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G. A. KWASNIEWSKI

2,639,338

SELECTOR SWITCH

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FIG. 1

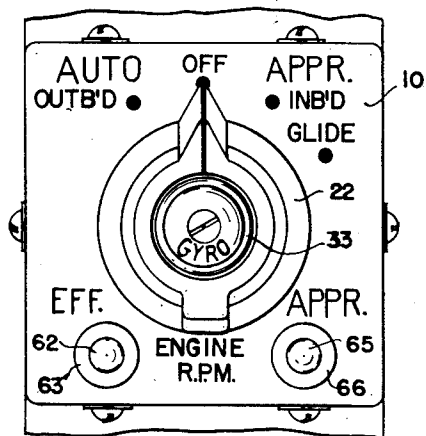


FIG. 3

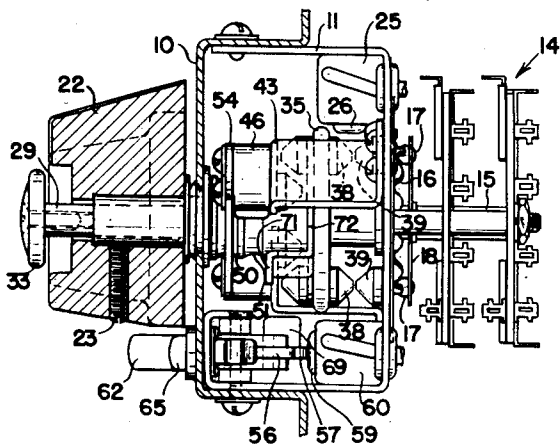
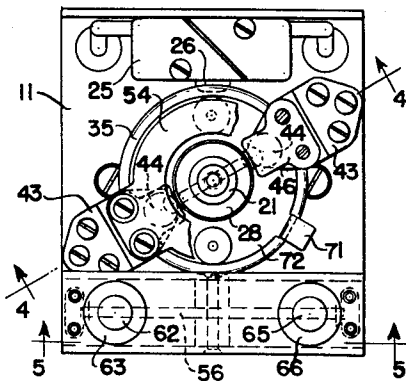


FIG. 2

FIG. 5

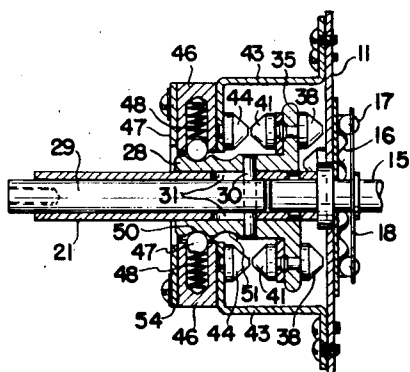
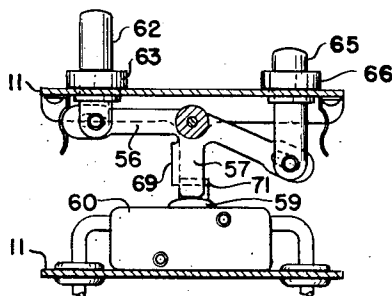


FIG. 4

INVENTOR.
GEORGE A. KWASNIEWSKI
BY

George H. Fisher

ATTORNEY

UNITED STATES PATENT OFFICE

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SELECTOR SWITCH

George A. Kwasniewski, Moundview Township,
Ramsey County, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis,
Minn., a corporation of Delaware

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This invention is directed to a switch having a plurality of sets of contacts with an interlock between sets to correlate their operation under certain conditions.

One object of the invention is to provide a switching mechanism having two sets of contacts with an interlock that determines the position of one set at a predetermined position or positions of the other set.

Another object is to provide a switching mechanism in which one set of contacts is moved between a plurality of positions by rotation of a member and another set of contacts is actuated by a second member slidably axially in the first member. Under one phase of the invention the position of the second set of contacts will be correlated with the position of the first set at one or more positions of the first set. A broader object is to provide a mechanism in which the operative position of two control means of any type are correlated under certain conditions.

A still further object is to provide a switch mechanism wherein two normally manually operable switches are moved to predetermined positions under certain conditions of a third switch.

Other objects will be apparent from the following specification and claims, and from the drawing, in which:

Figure 1 is an elevation of the panel of the selector switch as it appears to the operator;

Figure 2 is an elevation of the selector switch as seen from the right of Figure 1;

Figure 3 is an elevation of the switch in the same aspect as Figure 1 but with the panel and control knobs removed, and with the operative parts in the same position as in Figure 1;

Figure 4 is a sectional view taken on line 4—4 of Figure 3 and with the switch turned to the "Glide" position; and

Figure 5 is a fragmentary section taken on line 5—5 of Figure 3, with the switch turned to the "Glide" position.

The illustrative embodiment of the invention is a function selector switch used in an airplane to tie the automatic approach system into the autopilot system so that the airplane will be guided in accordance with a radio landing approach beam. In the "Outbound" and "Inbound" positions, the radio beam controls only the horizontal direction of the airplane, while in the "Glide" position the altitude of the airplane, is also controlled. In order to prevent excessive deviations from the desired course, as might be caused by changing cross wind, a directional gyroscope signal may be added to the radio signal so that changes in heading will be sensed and corrected before the airplane is actually off the beam. The construction of the switch is such

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that the gyroscope signal is optionally available in the "Inbound" and "Outbound" positions, but is positively included in the "Glide" position. An additional manual switch controlling available engine power is also positively moved to its high power position when the selector switch is turned to "Glide."

Figures 1 and 2 show a portion of a panel 10 which also carries other controls for an automatic approach coupler with which the present invention is not concerned. A channel shaped frame 11 is suitably secured to the backside of the panel 10 and carries the several elements of the switching mechanism. As seen in Figure 2, a two section rotary tap switch 14 is secured to the rear surface of the frame 11. The tap switch 14 includes a drive shaft 15 that extends through the frame 11 toward the panel 10. The switch 14 includes a detent mechanism comprising a stationary member 16 having a plurality of raised and lowered portions with which a pair of balls 17 are adapted to engage. The balls 17 are carried by a flexible strip 18 rotatable with the shaft 15 so that the shaft will tend to stop only in positions corresponding to operative positions of the tap switch. The rotary tap switch is of conventional commercially available construction and it is not believed necessary to describe it in detail. A tube 21 is secured to the end of the shaft 15 and extends outwardly through the panel 10, and a knob 22 is secured thereto by a set screw 23 so that the rotary tap switch 14 may be angularly positioned from the front face of the panel 10. Suitable stop means, not shown, is provided in the tap switch 14 to limit rotation of the knob 22 to the indicated positions of "Outbound" and "Glide," as indicated in Figure 1.

As seen in Figures 2 and 3, the frame 11 carries a snap switch 25 having an actuating button 26 which, when depressed, is adapted to close the circuit through the switch to provide the gyroscope control function mentioned above. The details of the internal construction of the switch 25 have no bearing on the present invention and are therefore not shown in detail. As shown most clearly in Figure 4, a sleeve 28 is carried by the tube 21 and is axially slidable thereon. A rod 29 is carried within the tube 21 and is connected to the sleeve 28 by a pin 30 which extends through slots 31 in the tube 21. It will be seen, therefore, that the sleeve 28 and rod 29 will rotate with the tube 21 but may be axially displaced with respect thereto by movement of the pin 30 in the slot 31. A knob 33 carried on the end of rod 29 and disposed on the outer surface of the sleeve 28 is available for manually displacing the sleeve 28 when the knob 22 is in either the "Outbound" or "Inbound" positions. A circular disc

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35, integral with the sleeve 28, has a rounded periphery adapted to engage the actuating button 26 of the snap switch 25 when the sleeve 28 is moved inwardly to the position indicated in Figure 4.

A pair of conically shaped cams 38 are carried on the surface of the disc 35 facing rearwardly or toward the tap switch 14. A pair of cooperating conical cams 39 are carried by the frame 11 and face outwardly therefrom and cooperate with the cams 38 in the "off" position of the tap switch to force the disc 35 out of engagement with the actuating button 26 of the snap switch 25. The disc 35 also carries a pair of conically shaped cams 41 which extend from the opposite surface thereof or toward the panel 10. A pair of brackets 43 are suitably secured to the frame 11 and carry a pair of conically shaped cams 44 disposed to cooperate with the cams 41 to force the sleeve 28 and the disc 35 to its innermost position to actuate the snap switch 25 when the knob 22 is turned to place the tap switch 14 in the "Glide" position. It will be noted that neither set of cams are effective to determine the position of the sleeve 28 when the knob 22 is positioned in either the "Outbound" or the "Inbound" positions. The brackets 43 also carry a pair of blocks 46 which are bored to receive a pair of radially displaceable balls 47, which are biased by springs 48 into an engagement with the sleeve 28. The sleeve 28 is provided with a pair of shallow annular depressions 50 and 51 separated along the length of sleeve 28 by distance corresponding to the two operative positions thereof. The spring biased balls 47 cooperate with the depressions 50 and 51 to provide a detent to maintain the sleeve 28 in either of its operative positions. The blocks 46 are surmounted by a generally annular plate 54 that serves to increase the rigidity of the assembly comprising the brackets 43 and blocks 46.

The switching mechanism also includes a manually operable switch adapted to control the power available from the aircraft power plant. As seen in Figure 1 this switch is designated "Engine R. P. M." and is actuated by two buttons, one of which is labeled "Efficiency" and the other of which is labeled "Approach." The details of this switch are best seen in Figure 5. A rockable lever 56 is pivoted in the frame 11 and has a laterally extending arm 57 adapted to engage the actuating button 59 of a snap switch 60 which is secured to the frame 11. A push button 62 is slidable in a bushing 63 which is secured to the frame 11. The push button 62 has a pin on its inner end that engages a slot in the left hand end of the lever 56 so that rectilinear movement of the button may be translated into rotary movement of the lever 56. Likewise, a push button 65 is slidable in a bushing 66 and carries a pin that rides in a slot in the right hand end of the lever 56. It will be seen that depression of the button 65 causes engagement of the actuating button 59 of the switch 60 by the arm 57 whereas depression of the button 62 causes the arm 57 to move to the right out of engagement with the actuating button. As best seen in Figure 2, the arm 57 is provided with a laterally extending ear 69 that is adapted to be engaged by an arm 71 that extends radially from the disc 35 and is carried thereon by a plate 72 that is secured to one face of the disc. The arm 71 is so located with respect to the disc 35 that it engages the ear 69 and moves the lever 56 and the arm 57 to switch actuating position

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when the disc 35 and the sleeve 28 are turned to the "Glide" position. It is desirable that the engine should be operating under conditions such that emergency power is available when the aircraft is coming in for a landing. Under blind landing conditions the pilot has many things to occupy his mind and it is desirable that the engine be conditioned to supply maximum power in case of emergency even though the pilot should forget to actuate the switch. By providing the described interlock between the switch that controls engine power and the automatic approach system the proper engine condition is assured.

As described above, the switch 25 may be actuated at the option of the pilot when the tap switch 14 is positioned in either the "Outbound" or "Inbound" positions, but it is impossible for the pilot to forget to actuate the gyroscope controlling switch 25 when the tap switch 14 is turned to the "Glide" position, and the airplane is descending for a landing.

While the invention has been described in connection with a switching mechanism designed for a very specific purpose, it will be understood that it would be equally applicable to other purposes where correlation between the operative positions of two or more switches is desired. It is also contemplated that the invention might be utilized in connection with other than manually operable switches. The scope of the invention is to be determined only by the appended claims.

I claim as my invention:

1. An electric switching mechanism comprising, a frame, a first switch carried by said frame, a member movable in said frame to move said first switch between a plurality of operative positions, a second switch carried by said frame, a second member movable in said frame to move said second switch between two operative positions, a linkage interconnecting said first and second members causing said second member to assume a position causing operation of said second switch to one of its operative positions when said first member is moved to a predetermined position, and manually operable means effective to move said second member at other positions of said first member to determine the operative position of said second switch.

2. An electric switching mechanism comprising, a frame, a first switch carried by said frame, a member movable in said frame to move said first switch between three operative positions, a second switch carried by said frame, a second member movable in said frame to move said second switch between two operative positions, and a linkage interconnecting said first and second members and said frame, said linkage actuating said second member to a position corresponding to one operative position of said second switch on movement of said first member to a position corresponding to the first position of said first switch, said linkage actuating said second member to a position corresponding to the other operative position of said second switch on movement of said first member to a position corresponding to the second position of said first switch, and said linkage having no effect on the operative position of said second member when said first member is moved to the position causing said first switch to assume its third operative position.

3. An electric switching mechanism comprising, a frame, a first member rotatable in said frame, a first switch movable between a plurality of

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operative positions by angular movement of said first member, a second member rotatable with said first member and slidable axially with respect thereto, a second switch actuated between first and second operative positions by axial movement of said second member, cam means acting between said frame and said second member in one angular position of said members to cause said second member to assume a position to actuate said second switch to its first operative position, and a knob on said second member for manually positioning said second member to move said second switch between its first and second positions at other angular positions of said first member.

4. An electric switching mechanism comprising, a frame, a first member rotatable in said frame, a first switch movable between three operative positions by rotation of said first member, a second member rotatable with said first member and slidable axially thereon, a second switch actuated between first and second operative positions by axial movement of said second member, and cam means acting between said frame and said second member in one angular position of said members to move said second member to actuate said second switch to its first operative position, in a second angular position to permit said second member to be moved axially to actuate said second switch to either of its operative positions, and in a third angular position to move said second member positively to the position in which said second switch is moved to its second operative position.

5. An electric switching mechanism comprising, a frame, a member pivotally mounted in said frame, means on said frame preventing axial movement of said member, a tap switch carried by said frame and actuatable between a plurality of operative positions on a rotation of said member, a rod slidable axially within a tubular portion of said member, a sleeve slidable axially on an external surface of said member, means extending radially through a lateral opening in said member and interconnecting said rod and said sleeve to cause the axial position of said sleeve to correspond to the axial position of said rod, a second switch carried by said frame and having an actuator movable between two operative positions by said sleeve on axial movement thereof, a pair of cooperating cam surfaces carried by said frame and said sleeve causing said sleeve to assume a predetermined axial position when said member is moved to a predetermined angular position, and a knob on said rod for manually positioning said sleeve.

6. An electric switching mechanism comprising, a frame, a member pivotally mounted in said frame, means on said frame preventing axial movement of said member, a tap switch carried by said frame and actuatable between a plurality of operative positions on rotation of said member, a rod slidable axially within a tubular portion of said member, a sleeve slidable axially on an external surface of said member, means extending radially through a lateral opening in said member and interconnecting said rod and said sleeve to cause the axial position of said sleeve to correspond to the axial position of said rod, a second switch carried by said frame and having an actuator movable between two operative positions by said sleeve on axial movement thereof, a first pair of cooperating cam surfaces on said frame and said sleeve causing said sleeve to assume one axial position when said member

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is moved to a first predetermined angular position, a second pair of cooperating cam surfaces on said frame and said sleeve causing said sleeve to assume its other axial position when said member is moved to a second predetermined angular position, and a knob on said rod for manually positioning said sleeve and determining the operative position of said second switch at other angular positions of said member.

7. An electric switching mechanism comprising, a frame, a first member rotatable in said frame, a first switch movable between a plurality of operative positions by angular movement of said first member, a second member rotatable with said first member and slidable axially with respect thereto, a second switch actuated between first and second operative positions by axial movement of said second member, cam means acting between said frame and said second member in one angular position of said members to cause said second member to assume a position to actuate said second switch to its first operative position, a knob on said second member for manually positioning said second member to move said second switch between its first and second positions at other angular positions of said first member, a third switch carried by said frame, means including a manually operable member for actuating said third switch between first and second operative positions, and an arm projecting radially from said second member and adapted in one angular position of said members to engage said means and actuate said third switch to its first operative position.

8. An electric switching mechanism comprising, a frame, a first member rotatable in said frame, a first control means movable between a plurality of operative positions by angular movement of said first member, a second member rotatable with said first member and slidable axially with respect thereto, a second control means actuated between first and second operative positions by axial movement of said second member, cam means acting between said frame and said second member in one angular position of said members to cause said second member to assume a position to actuate said second control means to its first operative position, and a knob on said second member for manually positioning said second member to move said second control means between its first and second positions at other angular positions of said first member.

9. An electric switching mechanism comprising, a frame, a first switch carried by said frame, a member movable in said frame to move said first switch between a plurality of operative positions, a second switch carried by said frame, a second member movable in said frame to move said second switch between two operative positions, and interlocking means acting on said second member at one position of said first member to cause said second member to assume a position in which said second switch is moved to one of its operative positions, said interlocking means being ineffective to determine the position of said second member at another position of said first member.

GEORGE A. KWASNIEWSKI.

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