FOR ROTARY WAFER SWITCH WITH EMBEDDED CONTACT INTER- CONNECTING MEANS

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12 Claims. (Cl. 200—11)

This invention relates to rotary switches generally, and in particular to an improved rotor construction for rotary wafer switches.

Switches of this type all have a stator supporting a plurality of stationary contact members and a rotor equipped with conductive metal blades which selectively interconnects various combinations of stationary contact members as the rotor is rotated. This system is satisfactory for most switch circuits, however, when it is desired to electrically connect a contact member on the stator to another contact member which is perhaps 150° from the first with a number of contact members located between the two, which are not wanted in the circuit, then this system of simply extending the rotor blading to electrically connect the two contact members cannot be done. Some other system must be developed.

This same problem also arises when rotary wafer switches are provided with stationary contacts located on both sides of the stator, and it is desired to electrically connect a stationary contact member on one side of the stator to a stationary contact member on the other side of the stator.

Accordingly, it is a principal object of this invention to provide means whereby stationary contact members located remotely on the stator of a rotary wafer switch can be electrically connected without providing blading on the rotor which extends from one stationary contact member to the other.

An additional object of this invention is to provide means for electrically connecting the stationary contacts on a rotary wafer switch without affecting the desired pattern of blading used on the rotor.

Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly, the present invention is concerned with a rotary wafer switch comprising a stator provided with a plurality of contact members fixedly secured to the outer periphery thereof and a rotor provided with an internal arcuate passageway receiving a conductor, the ends of the conductor interconnecting remotely disposed blades molded into the body of the rotor for electrically interconnecting a pair of nonadjacent contact members on the same side or on opposite sides of the stator.

For a better understanding of the present invention, reference may be had to the accompanying drawings wherein the same reference numerals have been applied to like parts and wherein:

FIGURE 1 is a top plan view of a rotary wafer switch having a plurality of stationary contact members located on both sides of the stator and which employs a rotor having two sets of conductive blading to engage the stationary contact members on each side of the stator;

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 1 showing the inner construction of the rotor;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 1;

FIGURE 5 shows the configuration of a typical con-

ductor used to electrically connect separate blades on the rotor in accordance with this invention;

FIGURE 6 is a top plan view of a metal strip upon which the rotor body is molded; and

FIGURE 7 is a view of the strip shown in FIGURE 6 with the body of insulating material molded around the perforations in the strip.

The switch consists of a stator 10 and a rotor 12. The rotor has an opening 13 to receive a flat sided shaft (not shown) by which rotation is imparted to the rotor.

The stator comprises an annular body of insulating material having a plurality of contact members attached thereto. The annular body is provided with a relative thick peripheral section 14 and a relatively thin inner section 15. Mounted on both sides of the peripheral section 14 of the stator is a plurality of double sided, symmetrically shaped contact members indicated generally by the number 11. These contact members are identical except for their length. For example, the contact member 16 extends inwardly toward the rotor further than does the contact member 17. These contact members are attached to the stator by means of eyelets 18 which extend through openings 19 in the contacts and openings 20 in the stator as illustrated in FIGURE 2.

Each contact member is located between two equally spaced radially extending ribs 22, a plurality of which are provided on both sides of the thick peripheral section 14 of the stator 10. The ribs are equipped with wedge shaped back sections 25 so that the distance between the ribs is a minimum at the outer periphery of the annular body. The contact members 11 are designed so that they engage the ribs only at the periphery of the stator body. A portion of the contact member engaging the ribs is curved so that the contact members resiliently engage the ribs when fixedly secured to the stator. These features of the switch are fully described in my copending application Serial No. 221,096 entitled "Electric Switch." The openings 20 provided in the stator for receiving the eyelets 18 are located equidistant between each pair of ribs 22 so that one of the contact members 11 can be mounted between any pair of ribs on either side of the stator.

The contact members are conventionally shaped except for the curved section mentioned above. Each of the contact members is formed from a single strip of metal bent back on itself. Each contact member has contact jaws 28 and 29, opening 19 to receive the mounting eyelet or rivet and the opening 30 through which a wire lead can be passed when the switch is connected into a circuit. The contact members are arranged so that when they are assembled on the stator the contact jaws 28 and 29 will be forced together towards each other with some force. This insures that the contact jaws 28 and 29 of each contact member will make good electrical contact with the rotor blades as they pass between the jaws.

The rotor 12 comprises two sections 32 and 33. The two sections are identical and are combined to form the rotor by simply turning one section over so that the top side of each is facing outwardly from the switch. Each section of the rotor is formed by molding a body of insulating material 43 around a plurality of fingers formed in a metal strip. FIGURE 6 illustrates the metal strip before the insulating material is molded thereto. A group of perforations generally indicated by the numbers 40, 41, 52, and 53 is formed in the strip to form a plurality of fingers. The insulating material 43 is then molded around the fingers formed by the perforations as shown in FIGURE 7.

This section of the rotor is then cut out of the metal strip and simultaneously therewith the blading is formed for the particular switch in which the rotor is to be used. The configuration shown by the dotted lines in FIGURE 7 is typical and is the one employed in the switch shown in

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FIGURE 1. Obviously a large variety of patterns can be obtained from this arrangement so that a large variety of stationary contacts can be interconnected electrically at certain positions of the rotor.

Also adding flexibility to the arrangement is the fact that long and short contact members can be used on the stator and, by simply cutting out windows such as that indicated at 44 or notches 45 in the blade of the rotor, certain contact members can be taken out of the circuit at particular positions. For example, in FIGURE 1 in the position indicated the stationary contacts 46 and 47 are cut out of the circuit in this manner.

In the molding operation each section of the rotor is provided with a circular or an arcuate groove which combines to provide a passageway 48 when the two sections are assembled on the switch stator. Also formed in each section of the rotor during the molding operation is a plurality of holes 49 and 50. The holes 50 extend part way into the sections from the outer surface 51 and are in spaced coaxial relationship with the holes 49 communicating with the bottom surface 54. The holes 49 also intersect the passageway 48. Separating the holes 49 and 50 in each of the sections of the rotor are partitions which contain the metal fingers formed by the perforations 40 and 41.

Besides the perforations 40 and 41, two enlarged openings 52 and 53 are provided in the metal strip prior to the molding operation. These openings are large enough to allow the passage of the rivets 54 and 55 which are used to connect the two sections of the rotor. These rivets are located in holes 57 and 58 provided in the body of insulating material 43 and pass through the openings 52 and 53. In this manner the rivets 54 and 55 can pass through both sections of the rotor without engaging or electrically connecting the blading of either rotor.

In a preferred form of the present invention, means are provided whereby stationary contact members on the stator can be electrically connected together even though they may be as much as 150° apart on the same side or on opposite sides of the stator. Assume, for example, that in the switch shown in FIGURE 1 it is desired to electrically connect the stationary contact member 35 with the contact member 56 located on the opposite side of the stator and approximately 120° from the contact 35. The partition between a pair of spaced coaxial holes 49 and 50 is punched out to form a first elongated hole 49b adjacent to one of the stationary contact members, and a second elongated hole 49a is similarly formed adjacent to another of the stationary contact members. The elongated holes 49a and 49b may be in opposite sections of the rotor as shown in FIGURES 3 and 4 of the drawings or in the same section of the rotor. By punching out the insulating material which forms the partition between the holes 49 and 50, one of the metal fingers is upended 90° to a position where it extends along the wall of the elongated opening and above the surface of the rotor. An electrical conductor 62 shaped such as the one indicated in FIGURE 5 is placed in the passageway 48 so that its ends 60 and 61 extend into the openings 49a and 49b. This is done when the rotor is assembled after which the ends 60 and 61 of the conductor 62 can be soldered or spot welded to the rotor blades 31 and 63 as shown in FIGURES 3 and 4. This electrically connects the blade 31 in rotor section 32 with the blade 63 of rotor section 33 which in turn electrically connects the stationary contact members 35 and 56 when the switch is in the position indicated in FIGURE 1.

In the switch shown the two rotor sections are riveted together. The rivets make it impossible to electrically connect stationary contact members on opposite sides of the rivets since the rivets block the passageway 48. However, should other means, e.g., a nonconductive epoxy cement be employed to assemble the rotor so that all of the openings 49 and 50 are available, then it would be possible to electrically connect any stationary contact

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member on the switch to any other contact member on the same side or on the opposite side of the stator.

While there has been illustrated and described what is at present considered to be a preferred embodiment of the present invention, it will be appreciated that numerous changes and modifications are likely to occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications which fall within the true spirit and scope of the present invention.

The invention claimed is:

1. In a rotary wafer switch comprising in combination, a first contact carrier of insulating material provided with a central opening, a plurality of contact members attached to one side of the first contact carrier, a second contact carrier of insulating material rotatably supported in the opening of the first contact carrier, a plurality of coplanar electrically conducting fingers in laterally spaced relationship, the second contact carrier being molded to the electrically conducting fingers, an internal circular passageway in the second contact carrier, a portion of two of the fingers extending into the passageway, and a conductor in the passageway electrically connected to two of the coplanar electrically conducting fingers.

2. A switch comprising a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members arranged in a row and fixedly secured to one side of the first contact carrier, a pair of contact jaws integrally secured to each of the contact members and extending inwardly of the outer edge of the first contact carrier, a pair of blades in laterally spaced relationship electrically insulated from each other and lying in a plane interposed between the contact jaws of the contact members, an electrically conductive finger integrally connected to each of the blades, the second contact carrier being molded to the fingers and being provided with a pair of laterally spaced apertures normal to the pair of blades, a portion of each of the fingers extending into the apertures, an arcuate passageway in the second contact carrier lying in spaced parallel relationship to the pair of blades and communicating with the apertures normal to the pair of blades, and a conductor in the passageway extending into the apertures and electrically connected to the fingers together.

3. A rotary wafer switch comprising, in combination; a stator comprising an annular body of insulating material provided with a central opening and having a thick peripheral section; a plurality of contact members attached to both sides of the peripheral section of the annular body;

a rotor comprising a body of insulating material rotatably supported in the opening of the stator; a plurality of flat metal fingers in laterally spaced relationship embedded in the rotor and arranged to contact the contact members as the rotor is rotated, the fingers being arranged in two parallel planes with each plane being on opposite sides of the annular stator body;

a circular passageway located between the two parallel planes of the fingers and parallel thereto; at least two holes in the rotor extending transversely of the two parallel planes and communicating with the passageway; at least a portion of one of the metal fingers being disposed in each of the holes; and a conductor in the passageway and the holes electrically connecting the two metal fingers together.

4. A rotary wafer switch comprising, in combination; a stator having an annular body of insulating material with a relatively thick peripheral portion and a relatively thin inner portion defining a central opening; a plurality of radially extending contact members attached to both sides of the peripheral portion; a rotor rotatably supported in the opening defined by the relatively thin inner portion of the stator, the rotor comprising, two sections of insulating material;

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a plurality of coplanar metal fingers molded in each section and arranged to engage the contact members on the annular body of the stator;

- a groove in each of the sections combining to provide a circular passageway extending around the rotor between the two sets of coplanar metal fingers;
- a plurality of holes in each of the sections located above the circular passageway and extending partially into the sections toward the metal fingers;
- at least two holes communicating with the passageway;
- and a conductor extending through each hole and the passageway electrically connecting the fingers adjacent the said two holes.

5. The switch of claim 2, wherein the apertures communicate with the outer surface of the second contact carrier and a portion of each of the fingers is upended in the aperture and exposed to the outer surface of the second contact carrier, and means electrically securing the conductor to the fingers.

6. In a switch, the combination of a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members arranged in a row and fixedly secured to one side of the first contact carrier, a pair of contact jaws integrally secured to each of the contact members and extending inwardly of the outer edge of the first contact carrier, a pair of blades in laterally spaced relationship lying in a plane interposed between the contact jaws of the contact members, an electrically conductive finger integrally connected to each of the blades, the second contact carrier being molded to the fingers, an internal passageway in the second contact carrier lying in spaced parallel relationship to the pair of blades, and a conductor in the passageway, the fingers extending into the passageway and being connected to the conductor.

7. A switch comprising a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members arranged in a row and fixedly secured to one side of the first contact carrier, a pair of contact jaws integrally secured to each of the contact members and extending inwardly of the outer edge of the first contact carrier, a pair of blades in laterally spaced relationship lying in a plane interposed between the contact jaws of the contact members, an electrically conductive finger integrally connected to each of the blades, the second contact carrier being molded to the fingers, a passageway in the second contact carrier, the center portion of the passageway being parallel to the plane of the fingers, a portion of each of the fingers extending into the outer portions of the passageway, and a conductor in the passageway electrically connecting the fingers together.

8. A switch comprising a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members fixedly secured to opposite sides of the first contact carrier, a pair of blades adapted to make contact with the contact members when the carriers are moved edgewise relative to each other, an electrical conductive finger integrally connected to each of the blades, the fingers being disposed in laterally spaced relationship on each side of the first contact carrier, the second contact carrier being molded to the fingers and being provided with a pair of laterally spaced apertures normal to the pair of blades, a portion of each of the fingers extending into the apertures, an arcuate passageway in the second contact carrier lying in spaced parallel relationship to the pair of blades and communicating with

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the apertures normal to the pair of blades, and a conductor in the passageway extending into the apertures and electrically connected to the fingers together.

9. The switch of claim 8, wherein the second contact carrier comprises a pair of sections, each of the sections being molded to one of the fingers, the finger in one section being interconnected to the finger in the other section by the conductor electrically connecting the blades together.

10. The switch of claim 9, wherein an arcuate groove is provided in each section and, when the sections are secured together, the arcuate grooves of the sections cooperate to form the arcuate passageway.

11. A switch comprising a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members fixedly secured to both sides of the first contact carrier, a pair of blades electrically insulated from each other and adapted to make contact with the contact members when the first and second contact carriers are moved edgewise relative to each other, an electrically conductive finger integrally connected to each of the blades, the fingers being disposed in laterally spaced relationship on each side of the first contact carrier, the second contact carrier being molded to the fingers and being provided with a pair of laterally spaced apertures normal to the pair of blades, a portion of each of the fingers being upended and extending into the apertures, an arcuate passageway in the second contact carrier lying in spaced parallel relationship to the pair of blades and communicating with the apertures normal to the pair of blades, and a conductor in the passageway extending into the apertures electrically connecting the fingers together.

12. A switch comprising a first and second cooperating relatively movable contact carriers of insulating material, a plurality of contact members fixedly secured to both sides of the first contact carrier, a pair of blades electrically insulated from each other and adapted to make contact with the contact members when the first and second contact carriers are moved edgewise relative to each other, an electrically conductive finger integrally connected to each of the blades, the fingers being disposed in laterally spaced relationship on each side of the first contact carrier, the second contact carrier being molded to the fingers and being provided with a pair of laterally spaced apertures normal to the pair of blades, an upended portion of each of the fingers extending into the apertures, an internal arcuate passageway in the second contact carrier lying in spaced parallel relationship to the pair of blades and communicating with the apertures normal to the pair of blades, and a conductor in the passageway extending into the apertures electrically connecting the fingers together.

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