

[54] **SWITCH WITH PERIPHERAL CAM ACTUATOR**

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[51] Int. Cl. **H01h 19/62, H01h 19/64,**
H01h 33/91

[58] Field of Search..... **200/153 LB, 148 A, 21,**
200/28, 30 R, 38 B

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Primary Examiner—Robert K. Schaefer

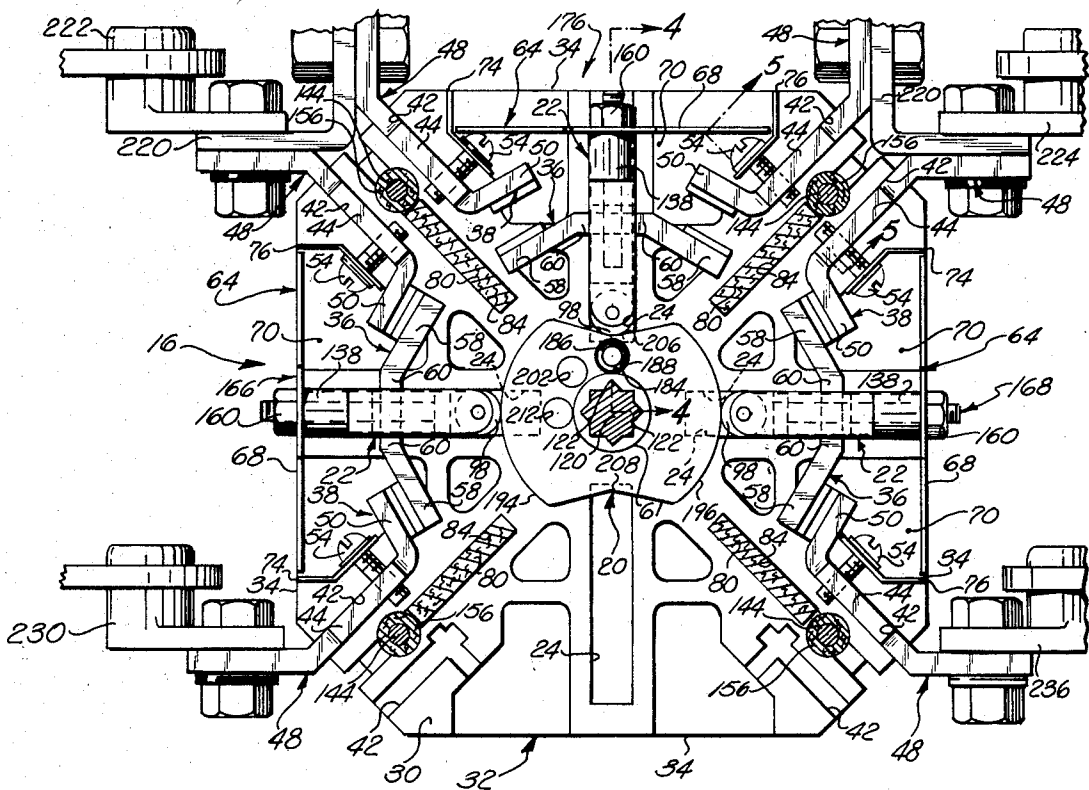
Assistant Examiner—William J. Smith

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ABSTRACT

An improved switch assembly includes a plurality of housing plates or walls having opposite major sides in which a plurality of fixed contact mounting slots are formed. Fixed contacts extend between the slots in adjacent housing walls. A carrier assembly is reciprocated by rotation of a cam to move movable contacts into and out of engagement with the fixed contacts. The movable contacts are resiliently mounted on a cross bar of a generally H-shaped body of the carrier assembly. The opposite legs of the H-shaped body are slidably disposed in guide slots formed in the major sides of the adjacent housing walls. To retard arcing upon opening of the contacts, a bellow plate is mounted on the carrier assembly and is moved in a chamber formed between the adjacent housing walls to induce a flow of air around the contacts as they are opened. This flow of air is promoted by shield members which extend between the housing walls and prevent a sideways escape of air upon movement of the bellow plate. In addition, barrier plates extend between the adjacent housing walls to further prevent the escape of air as the contacts are opened.

17 Claims, 6 Drawing Figures



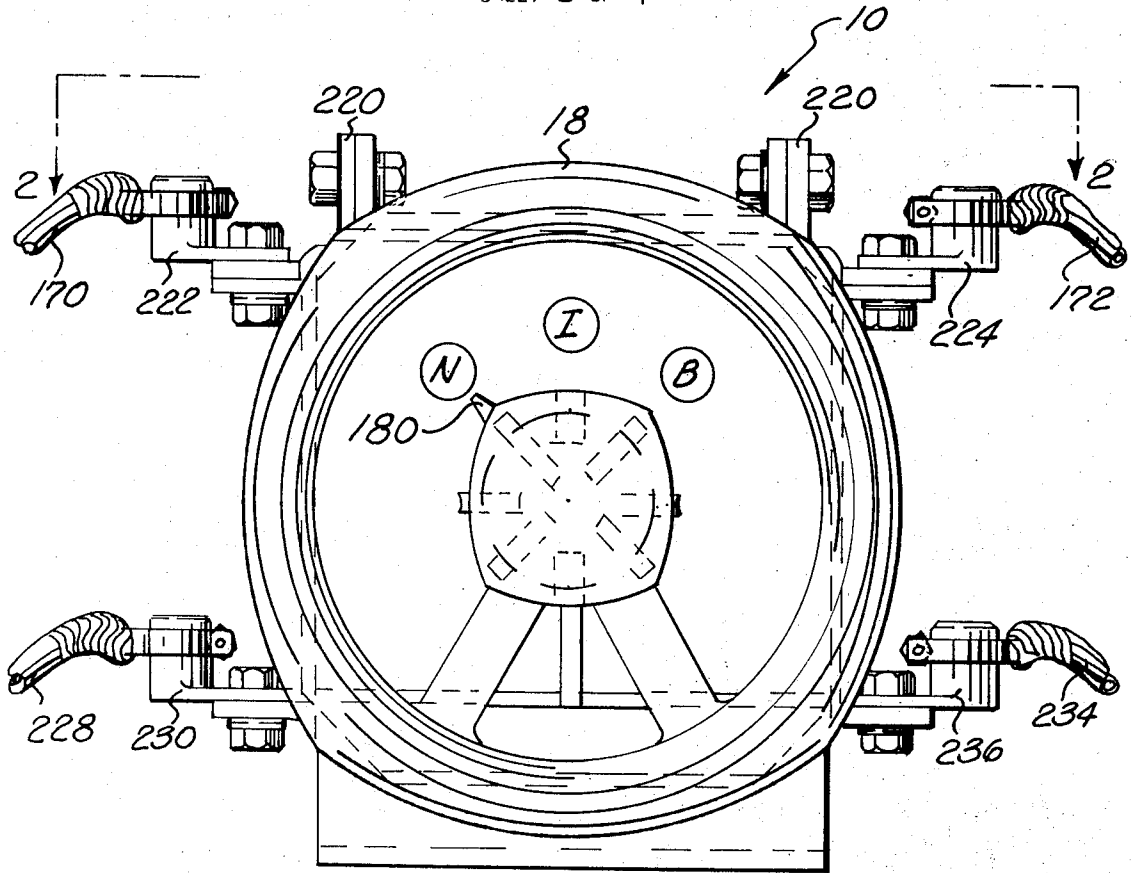


FIG. 1

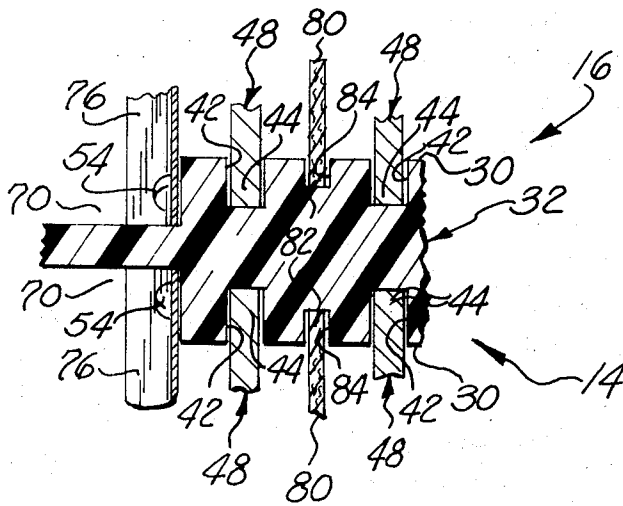


FIG. 5

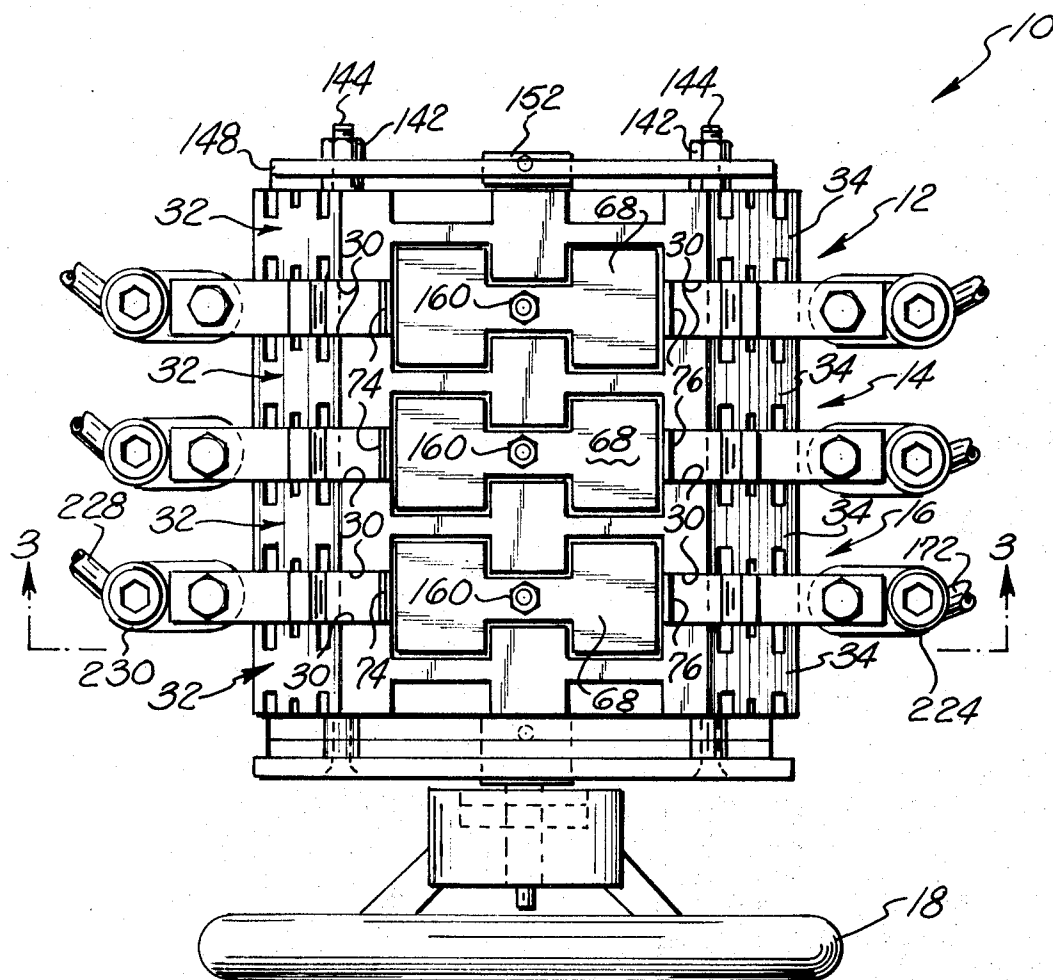


FIG. 2

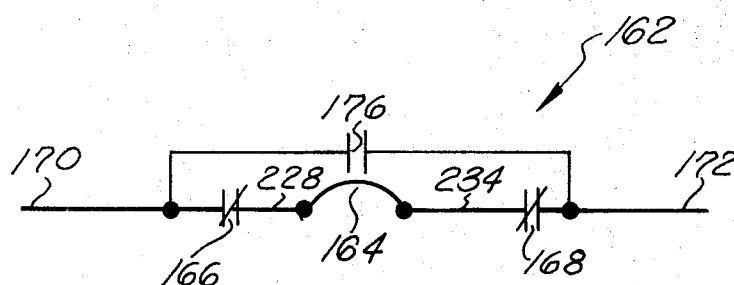
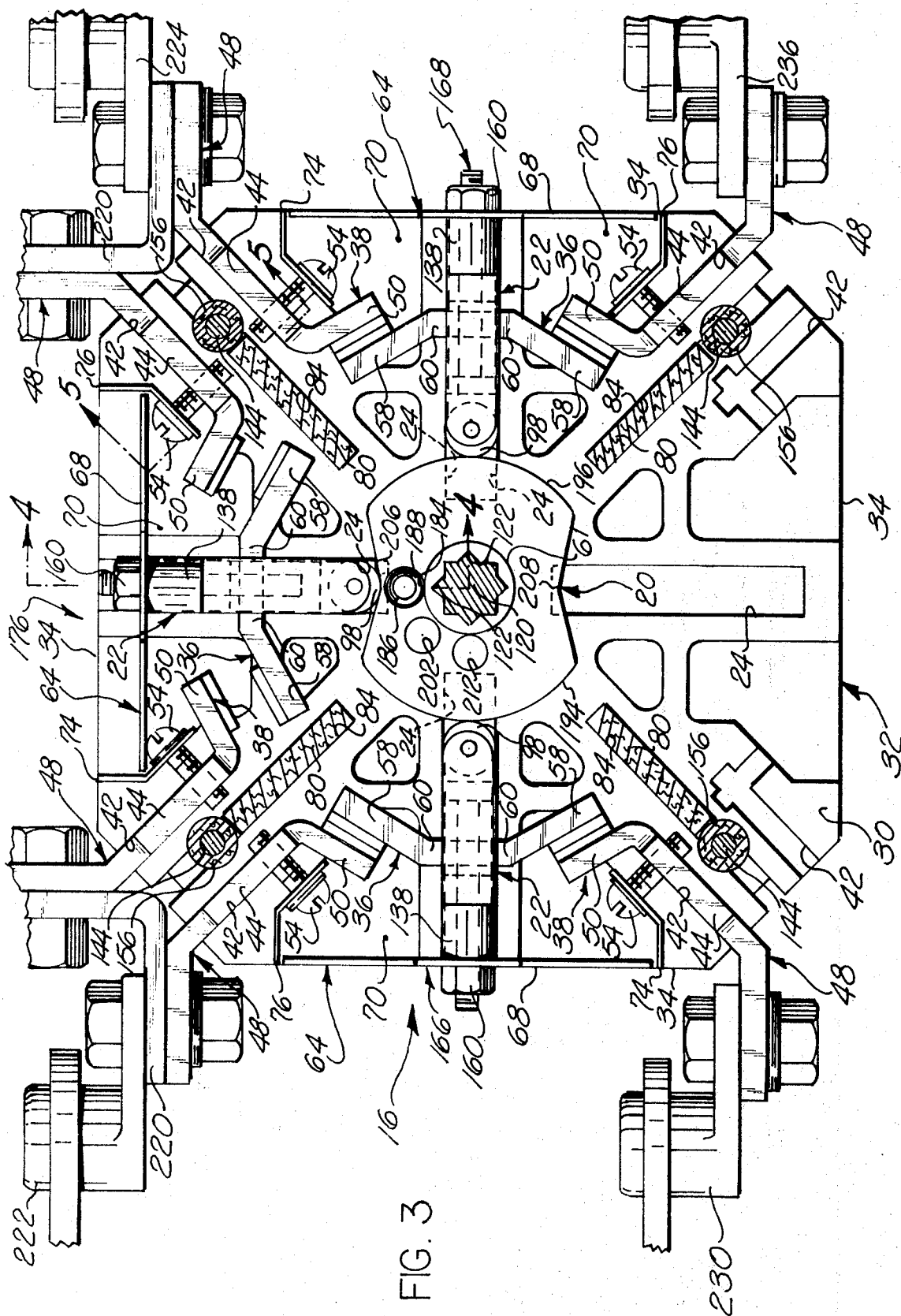


FIG. 6



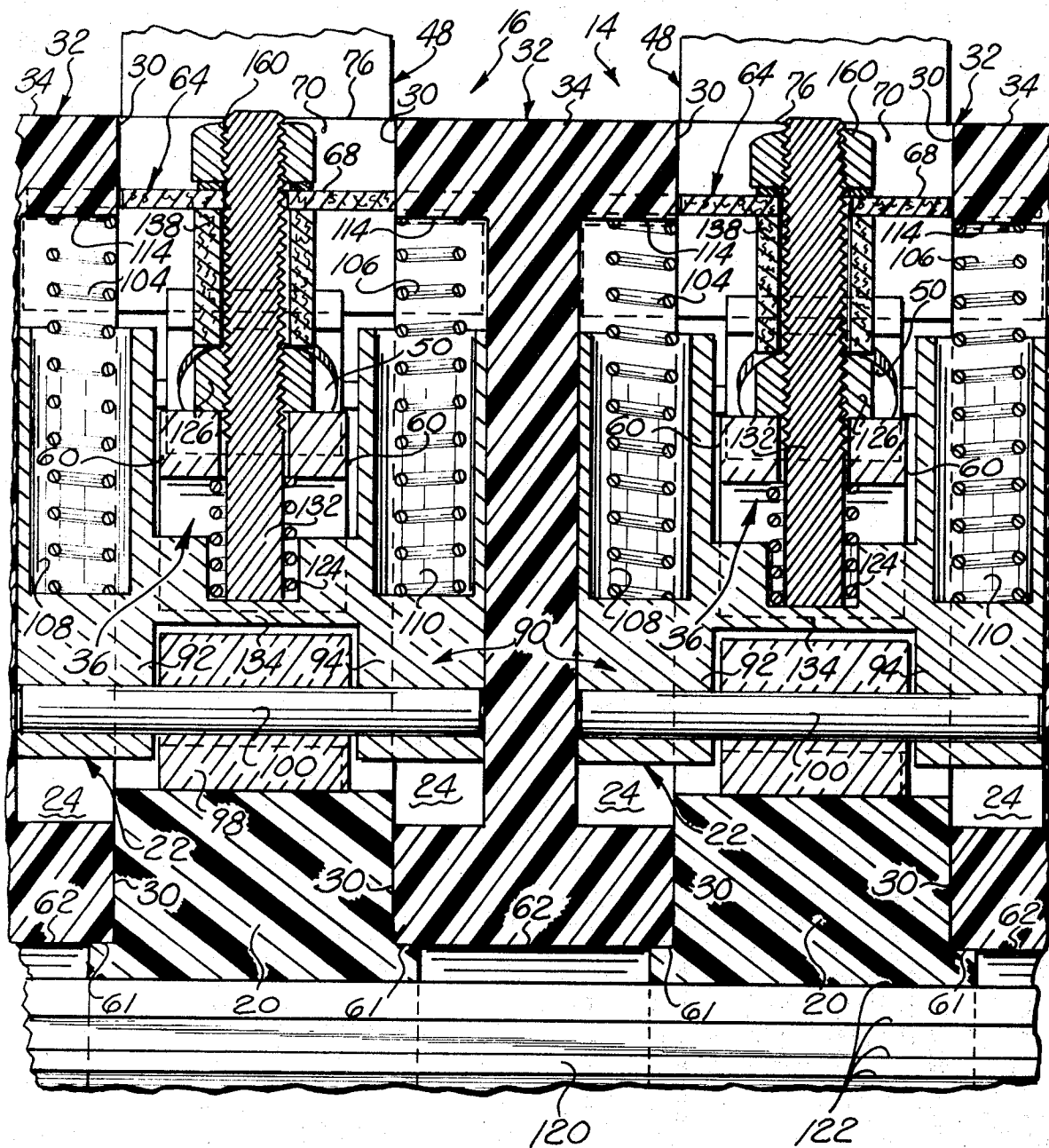


FIG. 4

SWITCH WITH PERIPHERAL CAM ACTUATOR

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved switch assembly and more specifically to a switch assembly having a plurality of housing walls with major sides which support fixed contacts and guide the movement of a carrier assembly on which movable contacts are disposed.

There are many known switch assemblies having a plurality of cams which are rotated to open and close switch contacts in a manner similar to that disclosed in U.S. Pat. Nos. 2,833,872 and 2,671,148. In addition, there are many known switch assemblies which have carriers which reciprocate movable contacts relative to stationary contacts. Some of these known switch assemblies are disclosed in U.S. Pat. Nos. 2,273,545; 2,276,698; and 3,088,007. Although these known switch assemblies have been more or less satisfactory in their mode of operation, they are not particularly well adapted for use in switching environments wherein high amperage electrical currents are to be controlled. In addition, these known switch assemblies are more or less limited in their adaptability for use in association with many different types of circuits.

SUMMARY OF THE INVENTION

An improved switch assembly constructed in accordance with the present invention includes a plurality of housing walls or plates having side surfaces which define a plurality of contact recesses. A plurality of fixed contacts extend between contact recesses formed in a pair of adjacent housing walls. In addition, the adjacent housing walls define guide slots which engage opposite side portions of a carrier assembly. Biasing springs extend between outer ends of the guide slots and the contact carrier assembly to urge it into engagement with a rotatable cam disposed between the housing walls. When this cam is rotated, a set of movable contacts disposed on the carrier assembly is moved into engagement with a set of fixed contacts mounted on the housing walls. When the movable contacts are moved away from the fixed contacts, a bellows arrangement induces a flow of air between the fixed and movable contacts to retard arcing.

The housing walls have opposite major sides which are recessed to receive the fixed contacts and to provide carrier guide slots. This enables each housing wall to cooperate with two other housing walls so that a series of switch units may be formed by mounting fixed contacts and contact carrier assemblies in association with opposite major sides of a single housing wall. The fixed contacts can be readily replaced without disassembling a switch assembly to facilitate maintenance.

Accordingly, it is an object of this invention to provide a new and improved switch assembly which is readily manufactured and is capable of being utilized in many different environments and particularly in environments where high amperage currents are to be controlled with the switch assembly.

Another object of this invention is to provide a new and improved switch assembly which includes a pair of housing walls which define recesses for receiving portions of fixed contacts which extend between the housing walls.

Another object of this invention is to provide a new and improved switch assembly which includes a pair of housing walls each of which defines a longitudinally extending carrier guide slot which receives a portion of a carrier assembly disposed between the housing walls to support the carrier assembly and movable contacts thereon for movement between open and closed positions.

Another object of this invention is to provide a new and improved switch assembly which includes a bellows arrangement for inducing the flow of air upon opening of an associated set of contacts to thereby retard arcing between the contacts.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the present invention will become more apparent upon a consideration of the following description taken in connection with the accompanying drawings, wherein:

FIG. 1 is an elevational view of a switch assembly constructed in accordance with the present invention;

FIG. 2 is a plan view taken generally along line 2—2 of FIG. 1, illustrating the relationship between a plurality of switching units in the switch assembly of FIG. 1;

FIG. 3 is an elevational view taken generally along line 3—3 of FIG. 2, illustrating the construction of one of the switching units;

FIG. 4 is a fragmentary sectional view taken generally along the line 4—4 of FIG. 3, illustrating the relationship between carrier assemblies for moving contacts into and out of engagement with fixed contacts in adjacent switching units;

FIG. 5 (on sheet 1 of the drawings) is a fragmentary sectional view, taken generally along the line 5—5 of FIG. 3, illustrating the relationship between a housing wall and components of one of the switching units; and

FIG. 6 (on sheet 2 of the drawings) is a schematic illustration of a circuit with which one of the switching units in the switch assembly is associated.

DESCRIPTION OF ONE PREFERRED EMBODIMENT OF THE INVENTION

A switch assembly 10 constructed in accordance with the present invention is illustrated in FIGS. 1 and 2 and includes a plurality of switching units 12, 14 and 16 (FIG. 2). Upon rotation of a hand wheel 18, suitable cams 20 (FIG. 3) are rotated to move carrier assemblies 22 in guide slots 24 (FIGS. 3 and 4) formed in major sides 30 of housing walls or plates 32 having relatively small minor sides 34. Upon reciprocation of the carrier assemblies 22 in the guide slots 24, a set of contacts 36 on each of the carrier assemblies 22 is moved into and out of engagement with an associated set of fixed contacts 38.

The opposite major sides or face surfaces 30 of each of the housing walls 32 define a plurality of linear recesses 42 (see FIGS. 3 and 5) which receive side portions 44 (FIG. 5) of fixed contact members 48. Each of the fixed contact members 48 has two side portions 44. One of these side portions 44 is disposed in a recess 42 in a major side of one housing wall 32. The other side portion 44 is disposed in a recess 42 in the major side of a next adjacent housing wall. This positions a contact portion 50 of a fixed contact between major side sur-

faces of a pair of adjacent side walls 32 (see FIG. 4). The fixed contact members 48 are provided with threaded internal passages which receive screws 54 (FIG. 3) to hold the fixed contact members 48 against movement relative to the associated housing walls 32.

The movable contacts 36 are mounted on the carrier assemblies 22 for movement between open and closed positions. When the movable contacts 36 are in the closed position, contact portions 58 of the movable contacts are disposed in abutting pressure engagement with contact portions 50 of a set of fixed contacts 38. The contact portions 58 are electrically interconnected by a body portion 60 to provide an electrical interconnection between the fixed contact members 48 of a set of fixed contacts 38 when the movable contacts 36 are in the closed position. Of course, when the movable contacts 36 are in the open position, the contact portions 58 are spaced from the fixed contacts 36 to interrupt the electrical interconnection between the fixed and movable contacts.

Each of the cams 20 is rotatably supported on an associated pair of housing walls 32. Thus, the cam 20 has a pair of cylindrical support sections 61 which are rotatably disposed in cylindrical central openings 62 in the housing walls 32 (FIG. 4). The carrier guide slots 24 radiate outwardly away from the openings 62 and have straight longitudinal axes which intersect at the center of the openings.

It is contemplated that the switch assembly 10 may be utilized in environments wherein relatively large currents are conducted between the fixed and movable contacts when they are in the closed position. Due to the relatively large magnitude of the currents, arcing may tend to occur between the fixed contacts 48 and movable contacts 36 when operated from the closed position toward the open position upon rotation of the cam 20 and inward movement of the associated carrier assembly 22. Of course, any arcing is detrimental to the contacts and tends to decrease their service life.

In order to prevent the occurrence of excessive arcing, a bellow arrangement 64 is associated with each set of movable and fixed contacts 36 and 38. A bellow arrangement 64 includes a bellow plate 68 which moves inwardly in a bellow chamber 70 formed between the major face surfaces 30 of a pair of housing walls 32 when the movable contacts 36 are moved away from the fixed contacts 38 (see FIGS. 3 and 4). As the bellow plate 68 moves inwardly, a flow of air is forced between the fixed and movable contact portions 50 and 58. To provide for this inward movement of the bellow plate 68 when the movable contacts 36 are moved away from the fixed contacts 38, the bellow plate 68 is mounted on the carrier assembly 22 along with the fixed contacts 36 (FIG. 3).

To effectively retard arcing between the fixed and movable contact portions 50 and 58 as they are opened, it is necessary to induce a stream of air to flow between the contact portions. This flow of air is promoted by blocking a sidewise flow of air out of the bellow chamber 70. Accordingly, a pair of shield members 74 and 76 are disposed adjacent to the ends of each of the bellow plates 68 and extend between the major face surfaces 30 of the housing walls 32 (see FIGS. 2, 3 and 4). The shield members 74 are connected with the housing wall sections 32 by the screws 54 which hold the fixed contacts in position. Since the shield members

extend between the major face surfaces 30 of a pair of adjacent wall members 32, the shield members block a sidewise flow of air out of the bellow chamber 70 when the bellows plate 68 is moved inwardly.

To further prevent a sidewise flow of air as the bellow plate 68 is moved inwardly, a plurality of barrier plates 80 (FIG. 3) are mounted between adjacent sets of switch contacts. The barrier plates 80 have opposite end portions 82 which are received in slots 84 (see FIG. 5) formed in the major sides 30 of the housing walls 32. Since the barrier plates 80 extend across the space between the adjacent housing walls, they prevent air induced by movement of a bellow plate 68 associated with a switch being opened from being exhausted into the area adjacent to a non-opening switch (see FIG. 3).

The carrier assembly 22 is slidably received in the linear guide slots 24 formed in a pair of adjacent housing walls 32 (see FIG. 4). The carrier assembly 22 includes a unitary body member 90 which has a generally H-shaped configuration (FIG. 4). The opposite legs 92 and 94 of the body 90 are disposed in the guide slots 24 adjacent housing walls 32. A roller 98 is disposed between the inner ends of the legs 92 and 94 of the body on an axle 100. The roller 98 is pressed against an associated cam 20 under the influence of biasing springs 104 and 106 which are received in cylindrical cavities 108 and 110 in the leg section 92 and 94. The biasing springs 104 and 106 engage in outer end surface 114 (FIG. 4) of the guide slot 24 to press the body 90 downwardly.

When the handwheel 18 (FIG. 1) is rotated, a central shaft 120 (FIGS. 3 and 4) rotates the cams 20 to move the carrier assembly 22 outwardly from the position shown in FIG. 4 against the influence of the biasing springs 104 and 106. Outward movement of the carrier assembly 22 moves the associated movable contacts 36 into abutting engagement with the associated set of fixed contacts 38. The shaft 120 extends through the center of the switch assembly 10 and is fixedly connected with the knife 18. Longitudinally extending ridges 122 on the shaft 120 enables the shaft to be positioned axially relative to the cams 20 and prevent relative rotation between the shaft and cams when the handwheel 18 is turned.

It should be noted that the movable contacts are urged outwardly against a stop nut 126 by a biasing spring 124 (FIG. 4). As the carrier assembly 22 is moved outwardly by the associated cam 20, the movable contacts 36 are moved into engagement with the fixed contacts 38. The outward movement of the carrier assembly 22 under the influence of the cam 20 is continued so that the spring 124 is compressed to press the movable contacts firmly against the fixed contacts 38. Thus, after the movable contacts 36 have engaged the fixed contacts 38, the body 90 of the carrier continues to move outwardly and the stop nut 126 moves away from the movable contacts. The movable contacts 36 are connected with the body 90 of the carrier assembly 22 by an outwardly projecting stud 132 which is fixedly connected to a crossbar portion 134 of the carrier body 90 (FIG. 4). The bellow plate 68 is mounted on the stud 132 above the movable contacts 36. The bellow plate 68 is separated from the stop nut 126 by a cylindrical spacer 138 formed of electrically insulating material. Although the bellow plate 68 is shown in an inwardly or retracted position in FIG. 4,

since the associated switch unit is in the open condition, it should be understood that when the carrier assembly 22 is moved outwardly in the guide tracks 24 to move the contacts 36 into engagement with the fixed contacts 38, the bellow plate moves to the outer end of the bellow chamber 70. Therefore, when the carrier assembly 22 is subsequently moved inwardly under the influence of the return springs 104 and 106, the bellow plate 68 moves inwardly in the bellow chamber 70 to induce a flow of air between the fixed and movable contacts as they are opening to retard arcing.

The switch assembly 10 includes three switching units 12, 14 and 16 (see FIG. 2). The housing walls 32 all have the same construction and are slotted or recessed on both sides so that each of the housing walls can be used in the formation of two switching units. Thus, although only one major side of the housing wall 32 has been shown in FIG. 3, it should be understood that the opposite major side of the housing wall 32 has the same construction as the illustrated major side.

Since the opposite major sides of the housing walls 32 are of the same construction, the size of the switch assembly 10 can be either increased or decreased by merely adding housing walls along with the associated fixed contacts 38, movable contacts 36, carrier assemblies 22, and cams 20. For example, if it were desired to increase the size of the switch assembly 10 by one switching unit, nuts 142 (FIG. 2) would be loosened on tie rods 144 to release an end or mounting plate 148. In addition, a retaining collar 152 on the central shaft 120 would be released. A central shaft having a length which is slightly longer than the length of the shaft 120 would be exchanged for the shaft 120. The contact and carrier apparatus associated with an additional switching unit would then be mounted on the last housing wall 32 of the switch assembly 10 and on an additional housing wall. After this was done, slightly longer tie rods would be substituted for the tie rods 144 and the end plate 148 would be secured back into position. Spacer sleeves 156 (FIG. 3) are mounted on the tie rods 144 between the housing walls 32 to space them apart by the proper distance.

Although the bellow arrangement 64 retards arcing to promote contact life, it is contemplated that it will be necessary to occasionally replace the fixed contacts 38. If each of the switch units 12, 14 and 16 had to be disassembled to replace the fixed contact 38 in one of the units, maintenance costs would be relatively large. Accordingly, any set of fixed contacts 38 can be replaced by loosening the leads to the fixed contacts and then removing them from the switch assembly. To remove a set of fixed contacts 38, it is necessary to remove the associated bellow plate 68 by loosening a nut 160 (FIG. 3) to expose the screws 54 holding the fixed contacts 38 in place. After the screws 54 have been loosened, the mounting portions 44 of the fixed contacts can be slid axially outwardly along the recesses 42 to remove the fixed contacts. It should be noted that the contact portions 50 do not extend into the slots 42 and would not interfere with this movement.

Although it is contemplated that the switching units 12, 14 and 16 of the switch 10 could be used in many different types of circuits, the switching units may advantageously be connected with a bypass circuit 162 (FIG. 6) for bypassing a fuse 164. When the bypass circuit 162 is in its normal condition, a set of contacts 166 and 168 are closed to connect the power supply line

170 with a line 172 leading to a suitable load. When the fuse 164 is to be replaced, switch 176 is closed to complete a circuit around the fuse 164. The switches 166 and 168 are then opened to bypass the fuse 164.

The switching unit 16 and its associated cam 20 (FIG. 3) are adapted for connection in the bypass circuit 162. The cam 20 has a configuration such that when the handwheel 18 is in a normal position (FIG. 1) with a pointer 180 pointing toward the indicia N, the switches 166 and 168 are in the closed condition of FIG. 3. In addition, the switch 176 is in the open condition. A detent ball 184 (FIG. 3) is depressed by a spring 186 into a recess 188 formed in the cam 20 to hold the cam in the normal position.

When the bypass circuit 162 is to be changed from the normal condition illustrated in FIG. 6 to an intermediate condition in which all of the contacts 166, 168 and 176 are closed, the handwheel is rotated in a clockwise direction (as viewed in FIG. 1) to move the pointer 180 into alignment with the mark I. This rotates the cam 20 through approximately 45° and causes the cam to move the carrier 22 of the switch 176 (FIG. 3) outwardly to thereby close the switch. When this has been accomplished, the roller 98 of the carrier assembly 22 of the switch 176 and the roller 98 of the carrier assembly 22 of the switch 166 are disposed on an arcuate dwell surface 194 of the cam 20 (see FIG. 3). Of course, the roller 98 of the carrier assembly 22 for the switch 168 is on a second arcuate dwell surface 196 to maintain the switch 168 closed. At this time, the spring biased detent ball 184 will be disposed in a second recess 202 on the cam 20.

Continued rotation of the handwheel 18 moves the pointer 180 into alignment with the indicia B (FIG. 1). As this occurs, the switches 166 and 168 are opened to disconnect the fuse 164 from the power line 170 and load line 172 (FIG. 6). This rotation of the handwheel 18 moves the cam 22 an additional 45° so that the rollers 98 on the carrier assemblies 22 for the switches 166 and 168 move into recesses 206 and 208 (FIG. 3) on the cam 20. As this occurs, the movable contacts 36 in the switches 166 and 168 move inwardly away from the fixed contacts 38. As the movable contacts move inwardly, the bellow plates 68 induce a flow of air between the switch contacts to retard arcing. At this time a third recess 212 in the cam 20 is disposed in engagement with the detent ball 184.

When the fuse 164 has been replaced, the handwheel 18 is rotated in the opposite direction, that is counter clockwise as viewed in FIG. 1. This movement of the handwheel 18 and the cam 20 is effective to first close the switches 166 and 168 and then to open the switch 176. Of course, as the switch 176 opens the associated bellows plate 68 will retard arcing.

To provide an interconnection between the switches 166, 168 and 176, as required by the circuit 162, jumper bars 220 are connected between the fixed contacts for the switch 176 and the switches 166 and 168 in the manner shown in FIG. 3. The line 170 is connected at lug 222 on the jumper bar 220 between the switches 176 and 166 (see FIGS. 1 and 3). Similarly, the load line 172 is connected at a lug 224 on the jumper bar 220 between the switches 168 and 176. A line 228 interconnecting the fuse 164 and the switch 166 (FIG. 6) is connected to a lug 230 (FIG. 1) on a fixed contact member 48 of the switch 166. Finally, a line 234 (FIG. 6) interconnecting the switch 168 and

the fuse 164 is connected with a lug 236 (FIG. 1) on a fixed contact of the switch 168.

Although only the switch unit 16 has been described in detail, it should be understood that the switch units 12 and 14 have the same construction as the switch unit 16. It should also be understood that although only three switches have been illustrated in the switch unit 16, it is contemplated that four switches could be mounted therein if desired. It is also contemplated that the number of switch units provided in the switch assembly 10 could be varied in the manner previously explained. The cam 20 has been illustrated in FIG. 3 as having a configuration which is particularly adapted to the circuit 162. Of course, the cam 20 will have a different configuration if the switch unit 16 is utilized in a different type of circuit. For example, the cam 20 could have four lobes which could be utilized to simultaneously actuate each of four switches.

In view of the foregoing description, it can be seen that the switch assembly 10 includes a plurality of housing walls 32 having major sides 30 which define a plurality of recesses 42 for holding fixed contacts 38. In addition, the major sides of the housing walls 32 define linear guide slots 24 which engage side portions of carrier assemblies 22. The carrier assemblies 22 are biased into engagement with a rotatable cam 20 under the influence of biasing springs 104 and 106 which extend between the outer end of the guide slots 24 and chambers 108 and 110 formed in the legs 92 and 94 of the H-shaped body 90. When the cam 20 is rotated by the shaft 120, a set of movable contacts 36 disposed on the carrier assembly 22 is moved into engagement with the fixed contacts 38 mounted on the housing walls 32. During subsequent rotation of the cam 20, the movable contacts 36 are moved away from the fixed contacts 38 and a bellows plate 68 on the carrier assembly 22 induces a flow of air between the fixed and the movable contacts to retard arcing.

The opposite major sides 30 of each of the housing walls 32 is recessed to receive mounting portions of the fixed contacts and to provide the carrier guide slots 24. This enables each housing wall 32 to cooperate with two other housing walls so that a series of switch units may be formed by mounting fixed contacts 38 and carrier assemblies 22 in associated engagement with the opposite major sides 30 of a single housing wall. To facilitate maintenance, the fixed contacts 38 can readily be replaced by removing an associated bellows plate 68 and loosening the holding screws 54. The fixed contacts can then be slid axially outwardly along the slots 42 without completely disassembling the switch assembly 10.

Having described a specific preferred embodiment of the invention, the following is claimed:

1. A switch mechanism comprising a plurality of spaced apart housing walls having major and minor sides, said plurality of housing walls including a pair of adjacent housing walls one of which has a major side facing and extending parallel to a major side of the other housing wall of the pair of housing walls, each of the housing walls of the pair of housing walls including surface means defining a plurality of contact mounting recesses in the major side of the housing wall, a plurality of fixed contact members extending between the facing major sides of the pair of housing walls, said fixed contact members being associated in pairs, each of said fixed contact members including a first mount-

ing portion disposed in a contact mounting recess formed in the major side of one of the pair of housing walls, a second mounting portion disposed in a contact mounting recess formed in the major side of the other wall of the pair of housing walls, and a contact portion disposed between the facing major sides of the pair of housing walls, a plurality of movable contact members disposed between the facing major sides of the pair of housing walls, each of said movable contact members being associated with a pair of fixed contact members and including a pair of contact portions movable between a first position spaced apart from the contact portions of the associated pair of fixed contact members and a second position disposed in abutting engagement with the contact portions of the associated pair of fixed contact members, a plurality of carrier means disposed between facing major sides of the pair of housing walls for supporting said movable contact members for movement between the first and second positions, cam means disposed between the facing major sides of the pair of housing walls for moving said carrier means relative to said fixed contact members to thereby move said movable contact members between said first and second positions, means for supporting said cam means for rotation about an axis extending transversely to said major sides of the pair of housing walls, and means for rotating said cam means relative to said pair of housing walls.

2. A switch mechanism as set forth in claim 1 wherein each of the housing walls of the pair of housing walls includes second surface means defining a plurality of carrier guide slots, each of said carrier means including a first portion slidably disposed in a carrier guide slot formed in the major side of one of the pair of housing walls, a second portion slidably disposed in a carrier guide slot formed in the major side of the other wall of the pair of housing walls, an intermediate portion disposed between said first and second portions and the facing major sides of the pair of housing walls, and means for connecting said intermediate portion with one of said movable contact members, said cam means being operable to effect reciprocation of said plurality of carrier means in the associated carrier guide slots to thereby move said movable contact members between said first and second positions.

3. A switch mechanism as set forth in claim 2 wherein said carrier guide slots have longitudinally extending central axes which intersect the axis of rotation of said cam means.

4. A switch mechanism as set forth in claim 2 wherein said surface means for defining a plurality of contact mounting recesses in the major side of a housing wall includes means for defining a plurality of contact mounting recesses in one of the major sides of the housing wall and means for defining a plurality of contact mounting recesses in another major side of the housing wall opposite from said one major side of the housing wall to enable fixed contact members to be mounted on the two opposing major sides of the housing wall.

5. A switch mechanism as set forth in claim 4 wherein said second surface means for defining a plurality of carrier guide slots includes means for defining a plurality of carrier guide slots in said one of the major sides of the housing wall and means for defining a plurality of carrier guide slots in said other major side of the housing wall to enable carrier means to be slidably dis-

posed in carrier guide slots on the two opposing sides of the housing wall.

6. A switch assembly as set forth in claim 1 further including a plurality of bellow means for inducing a flow of air between the contact portions of said fixed and movable contact members upon movement of said movable contact members from said second position to said first position to retard arcing between said contact portions.

7. A switch mechanism as set forth in claim 6 wherein each of said bellow means includes a bellow plate connected with an associated one of said carrier means and movable therewith to induce a flow of air.

8. A switch mechanism as set forth in claim 7 wherein each of said bellow means further includes a first shield member disposed adjacent to one end of a bellow plate and extending between said major sides of said pair of housing walls to block flow of air in a direction transverse to the direction of movement of said bellow plate, and a second shield member disposed adjacent to an end of said bellow plate opposite from said one end and extending between said major sides of said pair of housing walls to further block a flow of air in a direction transverse to the direction of movement of said bellow plate.

9. A switch mechanism as set forth in claim 1 wherein each of the housing walls of the pair of housing walls includes second surface means for defining a plurality of barrier mounting slots, said switch mechanism further including a plurality of barrier plates extending between the major sides of the pair of housing walls adjacent to the contact portions of said fixed contact members to further block a flow of air in a direction transverse to the direction of movement of said bellow plate, each of said barrier plates including a first portion disposed in a barrier mounting slot formed in the major side of one of the pair of housing walls, a second portion disposed in a barrier mounting slot in the major side of the other wall of the pair of housing walls, and an intermediate portion disposed between said first and second portions and the facing major sides of the pair of housing walls.

10. A switch mechanism comprising a plurality of spaced apart housing walls having major and minor sides, said plurality of housing walls including a pair of adjacent housing walls one of which has a major side facing and extending parallel to a major side of the other housing wall of the pair of housing walls, a plurality of fixed contact members disposed between the facing major sides of the pair of housing walls, said fixed contact members being associated in pairs, each of said fixed contact members including a contact portion disposed between the facing major sides of the pair of housing walls, a plurality of movable contact members disposed between the facing major sides of the pair of housing walls, each of said movable contact members being associated with a pair of fixed contact members and including a pair of contact portions movable between a first position spaced apart from the contact portions of the associated pair of fixed contact members and a second position disposed in abutting engagement with the contact portions of the associated pair of fixed contact members, each of the housing walls of the pair of housing walls including surface means defining a plurality of longitudinally extending carrier guide slots in the major side of the housing wall, a plurality of carrier means disposed between facing major sides

of the pair of housing walls for supporting said movable contact members for movement between the first and second positions, each of said carrier means including a first portion slidably disposed in a carrier guide slot formed in the major side of one of the pair of housing walls, a second portion slidably disposed in a carrier guide slot formed in the major side of the other housing wall of the pair of housing walls, an intermediate portion disposed between said first and second portions and the facing major sides of the pair of housing walls, and means for connecting said intermediate portion with one of said movable contact members, cam means disposed between the facing major sides of the pair of housing walls for moving said carrier means in said carrier guide slots relative to said fixed contact members to thereby move said movable contact members between said first and second positions, means for supporting said cam means for rotation about an axis extending transversely to said major side of the pair of housing walls, and means for rotating said cam means relative to said pair of housing walls.

11. A switch mechanism as set forth in claim 10 further including a plurality of spring means disposed in said carrier guide slots for urging said carrier means toward said cam means, each of said spring means having a first end portion which presses against one end of the associated one of said carrier slots and a second end portion which presses against the associated one of said carrier means.

12. A switch mechanism as set forth in claim 10 wherein said carrier means includes a body having a generally H-shaped configuration with the legs of said H-shaped body forming said first and second portions of said carrier means and the cross bar of said H-shaped body forming said intermediate portion of said carrier means.

13. A switch mechanism as set forth in claim 10 further including a plurality of bellow means for inducing a flow of air between the contact portions of the fixed and movable contact members upon movement of said movable contact members from said second position to said first position to retard arcing between said contact portions, each of said bellows means including a bellow plate connected with the intermediate portion of an associated one of said carrier means and movable therewith to induce a flow of air.

14. A switch mechanism comprising a plurality of spaced apart housing walls having major and minor sides, said plurality of housing walls including a pair of adjacent housing walls one of which has a major side facing and extending parallel to a major side of the other housing wall of the pair of housing walls, a plurality of fixed contact members disposed between the facing major sides of the pair of housing walls, said fixed contact members being associated in pairs, each of said fixed contact members including a contact portion disposed between the facing major sides of the pair of housing walls, a plurality of movable contact members disposed between the facing major sides of the pair of housing walls, each of said movable contact members being associated with a pair of fixed contact members and including a pair of contact portions movable between a first position spaced apart from the contact portions of the associated pair of fixed contact members and a second position disposed in abutting engagement with the contact portions of the associated pair of fixed contact members, a plurality of carrier means dis-

posed between facing major sides of the pair of housing walls for supporting said movable contact members for movement between the first and second positions, cam means disposed between the facing major sides of the pair of housing walls for moving said carrier means relative to said fixed contact members to thereby move said movable contact members between said first and second positions, means for supporting said cam means for rotation about an axis extending transversely to said major side of the pair of housing walls, means for rotating said cam means relative to said pair of housing walls to move said carrier means, and a plurality of bellow means for inducing a flow of air between the contact portions of said fixed and movable contact members upon movement of said movable contact members from said second position to said first position to retard arcing between said contact portions.

15. A switch mechanism as set forth in claim 14 wherein each of said bellow means includes a bellow plate connected with an associated one of said carrier means and movable therewith to induce a flow of air.

16. A switch mechanism as set forth in claim 15 wherein each of said bellow means further includes a first shield member disposed adjacent to one end of a bellow plate and extending between said major sides of

said pair of housing walls to block a flow of air in a direction transverse to the direction of movement of said bellow plate, and a second shield member disposed adjacent to an end of said bellow plate opposite from said one end and extending between said major sides of said pair of housing walls to further block a flow of air in a direction transverse to the direction of movement of said bellow plate.

17. A switch mechanism as set forth in claim 16 wherein each of the housing walls of the pair of housing walls includes second surface means for defining a plurality of carrier mounting slots, said switch mechanism further including a plurality of barrier plates extending between the major sides of the pair of housing walls adjacent to the contact portions of said fixed contact members to further block a flow of air in a direction transverse to the direction of movement of said bellow plate, each of said barrier plates including a fixed portion disposed in a barrier mounting slot formed in the major side of one of the pair of housing walls, a second portion disposed in a barrier mounting slot in the major side of the other wall of the pair of housing walls, and an intermediate portion disposed between said first and second portions and the facing major sides of the pair of housing walls.

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