

Jan. 23, 1951

E. N. JACOBI

2,539,252

ELECTRIC CONTROL INSTRUMENT

Original Filed March 11, 1943

3 Sheets-Sheet 1

Fig. 1.

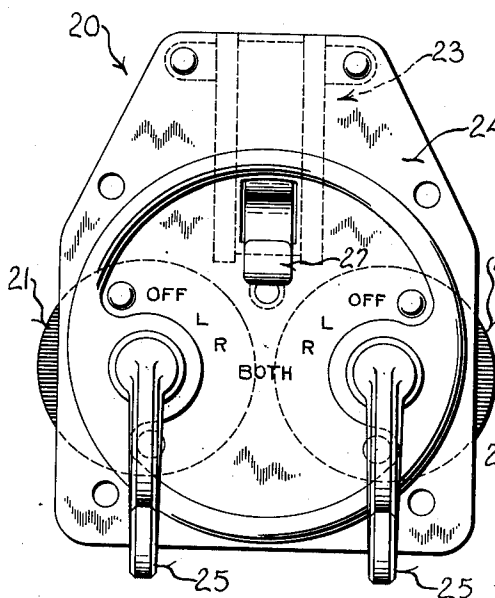


Fig. 2.

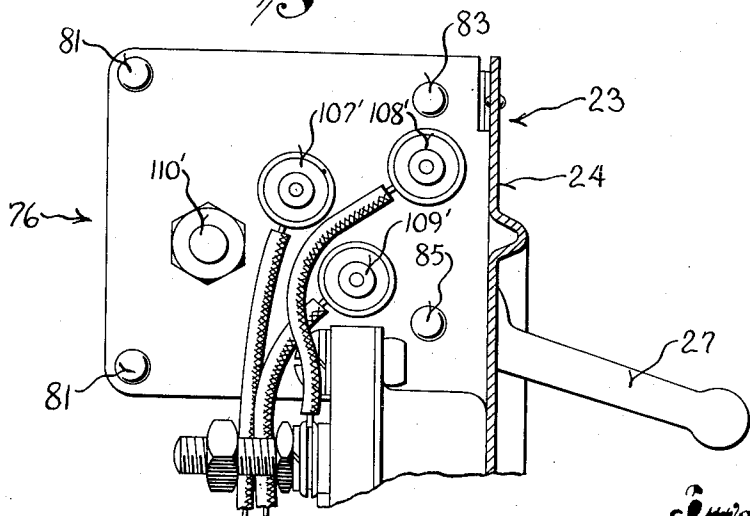
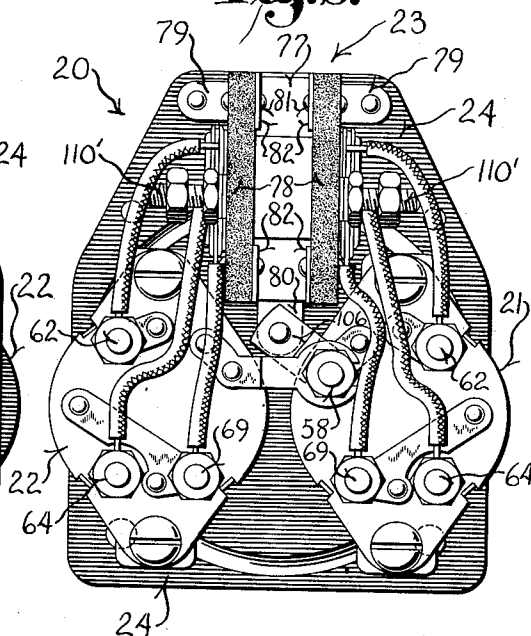


Fig. 3.



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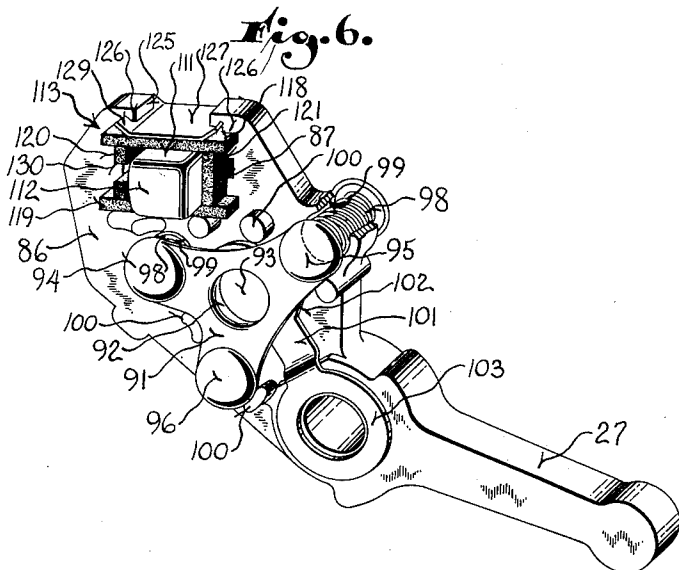
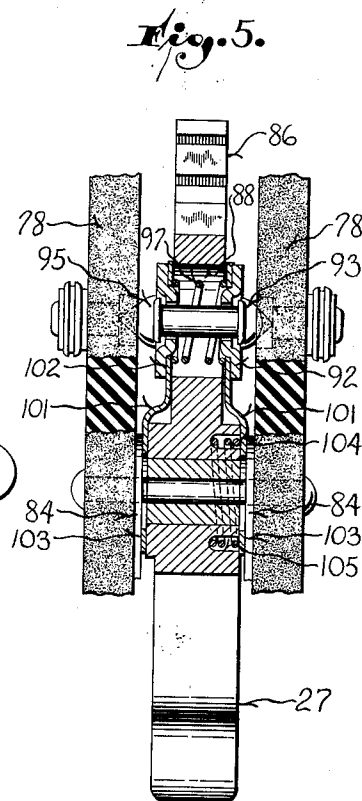
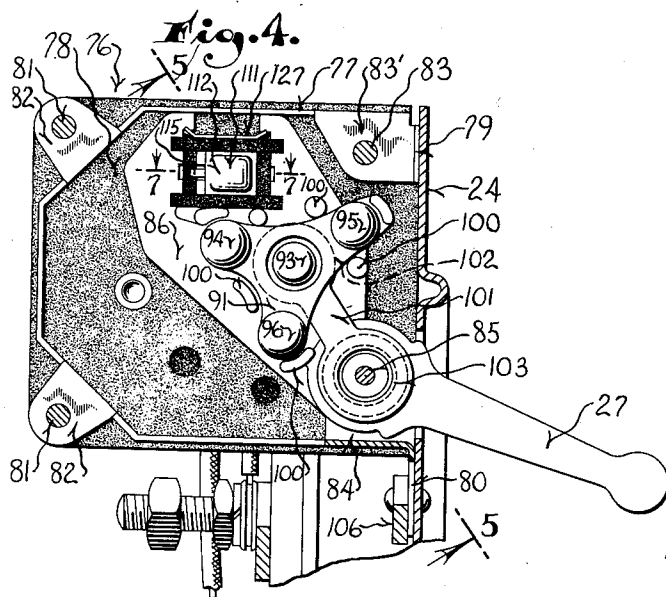
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ELECTRIC CONTROL INSTRUMENT

Original Filed March 11, 1943

3 Sheets-Sheet 2



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ELECTRIC CONTROL INSTRUMENT

Original Filed March 11, 1943

3 Sheets-Sheet 3

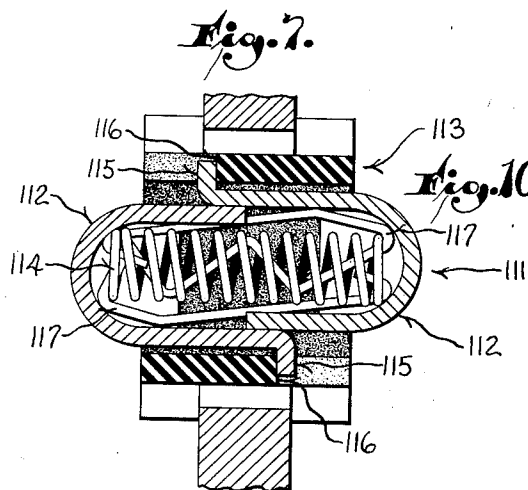


Fig. 10.

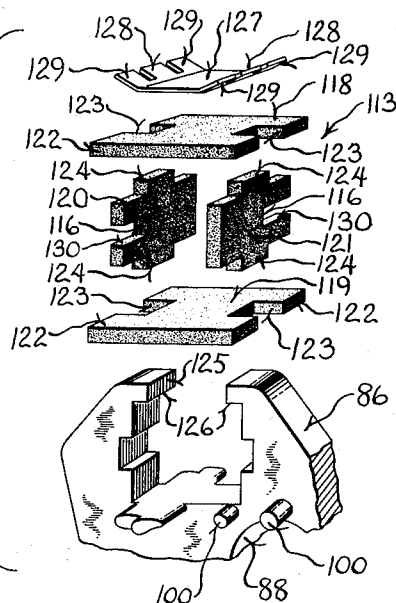
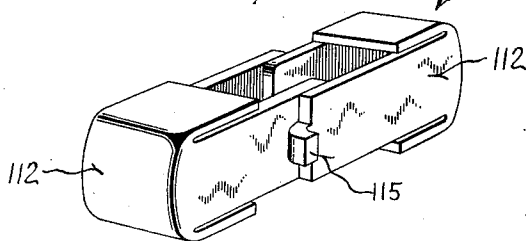
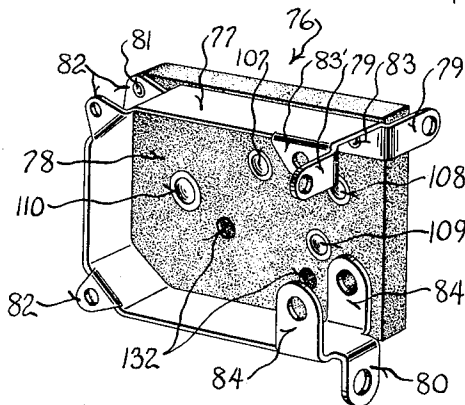
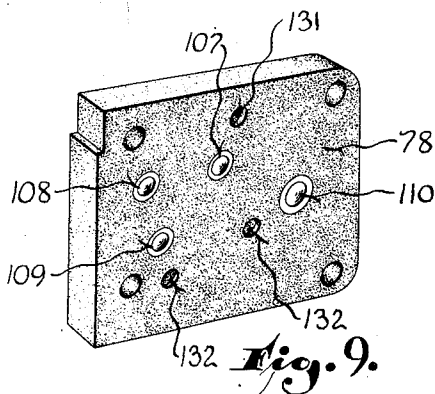


Fig. 8.



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UNITED STATES PATENT OFFICE

2,539,252

ELECTRIC CONTROL INSTRUMENT

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Original application March 11, 1943, Serial No.
478,763, now Patent No. 2,450,144, dated Sep-
tember 28, 1948. Divided and this application
December 29, 1947, Serial No. 794,244

15 Claims. (Cl. 200-7)

1

This invention relates to electrical control instrumentalities and refers more particularly to master switches for aircraft.

In aircraft it is customary to provide a separate switch for each engine to control the two magnetos with which the engine is provided for ignition purposes. In addition to the usual switches provided for each of the electrical instrumentalities on the aircraft, it is also customary to provide a single readily accessible master switch whereby in an emergency all of the electrical circuits in the aircraft can be broken and all of the engines simultaneously cut off by actuation of a single switch lever. The so-called master switch by means of which this operation is effected is commonly associated with the switch or switches which control grounding of the individual engine magnetos, and it must be so designed that it will "make" grounding circuits for all magnetos at the same time that it breaks the electrical power supply circuits, and vice versa.

This invention relates to a switch of the master control type which is particularly adapted for use with a pair of magneto control switches and is especially well suited for use in conjunction with the switch described in my copending application, Serial No. 478,763, filed March 11, 1943, now Patent No. 2,450,144, September 28, 1948, of which this application is a division.

It is thus an object of this invention to provide a master switch of the character described having a novel one-piece lever providing both a carrier for a multiplicity of movable contacts and an actuator for swinging the carrier to and from positions at which it contacts engage cooperating stationary contacts.

Another object of this invention resides in the provision of a novel manner of associating the movable contacts as a unit with the lever of the master switch to thereby simplify assembly of the switch.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

2

Figure 1 is an elevational view of a typical switch assembly incorporating the master switch of this invention;

Figure 2 is a left side view of the master switch of this invention, a portion of a magneto control switch being indicated therebeneath;

Figure 3 is a rear elevational view of the switch assembly shown in Figure 1;

Figure 4 is a view similar to Figure 2 but showing the interior of the switch;

Figure 5 is a sectional view taken through Figure 4 on the plane of the line 5-5;

Figure 6 is a perspective view of the switch lever illustrating the manner in which the movable contacts carried thereby are assembled with the lever as a unit;

Figure 7 is a detail sectional view taken through Figure 4 on the plane of the line 7-7;

Figure 8 is a perspective view of the master switch housing showing one of the terminal heads separated therefrom;

Figure 9 is a perspective view illustrating the construction of the battery circuit contactor of the master switch; and

Figure 10 is an exploded perspective view of the components of the guideway for the battery circuit contactor.

Referring now more particularly to the accompanying drawings in which like numerals designate like parts throughout the several views, the numeral 20 designates a switch assembly having a pair of individual magneto switches 21 and 22 and a master switch 23.

Since each magneto grounding switch controls two magnetos and a magneto booster, and since each switch has three positions of operativeness, designated "L," "R," and "Both" in Figure 1, it follows that either of the two magnetos controlled by each switch may be rendered operative or inoperative as desired, or that both may be rendered effective. In the "off" position of the switches the magnetos and their boosters are all rendered ineffective.

The master switch 23 is secured to a panel 24 centrally and above the two magneto grounding switches 21 and 22, and is operated by means of a readily accessible lever 27, located between, and directly above, the magneto switch handles 25.

The master switch 23 is enclosed within a housing 76 formed jointly by a band of brass 77 bent to substantially U-shape (see Fig. 8) and a pair of substantially rectangular insulating sheets 78 secured flatwise against the opposite side edges of the band so as to provide spaced apart substantially parallel terminal heads for the switch.

Opposite lugs 79 bent outwardly from the extremity of the upper leg of the band 77 cooperate with a lug 80 bent downwardly from the extremity of the lower leg of the band to mount the housing from the panel 24 with the open side of the housing facing the rear of the panel and closed thereby.

The two corners of the terminal heads remote from the panel 24 are riveted as at 81 to ears 82 bent outwardly from the band 77, while the upper corner of each terminal head adjacent to the panel 24 is riveted as at 83 to ears 83' bent inwardly from the edges of the band 77.

Spaced apart substantially parallel lugs 84 bent inwardly from the opposite edges of the metal band 77 provide for securement of the fourth corner of each terminal head to the band and for pivotally mounting the operating lever 27 of the master switch.

The operating lever is medially pivotally mounted on a pin 85 (see Figure 2) and the opposite ends of this pin are received in aligned holes in the lugs or standards 84. The opposite ends of the pin 85 also project through holes in the terminal heads and have rivet heads formed thereon so that the pin which pivotally mounts the lever also provides for securing together the fourth corner of the switch housing.

The inner end 86 of the lever projects into the housing for swinging motion across the opposing faces of the terminal heads and constitutes a contact carrier. For this purpose it is provided with a pair of holes or recesses 87 and 88 spaced different radial distances from the pivot axis.

Identical spider-like brass contact members 91 have depressed medial portions 92 overlying the hole 88 at opposite sides of the lever and are joined by a rivet 93 which passes through the hole 88 and the heads of which limit diverging motion of the contact members. Each of the contact members has three arms extending radially outwardly from its medial portion to overlie the adjacent face of the carrier 86 and the extremities of these arms have hollow convex contact portions 94, 95 and 96 engaging the opposing faces of the terminal heads.

The contact members 91 are yieldingly urged apart and into engagement with the inner faces of the terminal heads adjacent thereto by a spring 97 in the hole 88 (see Figure 5). In addition, contact pressure for the individual contacts 94, 95 and 96 is afforded by means of compression springs 98 passing through suitable holes 99 in the carrier and having their opposite ends received inside the hollow socket-like interiors of the contact portions.

As will be clearly understood from Figure 5, the heads of the rivet 93 do not interfere with yielding engagement of the contacts 94, 95 and 96 with the inner faces of the terminal heads, but prior to mounting of the lever in the housing, the rivet 93 acts to hold the contact members assembled with the lever.

Movement of the contact members 91 either about the axis of the rivet 93 or out of coaxiality with respect to the hole 88 is precluded by lugs 100 projecting from opposite faces of the carrier and engaging various edge portions of the contact members.

A resilient brass grounding connector 101 for each of the contact members 91 has an integral eyelet 102 at one end encircling the depressed medial portion 92 of its contact member and confined between the adjacent end of the spring

97 and the contact member, and another integral eyelet 103 at its other end lying alongside the face of the hub of the lever so as to be disposed between the hub of the lever and the lug or standard 84 adjacent thereto.

A compression spring 104 received in an annular recess 105 in the lever concentric with its hub yieldingly presses the eyelet 103 of one of the grounding connectors into engagement with the adjacent lug or standard 84.

Thus since the attaching ear 80 of the housing is electrically joined with a ground terminal 58 on one of the magneto control switches by means of a brass connector 106, it follows that the movable contacts 94, 95 and 96 are at all times grounded through an all brass circuit. This is desirable because it eliminates the possibility of electrolytic action which may occur when electrical circuits are led through dissimilar metals.

Stationary contacts 107, 108 and 109, carried by each terminal head 78 and engaged by the movable contacts 94, 95 and 96 in the "off" position of the master switch, shown in Figure 4, ground all of the magnetos. For this purpose the stationary contacts 107, 108 and 109 on each terminal head have corresponding normally ungrounded terminals 107', 108' and 109' exteriorly of the housing electrically connected with the normally ungrounded terminals 62, 64 and 69 of one magneto grounding switch by short flexible conductors as shown in Figure 5.

Consequently, simultaneous engagement of the six grounded movable contacts 94, 95 and 96 with their cooperating stationary contacts on the terminal heads by actuation of the lever 27 to the "off" position of the switch simultaneously connects the normally ungrounded terminals of the four magnetos controlled by the two magneto grounding switches 21 and 22 with the ground, regardless of the positions of the individual magneto switches.

In addition to the stationary contacts previously described, each of the terminal heads 78 has an additional stationary contact 110 exposed on its inner face and connected with a corresponding battery terminal 110' on the exterior of the housing. All of the battery circuits of the aircraft are adapted to lead through the contacts 110 so as to be controlled by the position of the movable bridging contactor designated generally by the numeral 111.

The bridging contactor 111 is driven by the carrier 86 so that in the "off" position of the switch (shown in Figure 4), in which all of the magnetos are grounded, the bridging contactor 111 is out of engagement with the stationary contacts 110 simultaneously to disrupt all of the battery circuits. Upon actuation of the lever 27 to the "on" position of the switch, in which all of the magnetos are under the direct control of the two magneto grounding switches, the bridging contactor 111 engages the two stationary contacts 110 to enable the various electrically operated instrumentalities of the craft to be connected with their source of E. M. F. through their individual switches.

The bridging contactor 111 is of special construction to permit its assembly with the carrier 86 as a unit, and to this end the contactor comprises a pair of opposite hollow telescoping plungers 112, substantially rectangular in cross section as shown in Figure 9, which enter the hole 87 in the carrier 86 from opposite faces of the carrier. These plungers are guided for axial

motion in the hole 87 by an insulating guideway 113 serving as a lining for the hole 87. The end portions of the plungers facing the terminal heads 78 are formed with a convex shape, as shown, so as to engage the concave faces of the stationary contacts 110 with a detent action under the influence of a compression spring 114 confined between the plungers to yieldingly urge the same apart.

A tang 115 on each of the plungers engages a cooperating shoulder 116 on each side of the insulating guideway to limit spreading apart of the plungers in response to pressure of the spring between them to enable the bridging contactor to be assembled with the carrier 86 prior to assembly of the lever with the housing.

Although the spring 114 is capable of electrically connecting the plungers 112, it is not relied upon in the present instance other than to press the ends of a flexible braided jumper 117 looped about the coils of the spring into firm engagement with the contact engaging ends of the plungers. Thus, since the spring is shunted out of the electrical circuit between the plungers by the jumper 117, the jumper provides an electrical connection between the plungers 112 which insures maximum and undiminished current carrying capacity therebetween.

The rectangular shape of the telescoping plungers precludes rotation of the same relative to each other about the axis of the hole 87, and in addition provides corner spaces inside the plungers alongside the compression spring 114 to accommodate two stretches of the braided jumper 117.

Attention is directed to the fact that the insulating guideway 113 for the plungers of the bridging contactor is formed of four separate pieces interlocked together and secured in the hole 87 in a novel manner. Referring to Figures 6 and 10, it will be seen that the hole 87 is substantially rectangular and that the guideway comprises identical top and bottom plates 118 and 119, respectively, retained in spaced apart parallel relationship by similar upright side plates 120 and 121 and cooperating with them to form a hollow rectangular unit fitting the hole 87.

The top and bottom plates have a depth greater than the thickness of the carrier 86 so as to project from opposite faces thereof and so that laterally extending shoulders 122, formed by notches 123 cut into the opposite side edges of these plates, overlie the opposite faces of the carrier 86 alongside the hole 87. The notches 123 also serve to receive tabs 124 on the top and bottom edges of the side plates so that the top and bottom plates 118 and 119 hold the side plates spaced apart and parallel and secure them against motion relative to the carrier axially of the hole 87.

The carrier 86 is provided with a slot 125 leading to the hole 87 but narrower than the hole to provide for assembly of the insulating guideway in the hole. In assembly, the bottom plate 119 is first inserted into the hole through the slot 125 to its proper position shown in Figure 6. The side plates 120 and 121 are next inserted so that their lower tabs engage in the notches 123 of the bottom plate, and the top plate is then slipped into its proper position shown in Figure 6 with the upper tabs of the side plates received in its notches 123.

Attention is directed to the fact that the side plates are of such height that clearance is pro-

vided between overhanging ledges 126 on the carrier at opposite sides of the entrance to the hole and the top plate. This clearance permits assembly of the top plate with the guideway and also accommodates a leaf-type spring clip 127, the body portion of which is pressed flatwise against the top plate 118 by tongues 128, bent upwardly from the clip, which yieldingly engage the overhanging ledges 126 on the carrier. Other tongues 129 at each side of the tongues 128, bent up similarly thereto, engage over the opposite sides of the ledges 126 to securely lock the clip and the guideway in place in the hole 87.

It is also to be noted that the shoulders 116 on the side plates 120 and 121 constitute the bottoms of slots 130 opening to the front edge of one side plate and to the rear edge of the other side plate, and that there is sufficient clearance between the plungers of the bridging contactor and the guideway 111 to permit hooking of the tangs 115 of the plungers over their respective shoulders 116 in assembling the contactor with the carrier.

The stationary contacts 107, 108 and 109 have concave faces so that the movable contacts 94, 95 and 96 engage them with a detent action to define the "off" position of the master switch. Attention is also directed to the fact that the terminal heads 78 are provided with recesses 131 aligning with the opposite ends of the bridging contactor 111 in the "off" position of the switch and into which the plungers of the bridging contactor snap to increase the positiveness of the detent action at the "off" position of the switch.

While the detent-like engagement of the plungers 112 of the bridging contactor with their cooperating stationary contacts 110 defines the "on" position of the switch, it is desirable to provide at least two recesses 132 in the terminal heads 78 into which each pair of movable contacts 94 and 96 are projected by their springs 98 in the "on" position of the switch to further guard against accidental actuation from said position.

It is to be observed that the provision of grounding connectors for the movable contact members 91 permits the lever 27 to be made of insulating material if desired, but the lever is preferably made as a one-piece die casting. If the lever 27 is formed of insulating material, the insulating guideway for the bridging contactor 111 can be dispensed with and the plungers guided by the hole in the lever itself.

From the foregoing description it will be readily seen that this invention provides an improved electrical control instrumentality of the type adapted to be used as an aircraft master switch which is of unusually compact and simple construction and which will prove sturdy and dependable in service.

What I claim as my invention is:

1. In a switch of the character described: spaced apart substantially parallel metallic supports adapted to be connected to ground; a lever having a hub substantially medially of its ends pivotally received between said supports, said lever having a hole in one arm thereof the axis of which is parallel to the pivot axis of the lever; contact members at each side of said arm in a plane normal to the pivot axis of the lever and overlying the hole therein; a compression spring in said hole confined between the contact members to yieldingly urge the same apart and outwardly from the adjacent faces of said arm;

means passing through said hole and engaging the contact members to limit spreading apart thereof; a grounding connector for each contact member having a part confined between its adjacent contact member and the spring and having another part confined between one face of the hub and the metallic support adjacent thereto; and spring means reacting between the hub of the lever and one of said connectors for holding both connectors in engagement with said metallic supports.

2. In a switch of the character described: a switch housing having a metal wall portion adapted to be connected to ground; a lever substantially medially pivoted from the housing with one arm thereof inside the housing and the other arm thereof projecting outside the housing to provide an actuator for the lever; a movable contact carried by the lever arm inside the housing alongside one face thereof for swinging motion therewith about the pivot axis of the lever and for limited motion relative thereto in a direction substantially parallel to said pivot axis; a stationary contact on the housing insulated therefrom and located so as to be engaged by the movable contact in one position of the lever; means biasing the movable contact outwardly away from its lever arm so that said contacts engage with substantial pressure in said position of the lever; a resilient metal grounding connector for the movable contact having a part maintained in electrical engagement therewith by said biasing means and having a portion disposed alongside said metal wall portion of the housing; and spring means confined between the lever and said portion of the connector to yieldingly press the same into engagement with said metal wall portion of the housing to thereby effectively ground the movable contact.

3. In a switch of the character described: a movable contact carrier having spaced holes therein the axes of which are normal to the plane of motion of the carrier; a pair of movable contacts projecting into one of said holes from opposite sides of the carrier; a compression spring disposed in said hole between the contacts to yieldingly urge the same apart; an insulating guideway fixed to the carrier and surrounding said contacts to guide the same for motion toward and from each other in said hole; cooperating abutments on the contacts and the guideway for limiting motion thereof apart and for holding the contacts assembled with the carrier; other contact members overlying opposite sides of the carrier adjacent to the hole therein; a compression spring in said other hole confined between the contact members to yieldingly urge the same apart; and means passing through said other hole and engaging said other contact members to limit spreading apart thereof and to thereby hold the same assembled with the carrier.

4. In an electrical switch instrumentality of the type having a housing: a metal contact carrier adapted to be mounted for pivotal motion on an axis fixed with respect to the housing, said carrier having spaced holes therein the axes of which are substantially parallel to the pivot axis of the carrier; a pair of movable contacts projecting into one of said holes from opposite sides of the carrier; a compression spring disposed in said hole between the contacts to yieldingly urge the same apart; an insulating guideway fixed to the carrier and surrounding said contacts to insulate the same from the carrier and to guide the contacts for axial motion toward and from each

other in said hole; cooperating abutments on said contacts and the guideway for limiting motion of the contacts apart and for holding the contacts assembled with the carrier; other contact members at each side of the carrier overlying the other hole therein; a compression spring in said other hole for yieldingly urging said other contact members apart; means passing through said other hole and engaging said other contact members to hold the same assembled with the carrier and to limit spreading apart thereof; metal grounding connectors for said other contact members, each of said grounding connectors having a part confined between one end of said compression spring and the contact member adjacent thereto so as to be held in good electrical contact therewith and having another portion disposed alongside one face of the carrier adjacent to its pivot axis so as to be engageable with a grounded part of the switch housing alongside the carrier; and spring means confined between the carrier and said portion of one of the grounded housing parts for yieldingly urging the same outwardly away from the carrier.

5. In a switch of the type having a housing provided with spaced apart metal wall portions adapted to be connected to ground and stationary contacts insulated from said metal wall portions: a lever pivotally supported from said spaced metal wall portions at a medial point of the lever and with one arm disposed inside the housing to provide a contact carrier; a pair of contacts, one on each side of the carrier, bodily movable with the carrier; compression spring means reacting against the contacts to yieldingly urge the same into engagement with said stationary contacts on the housing in one position of the carrier; means for electrically connecting said movable contacts; other contact members bodily movable with the carrier and overlying opposite faces of the carrier; compression spring means for yieldingly forcing said other contact members into engagement with cooperating stationary contacts on the housing in another position of the carrier; a grounding connector for each of said other contact members, each of said grounding connectors having an apertured end portion confined between the spring means and one of said other contact members and having an extension engaged with the metal wall portions of the housing adjacent thereto; and spring means reacting between one of said grounding connector extensions and the lever for simultaneously pressing each of said grounding connector extensions into good electrical contact with said metal wall portions of the housing.

6. In a switch of the character described: two insulating plates constituting a pair of terminal heads; a metal wall disposed edgewise between said terminal heads and secured thereto to hold the same in parallel spaced apart relationship, said metal wall cooperating with the terminal heads to provide a switch housing and being adapted to be connected to ground; spaced apart apertured ears on said metal wall overlying the opposing faces of the terminal heads inside the housing; a switch lever substantially medially pivotally mounted between said terminal heads and having a portion inside the housing adapted to swing in a plane parallel to the terminal heads; contact members at each side of said lever portion constrained to motion therewith; spring means reacting against said contact members to yieldingly urge the same toward the inner faces of the terminal heads for engagement with co-

operating stationary contacts on the terminal heads in one position of the lever; and means electrically connected with each of said contact members and with its adjacent apertured ear whereby engagement of the contact members with said stationary contacts provides a ground connection for said stationary contacts.

7. In a switch of the type having aligned spaced apart stationary contacts: a metal contact carrier movable between said stationary contacts, said carrier having a hole therein; a bridging contactor disposed in said hole so as to be bodily movable with the carrier, said bridging contactor having portions projecting from opposite sides of the carrier for engagement with the stationary contacts in one position of the carrier; and an insulating shell surrounding the bridging contactor, said shell comprising a plurality of interlocked separate insulating plates encircling the edges of said hole to preclude engagement of the bridging contactor with the carrier; and means on certain of said insulating plates engaged with portions of the carrier bounding said hole therein for precluding axial disassembling motion of the shell relative to the hole in the carrier.

8. In a switch of the type having aligned spaced apart stationary contacts: a contact carrier movable between said stationary contacts, said carrier having a hole therein; a bridging contactor disposed in said hole so as to be bodily movable with the carrier, said bridging contactor comprising a pair of opposed electrically connected plungers axially movable in said hole and having contact portions projecting from opposite sides of the carrier for engagement with the stationary contacts in one position of the carrier; a spring confined between the plungers for yieldingly forcing the same apart; an insulating shell in said hole surrounding the plungers to guide the same for axial motion in said hole, said shell comprising a plurality of interlocked separate insulating plates encircling the edges of said hole; means on at least one of said insulating plates engaging portions of the carrier bounding the hole therein for precluding axial disassembling motion of the shell relative to the hole in the carrier; and cooperating means on the shell and the plungers for limiting axial motion of the plungers apart under the influence of the spring confined therebetween.

9. In a switch of the type having aligned spaced apart stationary contacts: a contact carrier movable between said stationary contacts, said carrier having a hole therein; a bridging contactor disposed in said hole so as to be bodily movable with the carrier, said bridging contactor comprising a pair of opposed hollow plungers substantially rectangular in cross section, said plungers being axially movable in said hole and having contact portions projecting from opposite sides of the carrier for engagement with the stationary contacts in one position of the carrier; a compression spring having its ends telescoped into the hollow interiors of the plungers for yieldingly forcing the same apart; a jumper of flexible low resistance wire inside the bridging contactor having portions confined between the ends of the spring and the inner sides of said contact engaging portions of the plungers to electrically connect the same independently of the spring; an insulating shell in said hole comprising two substantially opposite pairs of insulating plates having interlocking connections with each other to form a guideway substantially rectangular in cross section to receive the plungers and to guide

the same for axial motion; means on at least one of said plates engaging portions of the carrier bounding the hole therein for precluding axial disassembling motion of the guideway relative to said hole; and cooperating abutments on the plungers and two of the plates engageable to limit axial motion of the plungers apart under the influence of the spring confined therebetween.

10. In a switch of the type having aligned spaced apart stationary contacts: a metal contact carrier movable between said stationary contacts, said carrier having a hole therein opening to one marginal edge of the carrier through a restricted throat; a plurality of insulating plates lining the edges of said hole and forming a hollow insulating guideway axially of said hole, one of said plates extending across said throat at its junction with the hole; means connecting the plates together, said means being operable to hold the plates against relative shifting edgewise or toward one another whereby said connecting means cooperates with the edge portions of the hole to hold the guideway against motion relative to the carrier except in a direction axially of the hole in the carrier; means on at least one of the plates engaging portions at opposite sides of the carrier bounding the hole therein for precluding axial disassembling motion of the guideway relative to said hole; a bridging contactor comprising opposite electrically connected contact sections telescoped into the insulating guideway from opposite sides of the carrier; a spring confined between said contact sections to yieldingly urge the same apart and into firm engagement with the stationary contact in one position of the carrier; and cooperating abutments on the telescoping contact sections and the guideway for limiting spreading of said sections apart whereby the bridging contactor may be assembled as a unit with the carrier prior to assembly of the carrier in the switch.

11. In a switch of the character described: a pair of terminal heads in fixed spaced apart relationship parallel to and opposing one another; a lever pivotally secured between said terminal heads for motion in a plane parallel to them, with one arm of said lever extending beyond said terminal heads to form an actuator for the switch and the other arm of said lever lying between said terminal heads and forming a contact carrier; a pair of contactor spiders each positioned between one side of said carrier and the terminal head adjacent thereto and adapted to be carried by said carrier and to engage fixed contacts on the terminal head in one position of the carrier; lug means on the carrier cooperating with said contactor spiders to constrain them to move with the carrier in the plane of carrier motion but leaving them free to move toward and from the terminal head; and means yieldingly biasing each of said contactor spiders away from the adjacent side of the carrier and into engagement with the adjacent terminal head.

12. In a switch of the character described: a pair of terminal heads; means holding said terminal heads in spaced apart relationship parallel to and opposing one another, said means cooperating with the terminal heads to define a switch housing open at one side; a lever pivoted substantially medially between said terminal heads for motion in a plane parallel to them, one end of said lever extending out of said housing through its open side to provide an actuator for the switch and the other end thereof lying within the housing and forming a carrier; a contactor

spider positioned between each side of the carrier and its adjacent terminal head and adapted to be moved by the carrier and to engage fixed contacts on the terminal head in one position of the carrier; lug means on the carrier cooperating with each of said contactor spiders to constrain the spiders to movement with the carrier in the plane of its motion but leaving them free to move in directions parallel to the lever axis; and spring means yieldingly urging each of the spiders into engagement with its adjacent terminal head.

13. In a switch of the character described: a pair of terminal heads in fixed spaced apart relationship parallel to and opposing one another; a lever pivotally secured between said terminal heads for motion in a plane parallel to them, with one arm of said lever extending beyond said terminal heads to form an actuator for the switch and the other arm of said lever lying between said terminal heads and forming a contact carrier; a pair of contactor spiders each positioned between one side of said carrier and the terminal head adjacent thereto and adapted to be carried by said carrier and to engage fixed contacts on the terminal head in one position of the carrier; means cooperating with said contactor spiders to constrain them to move with the carrier in the plane of carrier motion but leaving them free to move toward and from the terminal head; and means yieldingly biasing each of said contactor spiders into engagement with its adjacent terminal head.

14. In a switch of the character described: a pair of terminal heads fixed in spaced apart relationship; a lever journaled on a pivot fixed with respect to said terminal heads, one arm of said lever extending outwardly of the terminal heads to provide an actuator for the switch, and the other arm forming a carrier movable in a plane parallel to and intermediate the terminal heads, said carrier having a hole therethrough, the axis of which is substantially parallel to the lever pivot axis; a pair of electrically connected telescoping contactor members in said hole, each extending outwardly therefrom, and adapted to engage a fixed contact on one of the terminal heads in one position of the carrier; and a spring between said contactor members urging them apart and into engagement with said fixed con-

tacts in said position of the carrier so that electric current may be conducted from the fixed contact on one terminal head through the contactor members to the fixed contact on the other terminal head.

15. An aircraft master switch of the character described comprising: a pair of terminal heads fixed in spaced apart, parallel and opposed relationship; a lever pivotally secured between said terminal heads for motion in a plane parallel to them to either of two positions, one arm of said lever extending beyond the terminal heads to form an actuator for the switch, and the other arm of said lever lying between said terminal heads and forming a contact carrier, said contact carrier having a hole therethrough the axis of which is parallel to the pivot axis of the lever; a pair of contactor spiders each positioned between one side of said carrier and the terminal head adjacent thereto said contactor spiders being adapted to be carried by said carrier and to engage fixed contacts on the terminal head in one position of the carrier to thereby connect said contacts with ground; lugs on the carrier cooperating with said contactor spiders to constrain them to move with the carrier in the plane of carrier motion but leaving them free to move toward and from the terminal head; means yieldingly biasing each of said contactor spiders into engagement with its adjacent terminal head; a pair of electrically connected telescoping contactor members in said hole in the carrier, each extending outwardly therefrom and adapted to engage a stationary contact on the terminal head adjacent thereto in the other position of the carrier to complete a battery circuit across said stationary contacts; and a spring between said contactor members urging them apart and toward engagement with the terminal heads.

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