United States Patent

[11] **3,548,123**

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[54] **ROTARY ELECTRIC SWITCH**
4 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **200/11,** 200/166, 200/168
[51] **Int. Cl.** **H01h 19/58**
[50] **Field of Search** 200/11D, 166B8, 166ICTS, 168A

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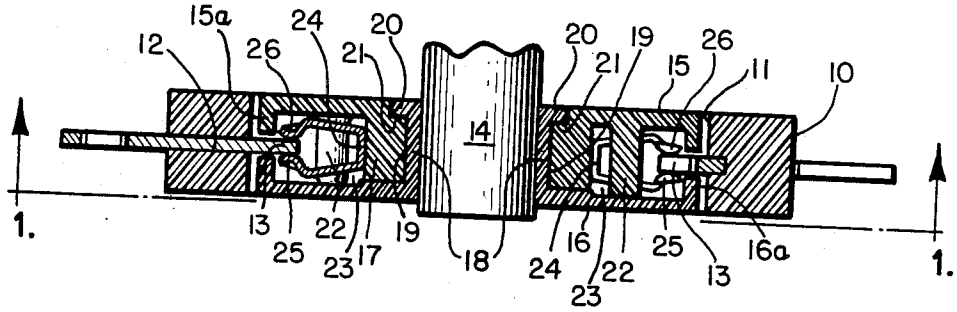
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Assistant Examiner—J.R. Scott
Attorney—Stanley Hoods

ABSTRACT: A rotary electric switch having a rotor and a stator provided with a rotor-receiving opening, and cooperating contacts supported on said rotor and said stator including first and second coplanar stator contacts occupying a plane intermediate opposite faces of said stator spaced apart a distance in excess of 90° circumferentially of an arc in which said rotor travels and rotor contacts simultaneously engageable with said stator contacts, each of said rotor contacts having axially opposed jaws defined by branches formed integrally with an arcuately formed conductor strip seated in an annular clearway between the area occupied by said stator contacts and the hub of the rotor.



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FIG. 1

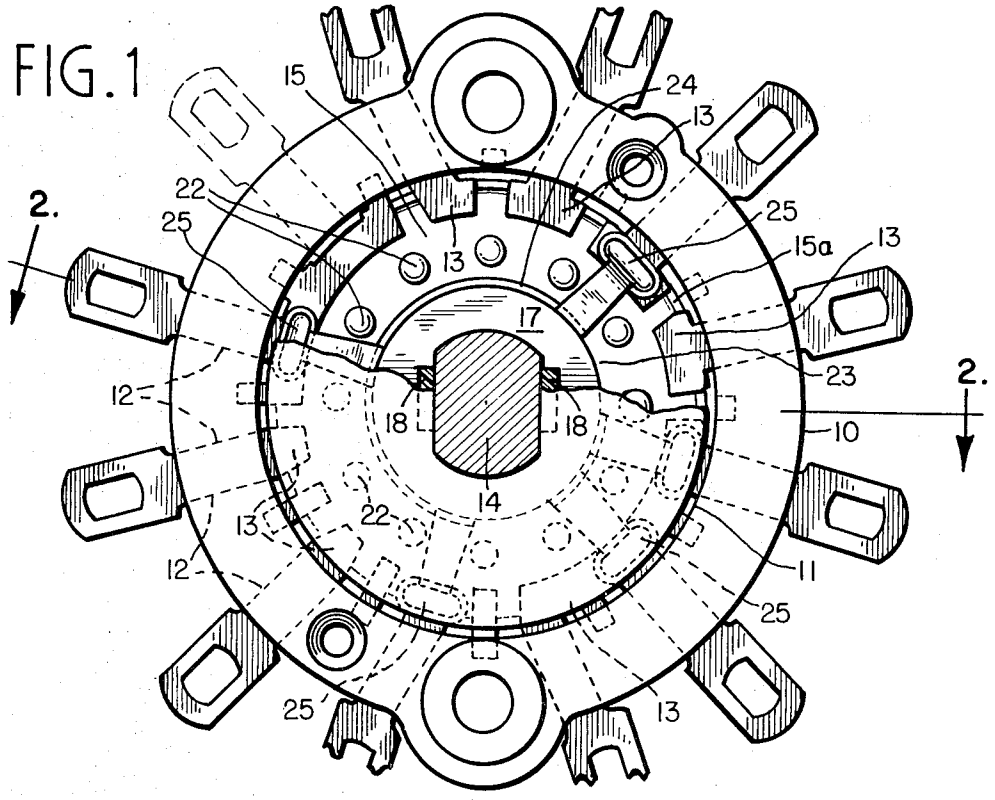


FIG. 2

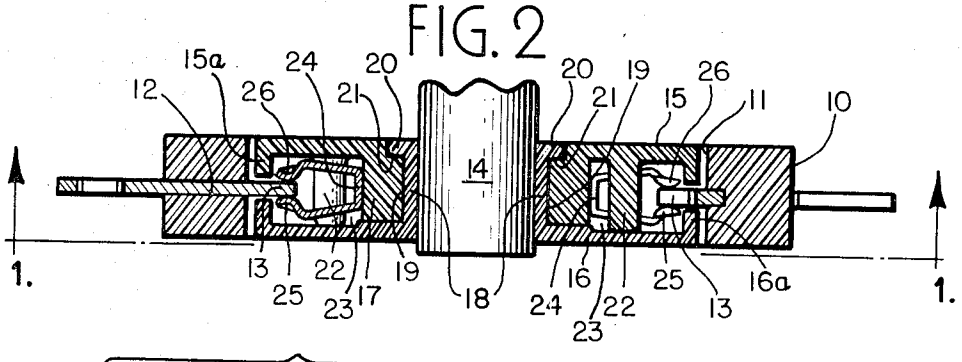
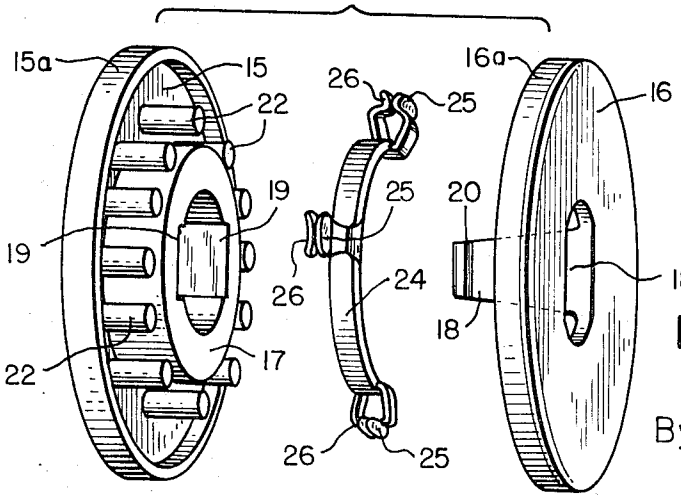


FIG. 3



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ROTARY ELECTRIC SWITCH

This invention relates to a rotary electric switch wherein multiple contacts secured to a fixed stator of insulating material have coplanar end portions projecting radially inwardly from the wall of a rotor receiving opening in said stator so as to occupy positions in the path of a pair of rotor contacts supported on a rotor in said opening whereby said contacts secured to the stator are sequentially engaged by said rotor contacts incident to rotation of said rotor about an axis centrally of said opening and perpendicular to the plane common to said end portions of the stator contacts.

It is an object of this invention to provide a switch of the type indicated in which novel features of construction and assembly incorporated therein simplify its production with resulting cost savings and improved quality while also enhancing the design flexibility of the switch in meeting the demands of ever widening diversity of switch circuitry patterns.

It is also an object of this invention to provide a rotary switch wherein an arcuately formed conductor strip seated in ann annular clearway on the rotor between the area occupied by the stator contacts and the hub of the rotor has integral branches defining a first pair of axially opposed contact jaws and a second pair of axially opposed contact jaws whereby said first and second pairs of contact jaws are linked by said strip at a distance apart in excess of 90° circumferentially of said clearway.

Other objects and advantages of the invention will be apparent in the following description and the accompanying drawings wherein:

FIG. 1 is a plan view of a rotary electric switch looking in the direction of the arrows along line 1–1 in FIG. 2 with portions of the rotor assembly removed.

FIG. 2 is a section taken along line 2–2 of FIG. 1.

FIG. 3 is an exploded view of the rotor assembly and one of the rotor contact members.

A switch incorporating the features of this invention is adaptable for use in a great variety of applications wherein a plurality of circuits are to be established. The switch shown in the drawings and described hereinafter shows only one of the many contact arrangements available in a switch embodying the present invention.

In the particular embodiment shown herein, reference numeral **10** designates a stator of molded insulating material and having a rotor-receiving opening **11** intersecting opposite faces of the stator. Exposed end portions of conductor strips **12** embedded in the stator **10** between opposite faces thereof define stator contacts **13** which occupy a common plane within the confines of the rotor-receiving opening **11** while spaced apart circumferentially of the wall of said opening. A rotor operable via a drive shaft **14** to rotate within the opening **11** in the stator **10** about an axis centrally of the opening and perpendicular to the plane occupied by said stator contacts **13** includes a first rotor section **15** and a second rotor section **16**. Each section **15** and **16** is formed of suitable insulating material. As illustrated in FIG. 3 of the drawing, rotor section **15** is provided with a hub portion **17** in axially extending relation to the area of the section **15** in radially outlying relation to said hub portion. Means for joining rotor section **16** to the hub portion **17** of rotor section **15** so as to establish a rigid axially aligned assembly includes a pair of coupling fingers **18** defined by axial extensions of the rotor section **16** along opposite edge portions of the opening in which the shaft **14** has driving fit with the rotary section **16**. Pockets **19** are formed in opposite wall portions of the opening in which the shaft **14** has driving fit with the hub **17** of rotor section **15** so as to position said pockets **19** in axial aligned relation with the fingers **18** and thereby said fingers are received in and having interfitting engagement with said pockets **19**. When thus fitted in the pockets **19** of the hub **17** of rotor section **15**, a tab **20** at the terminal of each finger **18** has overlapping engagement with surfaces **21** of the hub **17** which face axially away from the rotor section **16** to prevent axial separation of the rotor sections **15** and **16**. It should also be noted that the surface of the shaft **14** and the surface of the fingers **18** facing the shaft have

such interfitting engagement as to prevent withdrawal of the tab **20** from interlocked engagement with the surface **21** of the hub **17**. When the rotor sections **15** and **16** are thereby joined in rigid assembly, the areas of the rotor sections extending radially away from the hub portion **17** are spaced apart axially of the hub **17** to form an annular slot through which the stator contacts **13** have access to the area between the rotor sections **15** and **16**.

Reference numeral **22** designates cylindrical axial extensions or division members formed integrally with the rotor section **15** between the area occupied by the stator contacts **13** and the hub portion **17** of rotor section **15**. The division members **22** are uniformly spaced apart circumferentially of a circle concentric with the hub portion **17** and each member **22** substantially spans the distance between the rotor sections **15** and **16**. The surface of the hub portion **17** of rotor section **15** and the surface of the division members opposite thereto cooperate to form an annular clearway **23** therebetween, while the space between each neighboring pair of division members **22** provides a radial clearway between said annular clearway **23** and the area occupied by the stator contacts **13**. A curved conductor strip **24**, as shown in FIG. 3, is defined by a metallic band extending circumferentially of and confined within the annular clearway **23**. The strip **24** accordingly includes segments of uniform dimension which are in radial alignment with the radial clearways between the division members **22** while portions of the strip **24** facing the division members **22** provide a series of spacer areas of uniform dimension to which said segments of the strip **24** are joined in alternating relation along meeting lines parallel to the axis of rotation of the rotor sections **15** and **16**. Branches of selected segments of said strip **24** occupying positions within radial clearways in alignment with said selected segments provide pairs of resilient axially opposed contact jaws **25** and **26** which have sliding engagement with the stator contacts **13** as the rotor sections **15** and **16** are turned by the shaft **14**. It will be observed that a vacant area of the strip **24** containing a continuity of two of said segments having no branches projecting therefrom separates a first pair of contact jaws **25** and **26** situated immediately to the left of the lower end of a vertical line drawn diametrically of the switch as shown in FIG. **1** from a second pair of contact jaws **25** and **26** next in clockwise relation to said first pair of contact jaws **25** and **26** as viewed in FIG. **1**. Another vacant area of the strip **24** containing a continuity of three of said segments having no branches projecting therefrom separates said second pair of contact jaws **25** and **26** from a third pair of contact jaws **25** and **26** next in clockwise relation to said second pair of contact jaws **25** and **26** as shown in FIG. **1**. Accordingly, in a twelve position switch as shown in the drawings, said first pair of contact jaws **25** and **26** and said third pair of contact jaws **25** and **26** are linked by the strip **24** at a distance apart in excess of 180° along an arc concentric with the axis of rotation of the rotor sections while said second pair of contact jaws **25** and **26** occupy a position at a distance away from the first and third pairs of contact jaws not less than 90° along said arc.

Accordingly, a first stator contact **13** and a second stator contact **13** occupying circumferentially spaced-apart positions in excess of 90° along the path of rotation of the rotor contacts **25** and **26** may be simultaneously electrically connected via the conductor strip **24** and the axially opposed contact jaws **25** and **26** defined by the branches formed integrally with said conductor strip.

A rim **15**^{a} along the edge of rotor sections **15** facing the wall of the opening **11** in the stator **10** and a similar rim **16**^{a} along the corresponding edge of the rotor section **16** have engagement with the area of the stator contacts **13** between said wall of the opening **11** and that portion of the stator contacts **13** overlapped by the rotor contact jaws **25** and **26** to restrict axial movement of the rotor sections **15** and **16** relative to the stator. While the conductor strip **24** is trapped against withdrawal from the clearway in directions radially as well as axially of the rotor section **15**, it is to be noted that a slight

freedom of movement is available so as to permit sufficient shifting of the rotor contact jaws **25** and **26** to accommodate slight variances in the alignment of the stator contacts **13** relative to the path of movement of such contact jaws incident to rotation of the rotor.

I claim:

1. A rotary electric switch having a stator of nonconductive material, a rotor receiving opening intersecting opposite faces of said stator, stator contacts embedded in said stator between said faces of said stator and having coplanar end portions intersecting the wall of said rotor-receiving opening and exposed within the confines of said opening in spaced-apart relation circumferentially of said opening, a rotor occupying said rotor-receiving opening, said rotor having a first section and a second section, each section having a hub portion, means connecting said hub portions, areas if said rotor sections extending radially outwardly of said hub portion thereof being spaced apart axially of said hub to form an annular slot through which the stator contacts have access to the area between said rotor sections, hub portion of said first rotor section defining an annular clearway between the area occupied by said stator contacts and said hub portion of the rotor sections, a curved conductor strip arcuately conforming to and circumferentially coextensive with said clearway through an arc of not less than 90°, a radially extending branch formed integrally with said conductor strip, a second radially extending branch formed integrally with said conductor strip at a distance from said first branch h along an arc of not less than $\pi°$, said clearway defining means cooperating with said branches to releasably secure said conductor strip against relative displacement of said strip circumferentially of said clearway, and a pair of resilient axially opposed contact jaws defined by each of said branches of said conductor strip with which said stator contacts have sequential engagement in response to rotation of said rotor relative to said stator.

2. A rotary electric switch according to claim 1 wherein means cooperating with the hub portion of said first rotor section defining an annular clearway between the area occupied by said stator contacts and said hub portion of the rotor sections includes axially extending division members formed integrally with said first rotor section in uniformly spaced apart relation circumferentially of the hub portion of said first rotor section.

3. A rotary electric switch according to claim 1 wherein said hub portion of said first and second rotor sections is provided with an opening in which a rotatable operating shaft has driving fit to turn said rotor relative to said stator about an axis perpendicular to the plane occupied by said exposed ends of said stator contacts, and wherein means connecting hub portions of said rotor sections include coupling fingers defined by axial extension of said second rotor section along opposite edge portions of the shaft-receiving opening in said latter rotor section, and pockets formed in opposite wall portions of the shaft-receiving opening in the first rotor section with which said coupling fingers of the second rotor section are axially aligned for reception in said pockets, each of said fingers terminating in a tab having overlapping engagement with surfaces of the hub of the first rotor section bordering said pockets and facing away from the second rotor section to prevent axial separation of said rotor sections, and each of said fingers having engagement with said shaft to prevent withdrawal of said fingers from said pockets in directions inwardly of the area occupied by the shaft.

4. In a rotary electric switch unit, a rotor, said rotor having an integral axially extended central hub portion, a rotor contact member having a support section defined by a conductor strip curved in conformity to the arc of a circle of sufficient diameter vacant encompass said hub portion of the rotor, said strip consisting of a series of segments of uniform dimension and a series of spacer areas of uniform dimension to which said segments are joined in alternating relation along meeting liens parallel to lines axis of rotor of the rotor with which said contact member is associated, a first pair of axially opposed resilient contact jaws defined by integral radially outwardly projecting branches of a first segment of said strip, a second pair of axially opposed resilient jaws defined by integral radially outwardly projecting branches of a second segment of said strip, said first and second segments circumferentially flanking a vacant area of said strip containing a continuity of two or more segments having no branches projecting therefrom and containing the spacer areas with which said first and second segments of said vacant area are joined, and means for securing said rotor contact member in operative position on said rotor, said securing means including a series of axially extending division members formed integrally with said rotor to define an annular clearway between said hub portion of the rotor and the surfaces of said division members facing said hub portion in which said strip is confined to restrict relative displacement of said strip radially of said hub portion of the rotor, said division members occupying such spaced-apart positions circumferentially of said clearway as to provide for radial alignment of said segments of the strip with the areas between said division members while said strip is so confined in said clearway and to provide for engagement of each of said outwardly projecting branches of said strip with a pair of said division members in radial alignment with spacer areas of the strip which flank the segment of the strip from which said branch projects to restrict relative displacement of said strip circumferentially of said clearway.