June 19, 1951 J. M. JACOBSON 2,557,351

LEVER SEQUENCE CONTROL

Filed Oct. 24, 1947

Fig. 1

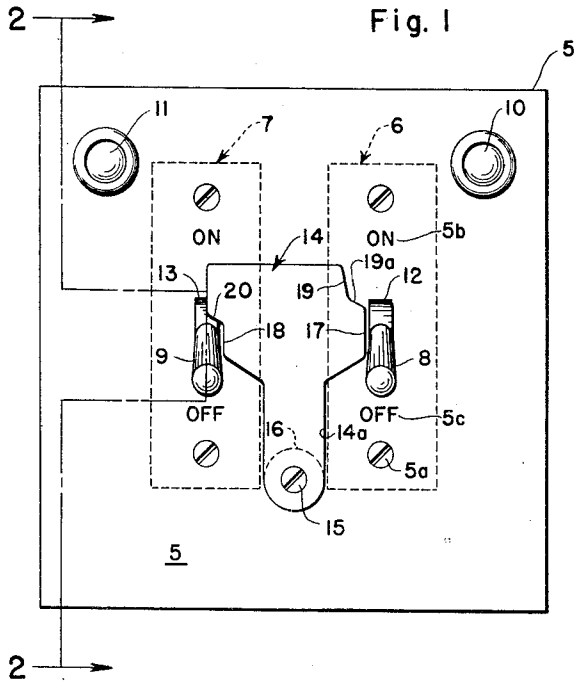


Fig. 2

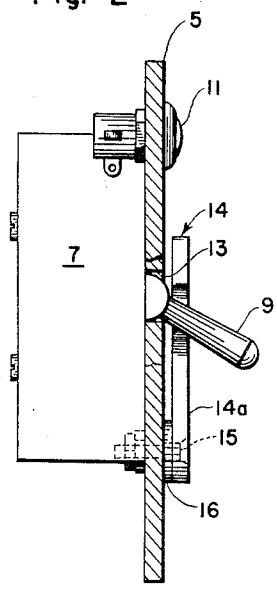


Fig. 3

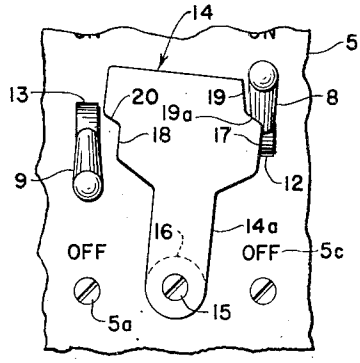
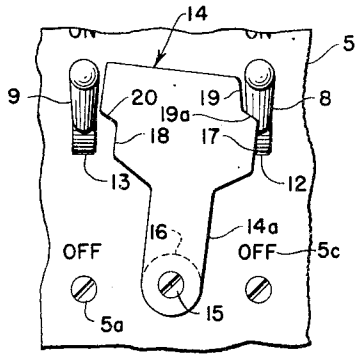


Fig. 4



Joel M. Jacobson

INVENTOR.

BY James M. Clark

HIS PATENT ATTORNEY

Patented June 19, 1951

2,557,351

UNITED STATES PATENT OFFICE

2,557,351

LEVER SEQUENCE CONTROL

Joel M. Jacobson, Hagerstown, Md., assignor to Fairchild Engine and Airplane Corporation, a corporation of Maryland

Application October 24, 1947, Serial No. 781,915

4 Claims. (Cl. 74—483)

1

The present invention relates to control mechanism and more particularly to improvements in sequence operating devices for switches, levers and the like.

In the control and operation of many devices it is frequently imperative that these devices be operated in a predetermined sequence and a number of complex blocking or interlocking sequence mechanisms have heretofore been proposed to insure the operation of such devices in a predetermined manner. These prior mechanisms have for the most part been complicated, cumbersome and difficult to apply to existing or standard equipment, and the present invention is directed to an improved, simple and effective means for determining the sequential operation of a pair of switches, levers or similar operating controls.

The improved device of the present invention consists of a pivoted blocking or cam element mounted between a pair of levers and having a form or configuration which will permit the movement of but one lever, preventing the movement of the other lever until the first lever has been moved. In an improved form the device is stamped or cut from a flat plate element which is readily mounted upon a switch panel or other base structure through which the lever elements project and may be operated.

It is, accordingly, a primary object of the present invention to provide an improved sequence control mechanism for switches, levers and the like. A further object of the invention includes the provision of an improved mechanical interfering or blocking element for preventing the movement of a second member before the first member has been moved. It is a further object to provide such a device which is simple and economical to construct and which is entirely safe and foolproof in its operation. A further object of the present invention is directed to providing an improved sequence operating device which is easily and readily applied to a panel or other mounting base between two existing switch or other lever operating members.

This invention contemplates the further objectives of providing an improved blocking or interfering element to predetermine the sequence operation of a pair of controls and which at the same time serves as a visual signal of the condition of these controls as well as to indicate the only movement of which they are permitted by the improved sequence device. Further objects reside in the improved form and arrangement of the sequence controlling element as well as its

2

arrangement and relationship with respect to the control or switch levers with which it is operated. Other objects and advantages of the present invention will occur to those skilled in the art after reading the present description, taken together with the accompanying drawings, forming a part hereof, in which:

Figure 1 is a front elevational view of a panel containing a pair of control switches to which the improved device has been applied;

Figure 2 is a side elevational view of the same as taken along the lines 2—2 of Figure 1;

Figure 3 is an elevational view of the improved device shown in Figure 1 with the first of the switch levers moved and the blocking device moved to freely permit operation of the second switch lever; and

Figure 4 is a similar view of the same showing the second switch lever moved into its operative position.

While the present invention is applicable to numerous devices, it will be described as applied to a pair of toggle switches for controlling the operation of a pair of remotely located signal lights, to which device it has proven particularly applicable. In aerial operations involving paratroopers or parachute-troops, it is a customary procedure for either the pilot or co-pilot of the aircraft to give the signal to the paratroopers to jump from the aircraft. This signal is usually provided through the medium of a pair of signal lights, located in the cabin or passenger compartment in full view of the paratroopers and usually comprises one red and one green light. The red light is a "caution" light to advise the paratroopers to prepare to jump and the green light is the signal to "jump."

During the approach run of the aircraft and some time prior to reaching the objective area upon which the paratroopers are to land, the pilot actuates the initial switch to light the red "caution" signal and when the aircraft reaches the position at which the jumps should start, the pilot throws the switch which lights the green or "jump" light. It will be obvious that considerable confusion would result in the event the pilot accidentally operated these switches in the reverse order. It is imperative and of the utmost importance that suitable precautionary measures be taken to prevent such inadvertent operation of these switches in the improper sequence and the present invention about to be described insures such satisfactory operation in connection with a parachute jumper's signalling system as well as in other installations. At

the same time it will, of course, be understood that the present invention is not limited to installations of the character described herein which is merely a preferred example of an application of the invention.

Referring now to Figures 1 and 2, the numeral 5 indicates a panel or base support upon which a pair of toggle switches 6 and 7 are mounted as by the mounting screws 5*a*. At a convenient position upon the panel 5, there are mounted the indicating lights 10 and 11, and the toggle levers 8 and 9 of the switches 6 and 7, respectively, extend through the front of the panel through suitable apertures 12 and 13 therein. The switches 6 and 7 are mounted in the customary manner upon the back of the panel 5 with only the operating toggle levers 8 and 9 projecting therethrough, and similarly the indicating lamps 10 and 11 are mounted for the most part on the back of the panel with only the retaining bezel and lens, or bull's-eye, projecting on the outside of the panel.

For the purposes of the present description the lamp 10 will be the red or "caution" lamp and the numeral 11 will represent the green or "jump" lamp. The lamps are connected to their respective switches by suitable wiring and to an adequate source of energy such that operation of switch 6 will control its adjacent indicating lamp 10 as well as a corresponding colored signal lamp in the cabin; and similarly, operation of switch 7 will control lamp 11 and its corresponding cabin lamp. The face of the panel will be suitably marked by "on" and "off" indicia, as indicated at 5*b* and 5*c*, the toggle levers in Figures 1 and 2 both being in their "down" or "off" position. The described switches are preferably of the type in which the toggle levers can only occupy an "on" or "off" position, being spring-actuated such that they are automatically thrown to either side of the central or intermediate position. The present invention is not, however, limited to such spring-actuated levers but can also be applied to those which may remain of themselves in an intermediate position. They are shown as of the digit or finger operated type but may also be of the larger hand grasped or pedal actuated types.

A blocking cam or interference element 14 is pivotally mounted upon a pivot bolt 15 at its lower downwardly extending portion 14*a* and is separated from the face of the panel 5 by a suitable spacer or washer 16 which is suitably apertured to permit the bolt 15 to be passed therethrough. The element 14, which might be described as a swinging cam, is generally T-shape in outline with its pivotal mounting at the lower end of its stem portion and may be constructed of a plastic, metal or other suitable material. The upper portion of the cam element 14 has parallel side faces 17 and 18 which in the neutral or central position of the cam element 14 as shown in Figure 1, are adapted to fit closely between the side faces of the toggle levers 8 and 9 respectively.

The blocking or cam element 14 is provided with symmetrically disposed parallel straight side portions 17 and 18 which in the neutral position of the element as shown in Figure 1, are disposed close to the inner ends of the toggle switch levers 8 and 9. As shown in the cross-sectional view in Figure 2, the surfaces of these side portions are spaced off the face of panel 5 by the washer 16 a sufficient distance such that they are disposed outside of and clear the central cylindrical hubs of the toggle levers which hubs are journaled or pivotally mounted in the respective switch housings. The blocking element 14 has a laterally extending portion at its upper left hand corner, the outer edge of this extending portion being carried angularly into the side face 18 by the inclined camming edge 20. The blocking element 14 also has a portion removed from its normally rectangular upper right hand corner as indicated by the obtuse angular lines 19 and 19*a* forming this edge of the element.

As indicated above, the lights 10 and 11 are mounted upon the panel 5, which is disposed in the cockpit of the aircraft convenient to the pilot or co-pilot, and are the indicating lights by which the pilot or co-pilot can determine at a glance as to whether the corresponding signal lights in the cabin of the aircraft are lighted to convey the proper message to the paratroopers. It will be readily understood that the switch 6 will control a circuit within which the light 10 on the panel and the signal light in the cabin will be in parallel such that both are lighted simultaneously as the switch 6 is thrown "on," and that the switch 7, the light 11 and the corresponding light in the cabin are similarly operated.

The operation of the presently disclosed mechanism is as follows: As the aircraft is traveling toward its objective, the toggle switch handles 8 and 9 are initially in their downwardly extending "off" positions as indicated in Figure 1 and the block element 14 will occupy its vertical central position as shown in this figure. It will be recalled that the "caution" signal during the approach run is indicated by the red light 10 and the light in the cabin corresponding thereto, and that it is subsequently followed by flashing on the "jump" or green light 11, and the corresponding lamp in the cabin. Accordingly, from the position shown in Figure 1, it is desired that switch 6 be initially operated, and that switch 7 be thrown "on" only after the switch 6 has been thrown "on." It will be seen from the extending portion 20 of the block element 14 and the closely disposed position of the opposite side face 17 with the lever 8 of the switch 6 that the lever 9 of switch 7 can not be moved into the "on" position, being blocked by the camming surface 20 of the block element which is prevented from rotating about the pivot 15 by immediate contact of the side surface 17 with the handle 8. The latter handle however is free to be moved upwardly into its "on" position, following which the handle 9 may also be moved upwardly into its "on" position in the course of which it contacts the camming surface 20 and imparts clockwise movement of the element 14 about pivot 15. This movement is permitted by the recessed corner portion 19 of the blocking element which is permitted to move adjacent to and beneath the lever 8 as shown in the upper right hand corner of Figure 3. After the toggle lever 8 has been thrown "on" and the toggle lever 9 has engaged the camming surface 20 to move the element 14 as it also is moved into its "on" position, all of the elements will assume the positions shown in Figure 4.

In order to again clear the signal and indicating system for the start of a new parachute jumping operation, the switch lever 9 is first moved downwardly into its "off" position as indicated in Figure 3. Similar downward movement of the switch lever 8 causes it to engage the camming

surface 19a on the opposite side of the blocking element 14, imparting counterclockwise movement to this element such that it is pushed aside or returned into its central position as indicated in Figure 1 and the switch lever 8 is permitted to pass downwardly to its "off" position.

It will, accordingly, be seen that starting from the initial position shown in Figure 1 in which both switches are in the "off" position the cam element 14 will permit the switches to be actuated in the desired or predetermined sequence only, namely the switch lever 8 being thrown "on" first followed by the switch lever 9. It will be appreciated that the cam element 14 may alternatively be inverted in which it is suspended from its pivotal mounting, and that in this position it would also provide a predetermined sequence of the adjacent switch levers. The improved blocking or cam element 14 is not limited to use in a bank of two switches, but can also be installed between each two switches in a bank or series of switches of an unlimited number. In such multiple installations, the operation of each individual cam element can be precisely the same as that shown and described herein just so long as the desired switch lever is first actuated to permit actuation of the switch lever on the opposite side of the cam element which latter switch lever in turn clears the way for rocking movement of the next cam element, and so on to the end of the series.

It will be understood that the preferred embodimeent of the invention which has been described above as applied to a jump signal control for paratroopers has been selected for illustrative purposes and the invention is not limited to installations of the type which has been described. Other forms and modifications of the invention, both with respect to the general arrangement of its elements and the details of its respective parts, are intended to come within the scope and spirit of the present invention as more particularly defined in the appended claims.

I claim:

1. In a switch lever sequence control installation including an apertured supporting panel and a pair of spaced switch levers mounted upon said panel and having handle portions projecting through said panel apertures for parallel movements between initial and advanced positions, a sequence controlling blocking element of flat plate material pivotally mounted upon the face of said supporting panel in an intermediate and contiguous relationship with respect to said lever handle portions, said blocking element being parallel sided with its free end offset with respect to its pivotally mounted end portion, said blocking element having a camming surface and a recessed portion in the region of the advanced position of a first said lever and having a camming surface and a recessed portion in the region of the initial position of the second said lever arranged such that the advance of a second of said levers engages said camming surface and pivotal displacement of said blocking element is blocked by engagement with said first lever handle portion until the first said lever handle portion has been advanced, subsequent to which advance of the second said lever handle portion engages said camming surface of said blocking element and imparts pivotal displacement thereto about its pivotal mounting to a position outside the path of advancing movement of said second lever handle portion and into a displaced position in which said first lever handle portion in its advanced position is disposed within said recessed portion of said blocking element and is blocked in its return movement to its initial position until said second lever handle portion has been returned to its initial position.

2. In a switch lever sequence control installation including an apertured supporting panel and a pair of spaced switch levers mounted upon the face of said panel and having handle portions projecting through said panel apertures for adjacent parallel movements between initial and advanced positions, the improvement of a sequence controlling blocking element of flat plate material mounted upon the face of said supporting panel in an intermediate and contiguous relationship with respect to said lever handle portions, said blocking element being generally paraliel sided and pivotally mounted adjacent an end portion, said blocking element having a camming surface and a recessed portion formed in the region of the advanced position of a first of said levers, said blocking element having a camming surface and a recessed portion formed in the region of the initial position of said second lever, the said camming surfaces and recessed portions of said blocking element being arranged such that the advance of a second of said lever handle portions engages its camming surface and displacement of said blocking element is blocked by engagement with said first lever handle portion until the first said lever handle portion has been advanced, subsequent to which advance of the second lever handle portion engages said camming surface of said blocking element and imparts pivotal displacement thereto about its pivotal mounting to a position outside the path of advancing mavement of said second lever handle portion and into a displaced position in which said first lever handle portion is disposed within said recessed portion of the head portion of said blocking element and is blocked in its return movement to its initial position until said second lever handle portion has been returned to its initial position, the said blocking element being pivotally mounted on the exposed face of said panel between and below said switch lever handle portions in a position in which it serves as visual signal for assisting the operator in determining the proper sequence of operation of the lever handle portions.

3. In a sequence control installation for a pair of operating levers movable in adjacent parallel paths between initial and advanced positions, the improvement of a blocking member disposed intermediate the parallel paths of said operating levers and movably mounted for displacement by either one of said levers into the path of the other said lever, said blocking member having dissimilar lateral edges each contiguously disposed toward its respective adjacent operating lever for engagement thereby, said blocking member having an elongated lateral edge adjacent a first of said operating levers in the region of the initial position of said lever, said blocking member having an indentation in the region of the advanced position of said first lever, the opposed second said lateral edge of said blocking member having an indentation in the region of the initial position of the second said operating lever and having its lateral edge uninterrupted in the region of the advanced position of said second lever, said operating levers and said intermediate blocking members being arranged in such manner that said second lever can only be advanced

subsequent to the advance of said first lever whereby displacement of said blocking member is permitted by the said indentation at said advanced position of said first lever.

4. In a sequence control installation for a pair of operating levers movable in adjacent parallel paths between initial and advanced positions, the improvement of a blocking member disposed intermediate the parallel paths of said operating levers and movably mounted for displacement by either one of said levers into the path of the other said lever, said blocking member having dissimilar opposite lateral edges each contiguously disposed toward the respective operating lever for engagement thereby, said blocking member having an elongated lateral edge adjacent a first of said operating levers in the region of the initial position of said lever and having an indentation in the region of the advanced position of said first lever, the opposed second said lateral edge of said blocking member having an indentation in the region of the initial position of the second said operating lever and having its lateral edge uninterrupted in the region of the advanced position of said second lever, said operating levers and said intermediate blocking member being arranged in such manner that said second lever can only be advanced subsequent to the advance of said first lever whereby displacement of said blocking member is permitted by the said indentation at said advanced position of said first lever, and angularly disposed camming portions interconnecting each said opposed lateral edge of said blocking member with its respective indentation edge in such manner that said blocking member is automatically displaced laterally by engagement of the respective operating lever with its corresponding camming portion.

JOEL M. JACOBSON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,040,705	Leppert	Oct. 8, 1912
1,070,936	Aalborg	Aug. 19, 1913
1,107,915	De Buhr	Aug. 18, 1914
1,205,377	Evers	Nov. 2, 1916
1,340,930	Catlin	May 25, 1920
1,565,498	Read	Dec. 15, 1925
1,610,505	Fix	Dec. 14, 1926
1,776,633	Libby	Sept. 23, 1930
2,080,964	Forstrom	May 18, 1937

FOREIGN PATENTS

Number	Country	Date
230,482	Great Britain	May 14, 1925
42,107	Sweden	Oct. 29, 1915