United States Patent

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[33] **Switzerland**
[31] **7085/68**

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[54] **MULTIPOSITIONAL SWITCH CONSTRUCTION**
7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **200/11,** 200/17, 200/166
[51] **Int. Cl.** **H01h 19/58,** H01h 21/78, H01h 3/00
[50] **Field of Search** ..... 200/5, 11, 17, 166(C), 166(CPC), 166.1

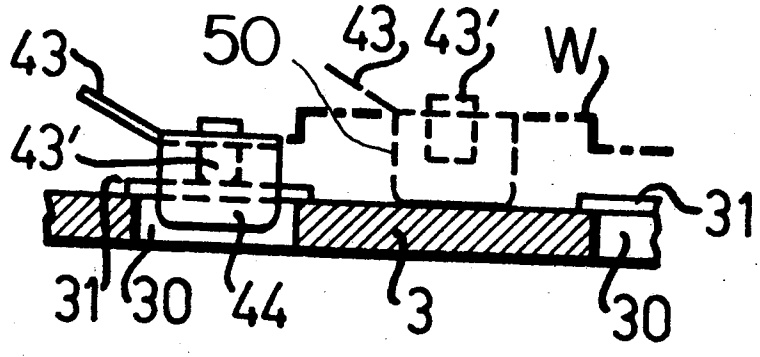
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Attorney—Werner W. Kleeman

ABSTRACT: There is disclosed a multipositional switch comprising a rotatably mounted switching wheel equipped with a rotary wiper switch means possessing at least two contact fingers. A circuit board having a plurality of contact tracks, for instance in the form of a number of contact segments and one ring-shaped contact member, cooperate with the rotary wiper switch means such that for each selected position of the switching wheel at least two of the contact tracks are electrically coupled with one another via the contact fingers. The circuit board possesses a plurality of spaced recesses, and cam means are provided for at least one of the contact fingers. The cam means for each switching position of the switching wheel being located in an associated one of said recesses. Upon rotation of said switching wheel into its next switching position, the cam means move out of the associated one recess and along the surface of the circuit board, to thereby rapidly raise the contact finger provided with such cam means from its associated contact track located at the circuit board.



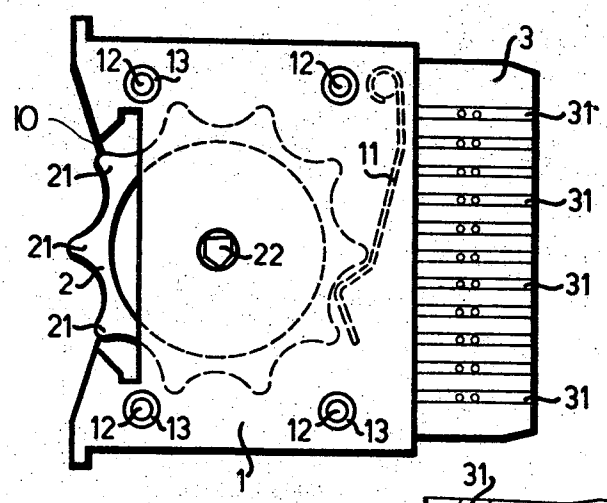


FIG. 1

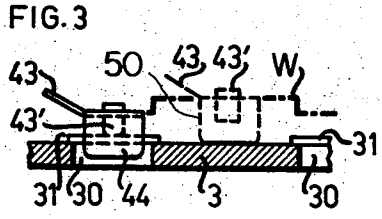


FIG. 3

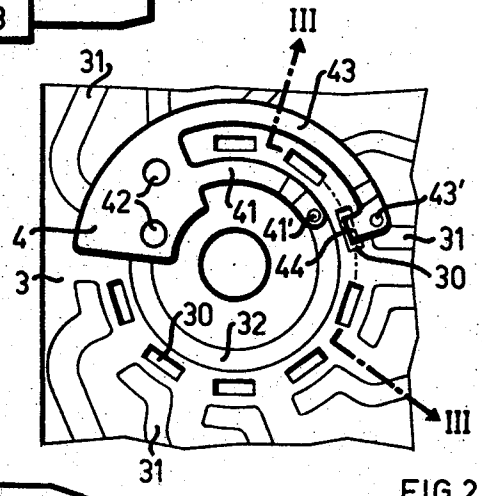


FIG. 2

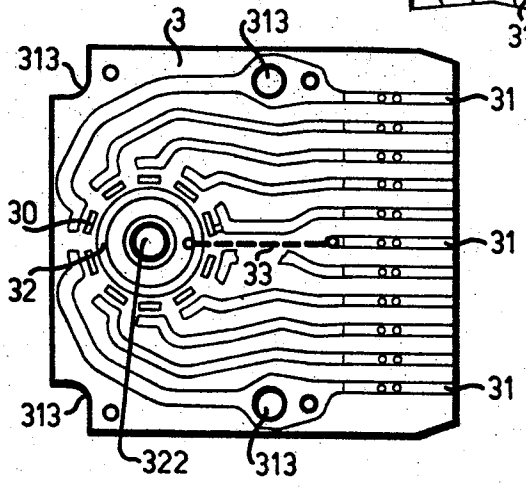


FIG. 4

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MULTIPOSITIONAL SWITCH CONSTRUCTION

BACKGROUND OF THE INVENTION

The present invention relates to an improved multipositional selector switch of the type incorporating a rotatable switching wheel at which there is mounted a rotary wiper switch means having at least two contact fingers in such a fashion that during each selectable switching position of the switching wheel at least two contact tracks of a circuit board are electrically coupled with one another.

In prior art multipositional selector switches of this general construction, during the switching operation, the contact fingers of the rotary wiper switch means slide from one contact track located upon the circuit board onto the nonconductive portion of the circuit board situated between two contact tracks, and then onto the next contact track. Such type physical construction is, however, unsuitable for many applications or is at the very least subject to disturbances. When switching current intensities above 0.3 amperes, the sparks which appear during the switching operation cause a rapid charring of the material of the circuit board at the region of the contact track. Since the contact points or rivets wipe across the circuit board any contaminations which are present upon the contact tracks will be entrained, which, in turn, impairs the operational reliability of the switch.

SUMMARY OF THE INVENTION

Accordingly, a need exists in the prior art to provide an improved multipositional selector switch which effectively overcomes the aforementioned drawbacks. Thus, one primary objective of this invention is to provide a multipositional selector switch which does just that.

Another, more specific object of the present invention is to provide an improved multipositional selector switch of the type mentioned which is relatively simple in construction, extremely reliable in its switching operation, not readily subject to breakdown, avoids the heretofore mentioned drawbacks of the prior art constructions, and improves the longevity of the switching unit.

Still another more specific object of the present invention relates to an improved multipositional selector switch which is equipped with means enabling the switching operation to be performed while substantially reducing the formation of sparks which otherwise would tend to char the material of the circuit board and which allows the contact fingers to be moved from one contact track to another without any appreciable danger of spreading contaminations or foreign materials from one such contact track to another.

Yet a further significant object of the present invention relates to an improved multipositional selector switch which can be readily mass produced in economical fashion, provides for (a) increased longevity of the components of the switch, (b) operational reliability of the switch itself, and (c) suppresses to a great extent wearing out of the components of the switch due to sparking, and (d) reduces malfunction of the switch by considerably avoiding spreading of foreign material along the circuit board and into contact with parts of the switch structure.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the proposed inventive multipositional selector switch construction is manifested by the features that a cam means is provided for at least one contact finger. This cam means is located for each switching position of the switching wheel in a recess of the circuit board provided for such cam means. Since the cam means, upon further rotation of the switching wheel into its next switching position, moves out of the recess onto the plane or surface of the circuit board and slides along such surface, there is brought about a rapid raising of the contact finger from the associated contact track located upon or at the circuit board.

By virtue of the inventive construction of multipositional selector switch, it is insured that the contact finger with its contact point or rivet is reliably and rapidly raised from a contact track and again placed onto a contact track. In this manner it is possible to switch considerably larger currents without the presence of disturbing or detrimental auxiliary affects, such as those experienced with the prior art constructions explained above. Likewise, soiling of the switching contacts is prevented due to the raising of the contact points or rivets from the contact tracks, which, in turn, favorably influences the operational reliability of the switch structure.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein:

FIG. 1 is a schematic side view of a multipositional selector switch construction according to the present invention;

FIG. 2 is a fragmentary view showing details of the rotary wiper switch means with its contact fingers and a portion of the circuit board provided with the contact track means and recesses;

FIG. 3 is a sectional view of the structure shown in FIG. 2, taken substantially along the line III–III thereof; and

FIG. 4 is a view of the entire circuit board illustrating details of the contact track means and the recesses.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, the exemplary embodiment of multipositional selector switch construction disclosed herein will be seen to comprise a switch housing **1** for the rotatably mounted switching wheel **2** and the circuit board or plate **3** equipped with the contact track means **31** and **32**. As will be explained more fully hereinafter, the contact track means **31** are in the form of contact segments whereas the contact track means **32** are here shown in the form of a substantially ring-shaped contact member. It will also be observed that the switching wheel **2** is equipped with a plurality of peripherally disposed teeth or finger-engaging projections **21**, wherein for each switching position of the switching wheel **2** a different one of these protruding teeth **21** extends out of the opening **10** provided at the front side of the switch housing **1**. A suitable spring member **11** within the switch housing **1** serves to retain the switching wheel **2** in its momentary located switching position.

Furthermore, the through passage openings or bores **12**, which may be advantageously conical at the inside, for the purposes to be explained shortly, and serve to receive the fastening means for holding together a plurality of such multipositional selector switch units into a composite switch assembly, will be understood to have these through passage openings **12** extended at one side by outwardly conical sleeve members **13**. These through passage openings **12**, together with the conical sleeve members **13**, and the protruding shaft **22** for the switching wheel **2** serve as alignment and retaining means for the correct mounting of the insertable or mountable circuit board **3**. Additionally, it is here mentioned that the protruding sleeve members **13** at one side of the switch housing **1** will be received in the through passage openings **12** provided at an adjacent switch housing **1**, so that a plurality of such switch units can be conveniently mounted together in side-by-side relationship.

In FIG. **2** there are shown details of the rotary wiper switch means **4** and the circuit board **3**. It will be seen that the rotary wiper switch means **4** is fixedly connected for rotation at the locations **42** with the switching wheel **2**. In the exemplary illustrated embodiment of switch construction depicted herein, both of the resilient contact fingers **41** and **43**, which advantageously each carry a respective silver contact pin or rivet **41'** and **43'**, electrically couple in each switching position of the switching wheel **2** the substantially ring-shaped contact track **32** with one of the contact tracks **31**. Furthermore, it will

be understood that according to an important aspect of the invention a cam member **44** is provided for the contact finger **43**. This cam member **44** is disposed substantially perpendicular to the associated circuit board **3**. Whenever the switching wheel has assumed a predetermined switching position, the cam member **44** is located in a given recess **30** of the circuit board **3**. Again, it will be seen that in the exemplary embodiment a plurality of such recesses are disposed in spaced arrangement around the ring-shaped contact member **32**, and specifically, between the latter and the associated contact segment **31**. Furthermore, the spacing between the contact tracks **31**, **32** of the circuit board **3** at all locations amounts advantageously to at least 3 mm.

FIG. **3** serves to explain the mode of operation of the depicted multipositional selector switch unit during the selection of a new switching position. When the switching wheel **2** is indexed or rotated further, and therefore also the contact finger **43** carrying the cam member **44**, this cam member **44** will be raised out of its recess **30** into the phantom line position where it slides upon the surface or plane of the circuit board **3**. Consequently, the associated contact pin or rivet **43'** is raised from the contact track **31**. If the switching wheel **2** is rotated further, then, the cam member **44** will slide into the neighboring recess **30** and the contact pin **43'** will again drop into contact with the corresponding contact track **31**. The dash-dot line W schematically depicts the path of movement of the contact finger **43** with the contact pin **43'** and the cam member **44** as it moves from one recess **30** into the next adjacent recess **30**.

Finally, in FIG. **4** there are shown details of the circuit board **3** with the contact tracks **31**, **32** and the recesses **30**. In this arrangement, one of the contact tracks in the form of a contact segment **31** is connected at the rear side of the circuit board **3** via a conductor **33** with the contact track **32** shown as a substantially ring-shaped contact member. Contact tracks **31**, recesses **30** and contact fingers **41**, **43**, as shown in the arrangement of FIG. **2**, could also be arranged such that for each switching position of the switch wheel **2**, two different contact tracks **31** are connected electrically with one another and, not as shown, a respective different contact track **31** with a given ring-shaped contact track **32**. The recesses or cutouts **313** and the bores **322** provided at the circuit board **3** serve to receive the sleeve members **13** and shaft **22** of the switching wheel **2**.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset to the specification have been successfully achieved.

I claim:

1. A multipositional selector switch comprising a rotatably mounted switching wheel indexable to assume a number of different selected switching positions, rotary wiper switch means possessing at least two contact fingers and carried for rotation by said switching wheel, a circuit board having a plurality of contact track means, said circuit board cooperating with said rotary wiper switch means such that for each selected switching position of said switching wheel at least two of said contact track means are electrically coupled with one another via said contact fingers, said circuit board being equipped with a plurality of spaced recesses, cam means provided for at least one of said contact fingers, said cam means for each switching position of said switching wheel being located in an associated one of said recesses, with said one contact finger then contacting an associated contact track means and the other contact finger contacting another contact track means, to thus electrically connect said associated contact track means and said another contact track means with one another, said cam means upon rotation of said switching wheel into its next switching position moving out of said associated one recess and along the surface of said circuit board to thereby rapidly raise said one contact finger provided with said cam means from its associated contact track means located at said circuit board, to thereby interrupt the previously established electrical connection of said associated contact track means and said another contact track means with one another.

2. A multipositional selector switch as defined in claim **1**, wherein one of said contact track means is a substantially ring-shaped contact member, said rotary wiper switch means electrically coupling by means of said contact fingers bearing upon said contact track means said ring-shaped contact member with one of the remaining contact track means as said switching wheel assumes its different switching positions.

3. A multipositional selector switch as defined in claim **1**, wherein the spacing between said contact track means of said circuit board amounts to at least 3 mm. at all locations.

4. A multipositional selector switch as defined in claim **1**, further including a switch housing for receiving said switching wheel, rotary wiper switch means and said circuit board, said switch housing being provided with through passage openings capable of receiving connecting screw means for connecting together a plurality of such multipositional selector switches into a switch assembly.

5. A multipositional selector switch as defined in claim **4**, wherein said through passage openings for said connecting screw means have associated therewith at one side protruding externally conical sleeve means and at the other side being provided with internal conical surface means, in order to receive the external conical protruding sleeve means of the neighboring multipositional selector switch.

6. A multipositional selector switch comprising a rotatably mounted switching wheel indexable to assume a number of different selected positions, rotary wiper switch means possessing at least two contact fingers and carried for rotation by said switching wheel, a circuit board having a plurality of contact track means, said contact track means including a plurality of contact segments and at least one substantially ring-shaped contact member, said circuit board cooperating with said rotary wiper switch means such that for each selected switching position of said switching wheel at least two of said contact track means are electrically coupled with one another via said contact fingers, said circuit board being equipped with a plurality of spaced recesses intermediate said contact segments and said ring-shaped contact member, cam means provided for at least one of said contact fingers, said cam means for each switching position of said switching wheel being located in one of said recesses, during which time said one contact finger is in conductive contact with a given associated contact track means and said other contact finger is in conductive contact with said ring-shaped contact member, to thus electrically connect said associated contact track means with said ring-shaped contact member, said cam means upon rotation of said switching wheel into its next switching position moving out of said one recess in a direction away from and substantially perpendicular to the surface of said circuit board and then along the surface of said circuit board, to thereby rapidly raise said one contact finger provided with said cam means out of said conductive contact with said associated contact track means located at said circuit board, to thereby interrupt the previously established electrical connection of said associated contact track means with said ring-shaped contact member.

7. A multipositional selector switch comprising a rotatably mounted switching wheel indexable to assume a number of different selected positions, rotary wiper switch means possessing at least two contact fingers each having a contact rivet and carried for rotation by said switching wheel, a circuit board having a plurality of contact track means, said contact track means including a plurality of contact segments and at least one substantially ring-shaped contact member said circuit board cooperating with said rotary wiper switch means such that for each selected switching position of said switching wheel at least two of said contact track means are electrically coupled with one another via said contact rivets of said contact fingers, said circuit board being equipped with a plurality of spaced recesses intermediate said contact segments and said ring-shaped contact member, cam means carried by at least one of said contact fingers for movement along a path completely out of the operable zone of said plurality of contact track means, said cam means therefore never physically

contacting said plurality of contact track means, said cam means for each switching position of said switching wheel being located in one of said recesses, during which time said one contact finger is in conductive contact via its associated contact rivet with a given associated contact track means and the other contact finger being in conductive contact via its associated contact rivet with said ring-shaped contact member, to thereby electrically connect said associated contact track means with said ring-shaped contact member, said cam means upon rotation of said switching wheel into its next switching position moving out of said one recess in a direction away from the surface of said circuit board and approximately perpendicular thereto and then moving again along the surface of said circuit board, to thereby rapidly raise said one contact finger provided with said cam means out of said conductive contact with said associated contact track means and its associated contact rivet out of physical contact with said circuit board, thereby suppressing switch sparking and the spreading of contaminants between said plurality of contact track means when moving said one contact finger between adjacent ones of said contact track means.