Oct. 9, 1951 C. H. PRIESMEYER 2,570,481

SWITCH CONSTRUCTION

Filed Sept. 28, 1946 3 Sheets-Sheet 1

FIG. 1

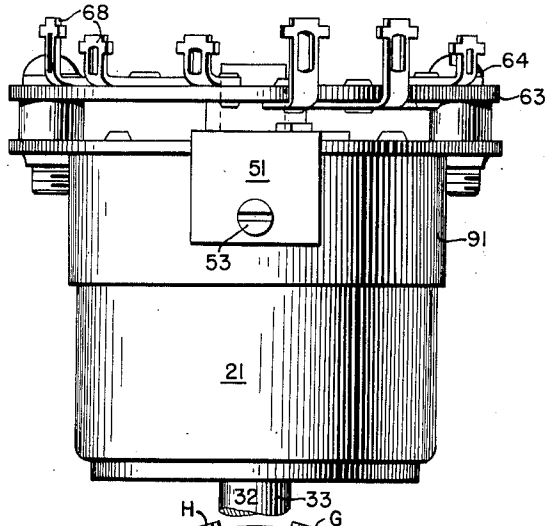


FIG. 3

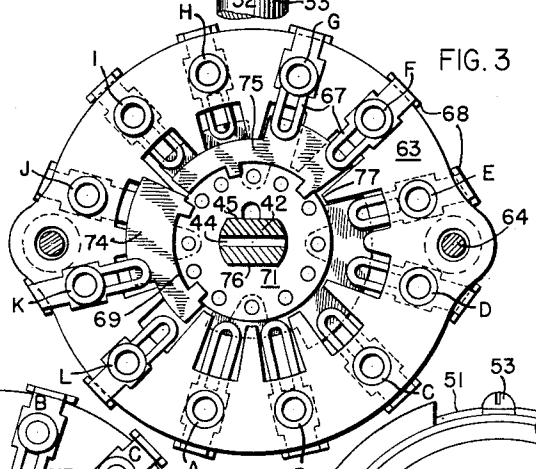


FIG. 2

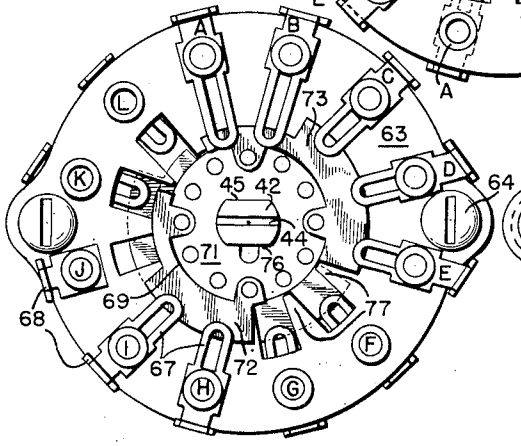
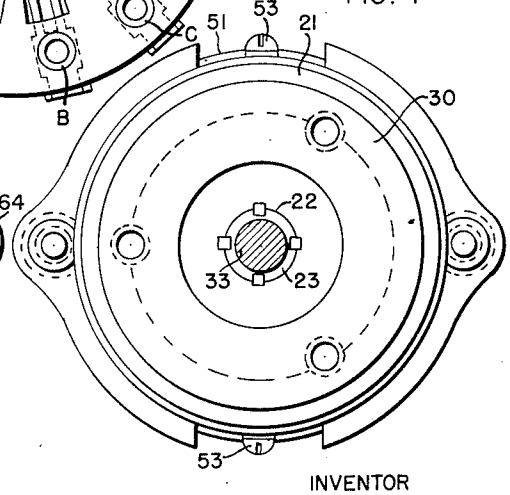


FIG. 4



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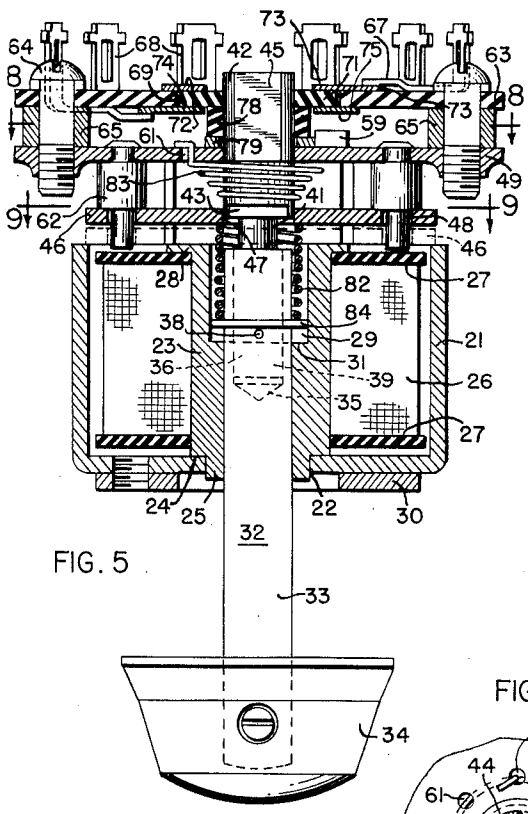


FIG. 5

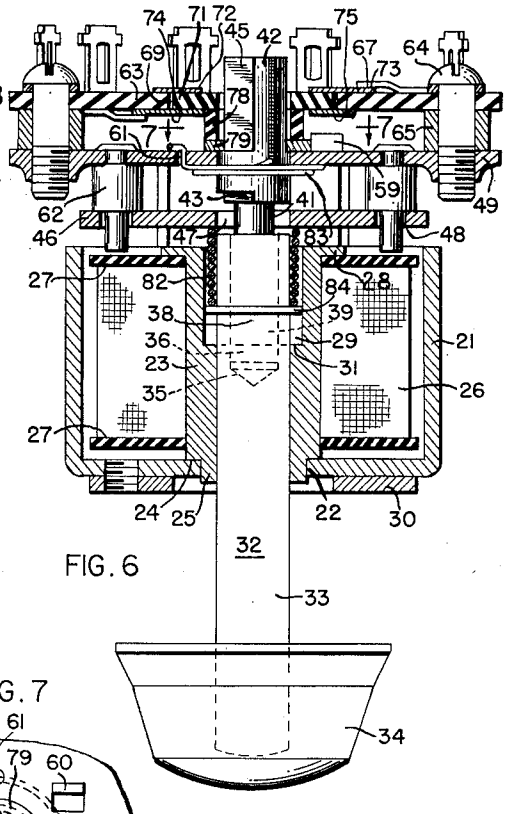


FIG. 6

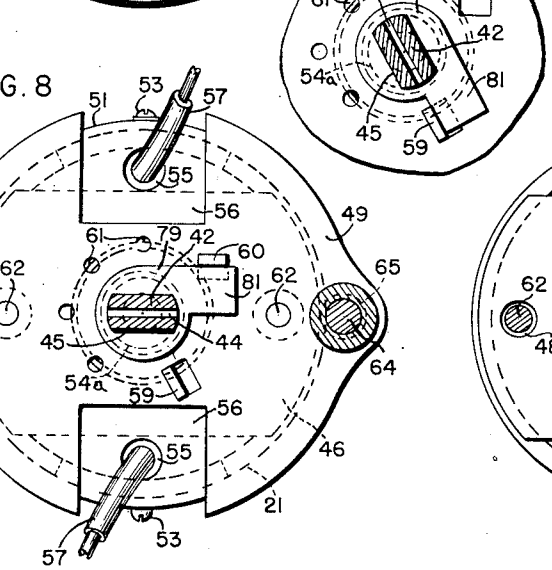
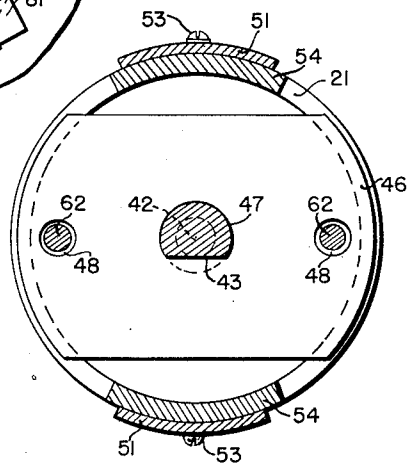


FIG. 7

FIG. 8

FIG. 9



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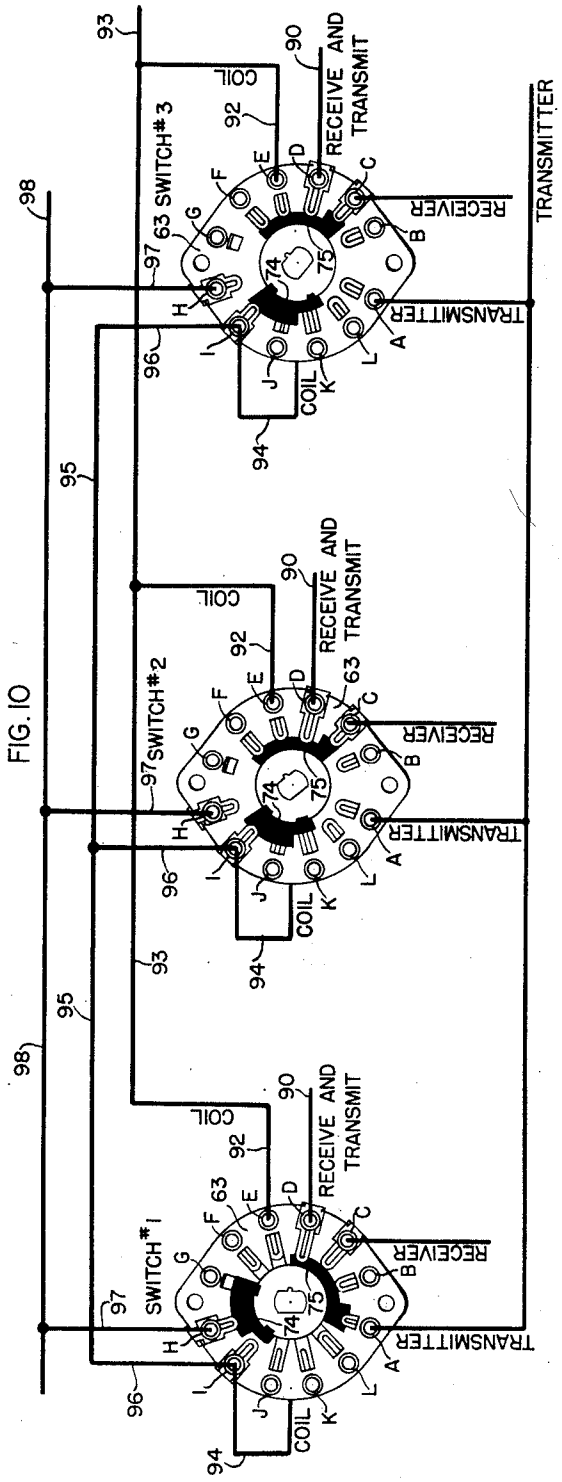


FIG. 10

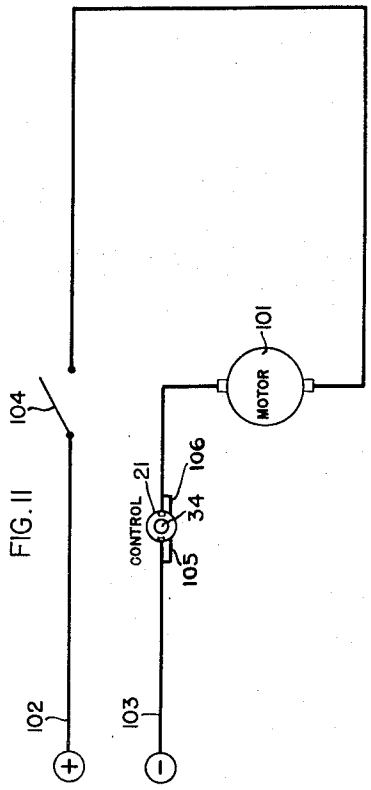


FIG. 11

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UNITED STATES PATENT OFFICE

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SWITCH CONSTRUCTION

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Application September 28, 1946, Serial No. 700,149

10 Claims. (Cl. 175—375)

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This invention relates to a switch construction and particularly to an electrical switch construction of the type which is tripped by an electromagnet or solenoid and is operator actuated for resetting.

While the switch construction is for use with a communication or an intercommunication system, for example, between several locations or stations in an airplane, it is also useful, for example, as an overload protective device.

When the switch construction is used with a communication or an intercommunication system, it is in the form of a tap switch and is particularly adapted for use in a system wherein the person at each station is equipped with a transmitter and a receiver, and wherein only one person can talk or transmit at a time, but all persons except the person talking hear what that person talking is saying or what is being received on the receiving set. Also the system contemplates that when that person is through with a transmitting period, and any other person wishes to transmit, the latter person, by turning his switch to the transmitting position, automatically moves any other switch on the transmitting position to the receiving and non-transmitting position. This is of particular advantage because it prevents jumbled conversations and when information or orders are to be given, only one voice or signal may be heard at a time.

In an electrical system which is to be protected from overloads, on the other hand, it is necessary to have a switch which is sensitive to predetermined overloads, is compact, and is manually resettable. Also, it is advantageous to provide a switch which provides a visual indication that it has tripped.

It is, therefore, an object of the invention to provide an improved electro-magnetically tripped, operator resettable electrical switch.

It is another object of the invention to provide an electromagnetically operated tap-switch.

It is a further object of the invention to provide an electrical switch which may be placed in a circuit in a manner such that when the switch is operator actuated to a predetermined position it automatically and electrically effects movement of all similar switches in the circuit to another predetermined position.

It is another object of the invention to provide an improved overload switch construction.

It is also an object of the invention to provide an electrical switch construction which is particularly applicable to a transmitting and receiving system of the type wherein only one person at a time may transmit, but all other persons

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may receive, and wherein any person may transmit when desirable.

It is a further object of the invention to provide a novel spring arrangement in an electromagnetically operated, operator resettable switch for effecting various required movements in the switch structure.

It is another object of the invention to provide a light, compact and relatively inexpensive electromagnetically operated tap-switch, and more particularly to provide a light, compact switch for use in aircraft.

It is also an object of the invention to provide an electromagnetically operated switch so constructed that the person transmitting may position his own switch to the receiving position in case of accident or if no one is transmitting.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevational view of a switch embodying the invention, with the operating knob broken off;

Figure 2 is a top plan view of the wafer or contact carrying element of the switch;

Figure 3 is a bottom plan view of the wafer shown in Figure 2;

Figure 4 is a bottom plan view of the switch casing with the knob removed;

Figure 5 is a vertical sectional view of the switch in the locked, transmitting position, with the operating shaft and knob shown in full, the dotted lines denoting the armature of the electromagnet in the release position;

Figure 6 is a view of the switch in the operator actuated release position;

Figure 7 is a partial horizontal sectional view of the switch taken on line 7—7 of Figure 6;

Figure 8 is a horizontal sectional view of the switch taken on line 8—8 of Figure 5;

Figure 9 is a horizontal sectional view of the switch taken on line 9—9 of Figure 5, the very thin flexible metal cover member being omitted;

Figure 10 is a wiring diagram showing a plurality of my switches diagrammatically and illustrating how the switches may be used in a transmitting and receiving circuit; and

Figure 11 is a wiring diagram showing a switch embodying the invention in a motor circuit in which the motor is to be stopped in case of overload.

Referring specifically to the drawings for a

detailed description of the invention, numeral 21 designates generally a switch housing which is substantially cup-shaped, as best shown in Figures 5 and 6, and which has a central aperture 22 at the bottom thereof. A bushing 23 provided with a shoulder 24 and a reduced portion 25 adjacent the bottom thereof is inserted in the housing 21 with the shoulder 24 resting on the bottom of the cup and reduced portion 25 extending through the aperture 22. The bushing 23 has an electromagnet in the form of a coil of wire 26 secured thereto and end washers 27 of insulating material retain the coil 26 thereon. The bushing 23 is also provided with a flange 28 adjacent the top thereof, against which one of the washers 27 is seated. The bushing 23 and coil 26 are retained within the housing 21 in any suitable manner. A cover plate 30 is preferably soldered to the bottom of casing 21.

The bushing 23 is hollow, as shown at 29, and is provided with an internal shoulder 31 for a purpose hereinafter described. A two-part shaft, generally indicated at 32, extends through and beyond the aperture 22 in housing 21 and hollow portion 29 of bushing 23. The shaft 32 is formed of a lower portion 33, equipped with a removable knob 34 and a bore 35, into which bore one end of an upper shaft portion 36 telescopically extends. The shaft portions 33 and 36 are provided with openings which may be aligned so that a pin 38 may be inserted to retain the two shaft portions together.

The upper shaft portion 36 is formed of one piece but comprises a number of differently shaped parts, for various specific purposes. The lower portion of shaft 36 is rounded at 39 to enter bore 35 in shaft 33. Above this, a reduced portion 41 is provided. Above the reduced portion 41, an enlarged portion 42 is formed, which is provided with a D-shaped portion 43 at the bottom thereof. Above this, the shaft is slotted at 44 axially thereof and is provided with flats 45 at the sides.

An armature 46 is disposed above the coil 26 in the cup-shaped housing 21 and is formed preferably of cast iron with a D-shaped aperture 47 in the center thereof slightly larger in size than the D-shaped portion 43 of shaft 36. The armature is also provided with a pair of diametrically opposite guide holes 48.

A combination retaining and stop plate generally indicated at 49 is disposed above the armature 46 in spaced relation thereto and is provided with a pair of arcuate downwardly depending ears 51 having openings therein through which screws 53 extend to secure plate 49 to corresponding upstanding arcuate ears 54 on casing 21. The plate 49 is provided with a central circular aperture 54*a* through which portion 42 of the shaft 36 extends. Plate 49 is provided with apertures 55 (see Figure 8), which apertures also extend through tab portions 56 of ears 51 and through which pass electrical conductors 57 and 58 for coil 26. The plate 49 is also provided with two arcuately spaced stops 59 and 60 on the top thereof and a series of spring retaining apertures 61. Downwardly extending guide pins 62 are secured to plate 49 and enter guide holes 48 in armature 46 to guide the same and prevent it from rotating.

Disposed above the plate 49 is a contact and terminal carrying wafer formed of insulating material, generally indicated at 63, which is secured to plate 49 by screws 64 and spaced therefrom by bushings 65 on the screws 64. A plurality of finger contacts 67, including terminals 68, are riveted at predetermined positions peripherally of both sides of wafer 63. The contacts and terminals 67 and 68 have been designated by the letters A to L inclusive reading clockwise in Figure 2 and, naturally, counterclockwise in Figure 3. The wafer 63 is provided with a large central aperture 69 therein, and a central circular insulating member 71, carrying slide contacts 72 and 73 of a predetermined configuration are secured the top side thereof and slide contacts 74 and 75 of a different configuration on the bottom side thereof. The central member 71 is provided with an aperture 76 therein which fits snugly over the flattened portions 45 of shaft portion 42. The central member 71 is disposed in position in the wafer 63 prior to riveting the contacts 67 thereto and is held in position thereon so that it may be freely rotated by shaft 42 with slide contacts 72, 73 and 74, 75. Insulating fingers 77 are formed on contact wafer 63.

Disposed between the wafer 63 and plate 49, and encompassing shaft portion 42, is an insulating washer 78 which retains a stop finger plate 79 in engagement with the top of plate 49. The stop finger plate 79 is formed in the same shape as the flats on shaft portion 42 so as to rotate therewith, and has an extension 81 thereon which engages with the stops 59 and 60 on plate 49 as the shaft is turned, as best shown in Figures 7 and 8.

A compression spring 82 is disposed in recess 29 of bushing 23 and engages a washer 84 on shaft portion 33 and the bottom of the armature 46, thus normally biasing the armature 46 away from the coil 26 and causing the armature to engage the D-shaped portion 43 of the shaft to prevent the shaft from rotating. Torsional force is imparted to shaft 32 by a helical spring 83 having one end secured in slot 44 in shaft portion 42 and the other end secured in one of the holes 61 in plate 49. By utilizing different holes 61, the torsional force exerted by spring 83 on shaft 32 may be varied.

Assembly

In order to assemble the switch, the coil 26 is first formed and is secured to bushing 23. The bushing 23 and coil 26 are then disposed in the casing 21 and secured therein in any suitable manner with the coil leads 57 extending from the top of the coil.

The two shaft portions 33 and 36 are then telescoped together with the armature 46 therebetween. The helical spring has one end fastened in the bottom of slot 44 in the shaft portion 42 and a washer 84 is forced up against the compression spring 82 which has been slid over the bottom shaft portion 33. The washer is forced above the aligned holes in the shaft portions 33 and 36 and pin 38 is inserted in the holes, thus retaining the shaft portions 33 and 36 together and holding spring 82 in proper position to bias the armature 46 upwardly.

The assembled shaft and armature are dropped into the recess 29 in bushing 23, and pin 38 rests on shoulder 31 therein. The plate 49 is then screwed to the housing 21 by the screws 53, and, if desired, a flexible metal cover member 91 may be provided and is held in position by the screws 53. The armature guide pins 62 are disposed in the guide holes 48 in the armature and the free end of the helical spring 83 is secured in one of the holes 61 in plate 49. The upper portion 36 of the shaft extends through the armature 46 and plate

49 and the D-shaped portion 43 of the shaft engages with the correspondingly shaped aperture 47 in armature 46, the bias of coil spring 82 retaining the armature in such position. The leads 57 for the coil 26 are threaded through the apertures 55 in plate 49.

The stop finger member 79 and insulating washer 78 are slid over the upper shaft portion and the contact wafer 63 is then slid over the upper flat portion 42 of the shaft and is screwed to the plate 49 by the screws 64 with the bushings 65 therebetween. The central slide contact carrying member 71 of wafer 63 has already been assembled therein, as stated hereinbefore. The assembly of the switch is completed by securing the knob 34 to the lower end of shaft portion 33.

Operation

As shown in Figures 10 and 11, the switch may be utilized in a number of circuits for effecting different results. For example, when the switch is disposed in a communication circuit, such as shown diagrammatically in Figure 10, a contact A is connected to a transmitting circuit, contact C is connected to a receiving circuit, and contact D is connected to a common lead 90 for receiving or transmitting. Contacts E and I are connected to the coil leads 57 and contact E is connected to one side of a line 93 by a lead 92. Contacts I are connected to the other coil leads by wires 94 and to a wire 95 which connects them together by leads 96. Leads 97 connect contacts H to the other side of the line, designated at 98.

As an example of operation, switch No. 1 in Figure 10 is shown in the transmitting position, and switches No. 2 and No. 3 are in the receiving position. Under such conditions, a transmitting circuit is set up in switch No. 1 by slide contact 75 bridging fixed contacts A and D. No other circuits are shown closed at this time, although other contacts may be bridged and may be connected to signal lights, amplifiers or other equipment. However, such circuits are not shown since they are not a part of the present invention.

Switch No. 2 and switch No. 3 are shown in the receiving position with contacts 75 bridging receiving contacts C and D.

Slide contact 74 is primarily for energizing coil 26 and it will be apparent that when the operator at switch No. 1 is finished transmitting, and the operator at switch No. 2, for example, desires to transmit, that the slide contacts 74 and 75 of switch No. 2 are moved in a counterclockwise direction in Figure 10 by knob 34 and shaft 32. Passing contacts H and I are, therefore, momentarily bridged, and all three coils 26 are energized from line 93, 98. Nothing happens in switch No. 3, but the armature 46 of switch No. 1 is pulled downwardly, thus tripping that switch and permitting spring 83 to return the slide contacts to the position of switch No. 3, for example. Thus, switch No. 1 and switch No. 3 are in condition for receiving.

The operator of switch No. 2 then continues to turn the knob 34 of his switch, and contacts H and I are then no longer bridged by slide contact 74, so that all the solenoid coils 26 are de-energized. Slide contact 75 of switch No. 2 will then bridge transmitting contacts A and D, and switch No. 2 is conditioned to transmit.

If the operator of any switch, such as switch No. 1 in Figure 10, who has been transmitting, wishes to receive, and no other switch is operated to transmit, or if for any reason the solenoid of a switch which has been transmitting does not release at the proper time, the switch may be manually tripped to the receive position by the operator pushing the knob 34 inwardly against the bias of spring 82, and the shaft 32, therefore, longitudinally of the switch, thus forcing the D-shaped portion 43 of the shaft 32 out of locking engagement with the armature 46, as shown in Figure 6, and permitting rotation of the shaft 32 by spring 83, which rotates the slide contacts 74 and 75 to the receive position.

Referring now to Figure 11, this figure illustrates the manner in which the switch may be used in a circuit as an automatic overload device. A motor 101 is connected to a line 102, 103 having a main switch 104 and a switch 21, such as shown in Figures 1 to 9 herein, both having terminals connected in series with the motor 101. The coil 26 of the switch is also connected in series with the motor through wires 105 and 106. When the main switch 104 is closed, and switch 21 moved to the locked position, the motor 101 will be energized, and coil 26 of the switch will also be energized. By properly proportioning the coil 26, the coil will not draw the armature downwardly to trip the switch unless there is current overload. When the switch trips, the same action takes place as described with respect to Figure 10, and the motor circuit is broken. It may be operator reset when the overload ceases.

From the foregoing, it will be apparent that a novel solenoid operated tap switch has been provided which has a variety of uses. Furthermore, the switch is light and relatively inexpensive, thus making it particularly adaptable for aircraft communication or intercommunication systems. When used as a radio communication system, the receive and transmit lead 90 in Figure 10 is merely connected to an antenna.

Some changes may be made in the construction and arrangement of the parts of my switch construction without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope without sacrificing any of the advantages thereof.

I claim as my invention:

1. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value owing therethrough to overcome said biasing means and move the armature toward said solenoid coil, an axially shiftable rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, and axially registrable cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature or upon axial shifting of said shaft, whereby said means tending to rotate said shaft in said one direction is rendered effective.

2. An electric switch comprising a plurality of fixed contacts, a movable contact means for es-

tablishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, an axially shiftable rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, axially registrable co-operating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature or upon axial shifting of said shaft, whereby said means tending to rotate said shaft in said one direction is rendered effective, and stop means for limiting rotation of said shaft in both directions.

3. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, an axially shiftable rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, axially registrable co-operating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature or upon axial shifting of said shaft, whereby said means tending to rotate said shaft in said one direction is rendered effective, and means associated with said switch for effecting said energization of said solenoid coil during movement of said shaft manually in said opposite direction.

4. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, an axially shiftable rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, axially registrable co-operating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature or axial shifting of said shaft, whereby said means tending to rotate said shaft in said one direction is rendered effective, means associated with said switch for effecting said energization of said solenoid coil during movement of said shaft manually in said opposite direction, said last means comprising other of said fixed contacts, and means connecting said latter contacts to a source of power and to said solenoid coil, said movable contact means establishing a circuit through said solenoid coil and then breaking said circuit through the solenoid coil as the shaft is rotated manually in said opposite direction.

5. A control circuit comprising a plurality of identical switches, each of said switches comprising a plurality of fixed contracts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contracts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, and means associated with each of said switches for energizing the coils of the other switches in said circuit to unlock any that are in a locked position during movement of the shaft of any of said switches in said opposite direction.

6. A control circuit comprising a plurality of identical switches, each of said switches comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, means associated with each of said switches for energizing the coils of the other switches in said circuit to unlock any that are in a locked position during movement of the shaft of any of said switches in said opposite direction, said last means comprising other of said fixed contacts on each of said switches, and means associated with each of said switches connecting said latter contacts to a source of power and to said solenoid coil of

a respective switch, said movable contact means of each switch establishing a circuit in the solenoid coils of the other switches and then breaking said circuit as the shaft of said one switch is rotated manually in said opposite direction.

7. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, said locking means comprising a portion of said shaft formed in D shape, and a cooperating D-shaped aperture in said armature.

8. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, said locking means comprising a portion of said shaft formed in D shape, a cooperating D-shaped aperture in said armature, and resilient means for normally biasing the D-shaped slot and the D-shaped aperture into axial registration with each other.

9. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, said locking means comprising a portion of said shaft formed in D shape, a cooperating D-shaped aperture in said armature, said shaft being formed of two parts, one of which contains said D-shaped portion and the other of which is secured to said manual means, and means for fastening said two shaft parts together after assembly in said switch.

10. An electric switch comprising a plurality of fixed contacts, a movable contact means for establishing a circuit between some of said fixed contacts in one position thereof and for breaking the circuit between said latter fixed contacts in another position thereof, a solenoid coil associated with said switch, an armature associated with said solenoid coil, means for biasing the armature away from the solenoid coil, said coil being operative when energized by current of sufficient value flowing therethrough to overcome said biasing means and move the armature toward said solenoid coil, a rotatable shaft coupled with said movable contact means, means tending to rotate said shaft in one direction, manual means for rotating the shaft in the opposite direction, cooperating means on said armature and said shaft for locking said shaft against rotation when the shaft is manually turned in said opposite direction, said locking means being rendered ineffective upon said energization of said armature, whereby said means tending to rotate said shaft in said one direction is rendered effective, said locking means comprising a portion of said shaft formed in D shape, a cooperating D-shaped aperture in said armature, resilient means for normally biasing the D-shaped slot and the D-shaped aperture into axial registration wtih each other, said shaft being formed of two parts, one of which contains said D-shaped portion and the other of which is secured to said manual means, and means for fastening said two shaft parts together after assembly in said switch.

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