Aug. 7, 1945. T. OBSZARNY 2,381,077

HAND GRIP SWITCH DEVICE

Filed May 2, 1944 2 Sheets-Sheet 1

Fig. 1.

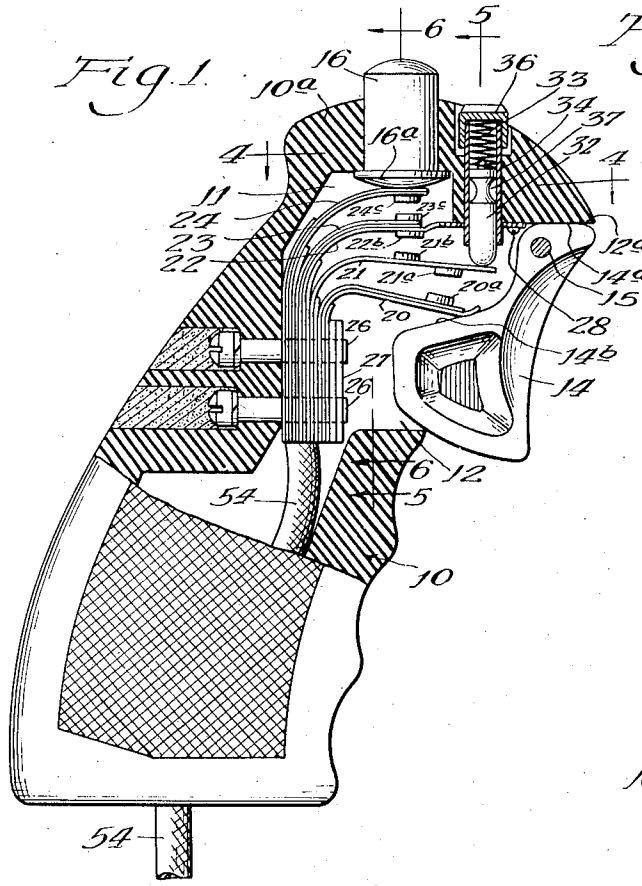
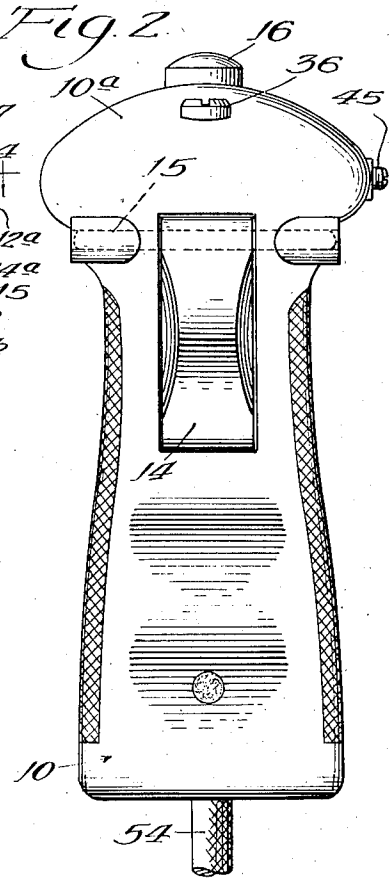


Fig. 2.



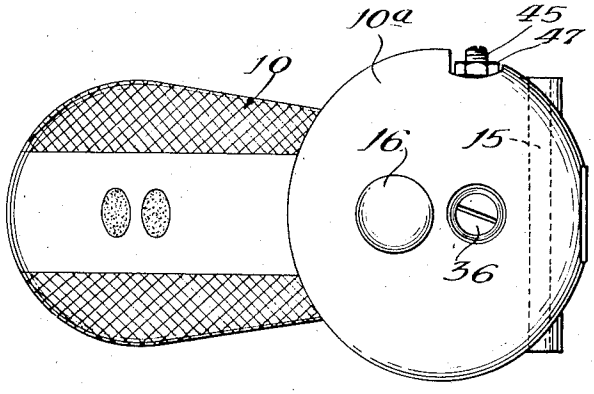


Fig. 3.

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Fig. 4

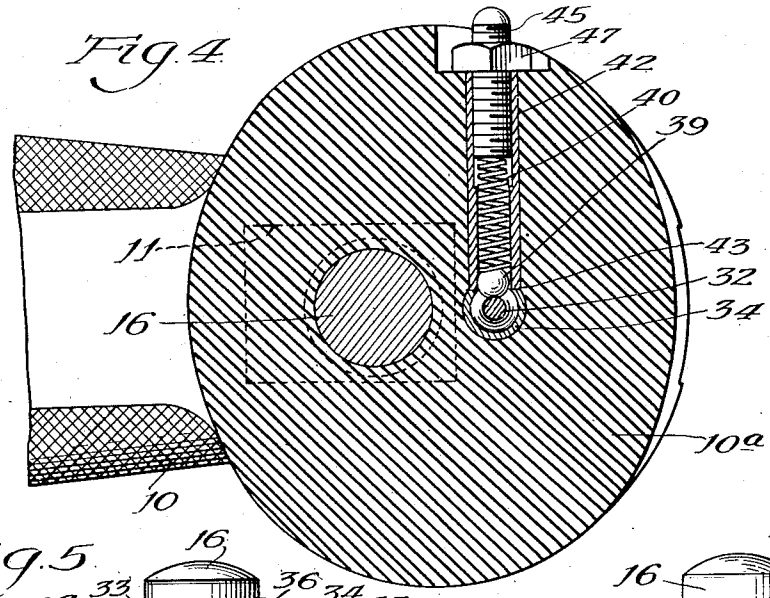


Fig. 5

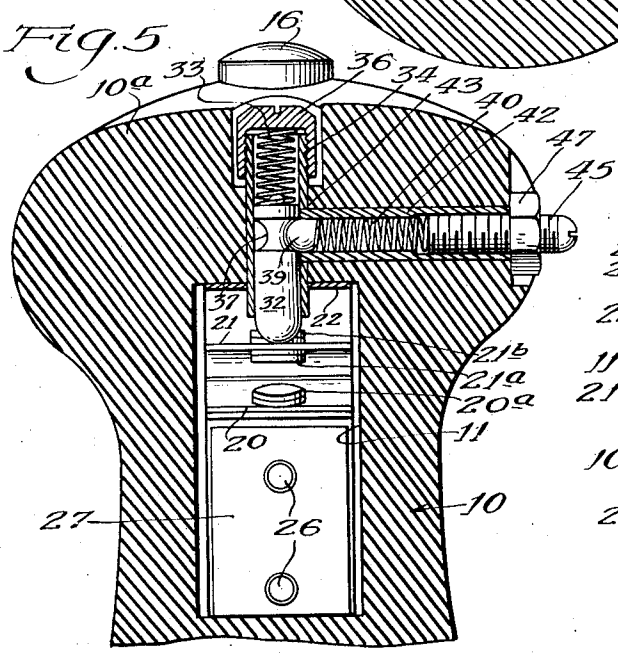


Fig. 6

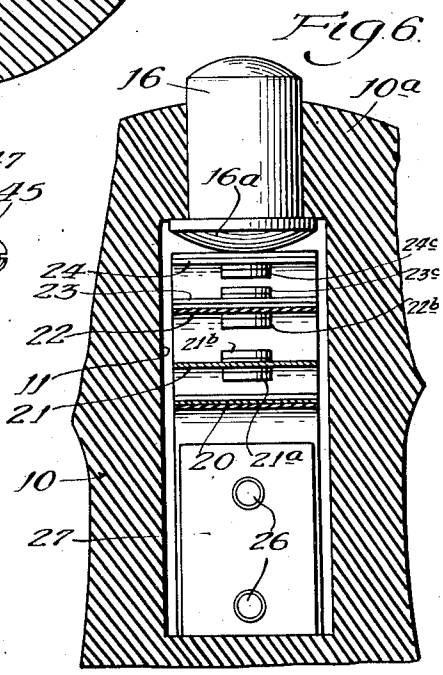
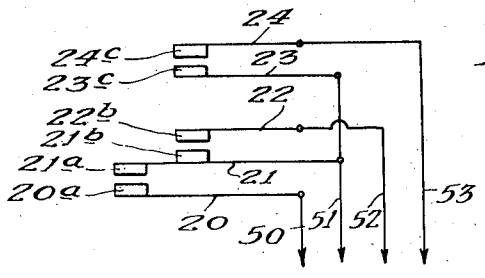


Fig. 7



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UNITED STATES PATENT OFFICE

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HAND GRIP SWITCH DEVICE

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8 Claims. (Cl. 200—157)

The present invention relates to hand grip control switches of the type comprising a plurality of switches for controlling separate electrical circuits, and wherein the switches are arranged to be actuated by control members which are formed and positioned to be manipulated by the finger and/or thumb of the operator. Hand grip switches of this general class are adapted to a relatively wide field of use, and are especially suitable for use in connection with "control stick," or as a part of a "control wheel" of an airplane so that the pilot may instantly and conveniently actuate the switches for controlling electrical circuits for operation of various devices or mechanisms, without the necessity of the pilot removing his hand from the grip. Switches of the hand grip type, when used on airplanes, may be employed for controlling the operation of the landing gear, the landing lights, radio, interplane communication system, and various other devices and mechanisms.

In connection with military planes, hand grip control switches of the type embodying the present invention may be employed for controlling the operation of various armaments, while affording maximum safety and convenience to the pilot in dispensing with the necessity of the pilot removing his hand from the "control stick" or "control wheel" when it is desired to cause operation of such armaments. This advantage is of utmost importance when it is necessary to operate such armaments during the time that the plane is travelling at high rates of speed, because it at all times permits the pilot to maintain proper and safe control of the plane.

One of the objects of this invention is to provide an improved hand grip control switch, comprising a double switch assembly, and a single manually operated control member, positioned so that when it is initially moved, it causes completion of one electrical circuit, and upon further movement, in addition, effects completion of another electrical circuit.

Another object is to provide an improved control switch of the character indicated, comprising a double switch assembly and a single manually operated control member positioned so that upon initial movement of said member one electrical circuit is completed, and upon further movement, in addition, a second electrical circuit is completed, together with detent means for yieldingly and releasably opposing such further movement of the operating member until said detent means is overcome by the exertion of additional pressure on said member.

A further object is to provide an improved hand grip control switch, comprising a double switch assembly and a single manually operated control member positioned so that upon initial movement of said member, one electrical circuit is completed, and upon further movement of said member, a second electrical circuit is completed, together with detent means for releasably opposing such further movement of the operating member, with the detent means constructed and arranged for varying the pressure required to be exerted by the operating member for permitting such further movement thereof.

Other objects and advantages of this invention will be apparent from the following descripiton, taken in connection with the accompanying drawings in which—

Figure 1 is a side elevational view, part in section, of the hand grip control switch embodying the present invention.

Figure 2 is an elevational view of the inner face of the hand grip control switch.

Figure 3 is a top view thereof.

Figure 4 is an enlarged, staggered, horizontal section through the upper end of the hand grip control switch, taken substantially as indicated at line 4—4 on Figure 1.

Figures 5 and 6 are vertical, staggered sections through the hand grip control switch, taken substantially as indicated at lines 5—5 and 6—6 respectively on Figure 1.

Figure 7 is a schematic wiring diagram showing the switch fingers and their connection to conductor wires of electrical circuits to be controlled thereby.

The hand grip control switch, embodying the present invention, includes a body 10 of suitable contour, to provide maximum convenience in gripping by the hand of an operator. The lower end of the body, it may be understood, is formed so as to permit securement to the upper end of a conventional "control stick" of an airplane, or a lever for controlling other apparatus, and when such grips are used in connection with a "control wheel" of an airplane, the grips are removably mounted at opposite sides of the upper end portions of a conventional figure eight type of "control wheel."

The interior of the body of the hand grip is formed with a cavity or chamber 11, the upper end of which is in communication with an opening 12, formed in the forward side of said body. As will be presently described, a pre-assembled switch structure is adapted to be inserted through the opening 12, and secured in position in the

cavity of the body. A finger operating member 14, of trigger-like formation, is pivotally mounted at its upper end on a pin 15, as clearly seen in the drawings. The upper end of the trigger, as indicated at 14a, constitutes an abutment and is adapted in the free position of said finger, to abut against a shoulder 12a, forming the upper wall of the opening 12 in which the trigger is mounted, so as to limit the outward movement of the trigger. The inner portion of the trigger is provided with a cam type of abutment 14b for actuating a portion of the switch mechanism and which yieldingly returns the trigger to the position seen in Figure 1 of the drawings.

Mounted in the top of the head 10a of the hand grip is a depressible plug or plunger member 16, the lower end of which is formed with a flanged button head 16a, positioned for actuating another portion of the switch mechanism; the flange 16a engaging the wall of the cavity 11 and serving to limit the upward movement of the plug 16.

The switch assembly is mounted within the cavity of the hand grip in a manner to permit convenient removal therefrom for repair or replacement, and is preferably formed as a unitary assembly. The switch assembly comprises contact fingers 20, 21, 22, 23 and 24, which are of elongated formation, and are formed of relatively resilient material. Said contact fingers are initially formed with vertical portions, and contact portions extending substantially transverse to the vertical portions, and normally disposed in spaced apart relation as clearly seen in Figure 1 of the drawings. The vertical portions of the contact fingers are rigidly connected together in insulated relation by suitable eyelet rivets, not shown, in a manner well understood in the art; and the switch assembly is rigidly mounted within the cavity by a pair of screws 26 which are threaded into a retainer plate 27 positioned against the inner face of the stack switch assembly.

The adjacent faces of the free end portions of the contact fingers 20 and 21 are provided with cooperating contact buttons 20a and 21a, and the adjacent faces of the free end of the contact finger 21 and the finger 22 are provided with contact buttons 21b and 22b respectively, and the adjacent faces of the free ends of the contact fingers 23 and 24 are also provided with cooperating contact buttons 23c and 24c respectively. All of the contact fingers with the exception of contact fingers 22 and 23, are movable. The contact finger 22, which for convenience may be termed an auxiliary finger, has the outer end of the transverse portion thereof rigidly attached, by means of a screw 28, to the shoulder 12a, forming the wall of the opening 12 in the hand grip body. The contact finger 23 is substantially stationary, the contact carrying portion of which may be permitted to flex slightly in a downward direction to the extent of its own inherent flexibility, together with the flexibility of the adjacent portion of the stationary contact finger 22.

Contact fingers 20, 21 and 22 constitute a double switch adapted to be controlled by the trigger member 14, and the contact fingers 23 and 24 constituting a single switch adapted to be controlled by depressing the plug 16.

The extreme outer end of the transverse portion of the contact finger 20 is formed to ride camwise upon the abutment 14b of the trigger member 14, and urges the trigger to the position seen in Figure 1. The transverse portion of the contact finger 24 slidingly engages the button head 16a of the plug 16, and due to the inherent resiliency of said finger 24, it normally maintains the plug 16 in the position seen in Figure 1 of the drawings. Due to the inherent resiliency of the formed transverse portions of the contact fingers, their free ends are disposed in spaced relation with their cooperating contact buttons out of engagement with each other, as seen in Figure 1 of the drawings,

The contact finger 21 is normally releasably restrained against upward movement by detent means mounted in the head 10a of the body 10. The detent means includes a plunger member 32, the lower end of which yieldingly engages the outer free end of the transverse portion of said contact finger 21 under pressure of a coil spring 33. The coil spring and plunger are mounted within a sleeve 34 which is press-fitted into the top or the head of the hand grip body. The lower end of the sleeve ends downwardly through an opening in the outer end of the auxiliary contact finger 22, and the upper end of said sleeve is externally threaded and is engaged by a cup-shaped nut 36. By turning of the nut, the pressure of the spring 33, acting on the plunger 32, may be varied to increase or decrease the pressure, opposing upward movement of the transverse portion of the contact finger 21.

The body of the plunger 32, intermediate its length, is formed with an annular groove 37, in which is normally seated a ball check member 39, under pressure of a coil spring 40. The spring 40, and ball 39, are confined within a sleeve 42, extending horizontally through one side of the head of the body, and press-fitted therein. The inner end of the sleeve preferably fits into an opening 43 formed in the wall of the upright sleeve 34 so as to insure proper guidance for the ball 39 into and out of engagement with the groove 37 of the plunger 32. Pressure on the spring 40 is maintained by a stud 45, threaded into the outer end of the sleeve 42, and a lock nut 47 is mounted on the outer end of the stud, abutting against a shoulder on the side of the head of the hand grip body for locking the stud 45 in a desired position of adjustment for exerting a predetermined spring pressure on the ball 39.

In the operation of the double switch composed of the contact fingers 20, 21 and the auxiliary contact finger 22, initial pivotal movement of the trigger member 14 causes movement of the contact finger 20 to dispose its contact button 20a into cooperative engagement with the contact button 21a of the contact finger 21, to complete an electrical circuit. While the yieldable plunger 32 tends to maintain the contact finger 21 in a fixed position by the action of the spring pressed check ball 39, it will be apparent that upon further inward movement of the trigger 14, overcoming the forces of the detent means, the two contact fingers 20 and 21 move as a unit in an upward direction, and causes the contact finger 21 to dispose its contact button 21b into cooperative engagement with contact button 22b of the auxiliary contact finger 22 to complete another electrical circuit. Such upward movement of the free end of contact finger 21 is permitted when the ball 39 is forced out of the groove 37 of the plunger 32. Hence the spring pressed ball check 39 serves to provide a releasable stop or detent for precluding movement of the contact finger 21, until sufficient pressure is exerted on the trigger member 14 to overcome the pressure exerted by the ball check

39, which tends to normally retain the plunger 32 in the position of adjustment, as seen in Figure 1 of the drawings.

By virtue of the adjustment for varying the pressure of the spring 40, I provide a releasable detent for the trigger member 14 which is capable of satisfying the particular or individual preferences of the operator or pilot. Some operators may prefer that the trigger member when initially actuated to complete an electrical circuit through the contact fingers 20 and 21, to abut against a substantial stop, so as to require a substantial amount of pressure to be exerted on the trigger member to permit further movement thereof and effect completion of another electrical circuit through the contact finger 21 and auxiliary contact finger 22. Others may prefer a relatively light opposing force, serving as a releasable stop against the actuation of the switch finger 21.

By virtue of the hand grip control switch embodying the present invention, it is possible to first effect completion of one electrical circuit by initial movement of the trigger member 14, and upon further movement of the trigger member to complete, in addition, a second electrical circuit. A third electrical circuit may be completed by depressing the plunger 16 for moving the contact finger 24 downwardly to cause its contact button 24c to operatively engage contact button 23c of the finger 23.

I have shown schematically in the wiring diagram of Figure 7, the respective contact fingers and their relationship to each other. By virtue of my novel construction it is possible, by the use of only four conductor wires, extending up into the hand grip and connected to the respective contact fingers, to control three separate electrical circuits. As shown, the contact finger 20 is connected to a conductor wire 50, the contact finger 21 is connected to a conductor wire 51, the auxiliary contact finger 22 is connected to a conductor wire 52, the contact finger 23 is connected to the conductor wire 51, while the contact finger 24 is connected to a conductor wire 53. It is to be understood that the conductor wires are connected to suitable terminals (not shown) of said contact fingers, and are encased in a sheath 54, extending downwardly in the cavity 11 and emerging from the lower end of the body, for connection to a suitable source of power and to devices or apparatus to be controlled by the electrical circuits including the switches. When the contact fingers 20 and 21 are engaged an electrical circuit is completed through the conductor wires 50 and 51; when the contact finger 21 and auxiliary contact finger 22 are engaged another electrical circuit is completed between the conductor wires 51 and 52, and when the contact fingers 23 and 24 are engaged, an electrical circuit is completed between the conductor wires 51 and 53.

To avoid possible injury to the hand of the pilot when operating the plane at high altitudes or in lower temperatures, it is preferred that the body of the hand grip 10, as well as the trigger member 14 and plunger 16, be formed of suitable heat insulating material. It is also preferred that after the unitary switch assembly has been rigidly secured in place by the screws 26, that the recessed areas, providing clearance for the heads of the screws, be filled with suitable heat insulating compound, such as a wax or asphalt composition.

Although I have herein shown and described a preferred embodiment of my invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise embodiment herein disclosed, except as I may be so limited by the appended claims.

I claim as my invention:

1. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising an elongated auxiliary finger, and two elongated, flexible and movable fingers disposed in aligned relation to the auxiliary finger, said fingers being fixedly secured at one corresponding end to said body in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and to the corresponding end of the auxiliary finger, the adjacent faces of said last mentioned ends of said fingers being provided with cooperating contact buttons, a movable operating member carried by the body and positioned to engage the free end of the outermost movable finger, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into cooperating engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and causes said other movable finger to cooperatively engage said auxiliary finger, and detent means acting on said other movable finger for releasably opposing such further movement of the operating member.

2. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising an elongated auxiliary finger, and two elongated, flexible and movable fingers disposed in aligned relation to the auxiliary finger, said fingers being fixedly secured at one corresponding end to said body in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and to the corresponding end of the auxiliary finger, the adjacent faces of said last mentioned ends of said fingers being provided with cooperating contact buttons, a movable operating member carried by the body and positioned to engage the free end of the outermost movable finger, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into cooperating engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and causes said other movable finger to cooperatively engage said auxiliary finger, detent means acting on said other movable finger for releasably opposing such further movement of the operating member, and means for varying the pressure exerted by said detent means for opposing such further movement of said operating member.

3. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising an elongated auxiliary finger, and two elongated, flexible and movable fingers disposed in aligned relation to the auxiliary finger, said

fingers being fixedly secured at one corresponding end to said body in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and to the corresponding end of the auxiliary finger, the adjacent faces of said last mentioned ends of said fingers being provided with cooperating contact buttons, a movable operating member carried by the body and positioned to engage the free end of the outermost movable finger, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into cooperating engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and causes said other movable finger to cooperatively engage said auxiliary finger, and detent means for normally positioning said other movable finger out of engagement with the movable finger and serving to releasably oppose movement thereof toward the auxiliary finger.

4. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising an elongated auxiliary finger, and two elongated, flexible and movable fingers disposed in aligned relation to the auxiliary finger, said fingers being fixedly secured at one corresponding end to said body in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and to the corresponding end of the auxiliary finger, the adjacent faces of said last mentioned ends of said fingers being provided with cooperating contact buttons, a movable operating member carried by the body and positioned to engage the free end of the outermost movable finger, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into cooperating engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and causes said other movable finger to cooperatively engage said auxiliary finger, and detent means acting on said other movable finger for releasably opposing such further movement of the operating member, said detent means comprising a spring pressed plunger engaging said free end of said other finger and having a circumferential groove intermediate its length, and a spring pressed ball normally seated in said groove for normally precluding movement of the spring pressed plunger until the pressure acting on the free end of said other finger exceeds a predetermined amount.

5. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising an elongated auxiliary finger, and two elongated, flexible and movable fingers disposed in aligned relation to the auxiliary finger, said fingers being fixedly secured at one corresponding end to said body in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and to the corresponding end of the auxiliary finger, the adjacent faces of said last mentioned ends of said fingers being provided with cooperating contact buttons, a movable operating member carried by the body and positioned to engage the free end of the outermost movable finger, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into cooperating engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and causes said other movable finger to cooperatively engage said auxiliary finger, and detent means acting on said other movable finger for releasably opposing such further movement of the operating member, said detent means comprising a spring pressed plunger engaging said free end of said other finger and having a circumferential groove intermediate its length, a spring pressed ball normally seated in said groove for normally precluding movement of the spring pressed plunger until the pressure acting on the free end of said other finger exceeds a predetermined amount, and means for varying the spring pressure on said ball for varying the predetermined pressure required to permit movement of the free end of said other finger into engagement with the auxiliary finger.

6. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising a double switch and a single switch, the double switch comprising an elongated stationary finger, two elongated, flexible and movable fingers disposed in aligned relation with and at one side of the stationary finger, the single switch comprising a relatively stationary elongated finger disposed adjacent the opposite side of the stationary finger of the double switch, and an elongated, flexible and movable finger, the fingers of the single switch being aligned with the fingers of the double switch, the fingers of said double and single switches being fixedly secured at one corresponding end to said body, in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and said stationary fingers, the adjacent faces of the fingers of the double switch and the fingers of the single switch being provided with cooperating contact buttons, an operating member for controlling the double switch carried by the body and positioned to engage the free end of the outermost movable finger of said double switch, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into contacting engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and cause contacting engagement of said other movable finger with the stationary finger of the double switch, and an operating element for the single switch, carried by the body and normally engaging the movable finger of said single switch, whereby movement of said element causes said latter finger to move into contacting engagement with the stationary finger of the single switch.

7. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising a double switch and a single switch, the double switch comprising an elongated sta-

tionary finger, two elongated, flexible and movable fingers disposed in aligned relation with and at one side of the stationary finger, the single switch comprising a relatively stationary elongated finger disposed adjacent the opposite side of the stationary finger of the double switch, and an elongated, flexible and movable finger, the fingers of the single switch being aligned with the fingers of the double switch, the fingers of said double and single switches being fixedly secured at one corresponding end to said body, in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and said stationary fingers, the adjacent faces of the fingers of the double switch and the fingers of the single switch being provided with cooperating contact buttons, an operating member for controlling the double switch carried by the body and positioned to engage the free end of the outermost movable finger of said double switch, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into contacting engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and cause contacting engagement of said other movable finger with the stationary finger of the double switch, detent means acting on said other movable finger of the double switch for releasably opposing movement of the free end thereof, and an operating element for the single switch, carried by the body and normally engaging the movable finger of said single switch, whereby movement of said element causes said latter finger to move into contacting engagement with the stationary finger of the single switch.

8. A switch device of the character described, comprising a body in the form of a hand grip, a unitary switch assembly fixedly mounted in a cavity formed in said body, said switch assembly comprising a double switch and a single switch, the double switch comprising an elongated stationary finger, two elongated, flexible and movable fingers disposed in aligned relation with and at one side of the stationary finger, the single switch comprising a relatively stationary elongated finger disposed adjacent the opposite side of the stationary finger of the double switch, and an elongated, flexible and movable finger, the fingers of the single switch being aligned with the fingers of the double switch, the fingers of said double and single switches being fixedly secured at one corresponding end to said body, in insulated relation to each other, the opposite ends of said movable fingers being free and normally disposed in spaced apart relation to each other and said stationary fingers, the adjacent faces of the fingers of the double switch and the fingers of the single switch being provided with cooperating contact buttons, an operating member for controlling the double switch carried by the body and positioned to engage the free end of the outermost movable finger of said double switch, whereby initial movement of said member exerts pressure on the free end of the latter finger and moves it into contacting engagement with the free end of the other movable finger, and further movement of said member causes the free ends of said movable fingers to move as a unit and cause contacting engagement of said other movable finger with the stationary finger of the double switch, detent means acting on said other movable finger of the double switch for releasably opposing movement of the free end thereof, means for varying the pressure exerted by said detent means for opposing movement of said other movable finger, and an operating element for the single switch carried by the body and normally engaging the movable finger of said single switch, whereby movement of said element causes said latter finger to move into contacting engagement with the stationary finger of the single switch.

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