Jan. 9, 1968 F. W. KUSSY 3,363,070

TWO AND THREE-POSITION SELECTOR SWITCH

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FIG. 1.

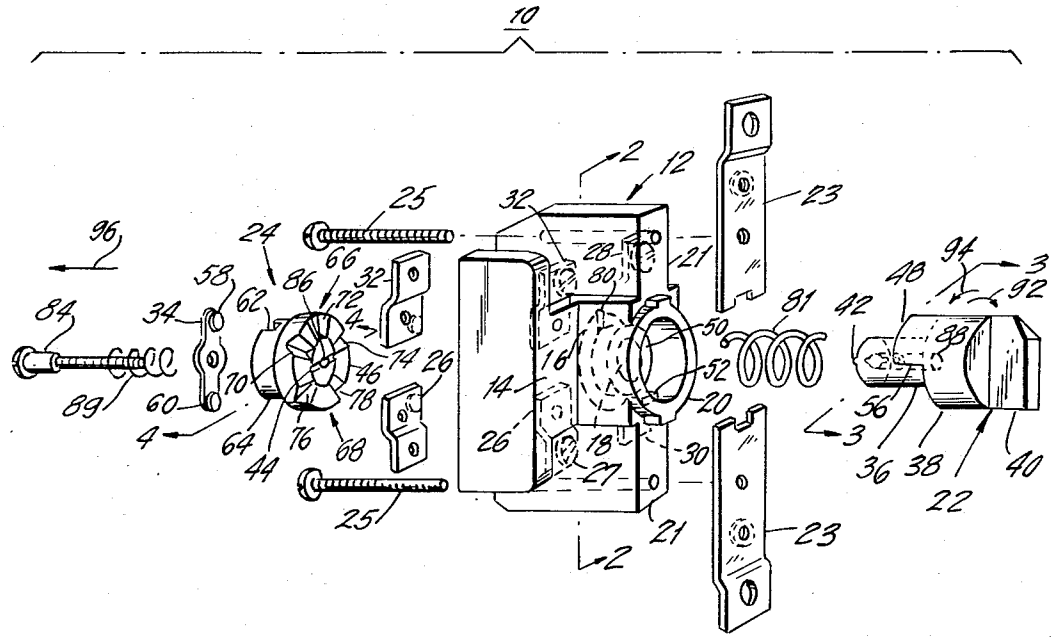
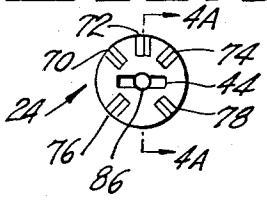


FIG. 4.



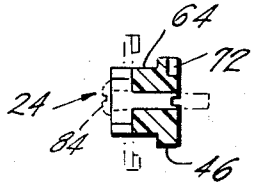


FIG. 4A.

FIG. 2.

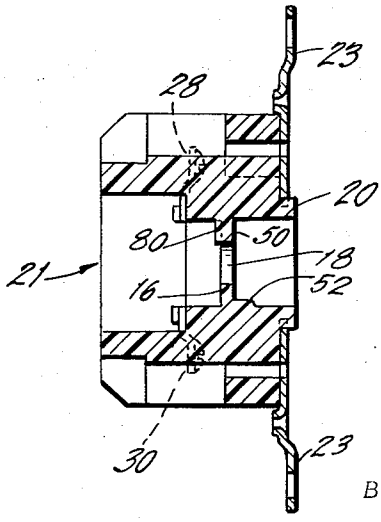
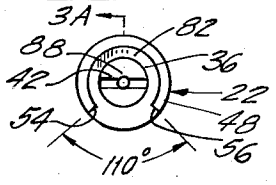


FIG. 3.



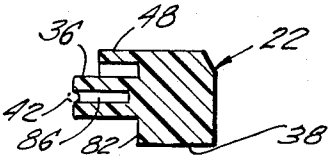


FIG. 3A.

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FIG. 5.

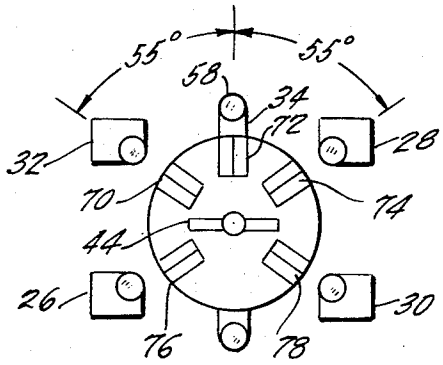

FIG. 6.

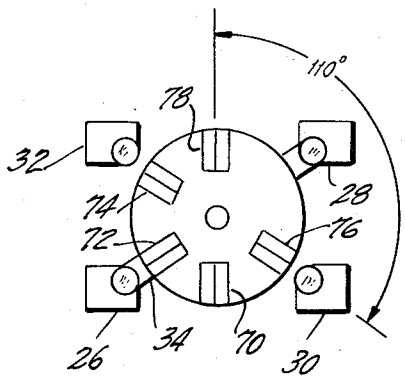

FIG. 7.

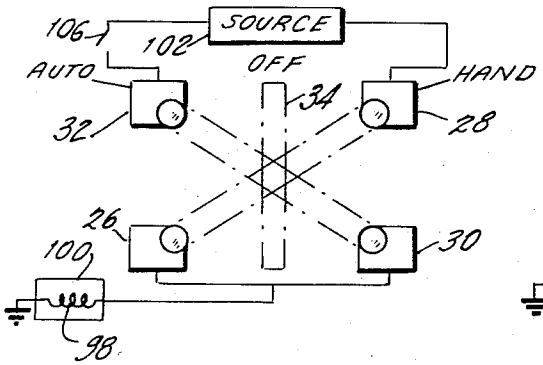

FIG. 8.

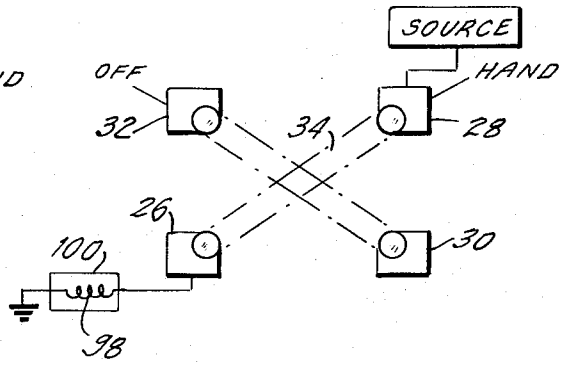

FIG. 9.

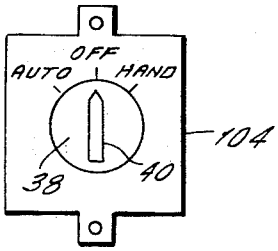

FIG. 10.

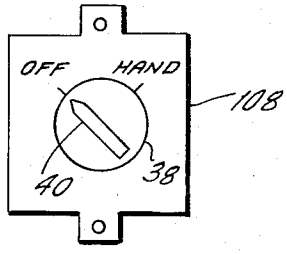

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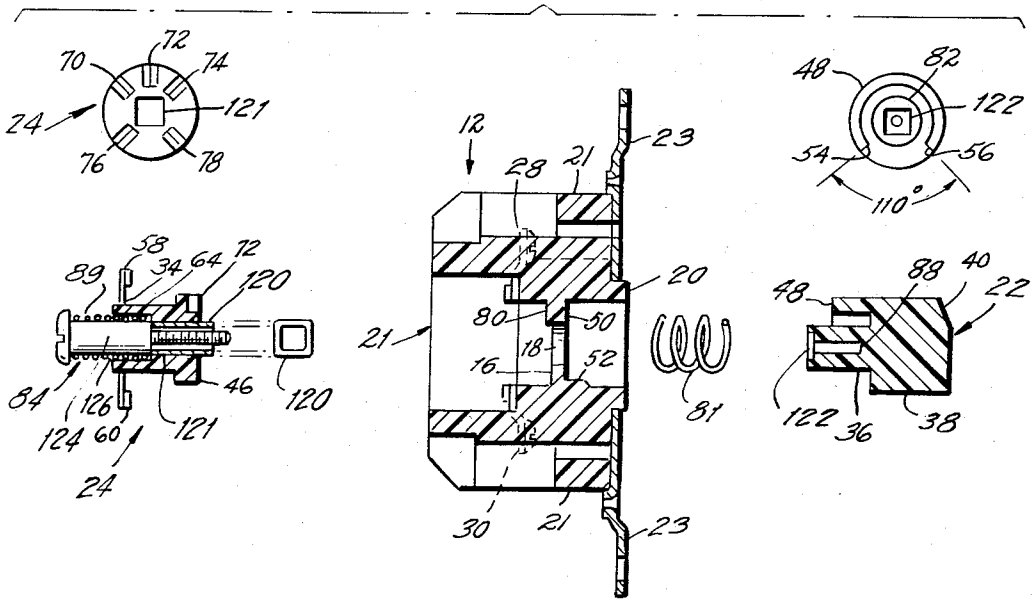
FIG. 11



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United States Patent Office

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TWO AND THREE-POSITION SELECTOR SWITCH

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Filed Dec. 1, 1965, Ser. No. 510,841
8 Claims. (Cl. 200—51.17)

ABSTRACT OF THE DISCLOSURE

A selector switch convertible between two and three-position capabilities including a housing and a movable carrier assembly rotatably mounted transversely with respect to the housing. The carrier assembly includes a handle and a bridge-carrying member, the front surface of which includes two distinct groups of notches which cooperate with a protrusion provided on the rear surface of the housing to cam the movable contacts of the carrier assembly into engagement with associated stationary contacts provided on the rear of the housing.

This invention relates to a selector switch and more particularly relates to a selector switch which may be easily converted from a three-position switch to a two-position switch, or vice-versa.

As is well known in the art, motor starters, that is, electro-mechanical devices which are selectively operable between open circuit and closed circuit positions, have been found useful for establishing an electrical path between a source and an electric motor. Typical motor starters ininclude a coil which, when energized, actuates a cooperating armature to close the contacts of the starter and thereby establish a current path between a source and the motor being controlled.

To energize the coil of the motor starter, various control characteristics are desirable, depending upon the use of the motor starter. In many applications it is sufficient that a simple two-position "on" and "off" switch be provided in series with the motor starter coil, whereby manual movement of the switch to the "on" position (commonly known as the "hand" position) will energize the coil to operate the motor starter. In other applications it is desirable to manually operate the motor starter from a remote position or to automatically operate the starter in response to some predetermined condition. In such applications it is customary to provide a three-position switch in series with the motor starter coil, the three positions of which include: "on" ("hand") for manual operation at the location of the switch; "off" which isolates the motor starter coil from its associated energizing source; and "auto" which places the motor starter coil in series with either a remote manual switch or in series with a device for energizing the motor starter coil in response to a predetermined condition.

The instant invention is directed to a selector switch which may be simply and easily converted between two and three-position capabilities and thereby eliminates the costs and manufacturing problems inherent in producing, storing and supplying both two-position and three-position switches.

As will be explained in greater detail, to convert a switch of the instant invention between its two modes of operation, e.g., two and three-position characteristics, one merely loosens a screw, disconnects a wire, and changes the face plate of the switch to indicate the change in operating characteristics. It is apparent that such simple steps may be performed by relatively unskilled personnel, either in the factory, during manufacture, or in the field.

Although the instant invention has been described with

respect to the control of motor starters, it is to be understood that the instant invention is applicable to any environment which might require the use of a two-position and/or three-position switch.

In its preferred embodiment the two and three-position selector switch of the instant invention includes a housing which may be molded or otherwise formed of electrically nonconducting material. A movable carrier assembly, which includes a handle and a bridge carrying member, is rotatably mounted transversely with respect to the plane of the housing such that a hand grasping portion of the handle extends forward of the housing while a smaller cylindrical portions of the handle extends through an aperture of the housing and is removably secured to the bridge carrying member. To prevent unintended relative displacement between the bridge carrying member and the handle, the engaging surfaces of these members are provided with an interlocking feature which can only be defeated by loosening the securing means which removably secures the bridge carrying member to the handle. The rear of the housing is provided with a plurality of pairs of electrical contacts which are arranged such that the individual contacts of each pair will be electrically joined through a conductive bridge which is carried at one end of the bridge carrying member when the switch is in the preselected "hand" and "auto" positions when the switch is functioning as a three-position switch, and when the switch is in the "on" position when the switch is functioning as a two-position switch.

To provide both two and three-position capabilities, the face portion of the bridge carrying member, i.e., that portion of the bridge carrying member which is in rotatable engagement with the rear surface of the housing, is provided with two groups of inwardly directed peripheral notches at diametrically opposed circumference areas thereof which cooperate with a depending protrusion provided on the rear surface of the housing to seat the bridge carrying member in its proper positions. To change the switch from two-position to three-position operation, or vice-versa, one merely loosens the fastening means which secures the bridge carrying member to the handle, thereby defeating the interlocking feature noted above, and rotates the bridge carrying member 180° whereby the oppositely disposed group of notches will now be in position to engage the protrusion depending from the rear surface of the housing. The fastening means is tightened once more whereby the bridge carrying member will be firmly tightened against the handle to prevent relative rotation therebetween.

As a further feature of the instant invention the front surface of the housing and the handle are provided with cooperating interference members which prevent the handle of the selector switch from being rotated beyond a predetermined arc which corresponds to the arc defined by the "auto" and "hand" position when the switch is operating as a three-position switch, and which arc corersponds to the arc defined by the "on" and "off" positions when the switch is operating as a two-position switch. Thus an operator cannot rotate the handle beyond the predetermined limits of the outermost switch positions.

Accordingly, it is an object of the instant invention to provide a selector switch which may be easily converted between two-position and three-position operation.

It is another object of the instant invention to provide a selector switch which comprises a housing having a front surface and a rear surface; a movable carrier assembly mounted on the housing for rotation about an axis extending transversely to the front surface, such movable carrier assembly including a conductive bridge carried thereby and being selectively movable between a first mode of operation wherein the carrier assembly may be

selectively rotated between a first, second and third circuit control position, and a second mode of operation wherein the carrier assembly may be selectively rotated between the first and third control positions; and a plurality of contacts mounted on a rear surface of the housing with pairs of such plurality of contacts being spaced on the rear surface to complete a path for electrical conduction between the contacts of each pair through the conductive bridge when the carrier assembly is in said first and third circuit control position.

Yet another object of the instant invention is to provide a selector switch which is capable of being changed in the the factory or in the field between two-position and three-position operation by relatively unskilled personnel.

Still another object of the instant invention is to provide such a selector switch whereby the convertability from two-position to three-position operation, or vice-versa, is accomplished by a device which has a minimum number of parts and is thereby extremely dependable throughout extended periods of operation.

Other objects and a fuller understanding of the instant invention may be had by referring to the following description and drawings, in which:

FIGURE 1 is an exploded perspective view of a selector switch constructed in accordance with the teachings of the instant invention;

FIGURE 2 is a side view, partially in section, taken along the arrows 2—2 of FIGURE 1;

FIGURE 3 is a view taken along the arrows 3—3 of FIGURE 1;

FIGURE 3A is a view taken along the arrows 3A—3A of FIGURE 3;

FIGURE 4 is a view taken along the arrows 4—4 of FIGURE 1;

FIGURE 4A is a view taken along the arrows 4A—4A of FIGURE 4;

FIGURE 5 is a view showing the bridge carrying member of the selector switch of the instant invention positioned to function as a three-position switch;

FIGURE 6 is a view similar to FIGURE 5 but showing the bridge carrying member adapted to operate as a two-position switch;

FIGURE 7 is a partial view of the circuit diagram and contact arrangement for FIGURE 1 and showing the switch operating in its three-position mode of operation;

FIGURE 8 is a view similar to FIGURE 7 but showing the circuit diagram and contact arrangement for the switch of FIGURE 1 when it is in its two-position mode of operation;

FIGURE 9 is a view of the selector switch of FIGURE 1, with an indicating cover placed thereon, with such cover plate providing an indication of three-position operation;

FIGURE 10 is a view similar to FIGURE 9, but showing the cover plate used when the switch is in its two-position operation; and

FIGURE 11 is a side view partially in section of an alternative embodiment of the instant invention;

Referring to FIGURE 1, there is shown a selector switch **10** which includes a housing **12** which may be molded or otherwise formed of electrically nonconductive material. The housing **12** includes a front surface **14** and a rear surface **16** (see FIGURE 2) with an aperture **18** passing therethrough. Surrounding the aperture **18** and extending forward thereof is a hollow cylindrical shell **20** within which rotatably resides handle **22**. Cylindrical shell **20** is supported by ribs **21** upon which cover plate brackets **23** may be removably secured by fastening means **25**. Handle **22** together with a bridge carrying member **24** cooperate to define a movable carrier assembly which is mounted on the housing for rotation about an axis extending transverse to the front surface **14**.

As seen in FIGURES 1 and 2, the rear surface **16** of housing **12** is provided with a plurality of pairs of electrical contacts **26**, **28** and **30**, **32**, respectively, which are spaced on the rear surface so that contacts **26** and **28**, or contacts **30** and **32** will be electrically connected through the conductive bridge **34** on bridge carrying member **24** when the selector switch is seated in certain preselected positions. Contacts **26**, **28**, **30** and **32** are each provided with a terminal post, in the form of screws **27**, by which leads (not shown) may be electrically and mechanically and mechanically connected to the contacts.

As seen most clearly in FIGURES 1 and 3, the handle **22** includes a cylindrical central portion **36** having an enlarged head portion **38** upon which is provided an arrow-shaped hand-grasping knob **40**. At the opposite end of the cylindrical central portion **36** is provided a longitudinally extending projection **42** which is adapted to pass through the aperture **18** in the housing **12** and be received by the projection receiving slot **44**, provided on the face **46** of the bridge carrying member **24**. The enlarged head portion **38** of handle **22** further includes a depending skirt **48** which seats on a shelf **50** which surrounds the aperture **18** through housing **12**, when the handle **22** is inserted within the cylindrical shell **20**. The interior of the shell **20** is provided with an upstanding interference member **52** which engages either end **54** or **56** of depending skirt **48** when the handle **22** is rotated in either of its two directions. It will be apparent that interference of member **52** with depending skirt **48** limits the rotational movement of handle **22** to an arc, illustratively shown as 110° in FIGURE 3, which is defined by the missing arcuate section of depending skirt **48**.

Bridge carrying member **24** carries the conductive bridge **34**, having contact pads **58** and **60** at opposite ends thereof, in a notched recess **62** provided at one end of a generally cylindrical center portion **64**. The opposite end of the bridge carrying member **24** comprises the face portion **46** in which is provided the projection receiving slot **44** and a pair of oppositely disposed notch arrangements **66** and **68**. Notch arrangement **66** includes three inwardly directed peripheral V-shaped notches **70**, **72** and **74** (see FIGURES 4 and 5), spaced apart, preferably about 55°. Notch arrangement **68** includes V-shaped notches **76** and **78** spaced apart by about 110°. It is noted that notches **70** and **78**, and **74** and **76** are spaced apart by 180° while notch **72** is located mid-way between notches **70** and **74** and is parallel to the conductive bridge **34**. Notches **70**, **72**, **74**, **76** and **78** cooperate with a depending tapered protrusion **80** provided on the rear surface of shelf **50** (see FIGURE 2) in a manner to be described in greater detail.

In assembling the selector switch of the instant invention, the handle **22** is inserted within the cylindrical shell **20** such that the interference member **52** resides within the 110° arc provided between ends **54** and **56** of depending skirt **48**. The lower surface of depending skirt **48** bottoms on shelf **50** so that ends **54** and **56** of the skirt and interference member **52** limit the rotation of handle **22** to 110°. For a purpose to be further explained, a biasing spring **81** is interposed between the shelf **50** of aperture **18** and the lower surface **82** (see FIGURES 3 and 3A) of enlarged head portion **38** of handle **22**.

With the lower portion of depending skirt **48** seated on shelf **50**, as explained above, the central cylindrical portion **36** (and elongated projection **42**) of handle **22** extend through aperture **18** and is removably secured to bridge carrying member **24** by means of a screw **84** which passes through the conductive bridge **34** and aperture **86** in bridge carrying member **24** and into screw threaded engagement with a tapped aperture **88** in handle **22**. A spring **89** interposed between the head of screw **84** and the conductive bridge **34** maintains the pads **58** and **60** of conductive bridge **34** in firm electrical engagement with the pairs of contacts **26**, **28** and **30**, **32**, respectively, when circuit connections are made.

With the bridge carrying member **24** in the position shown in FIGURE 1, the screw **84** is tightened into handle **22** until the elongated projection **42** of handle **22** is interlocked in the projection receiving slot **44** in the face **46**

of bridge carrying member **24**. Such arrangement prevents relative rotation between the bridge carrying member **24** and handle **22**.

Assuming that notch **72** in face portion **46** is aligned with the tapered protrusion **80** on the rear surface of the shelf **50** of housing **14**, it will be seen that conductive bridge **34** will be parallel with supporting ribs **21** of housing **12**, and therefore the pads **58**, **60** will not engage either of the two contacts pairs **26**, **28** or **30**, **32** (see FIGURE 5).

Since biasing spring **81** urges handle **22** away from the front surface **14** of housing **12**, and since bridge carrying member **24** is secured to handle **22** by screw **84**, it will be apparent that the face **46** of bridge carrying member **24** will be urged into engagement with the rear surface of shelf **50** (see FIGURE 2) such that the tapered protrusion **80** will be firmly seated within notch **72**. As will be described in greater detail with respect to FIGURES 5 and 6, such positioning of the conductive bridge **34** corresponds to the "off" position when the selector switch is being used as a three-position switch.

If the handle **22** is now rotated clockwise in the direction of arrow **92** of FIGURE 1, the interlock provided between projection **42** and projection receiving slot **44**, on the handle **22** and bridge carrying member **24**, respectively, will assure that the face **46** of bridge carrying member **24** will be rotated relative to the fixed protrusion **80** whereby at the end of the rotational movement, the notch **70** will be firmly seated on protrusion **80** and terminal pads **58** and **60** will be in firm electrical engagement with contacts **26**, **28** to complete an electrical path therebetween.

Similarly, if the handle **22** is rotated counterclockwise in a direction of arrow **94**, face **46** of bridge carrying member **24** will be rotated in the direction of arrow **94** whereby notch **74** will seat itself upon protrusion **80** and terminal pads **58** and **60** will be in firm electrical engagement with contacts **30** and **32**.

It will be noted that resilient spring **81** continually urges handle **22** away from the front surface **14** of the housing **12** thereby firmly seating the notches **70**, **72** and **74** of the bridge carrying member **24** on the tapered protrusion **80**. During rotation of the handle, the interaction of the protrusion **80** and the surface of the face member **46** between any two adjacent notches will cam the bridge carrying member in the direction of arrow **96** thereby drawing the handle **22** in the same direction against the bias of spring **81**. When one of the notches **70**, **72** or **74** seats on the protrusion **80** the spring **81** will expand driving the handle **22** and bridge carrying member **24** in a direction opposite arrow **96**.

As can be seen in FIGURE 5, notches **70** and **74** are displaced from one another by an angle of 110°. Such angle corresponds to the arc of permissive motion of handle **22** as defined by the missing arc section of depending skirt **48** (see FIGURE 3). Thus the limits of rotatonal movement of handle **22** correspond exactly to the displacement of notches **70** and **74** and thereby prevent an operator from rotating the handle **22** beyond the seating position defined by notches **70** and **74**.

An application of the three-position mode of operation for the selector switch thus far described may be seen in FIGURE 7 wherein the coil **98** of a motor starter **100** is to be energized by a source **102** in response to various circuit paths established by the three-position mode of operation. With the arrow-head **40** of handle **22** pointing in the direction shown in FIGURE 1, i.e., parallel to the ribs **21**, the notch **72** of bridge carrying member **24** is seated on protrusion **80** and the conductive bridge is parallel to the ribs **21**. This corresponds to the "off" position shown in FIGURE 7 in which no current path is established between the source **102** and coil **98**. A visual indication of such condition may be provided on the front of the selector switch by means of an index cover plate **104** which is removably secured to the cover plate brackets **23** (see FIGURE 9). When the handle **22** is rotated to the "hand" position, notch **70** will then be seated protrusion **80** and conductive bridge **34** will electrically interconnect terminals **26** and **28** to energize the coil **98** to actuate the motor starter. Similarly, if the handle **22** is rotated to the "auto" position (see FIGURE 9) notch **74** will seat on protrusion **80** and the conductive bridge **34** will electrically interconnect contacts **30** and **32** whereby the coil **98** may be energized by closing remotely located switch **106**, or in response to some other predetermined condition. For the purpose of convenient phraseology the "handle" and "auto" positions may be termed "active" while the "off" position may be termed "passive."

When it is desired that the selector switch function as a two-position switch, the following simple steps are taken. The screw **84** is loosened so that the bridge carrying member **24** may be separated from handle **22** to defeat the interlock of projection **42** and projection receiving slot **44**. The bridge carrying member **24** is now rotated manually by 180° and the screw **84** tightened once more into handle **22**. Thus notches **76** and **78** are now in position to cooperate with the protrusion **80** on rear surface of the shelf **50**. FIGURE 6 shows the new position of notches **76** and **78** and as can be seen by referring to FIGURE 5 such positions are 180° away from the positions they occupied when the selector switch was in its three-position mode of operation. As indicated in FIGURE 6, notches **76** and **78** are spaced from one another by 110° with there being provided no notch (which could correspond to notch **72**) spaced therebetween. Thus in this mode of operation the bridge carrying member **24** may seat itself on protrusion **80** in only one of two positions. With handle **22** residing in its most clockwise position (with respect to FIGURE 1) as determined by end **54** of depending skirt **48** interfering with member **52**, notch **78** will be seated on protrusion **80** and conductive bridge **34** will electrically connect contacts **26** and **28** to establish an electrical path between source **102** and coil **98** of starter **100** (see FIGURE 8). If handle **22** is now rotated counterclockwise 110° (in a direction of arrow **94** in FIGURE 1), end **56** of skirt **48** will engage interference member **52** and notch **76** will seat itself on protrusion **80** whereby conductive bridge **34** will electrically connect contacts **30** and **32**. However, when the selector switch is used as a two-position switch, the electrical lead at contact **32** is disconnected thereby allowing the second position to function as an "off" position to isolate source **102** from coil **98**. In the two-position mode of operation a cover **108** is indexed with an "off" and "hand" notation (see FIGURE 10) to provide a visual indication of the condition of the selector switch. In a corresponding manner as the three-position mode of operation, the "hand" position may be termed "active," while the "off" position may be termed "passive."

In FIGURE 11 is shown an alternative embodiment of the instant invention. As most of the elements in FIGURE 11 are identical to those previously described, like elements have been identified by identical reference characters.

The switch of FIGURE 11 differs from the switch of FIGURES 1–10 in that a small, square-shaped, keying element **120** is keyed within square-shaped aperture **121** of bridge carrying member **24** and is adapted to fit within an appropriately shaped aperture **122** in handle **22**. The enlarged stem portion **124** of screw **84** bears against one end of keying element **120** and thereby assures that its other end will reside within aperture **122** of handle **22** when the screw **84** is tightened into tapped aperture **88** of the handle **22**.

Bridge carrying member **24** is freely fitting on keying element **120** so that there may be relative longitudinal motion therebetween. However, as long as the keying element is within the bridge carrying member there can be no relative rotational movement therebetween. Thus with

screw **84** tightened so that keying element **120** enters aperture **122** of handle **22**, handle **22** may not be rotated relative to bridge carrying member **24**.

Conductive bridge **34** is maintained on the enlarged stem portion **124** of screw **84** by spring **89** on one side and on spring **126** on the other.

As explained previously, spring **81** continually urges handle **22** away from the front surface of the housing **12** thereby firmly seating the notches **70**, **72**, **74**, **76** or **78** on the tapered protrusion **80**. It is apparent therefore that in the switch of FIGURES 1–10, if one accidentally depressed the handle **22** against the bias of spring **81**, it would be possible for the circuit to be broken through the conductive bridge **34**. The embodiment of FIGURE 11 eliminates this possibility by allowing the bridge carrying member **24** to move longitudinally relative to the key element **120** and the conductive bridge **34** so that even if the bridge carrying member is moved rearwardly by accidental depression of handle **22**, the conductive bridge will remain in contact with the contact pair it connects.

Conversion from the two to three-position mode of operation, and vice versa, is accomplished in the same manner as explained for the switch of FIGURES 1–10. The screw **84** is loosened, such that keying element **120** may be withdrawn from the square aperture **122** in handle **22**. The bridge carrying member **24** is rotated 180° and the screw **84** retightened so that keying element **120** is reinserted into aperture **122**.

There has thus been described a simple selector switch comprising a minimum number of parts and which is easily convertible by unskilled personnel between two and three-position modes of operation.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appending claims.

What is claimed is:

1. A selector switch comprising:

a housing having a front surface and a rear surface;

a movable carrier assembly mounted on said housing for rotation about an axis extending transverse to said front surface; said movable carrier assembly including a conductive bridge carried thereby; said carrier assembly being selectively movable between a first mode of operation wherein said carrier assembly may be selectively rotated between a first, second and third circuit control position, and a second mode of operation wherein said carrier assembly may be selectively rotated between said first and said third circuit control positions; and

a plurality of contacts mounted on the rear surface of said housing, pairs of said plurality of contacts being spaced on said rear surface to complete a path for electrical conduction between the contacts of each pair through said conductive bridge when said carrier assembly is in said first and third circuit control positions;

said housing and said carrier assembly having cooperating first and second interference means, respectively, for limiting the rotational movement of said carrier assembly to an arc which extends between said first and third control positions when said carrier assembly is in either of its two modes of operation;

said housing and said carrier assembly having cooperating cam means for accurately seating said carrier assembly in said first, second, and third control positions when said carrier assembly is in said first mode of operation, and for accurately seating said carrier assembly in said first and said third control positions when said carrier assembly is in said second mode of operation.

2. The selector switch of claim **1**, wherein said carrier assembly includes a bridge carrying member, handle means removably secured thereto, and interlock means for preventing rotation of said bridge carrying member relative to said handle means, said bridge carrying member being separable from said handle means to defeat said interlock means; separation of said bridge carrying member from said handle means allowing said bridge carrying member to be rotated relative to said handle means to change said carrier assembly between said first and said second mode of operation, said first and second interference means cooperating to prevent rotation of said handle means beyond the limits of said arc.

3. The selector switch of claim **1**, wherein:

said housing has an aperture passing therethrough and an interference member rigidly positioned adjacent said aperture on said front surface; and

said carrier assembly comprises:

handle means including a cylindrical center portion having an enlarged head portion at one end thereof, an elongated projection at the opposite end thereof, and an arcuate skirt portion depending from said head portion toward said opposite end; and

a bridge carrying member including a face portion having a projection receiving a slot therein;

said carrier assembly being mounted on said housing such that the skirt portion of said handle means bottoms on said front surface and such that said elongated projection extends through said aperture into removable engagement with the projection receiving slot in the face portion of said bridge carrying member, said depending skirt and said interference member cooperating to prevent rotation of said handle means beyond said first and third circuit control positions.

4. The selector switch of claim **1**, wherein:

said housing has an aperture passing therethrough and an interference member rigidly positioned adjacent said aperture on said front surface; and

said carrier assembly comprises:

handle means including a cylindrical center portion having an enlarged head portion at one end thereof, a rectangularly-shaped aperture at the opposite end thereof, and an arcuate skirt portion depending from said head portion toward said opposite end; and

a bridge carrying member including a face portion at one end thereof and a conductive bridge receiving slot at its opposite end thereof, said bridge carrying member having a rectangularly-shaped passageway extending centrally therethrough for the reception of a slidable rectangularly-shaped keying element, a portion of which extends partially out of said one end of said bridge carrying member; and

a conductive bridge mounted in said bridge receiving slot for longitudinal motion relative to said bridge carrying member;

said carrier assembly being mounted on said housing such that the skirt portion of said handle means bottoms on said front surface and such that said portion of said keying element extends through said aperture into removable engagement with the rectangularly-shaped aperture in said handle means, said depending skirt and said interference member cooperating to prevent rotation of said handle means beyond said first and third circuit control positions.

5. The selector switch of claim **3**, wherein the face portion of said bridge carrying member is provided with a first and second plurality of inwardly directed notches at opposing areas thereon, and the rear surface of said housing is provided with a depending protrusion which seats in selected notches of said first plurality of notches when said carrier assembly is in said first mode of operation, and which seats in selected notches in said second plurality of notches when said carrier assembly is in said second mode of operation.

6. The selector switch of claim **5**, wherein said bridge carrying member is provided with securing means for adjustably tightening said bridge carrying member into

engagement with said handle means to prevent relative rotation therebetween, said carrier assembly being changed between its two modes of operation by loosening said securing means and rotating said bridge carrying member 180° with respect to said handle means.

7. The selector switch of claim 6, and further including biasing means located between the front surface of said housing and the enlarged head portion of said handle means for urging the face portion of said bridge carrying member into engagement with the rear surface of said housing.

8. The selector switch of claim 6, wherein said first and third circuit control positions are active control positions and said second circuit control position is a passive control position when said carrier assembly is in said first mode of operation; and said first circuit control position is an active control position and said third circuit control position is a passive control position when said carrier assembly is in said second mode of operation.

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