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MAGNETIC AND MANUALLY OPERATED ELECTRIC SWITCH

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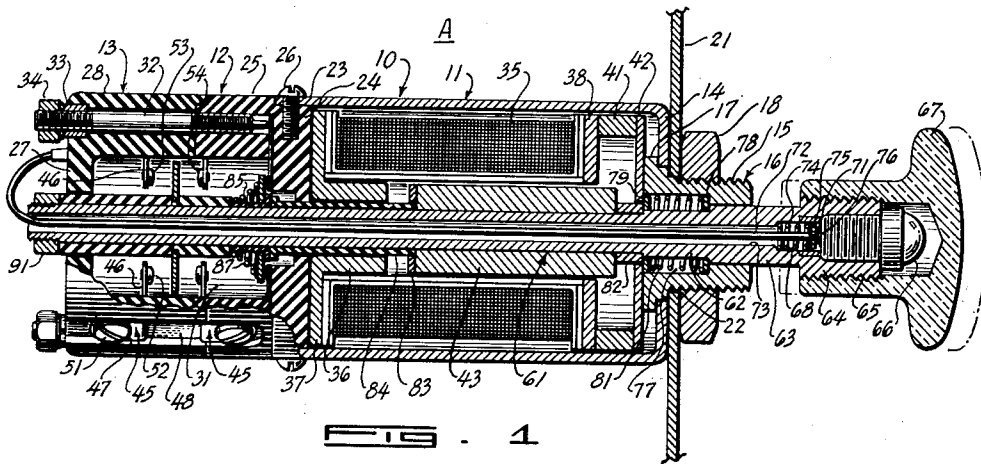


FIG. 1

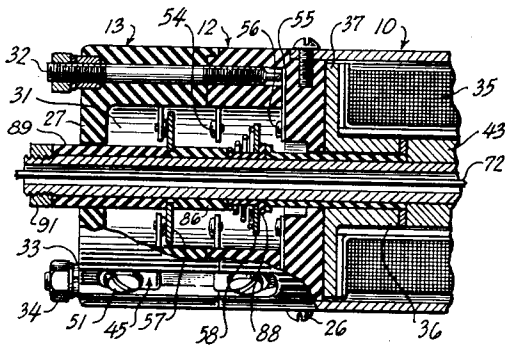


FIG. 2

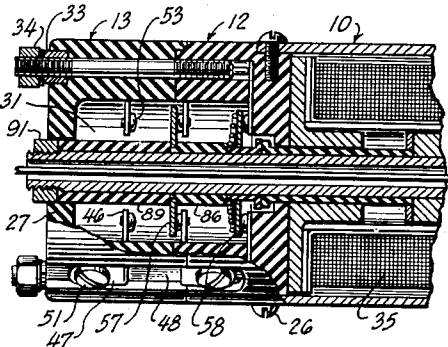


FIG. 3

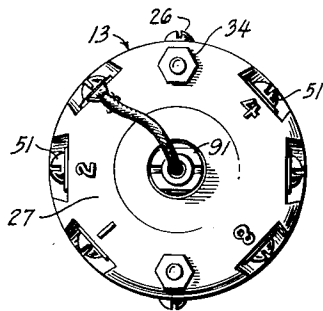


FIG. 4

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MAGNETIC AND MANUALLY OPERATED
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5 Claims. (Cl. 200—111)

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This invention relates to electric switches and more particularly to electric switches of the electromagnetically operated type.

An object of the present invention resides in providing an improved form of electromagnetically operated electric switch having associated therewith an indicating device which warns that the switch is in operative position.

Another object of this invention lies in the provision of an improved form of electric switch adapted to be manually and automatically operated.

Another object of this invention is to provide an improved form of electromagnetically operated electric switch embodying manually operable means for effecting manual control of the switch and with a warning light incorporated in the manually operable means which serves to indicate when the switch has been operated.

A further object of this invention is the provision of an electric switch having sturdy and economical construction and with improved and reliable operating characteristics.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings wherein is illustrated a preferred form of the invention, and in which:

Figure 1 is a view of the switch according to the present invention, with the greater portion thereof shown in vertical section;

Figure 2 is a fragmentary sectional view showing the movable contacts when they have been electromagnetically moved to contacts engaged position;

Figure 3 is a view similar to Figure 2 but with the movable contacts shown in contacts engaged position effected by manual movement thereof; and

Figure 4 is an end view of the switch.

Having further reference to the drawings the electric switch A of the present invention comprises a housing 10 which in the preferred embodiment is comprised of three parts; a metallic cylindrical casing 11, a first generally cup-shaped member 12 formed of molded insulating material secured to one end of casing 11, and a second generally cup-shaped member 13, also formed of molded insulation material, which is connected to member 12 at one end thereof, the two insulating members 12 and 13 serving further as contact blocks, as will be hereinafter more fully described.

The metallic casing 11 is provided with an inverted annular mounting flange 14 at one end

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thereof. Through an annular opening defined by the flange 14 there extends the threaded shank portion 15 of a cylindrical, hollow mounting boss 16, the head 17 of which boss is adapted to bear against flange 14. A nut 18 is provided for cooperation with the threaded shank portion 15 to effect the mounting of the electric switch A in any desired location. In mounting the electric switch A, as to a panel 21, for example, the shank portion 15 will be inserted through an opening 22 provided by the panel 21 and the nut 18 will then be threaded on shank portion 15 until it is brought to bear tightly against the panel surface. This operation will draw flange 14 of casing 11 tightly against the opposite surface of the panel and the electric switch A will then be securely mounted.

The generally cup-shaped insulating member 12 is disposed adjacent to the free and open end 23 of metallic casing 11. This member 12 comprises a base 24, which removably fits into the open end 23 of casing 11, and an annular wall 25. Studs 26 passing through the wall of casing 11 and threaded into base 24 of member 12 serve to connect the two members together. The second generally cup-shaped member 13 which completes the housing 10 serves, as shown in the drawings, as a capping or closing member for the housing 10 and comprises a base 27, and an annular wall 28. The annular walls of the two insulating members 12 and 13 are, when in assembled relationship, oppositely directed, and are disposed with their outer ends contiguous. In this position the two insulating members 12 and 13 define, between them, a substantially enclosed contact chamber 31. The insulating members 12 and 13 are maintained in assembly by studs 32, each of which carries a pair of nuts 33 and 34 with nut 33 retaining the stud in position. The studs 32 further serve both as terminals and to hold contact members, as will be hereinafter further described; and the nuts 34 act to connect electrical conductors to the studs 32.

Contained within casing 11 is an energizing coil or solenoid 35, one end of which is fitted upon a magnetic cylindrical boss 36 and bears upon an annular flange 37 provided on the boss 36.

Flange 37 rests against the exterior wall of base 24 of insulating member 12. A magnetic washer 38 is located at the opposite end of coil 35. A ring member 41 and a washer 42 disposed between washer 38 and head 17 of boss 16 maintain the coil 35 in proper location within casing 11. Appropriate terminal studs, not shown, are provided on the insulating member 12 to which

circuit wires for effecting energization of the coil 36 may be attached.

A magnetic plunger core or armature 43 having a bore extending longitudinally there-through is disposed within the coil 35 and is reciprocally movable therein upon energization and de-energization of the coil 35.

A plurality of generally L-shaped conducting members 45 is provided on the insulating members 12 and 13. Each of the conducting members 45 comprises a leg 46 which extends inwardly through an opening in the wall of the insulating member to lie within the contact chamber 31, and a leg 47 which is carried in a recess 48 formed in the exterior of the insulating members. Each of the conducting members 45 is held in position within its recess by a stud 51 threaded through exterior leg 47 and into the wall of the insulating member. The stud 51 further serves as a terminal screw for securing a conductor to the conducting member. The interior end of the leg 46 carries a contact face 52 which serves as a stationary contact. As shown in the drawings, two sets 53 and 54 of stationary contacts 52 are provided. It is understood, of course, that as many sets of contacts could be provided as there are circuits which are desired to be controlled by switch A.

Connected to each of the two mounting studs 32 is a contact plate 55 which extends into contact chamber 31 and carries a contact face 56 at its interior end.

To bridge the stationary contact sets 53 and 54 and the spaced stationary contacts 56 provided by the contact plates 55 for making and breaking the circuits therethrough, there are provided movable contact members 57 and 58, with movable contact member 57 being operative between contact sets 53 and 54 for alternate bridging thereof and with contact member 58 being adapted to bridge contacts 56.

Extending the length of switch housing 10 and passing through aligned openings in base 27 of insulating member of contact block 13, base 24 of contact block 12, boss 36, armature 43, washers 38 and 42 and boss 16, is an elongate, cylindrical, actuating rod 61 which has one end adapted to project beyond the panel 21 to which the switch A is mounted and the opposite end protruding beyond the base 27 of insulating member 13. The actuating rod 61 at the end adjacent boss 16 is provided with a series of progressively larger cylindrical portions 62, 63 and 64. Enlarged portion 64 is exteriorly threaded, and further is provided with a threaded bore 65 into which is screwed the base of an incandescent lamp 66. Mounted on the exterior threads of portion 64 is a translucent knob 67 which may be formed of molded plastic and through which light from lamp 66 is diffused. A smaller diameter bore 68 is provided adjacent threaded bore 65 and accommodates a contact 71 provided at the end of an electrical lead 72 which runs through an axially extending bore 73 provided in actuating rod 61. A compression spring 74 with one end resting on a seat provided by an annular ledge or portion in bore 68 and the other end biased against an insulating washer 75 associated with contact 71 yieldably urges contact 71 into engagement with a lamp contact 76 provided on the base of incandescent lamp 66. Lamp 66 is grounded through the engagement of actuating rod 61 with boss 16 mounted in panel 21 to complete an electrical circuit.

A chamber 77 is formed in boss 16 within which

is disposed a pair of washers 78 and 79 with a compression spring 81 disposed therebetween. Washer 78 rests against an annular shoulder provided by enlarged rod portion 63 whereby the bias of spring 81 is exerted to urge actuating rod 61 to the right, as viewed in the drawings, to return it to neutral position whenever the rod should be moved inwardly. A spacer ring 82 mounted on rod 61 is disposed between an annular shoulder provided by enlarged rod portion 62 and the end surface of armature 43 so that movement of the actuating rod 61 into the switch housing will effect longitudinal movement of armature 43. Spacer ring 82 also engages washer 79 whereby with movement of the actuating rod 61 outwardly and away from the housing the ring 82 will move washer 79 to compress spring 81 so that with release of knob 67 spring 81 expands to return the actuating rod 61 to its neutral position indicated by the full line representation of Figure 1.

Provided on actuating rod 61 adjacent the interior end of armature 43 are an insulating washer 83 and an insulating spacer sleeve 84. Also supported by actuating rod 61 is a pair of contact mounting insulation sleeves 85 and 86 with insulating sleeve 85 slidably carrying movable contact 58 and insulating sleeve 86 fixedly supporting movable contact 57. A compression spring 87 disposed upon sleeve 85 engages and biases movable contact 58 against an out-turned flange 88 on sleeve 85. The end of adjacent sleeve 86 provides a seat for the opposite end of spring 87.

A nut 91 threaded on the end of actuating rod 61 cooperates with a sleeve 89 to maintain the contact supporting sleeves 85 and 86 on the rod.

In the neutral position of the electric switch, as shown in Figure 1, movable contact 58 engages the spaced stationary contacts 56 and movable contact 57 normally lies disposed substantially midway between the stationary contact sets 53 and 54 and will engage one or the other sets dependent upon the direction in which actuating rod 61 is moved.

A preferred use of electric switch A is as a feathering switch in an airplane to control a propeller thereof, as is fully explained in my co-pending application, Serial No. 778,933, filed October 9, 1947. As described in this copending application multi-engine aircraft embody means which operate to feather a propeller to reduce the drag induced by a wind-milling propeller when the engine with which the propeller is associated fails. It is very necessary that a wind-milling propeller be feathered to relieve the load placed on the remaining engine or engines. Engine failure is particularly dangerous when an aircraft is taking off because it is then that the maintenance of the full power output is critical, and on occurrence of such an engine failure a pilot must act quickly so that the non-functioning propeller will be feathered before the drag effect takes place. Under such circumstances it has happened that pilots have not correctly ascertained the non-functioning engine and have pushed the feathering button associated with the wrong engine with resultant accidents.

Frequently, the pilot may push the correct feathering button but the elapsed time between the actual failure of the engine and the discernment of that failure is so great as to render the feathering of the propeller ineffective since the drag of the wind-milling propeller has already

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placed the aircraft in a dangerous situation. The electric switch A is adapted for use in the system of the aforementioned co-pending application which provides that the loss of engine power will be immediately detected and such loss will be signaled to the pilot and the wind-milling propeller associated with the inoperative engine will be automatically feathered before the propeller drag affects the operation of the aircraft. The use of electric switch A, by reason of the lamp 66, will prevent the pilot feathering a propeller associated with a properly functioning engine and immediately acquaints him with the fact that the engine serviced by that particular switch has failed.

The actuating rod 61 is adapted to be moved inwardly into switch housing 11 both automatically, on energization of coil 35, or manually by applying pressure to the knob 67. This inward movement will carry movable contact 57 into engagement with stationary contact set 53 which in the system of the aforementioned co-pending application controls the means for effecting the feathering of a propeller. Thus by virtue of the present electric switch the feathering can be done both automatically and voluntarily for the solenoid coil 35 is automatically energized by a switch which operates on engine failure. Engagement of stationary contact set 53 by movable contact 57 is adapted also to control the circuit, not shown, which provides power to the lamp 66 in the knob 67 to provide a visual indication that a feathering operation is occurring. After the feathering operation has occurred the coil 35 is de-energized and spring 81, compressed by the inward movement of actuating rod 61, will expand and move the actuating rod 61 in the reverse direction to return it to its neutral position and to disengage the movable contact 57 from stationary contact set 53.

The stationary contact set 54 is adapted to be engaged by movable contact 57 at such time as the actuating rod 61 is manually pulled outwardly from its housing. Contact set 54 as described in the co-pending application, controls the operation of unfeathering the propeller. After the propeller is unfeathered the pilot releases the knob 67 and the actuating rod 61 will move toward the housing 11 to its neutral position under the bias of springs 81 and 87 compressed by this outward movement of rod 61.

The stationary contacts 56 are provided in the system proposed by the co-pending application to control the operation of a second feathering electric switch and to prevent the latter's functioning if electric switch A itself occupies feathering position by breaking an electrical circuit thereto.

It is of course understood that the use described for the present switch is merely illustrative as this switch is adapted to be operative to control any variety of devices wherein it is required that both automatic and manual control be had and where it is desired that on operation of the switch a visual indication be provided to denote that fact.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

I claim:

1. In an electric switch, an elongate member, movable contact means supported by said elon-

gate member, a plurality of stationary contact means, said elongate member being positioned for longitudinal movement manually in opposite directions from a normal position, movement of said elongate member in either direction from its normal position effecting engagement between said movable contact means and certain of said stationary contact means, an energizing coil, a magnetic core disposed therein, means operatively connecting said elongate member to said magnetic core for automatic movement thereby in one direction from its normal position to a switch operating position upon energization of said energizing coil, resilient means operative on said elongate member and exerting its bias to resist manual and automatic movement thereof and adapted to return said elongate member to its normal position both after a manual operation and on deenergization of said coil, and a lamp carried by said elongate member, in circuit with certain of said stationary contact means, and adapted to light both upon automatic movement of said elongate member in one direction to a switch operating position and upon manual movement of said elongate member in this same one direction.

2. In an electric switch, an elongate member, movable contact means supported by said elongate member, a plurality of stationary contact means, said elongate member being supported for longitudinal movement manually in opposite directions from a normal position, movement of said elongate member in either direction from its normal position effecting cooperation between said movable contact means and stationary contact means, an energizing coil having a passage extending therethrough, a magnetic core slidably fitted within said coil and itself having a bore through which said elongate member passes to extend beyond each end of the core, means operatively connecting said elongate member to said magnetic core for automatic movement thereby in one direction from its normal position to a switch operating position upon energization of said energizing coil, resilient means operative on said elongate member and exerting its bias to resist manual and automatic movement thereof and adapted to return said elongate member to its normal position both after a manual operation and on deenergization of said coil, and a lamp carried by said elongate member, in circuit with certain of said stationary contact means, and adapted to light both upon manual and automatic movement of said elongate member in one direction to a switch operating position, said lamp and said movable contact means being carried by said elongate member at opposite sides of said core.

3. In an electric switch, an elongate member, movable contact means supported by said elongate member, a plurality of stationary contact means, said elongate member being supported for longitudinal movement manually in opposite directions from a normal position, movement of said elongate member in either direction from its normal position effecting cooperation between said movable contact means and stationary contact means, an energizing coil having a passage extending therethrough, a magnetic core slidably disposed within said passage and having a bore through which said elongate member extends, means operatively connecting said elongate member to said magnetic core for automatic movement thereby in one direction from its normal position to a switch operating position upon

energization of said energizing coil, resilient means operative on said elongate member and exerting its bias to resist the automatic movement thereof and to resist manual movement in the same direction as the automatic movement, and adapted to return said elongate member to its normal position both after a manual operation and on deenergization of said coil, a second resilient means for resisting manual movement of said elongate member in the other direction and adapted to return said elongate member to its normal position, and a lamp carried by said elongate member, in circuit with certain of said stationary contact means, and adapted to light both upon automatic movement and upon manual movement of said elongate member in the same direction to a switch operating position.

4. In an electric switch, an elongate member, movable contact means supported by said elongate member, a plurality of stationary contact means, said elongate member being supported for longitudinal movement manually in opposite directions from a normal position, movement of said elongate member in either direction from its normal position effecting cooperation between said movable contact means and stationary contact means, an energizing coil having a passage extending therethrough, a magnetic core slidably disposed within said passage, said magnetic core having a bore through which said elongate member passes to extend to each side of the core, means operatively connecting said elongate member to said magnetic core for automatic movement thereby in one direction from its normal position to a switch operating position upon energization of said energizing coil, resilient means operative on said elongate member and exerting its bias to resist automatic movement thereof in said one direction and resist manual movement in the same direction and adapted to return said elongate member to its normal position both after a manual operation and on deenergization of said coil, a second resilient means for resisting manual movement of said elongate member in the other direction and adapted to return said elongate member to its normal position, a lamp carried by said elongate member, in circuit with certain of said stationary contact means, and adapted to light both upon manual and automatic movement of said elongate member in said one direction to a switch operating position, said movable contact means and said lamp being carried by said elongate member at opposite sides of said core, and a translucent housing means provided on said elongate member for containing said lamp, the housing means adapted to be grasped to effect the manual actuation of said elongate member in opposite directions from its normal position.

5. In an electric switch, a housing comprising a cylindrical casing, an insulating structure secured to said casing at one end thereof and having a contact chamber, an elongate member, contact means supported by said elongate member for movement within said contact chamber, a plurality of stationary contact means mounted on said insulating structure and within said contact chamber, means for positioning said elongate member for longitudinal movement man-

ually in opposite directions from a normal position, movement of said elongate member in either direction from its normal position effecting cooperation between said movable contact means and stationary contact means, an energizing coil having a passage extending therethrough, a magnetic core slidably disposed within said passage and itself having a bore, said elongate member adapted to pass through said bore in said core to extend beyond each end thereof, with a portion extending into said contact chamber to support said movable contact, means operatively connecting said elongate member to said magnetic core for automatic movement thereby in one direction from its normal position to a switch operating position upon energization of said energizing coil, resilient means operative on said elongate member and exerting its bias to resist automatic movement thereof in said one direction and resist manual movement in the same direction and adapted to return said elongate member to its normal position both after a manual operation and on deenergization of said coil, a second resilient means for resisting manual movement of said elongate member in the other direction and adapted to return said elongate member to its normal position, a lamp carried by said elongate member, in circuit with certain of said stationary contact means, and adapted to light both upon manual and automatic movement of said elongate member in said one direction to a switch operating position, said lamp being carried by the elongate member exteriorly of the housing and on the side of the core opposite that at which the movable contact is carried, said elongate member having a recess in its end within which said lamp is positioned and a longitudinally extending bore running from said recess the length of the elongate member, an electrical conduit disposed in said longitudinally extending bore and electrically connected to said lamp, and a translucent housing provided on said elongate member within which said lamp extends, said housing adapted to be grasped to effect manual actuation of said elongate member in both directions from its normal position.

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REFERENCES CITED

50 The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
55 1,438,727	Schwagermann	Dec. 12, 1922
1,700,890	Hodgkins et al.	Feb. 5, 1929
1,839,629	Williams	Jan. 5, 1932
2,069,382	Morton et al.	Feb. 2, 1937
2,234,954	Bergman	Mar. 18, 1941
60 2,304,608	Smythe	Dec. 8, 1942
2,335,283	Johnson	Nov. 30, 1943
2,373,587	Martin-Hurst	Apr. 10, 1945
2,423,387	Johnson	July 1, 1947
2,430,189	Schellman	Nov. 4, 1947

FOREIGN PATENTS

Number	Country	Date
677,960	France	Mar. 17, 1930