March 7, 1967 K. STEPHAN ETAL 3,308,248

ROTARY SWITCH WITH IMPROVED CONTACT STRUCTURE

Filed Feb. 12, 1965 2 Sheets-Sheet 1

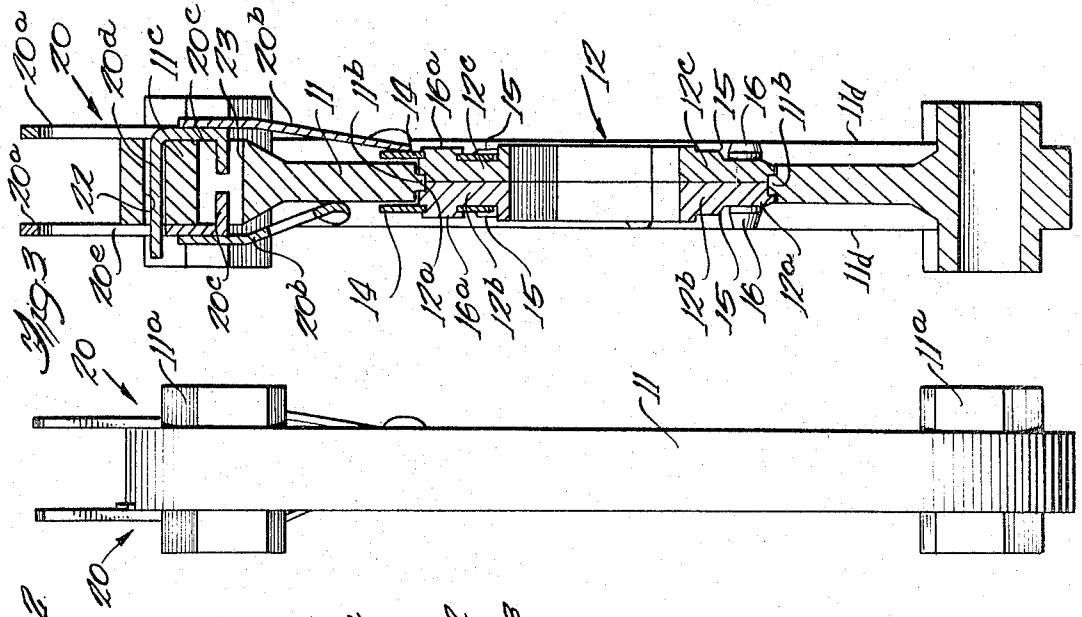

Fig. 3

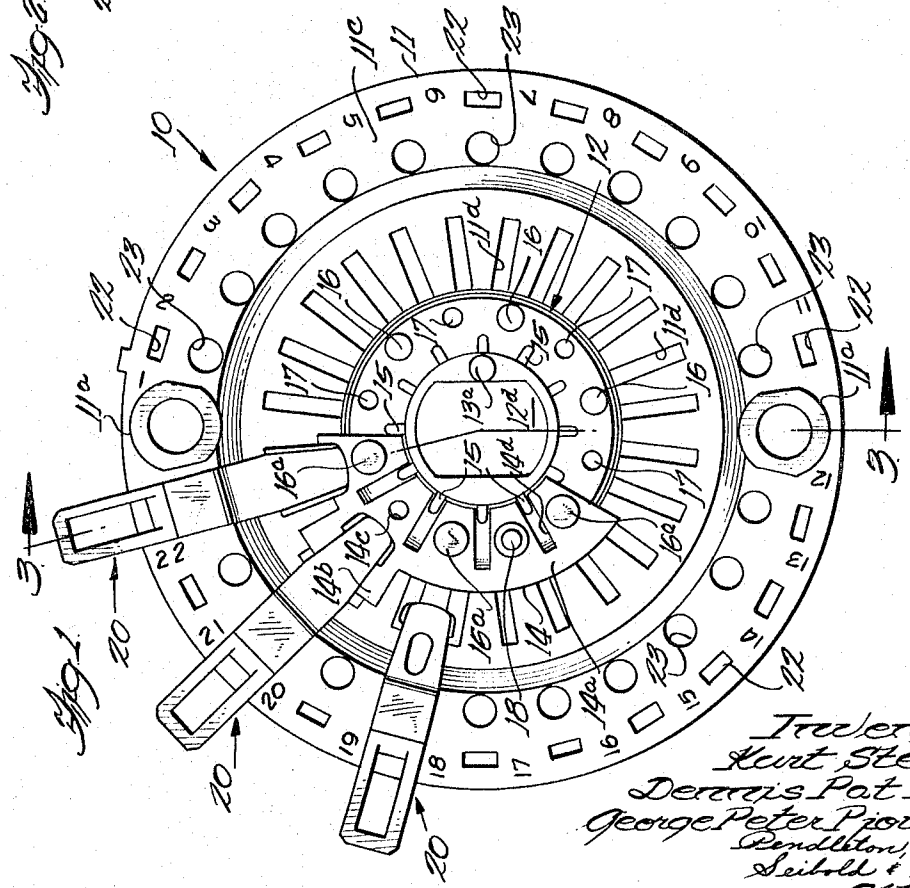

Fig. 2

Fig. 1

Inventors
Kurt Stephan
Dennis Pat Trocca
George Peter Piotrowski
Pendleton, Neuman
Seibold & Williams
Attorneys

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Fig. 4

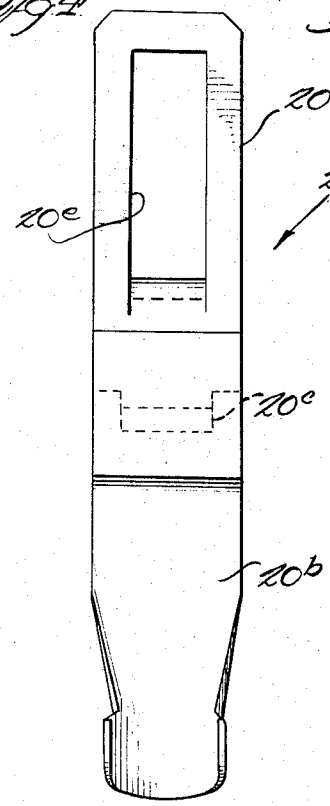


Fig. 5

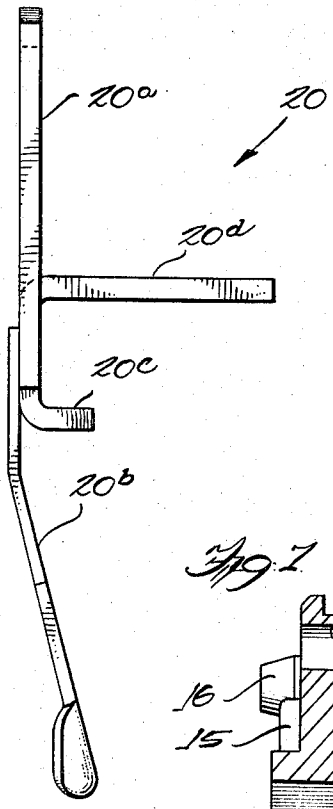


Fig. 7

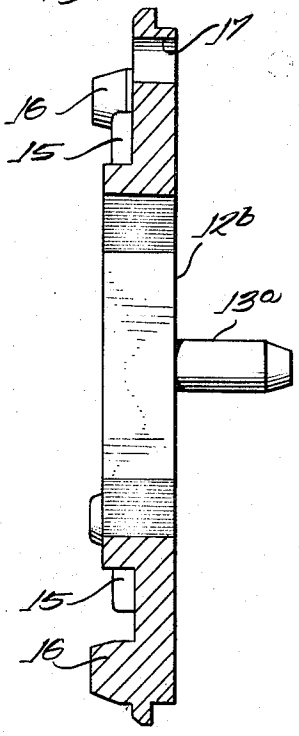
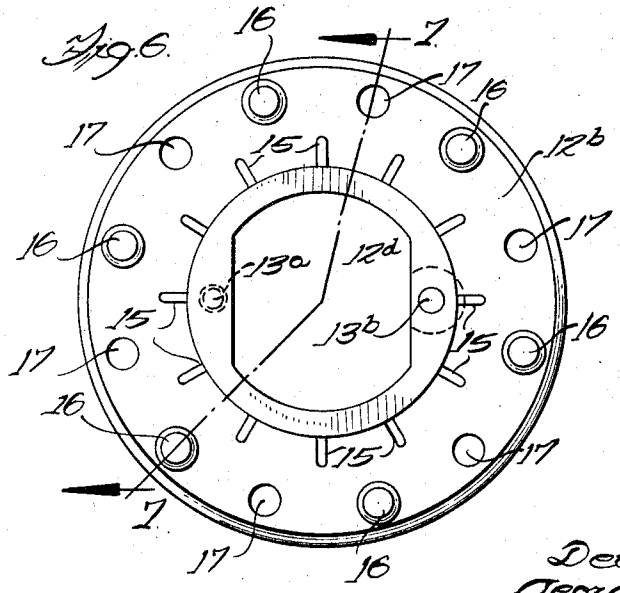


Fig. 6



Inventors
Kurt Stephan
Dennis Pat Trocco
George Peter Piotrowski
Pendleton, Neuman
Seibold & Williams
Attorneys

United States Patent Office 3,308,248 Patented Mar. 7, 1967

3,308,248

ROTARY SWITCH WITH IMPROVED CONTACT STRUCTURE

Kurt Stephan and Dennis Pat Tronca, Thiensville, and George Peter Piotrowski, Milwaukee, Wis., assignors to Globe-Union Inc., Milwaukee, Wis., a corporation of Delaware

Filed Feb. 12, 1965, Ser. No. 432,146
18 Claims. (Cl. 200—11)

The present invention relates to rotary switches and, more specifically, to a rotary switch having new and improved means for effecting an electrical connection.

A primary object of the present invention is to provide a new and improved rotary switch. More specifically, an object is to provide a new and improved rotary switch having new and improved means for effecting an electrical connection. Another object of the invention is to provide a new and improved rotary switch which prevents damage to the functional parts thereof during a handling operation. In this connection, an object is to provide a rotary switch employing a stator and a rotor and having its electrical connection contact area below the outer surface of the switch to prevent damage thereto during handling of the switch.

An additional object is to provide a new and improved wiper assembly for a rotary switch. More specifically, an object is to provide a wiper assembly including a terminal portion and a contact wiper portion which are separately formed and suitably connected together. A related object is to provide such a wiper assembly wherein standard variety terminal portions are provided which are adapted to be connected to various different wiper portions for forming the assembly. Another related object is to provide such a wiper assembly wherein the strength of the terminal portion is not limited by the desired strength of the wiper portion and wherein the terminal and wiper portions may be formed of different materials and/or different thicknesses.

A general object of the present invention is to provide a new and improved rotary switch which lends itself to mechanization and automation. Another general object is to provide a rotary switch having superior environmental conditions. A further general object is to provide a new and improved rotary switch characterized in its compactness, efficiency, economy and accuracy.

In a preferred form of the invention, a rotary switch is provided which includes an annular stator having an annular rim on at least one side thereof and a rotor positioned coaxially within the stator for rotational movement relative thereto. A contact assembly may be mounted on each side of the rotor associated with a side of the stator having an annular rim. A selected number of wiper assemblies are mounted on each annular rim of the stator for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween and damage thereto during a handling operation is substantially eliminated. Each wiper assembly includes a wiper arm adapted to engage associated contact assemblies and some variation of a standard terminal portion adapted to be connected to external circuitry, the wiper arm and terminal portion being secured together. The terminal portion and the wiper arm may be constructed of different materials and/or different thicknesses.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description taken in connection with the drawings wherein:

FIGURE 1 is a top plan view of a rotary switch constructed in accordance with the teachings of the present invention;

FIG. 2 is an enlarged side elevational view of the rotary switch shown in FIG. 1;

FIG. 3 is an enlarged sectional view taken along line 3—3 in FIG. 1;

FIG. 4 is an enlarged top view of a wiper assembly employed in the rotary switch of FIG. 1;

FIG. 5 is a side view of the wiper assembly in FIG. 4;

FIG. 6 is an enlarged top plan view of a rotor employed in the rotary switch of FIG. 1; and

FIG. 7 is an enlarged sectional view taken along line 7—7 in FIG. 6.

While the invention has been shown and will be described in some detail with reference to a particular, exemplary embodiment thereof, there is no intention that it be limited to such detail. Quite to the contrary, it is intended to embrace all modifications, alternatives and equivalents falling within the spirit and scope of the invention as defined by the appended claims.

Referring to the drawings, a rotary switch **10** is shown which is constructed in accordance with the teachings of the present invention. The rotary switch includes an annular stator **11** which is secured in a stationary position through mounting posts **11***a* by suitable means (not shown) and a disc-like rotor **12** which is positioned coaxially within the stator and is adapted to be rotatably driven relative to the stator by suitable means (not shown). For this latter purpose, the rotor **12** is provided with an aperture **12***d* having flat sides which is adapted to receive and be keyed to a driving shaft (not shown). The stator **11** and the rotor **12** are preferably constructed of nonconductive materials. For example, the stator may be constructed of alkyd thermosetting plastic, whereas the rotor may be constructed of any suitable thermoplastic material.

As may be seen by reference to FIG. 3, the stator **11** is provided with an annular ridge **11***b* around the inner circumferential surface thereof, whereas the rotor **12** is provided with an outer annular groove **12***a* which is adapted to receive and entrap the annular ridge **11***b*. While it is desired to construct the stator and rotor so that a snug fit exists therebetween, it will be appreciated that they must be constructed so that the rotor may be rotated relative to the stator. In its exemplary form, the rotor includes two disc-like sections **12***b* and **12***c* which are secured together to define the groove **12***a* and to entrap the annular ridge **11***b*, only section **12***b* of the rotor being shown in detail in FIGS. 6 and 7 since the sections are identical. For this purpose, the rotor sections **12***b* and **12***c* are provided with pin-like extensions **13***a* which are adapted to be received in bores **13***b* provided therein so that the sections may be heat sealed together to define the groove **12***a* and to entrap the ridge **11***b*.

In keeping with the present invention, at least one conductive, substantially arcuate contact assembly **14** is secured to at least one side of the rotor **12**. In the exemplary arrangement, however, contact assemblies **14** are mounted on opposite sides of the rotor. As may be seen by reference to FIG. 1, the exemplary contact assembly **14** has an inner contact area **14***a* and an outer contact area **14***b*. Additionally, the contact assembly **14** is provided with a plurality of circular apertures **14***c* and a plurality of radial grooves **14***d*. The apertures **14***c* are adapted to receive portions of nibs **16** formed integrally with each section **12***b* and **12***c* of the rotor in a securing operation. On the other hand, the grooves **14***d* are adapted to receive and cooperate with radial projections **15** formed integrally with the rotor **12** to properly align the contact assembly relative to the rotor for a securing operation. In securing of a contact assembly **14** to the rotor **12**, the contact assembly is positioned on the rotor so that projections **15** are received in the

grooves 14*d* and so that portions of selected nibs 16 extend into the apertures 14*c* of the contact assembly. The nibs 16 are then heat sealed down onto the contact assembly 14 to form connections 16*a* which secure the contact assembly to the rotor. It will be readily apparent that contact assemblies mounted on opposite sides of the rotor may be electrically connected together. For this purpose in the exemplary arrangement, apertures 17 are provided in the rotor 12 and a rivet connection 18 is formed between selected contact assemblies through one of the apertures 17 to form the electrical connection.

In further keeping with the present invention, a selected number of wiper assemblies 20 are mounted on each side of the stator 11, associated with a side of the rotor 12 having a contact assembly or contact assemblies 14 associated therewith, for cooperating with the contact assemblies 14 mounted on the associated side of the rotor 12 to establish desired electrical connections between selected wiper assemblies at prescribed times during each revolution of the rotor. Each wiper assembly 20 includes a standard, conductive terminal portion 20*a* extending radially outward from the stator which is adapted to be connected to external circuitry and a conductive wiper arm 20*b* extending radially inward of the stator for engaging associated contact assemblies 14 to establish electrical contact therebetween. Some of the wiper assemblies are provided with "long" wiper arms 20*b* for engaging the inner portions 14*a* of associated contact assemblies 14, whereas other wiper assemblies are provided with "short" wiper arms 20*b* for engaging the outer portions 14*b* of associated contact assemblies 14. Various standard variety terminal portions, such as wire wrap and plug on terminals, may be employed in the wiper assemblies as well as the exemplary terminal portion and the invention is intended to cover the utilization of any suitable terminal portion in conjunction with the wiper arms. Moreover, the invention is intended to cover the utilization of terminal portions of various desired sizes and shapes.

In each exemplary wiper assembly, the terminal portion 20*a* and the wiper arm 20*b* are separately formed of conducting materials and are suitably secured together. It follows, then that standard terminal portions 20*a* may be formed which are selectively secured to "long" wiper arms 20*b* and "short" wiper arms to form desired wiper assemblies 20. Additionally, it will be apparent that the terminal portions 20*a* and the wiper arms 20*b* may be formed of different materials and/or may be formed to have different thicknesses so that they have different strength characteristics. Further, different wiper arms 20*b* may be formed of different materials and/or to have different thicknesses so that they likewise have different strength characteristics. Consequently, the terminal portion 20*a* of each assembly may be formed to have a desired strength, whereas the wiper arm 20*b* may be formed to have a desired resilience so that a flexible contact is made between the wiper arm and associated contact assemblies 14 during operation of the rotary switch. In other words, the strength of the terminal portion is not limited by the strength of the associated wiper arm required to provide a flexible contact and the strengths of different wiper arms are not limited by one another. Moreover, standard terminal portions may be formed which are selectively secured to desired wiper arms. In an exemplary embodiment, the wiper arms 20*b* may be constructed of a conductive material having a thickness on the order of .005 inch so that it has an ideal resilient characteristic, whereas the terminal portion 20*a* may be constructed of a conductive material having a thickness on the order of .015 inch so that it has a higher strength characteristic. In view of the foregoing, it will be apparent that a wiper arm of any desired length and having any desired strength characteristic may be secured to a standard terminal portion.

In prior devices of this type, composite wiper assemblies have been formed as single units which have included a pair of wiper assemblies disposed in end-to-end relationship. In order to change the terminal length for such assemblies, a new stamping die must be employed. This is due to several basic factors. The grain of the strip material from which the assemblies are formed is to be oriented perpendicular to the axis of flexure for each assembly. Since the grain of strip stock is located longitudinally thereof, the die used must be reworked or replaced because the die lead locations, i.e., locations of matching holes and pins respectively in the strip material and the die, interfere with and limit axial extensions of the assemblies. Additionally, if the terminal ends of the completed assemblies are cut off to shorten them, the fulcrum for each assembly is destroyed and two separate basic assemblies are provided which are difficult to properly secure to the switch. With the wiper assembly disclosed herein, these problems are eliminated. Since the terminal portion is formed separately, there is no need for grain orientation therein, grain orientation only being required in the wiper arms. Consequently, the terminal portions may be stamped crosswise. When longer terminals are required, side rails are added to the die and wider strip stock is used. This has no effect on the die leads since the main body or central part of the terminal portion remains unchanged for any length terminal and the die leads are located intermediate the main body or central part.

In the formation of the terminal portions, relatively inexpensive dies may be employed. On the other hand, appreciably more expensive dies must be employed for the wiper arm. It follows then that, with the present wiper assembly construction, various terminal portion constructions may be employed without an appreciable increase in cost, even though different dies must be employed therefor. Conversely, with the prior one piece wiper assemblies, a change in the terminal portion will result in an appreciable cost increase if a different die must be used.

For the purpose of securing each wiper assembly 20 to the stator 11, the terminal portion 20*a* is provided with a transverse short tab 20*c* and a transverse long tab 20*d* (see FIGS. 3–5). Additionally, the stator 11 is provided with a plurality of pairs of apertures 22 and 23 which are spaced around the stator adjacent the outer periphery thereof and are adapted to receive the tabs 20*c* and 20*d*. The apertures 22 are rectangular in cross section and are adapted to receive the long tabs 20*d* with a clearance fit. On the other hand, the apertures 23 are circular in cross section and are adapted to receive the short tabs 20*c* with a gauging fit to secure the wiper assemblies to the stator 11. In construction of the rotary switch 10, the wiper assemblies 20 are staked into place in apertures 22 and pressed into apertures 23.

When wiper assemblies 20 are to be secured opposite one another on opposite sides of the stator 11, the long tab 20*d* is eliminated from one of the wiper assemblies and, when the assemblies are staked into place, the long tab of the other wiper assembly extends through the aperture 22 in the stator and through an aperture 20*e* formed in the terminal portion of the adjacent wiper assembly (see FIG. 3), the corresponding long tab of the second wiper assembly being eliminated. The short tabs 20*c* of the wiper assemblies 20 only extend partially into the apertures 23 when positioned therein and, therefore, do not engage one another to cause mechanical distortion.

As may best be seen by reference to FIG. 3, the side surfaces of the inner portion of the stator 11 and the side surfaces of the rotor 12 are substantially coplanar. Additionally, it may be seen that the contact assemblies 14 overhang and fit close to the side surfaces of the stator thereby eliminating wasted space between the contact assemblies and the stator. This structure permits the utilization of single-wipe wiper arms for en-

gaging the contact assemblies as opposed to the more costly double-wipe wiper arms presently utilized in conventional structures of this type. For the purpose of limiting the amount of tracking of the contact assemblies **14** on the outer surface of the stator **11** and thereby to limit the amount of wear on these parts, radial grooves **11***d* have been provided in the portion of the stator adjacent the rotor **12**.

In still further keeping with the present invention, the stator **11** is constructed so that the functional parts of the rotary switch **10** are not damaged during handling operations. For this purpose, each side of the stator **11** is provided with a raised outer portion or outer annular rim **11***c* upon which the wiper assemblies **20** are mounted. As may be seen, the wiper arms **20***b* of the wiper assemblies are constructed so that they bend inwardly and engage the contact assemblies **14** below the associated outermost side surfaces **11***d* of the rotary switch as best seen in FIG. 3. Consequently, the functional parts or electrical connection contact parts of the rotary switch, i.e., the wiper arms and the contact assemblies, are disposed below the outermost side surfaces of the switch and thus are protected thereby against damage during handling operations. In other words, by using this stator construction, the amount of exposure of the wiper arms **20***b* and the contact assemblies **14** during handling is reduced, thereby providing adequate protection for these parts against damage during handling.

In view of the foregoing, it will be readily apparent that an electrical connection is provided between wiper assemblies **20** mounted on the same side of the stator **11** when the wiper arms **20***b* thereof concurrently engage a contact assembly **14** mounted on the rotor **12**. Moreover, if the wiper arms **20***b* of wiper assemblies **20** mounted on opposite sides of the stator concurrently engage contact assemblies **14** on opposite sides of the rotor which are electrically connected together by a rivet **18**, an electrical connection is established therebetween. Thus, as the rotor **12** is rotated relative to the stator **11**, desired electrical connections are selectively provided between wiper assemblies **20** mounted on the stator **11**. The terminal portions **20***a* of the wiper assemblies **20** may be electrically connected to external circuitry so that the operation thereof is controlled by the rotary switch **10** as the rotor **12** is rotated relative to the stator.

While, in the exemplary rotary switch **10**, contact assemblies **14** and wiper assemblies **20** are provided on opposite sides thereof, it will be readily apparent that the switch will function as desired with such assemblies being provided only on one side and the invention is intended to cover either arrangement. Moreover, a desired plurality of individual contact assemblies may be selectively provided on opposite sides of the switch and the invention is likewise intended to cover such modifications.

What is claimed is:

1. In a rotary switch, the combination which comprises a stator having at least one raised portion on at least one side thereof, a rotor positioned coaxially within the stator for rotational movement relative to the stator, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having a raised portion, and a selected number of wiper assemblies mounted on the stator for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween the raised portions being disposed so that the engaging portions of the contact and wiper assemblies are not engageable by a surface when an outermost side surface rests upon the surface.

2. In a rotary switch, the combination which comprises an annular stator having an outer annular rim on each side thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor, and a selected number of wiper assemblies mounted on each annular rim for engaging the contact assemblies on the associated side of the rotor below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

3. In a roary switch, the combination which comprises an annular stator having an outer annular rim on at least one side thereof and having an annular ridge formed around the inner surface thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto and having an outer annular groove receiving and entrapping the ridge, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, and a selected number of wiper assemblies mounted on each annular rim for engaging the contact assemblies on the associated side of the rotor below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

4. In a rotary switch, the combination which comprises an annular stator having an annular rim on at least one side thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, and a selected number of wiper assemblies mounted on each annular rim for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween, each wiper assembly including a clip-wiping portion for engaging the associated contact assemblies and a terminal portion adapted to be connected to external circuitry which are separately formed and suitably secured together.

5. In a rotary switch, the combination which comprises an annular stator having an annular rim on at least one side thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, and a selected number of wiper assemblies mounted on each annular rim for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween, each wiper assembly including a clip-wiping portion for engaging the associated contact assemblies and a terminal portion adapted to be connected to external circuitry which are suitably secured together and may be separately formed of different materials having different thicknesses.

6. In a rotary switch, the combination which comprises an annular stator formed of a nonconductive material and having an outer annular rim on at least one side thereof, a rotor formed of a nonconductive material and positioned coaxially within the stator for rotational movement relative thereto, at least one substantially flat conductive contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, and a selected number of conductive wiper assemblies mounted on each annular rim for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

7. In a rotary switch, the combination which comprises an annular stator having an annular rim on at least one side thereof, a rotor poistioned coaxially within the stator for rotational movement relative thereto, contact means associated with each side of the rotor associated with a side of the stator having an annular rim, and means associated with each annular rim for engaging the associated

contact means below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical contact is selectively established therebetween.

8. In a rotary switch, the combination which comprises an annular stator having an annular rim on each side thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor, means for electrically connecting together selected contact assemblies mounted on opposite sides of the rotor, and a selected number of wiper assemblies mounted on each side of the stator for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established between wiper assemblies.

9. In a rotary switch, the combination which comprises an annular stator having an annular rim on each side thereof and having a plurality of apertures formed therein which extend through the rims, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor, and a selected number of wiper assemblies mounted on each annular rim for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween, each wiper assembly having tabs secured in the apertures for securing the wiper assembly thereto.

10. In a rotary switch, the combination which comprises an annular stator having an annular rim on each side thereof and having a plurality of pairs of apertures formed therein which extend through the annular rims, a rotor positioned coaxially within the stator for rotational movement thereto, at least one contact assembly mounted on each side of the rotor, and a selected number of wiper assemblies mounted on each annular rim, each wiper assembly having a pair of tabs secured in a selected pair of apertures in the stator for securing the wiper assembly thereto, each wiper assembly including a wiper arm extending radially inward for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween and a terminal portion extending radially outward which is adapted to be connected to external circuitry.

11. In a rotary switch, the combination which comprises an annular stator having an outer annular rim on at least one side thereof, a rotor corresponding in thickness to the inner portion of the stator positioned coaxially within the stator for rotational movement relative thereto, at least one substantially flat contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, each contact assembly overlapping a portion of the stator, and a selected number of wiper assemblies mounted on each annular rim of the stator for engaging the contact assembly below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

12. In a rotary switch, the combination which comprises an annular stator having an annular rim on at least one side thereof and having an annular ridge formed around the inner circumferential surface thereof, a pair of rotor sections positioned coaxially within the stator and secured together to define an outer annular groove for receiving and entrapping the ridge, the rotor being rotatable relative to the stator, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, and a selected number of wiper assemblies mounted on each annular rim for engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

13. In a rotary switch, the combination which comprises an annular stator having an annular rim on at least one side thereof, a rotor positioned coaxially within the stator for rotational movement relative thereto, at least one contact assembly mounted on each side of the rotor associated with a side of the stator having an annular rim, each contact assembly having outer and inner contact portions, a selected number of wiper assemblies mounted on each annular rim and adapted to engage the outer contact portions, and a selected number of wiper assemblies mounted on each annular rim and adapted to engage the inner contact portions, the wiper assemblies engaging the associated contact assemblies below the outermost associated side surface of the switch as the rotor is rotated relative to the stator so that electrical connections are selectively established therebetween.

14. In a wiper assembly for use in a rotary switch or the like, the combination which comprises a terminal portion adapted to be connected to external circuitry, and a resilient wiper arm having a desired length, both the terminal portion and the wiper arm having generally elongate shapes, the wiper arm being secured to the terminal portion in an end-to-end cantilever manner such that the wiper arm is in substantial lengthwise alignment with the terminal portion and forms a substantially lengthwise extension of said terminal portion.

15. In a wiper assembly for use in a rotary switch or the like, the combination which comprises a terminal portion adapted to be connected to external circuitry, and a resilient wiper arm having a desired length, both the terminal portion and the wiper arm having generally elongate shapes, the wiper arm being secured to the terminal portion in an end-to-end cantilever manner such that the wiper arm is in substantial lengthwise alignment with the terminal portion and forms a substantially lengthwise extension of said terminal portion, the terminal portion and the wiper arm having different material characteristics.

16. In a rotary switch, the combination which comprises an annular stator member, a coaxially mounted rotor member, and a plurality of wipers, each of said wipers comprising a terminal portion secured to said stator member and adapted to be connected to external circuitry, and a resilient wiper arm having a desired length to cooperate with said rotor member, both the terminal portion and the wiper arm having generally elongate shapes, the wiper arm being secured to the terminal portion in an end-to-end cantilever manner such that the wiper arm is in substantial lengthwise alignment with the terminal portion and forms a substantially lengthwise extension of said terminal portion.

17. In a wiper assembly for use in a rotary switch or the like, the combination which comprises a terminal portion adapted to be connected to external circuitry, and a resilient wiper arm having a desired length, both the terminal portion and the wiper arm having generally elongate shapes, the wiper arm being secured to the terminal portion in an end-to-end cantilever manner such that the wiper arm is in substantial lengthwise alignment with the terminal portion and forms a substantially lengthwise extension of said terminal portion, the terminal portion and the wiper arm being separately constructed of the same material having different thicknesses.

18. In a wiper assembly for use in a rotary switch or the like, the combination which comprises a terminal portion adapted to be connected to external circuitry, and a resilient wiper arm having a desired length, both the terminal portion and the wiper arm having generally elongate shapes, the wiper arm being secured to the terminal portion in an end-to-end cantilever manner such that the wiper arms is in substantial lengthwise alignment with the terminal portion and forms a substantially lengthwise extension of said terminal portion, the terminal portion and the wiper arm being separately constructed of different materials having different thicknesses.

(References on following page)

9

References Cited by the Examiner

UNITED STATES PATENTS

2,755,347	7/1956	Allison	200—11
2,989,710	6/1961	Gelzer et al.	
3,030,460	4/1962	Huetten et al.	
3,113,196	12/1963	Spooner et al.	

10

3,174,000	3/1965	Golbeck.
3,242,271	3/1966	Stephan et al.

FOREIGN PATENTS

961,338	6/1964	Great Britain.

ROBERT K. SCHAEFER, *Primary Examiner.*

K. H. CLAFFY, *Examiner.*

J. R. SCOTT, *Assistant Examiner.*