

June 26, 1945.

O. H. KAMINKY

2,379,305

SWITCH MECHANISM

Filed Dec. 16, 1942

2 Sheets-Sheet 1

Fig. 1

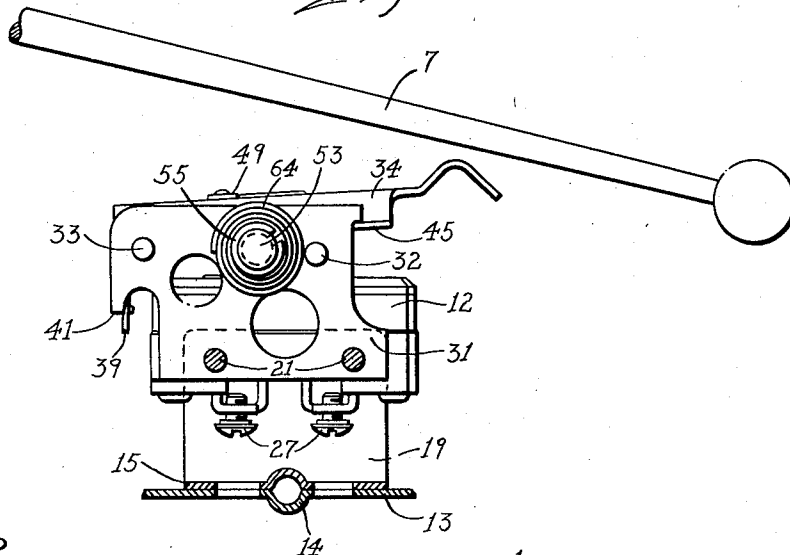


Fig. 2

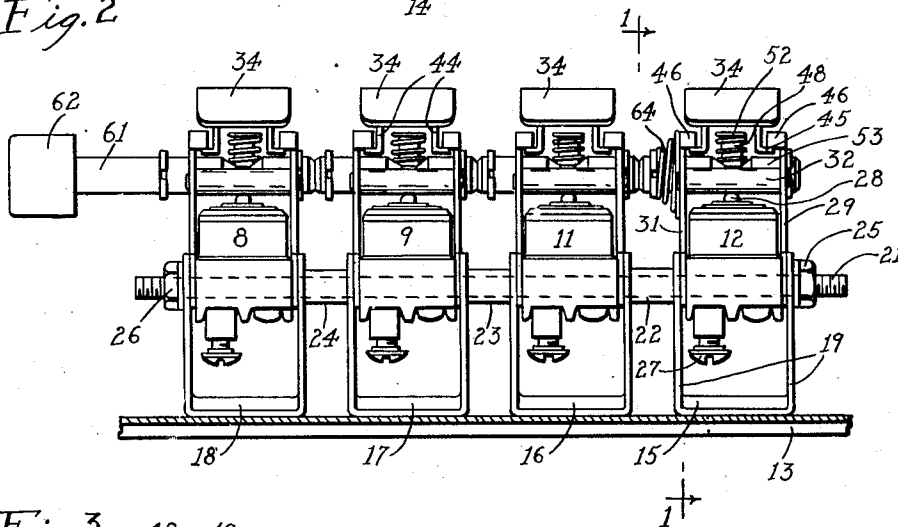
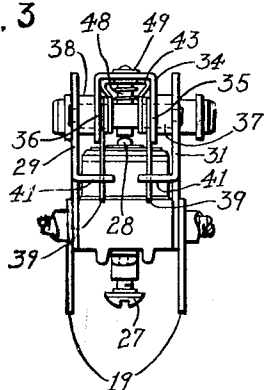


Fig. 3



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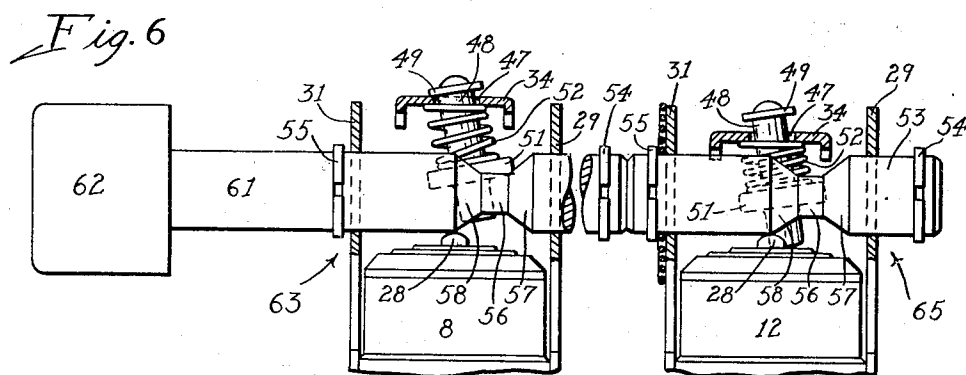
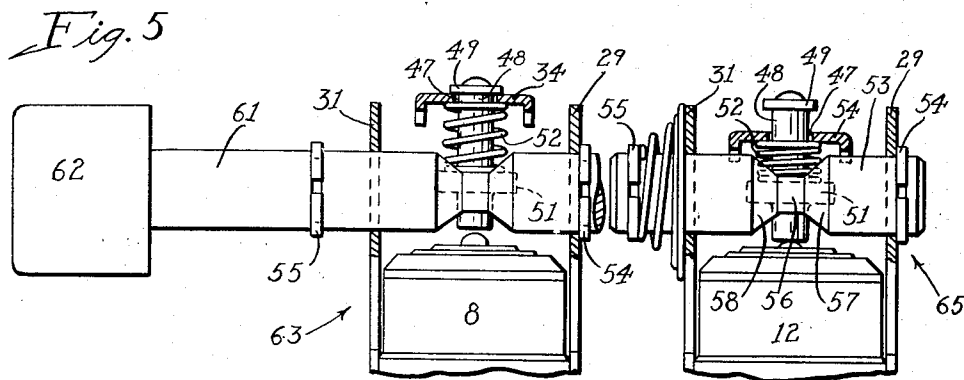
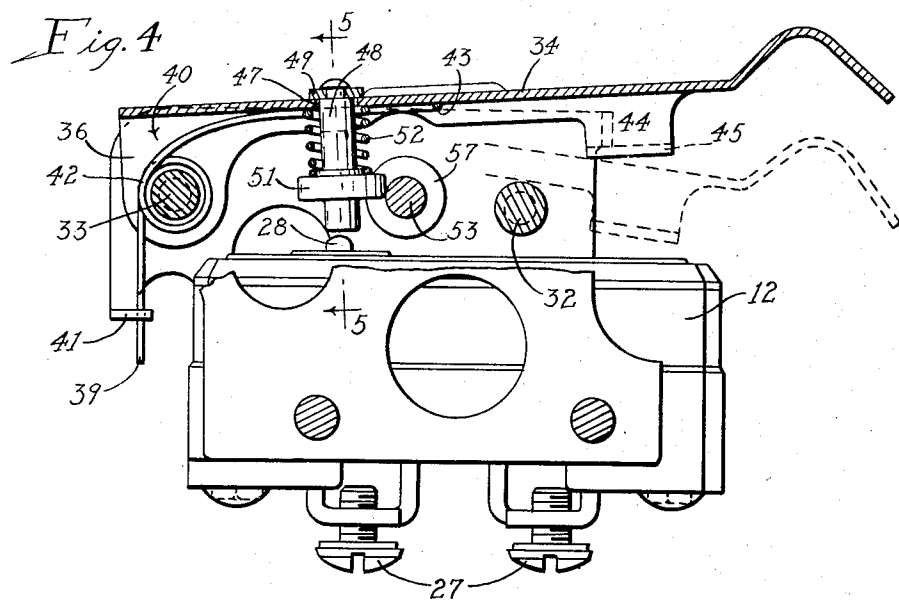
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SWITCH MECHANISM

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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SWITCH MECHANISM

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Application December 16, 1942, Serial No. 469,172

11 Claims. (Cl. 200—5)

This invention relates to switch mechanism and has special reference to switch mechanism particularly adapted for operation by the throttles in aircraft, though not limited to such use.

An important object of the invention is the provision of a novel switch mechanism including means adapted to be advanced for operation of the switch, and independent means for releasing the switch while the operating means occupies its advanced position.

Another object of the invention is the provision of a switch mechanism adapted to be assembled as a switch gang wherein means is provided for selectively operating the switches, and independent means is provided for repositioning the switch without disturbing the operating means, and wherein operation and release of any one of the switches does not interfere with the subsequent operation and release of another switch.

A further object of the invention is the provision of a switch mechanism in which the switch can be released and remain in released position while the actuating mechanism remains advanced.

A still further object of the invention is the provision of a switch mechanism of novel construction wherein the switch is actuated by a spring-pressed plunger which is deflectable to permit return of the switch to normal position.

Other objects and advantages will appear from the following description and the accompanying drawings, in which—

Figure 1 is an end elevation partly in section showing diagrammatically the manner in which the switch mechanism may be operated;

Fig. 2 is a side elevation partly in section showing a gang of four switch mechanisms such as used in the controls of four motored aircraft;

Fig. 3 is a view of the end of a switch mechanism opposite from that shown in Fig. 2;

Fig. 4 is an enlarged side view of a switch mechanism with parts broken away to show the actuating plunger;

Fig. 5 is a fragmentary view on the line 5—5 of Fig. 4 showing moved positions of the mechanism, and

Fig. 6 is a section similar to Fig. 5 showing additional moved positions.

While in most phases the invention is of general utility, the present embodiment is specifically adapted for use as a throttle warning switch for aircraft. Directing attention particularly to Figure 1, the switch actuating mechanism is located in such relation to the throttle levers 7 of aircraft that when the lever is moved to a position to re-

tard the speed of the aircraft below that required to sustain flight, the throttle levers engage actuating levers of the switch mechanism so as to actuate the switch, which is in turn connected to various parts of the aircraft and to a suitable warning device so as to initiate a warning to the operator in case parts of the aircraft are not in a position for landing. In this instance the actuating device is adapted for use with a small precision switch of the type shown in McGall Patent No. 1,960,020, though obviously other suitable types of switches may be employed. The unitary switches indicated generally by the numerals 8, 9, 11 and 12, are supported on a suitable bracket arranged for attachment to the aircraft, this bracket, in this instance, including a base plate 13 arranged at its ends in a manner not shown for attachment to a support, the base plate having a strengthening rib as shown at 14. Spaced along the base plate are upstanding U-shaped brackets 15, 16, 17 and 18, each of which has spaced upstanding ears 19. The switches 8, 9, 11 and 12 are supported between the ears 19 of each bracket by means of a threaded rod 21 which passes through openings in the switch cases and in the ears, spacers 22, 23 and 24 being disposed on the rods between the brackets, and nuts 25 and 26 threaded onto the rods acting to hold the switches rigidly in the bracket. The switches are of the type having binding posts 27 on their lower side for the connection of wires thereto and having an upstanding operating pin 28 projecting from the upper side of the casing, which pin acts to operate the switch in response to longitudinal movement thereof. The pin 28, which constitutes a self-returning actuating member, is preferably self-returning as disclosed in said McGall patent and may be constructed to maintain a normal open circuit, a normally closed circuit, or to maintain different circuits in different positions thereof, all of which are well known in the art.

Since each of the switches and switch operating mechanisms are substantially identical, only one will be described. The switch operating mechanism includes a frame formed by upstanding side members 29 and 31 carried on the rods 21 and disposed between the ears 19 of the brackets and the side of the switch case. Near their upper edges the frame members are interconnected by rivets 32 and 33 having reduced ends passing through the frame elements and shoulders adapted to abut against the inner side. Pivotaly carried on the rivet 33 is an operating lever 34 having depending ears 35 and 36 through which the rivet 33 passes, the sides of the ears

being spaced from the frame members by collars 37 and 38 (note Fig. 3). The lever is urged in a counterclockwise direction by the action of a spring 40, the ends 39 of which are seated behind hooks 41 on the frame members, the spring being coiled about the rivet 33 as shown at 42 and bearing adjacent its mid point against the underside of the lever 34 as best shown at 43 in Fig. 4. Adjacent that end of the lever opposite the ears 35 and 36, the lever has depending flanges 44 disposed on opposite sides of the lever, the flanges being bent outwardly as shown at 45 so as to come into abutment with inturned tabs 46 on the frame members so as to limit the counterclockwise rotation of the lever, and thus actually determine the inoperative position of the lever 34. Rotation of the lever in the clockwise direction to an advanced position is limited by contact thereof with the rivet 32 which acts as a stop for such movement. The lever 34 has an opening 47 in its upper side approximately in line with the pin 28 of the switch and a plunger 48 passes through this opening, the plunger being of slightly lesser diameter than the opening so that the plunger can be tilted angularly with respect to the lever. The upper end of the plunger carries a washer 49 riveted thereon as will be apparent from Fig. 4. The plunger is of such length that the lower end thereof will rest adjacent the pin 28 when the lever occupies its retracted position as shown in Fig. 4, and a collar 51 is positioned on the plunger adjacent its lower end. Disposed between the collar and the under surface of the lever 34 is a spring 52 which normally urges the plunger downward toward the pin and tends to maintain the washer 49 flat against the upper surface of the lever so as to maintain the plunger at right angles with respect to the lever. This spring and plunger, however, permit overtravel so that when the lever 34 is moved to an advanced position in which the pin 28 is depressed to operate the switch, such as shown in dotted lines in Fig. 4 bringing the end of the plunger against the pin 28, the lever can continue to move and compress the spring 52 and at the same time will apply only a limited actuating pressure on the end of the pin 28 as determined by the strength of the spring 52. When the lever 34 is released the spring 40 acts to return it to the inoperative position.

Disposed between the frame members 29 and 31 is a release rod indicated generally by the numeral 53, this rod being disposed near the plunger 48 and being slidable in openings of the frame members. The release rod is somewhat longer than the distance between the frame members and has snap rings 54 and 55 disposed in grooves adjacent the ends thereof. This rod has a central portion 56 of reduced diameter and outwardly flared portions 57 and 58 adjacent opposite ends thereof to provide an annular recess in the rod for the reception of the edge of the collar 51 as shown in Fig. 4, there being sufficient clearance between the portions 56 to 58 of the rod and the collar of the plunger to permit free movement of the plunger in response to movement of the lever 34. However, when the release rod is moved endwise toward the right facing Figs. 5 and 6 the sloping shoulder 58 engages the collar 51 tilting the plunger and moving the lower end thereof off the pin 28 when the operating lever 34 is in its advanced position. Where only a single switch mechanism is employed the rod 53 is extended as shown at 61 and carries an operating knob 62 for moving the rod longitudinally. However,

when the switch mechanisms are mounted in gangs as herein shown, an endmost switch operating mechanism such as that indicated at 63 in Figs. 5 and 6 is provided with a release rod such as therein shown having the knob 62, and the balance of the rods 53 are of such length that they rest in abutting relationship as shown in Figs. 2, 5 and 6 so that actuation of the knob 62 effectuates movement of the release plungers of each of the mechanisms. A coil spring as shown at 64 (Fig. 2) is disposed on one of the rods between one of the side frame elements and the spring snap ring 55, thereby acting to return the plungers when the knob 62 is released. Obviously where more than one mechanism is employed the spring 64 must be disposed on the endmost rod to cause actuation of the remainder.

Referring now more particularly to Figs. 5 and 6, these figures show the various positions of the parts. Thus the actuating mechanism 63 of Fig. 5 is shown in the normal inoperative position with the actuating lever 34 in its normal position as shown in full lines in Fig. 4. The switch operating mechanism 65 of this figure shows the relative positions of the parts when the switch lever 34 is moved to the advanced position as shown in dotted lines in Fig. 4, the pin 28 of the switch being depressed and the spring 52 compressed. This represents the position of the parts when the throttle lever 7 corresponding to this switch is retracted. Under these circumstances the pilot may desire to continue the motor, the throttle of which operates against the lever 34 of switch operating mechanism 65, in retracted position and at the same time stop the signal mechanism. Under these circumstances the knob 62 is momentarily moved inwardly to the position shown in Fig. 6, and thereupon the shoulder 58 engages the collar 51 moving the plunger into the position shown by the actuating mechanism 65 in Fig. 6, moving the end of plunger 48 from the pin 28 and allowing switch 12 to open. So long as the throttle lever remains retracted the plunger will occupy the position shown in the mechanism 65 of Fig. 6. The inward movement of knob 62 also acts to tilt the plungers of the other switch mechanisms such as that indicated by the numeral 63 but upon release of the knob 62 the release rod 53 returns under action of spring 64, to the position shown in Fig. 5 permitting the plunger of the mechanism 63 to return to the position of Fig. 5. Therefore, in spite of the actuation of the mechanism 65, should the throttle lever corresponding to the mechanism 63 now be retarded, the parts of the mechanism 63 will move into a position similar to that shown by the mechanism 65 in Fig. 5 and again actuate the signal mechanism of the device. It will therefore be seen that the gang arrangement is such that the release of one of the switches by operation of the release rod does not affect the operation of the remaining switch mechanisms. On the other hand, if all of the throttle levers are retarded to the point where they act to move the lever 34 to the dotted line position of Fig. 4, then operation of the plunger 62 will cause all of the switches to be released. Attention is also directed to the fact that the plunger 48 and associated parts provides an overtravel mechanism which prevents undue force or movement from being applied to the pin 28 of the switch sufficient to damage its mechanism.

I claim:

1. The combination in a switch mechanism for operation by a movable element of a unitary

switch having a self-returning actuating member to actuate said switch, spring pressed to a normal position and movable to an abnormal position, an operating lever having a free end positioned for engagement by said element at a preselected position thereof, said lever being rotatable about a fixed center spring pressed to an inoperative position and movable against the spring pressure to operate said member, a spring for said operating lever, said spring constantly urging said lever toward said inoperative position when unrestrained by said element means carried on said lever spaced from said member in the inoperative position of said lever and movable therewith for engaging and operating said member in response to movement of said lever to an advanced position, and means operable to disengage said means from said member while said lever occupies said advanced position to permit return of said member to said normal position.

2. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch spring pressed to a normal position and movable to an abnormal position, an operating lever rotatable about a fixed center, a spring for urging said lever to an inoperative position away from said member, said lever being movable to an advanced position toward said member against the spring pressure to operate the same, an overtravel plunger on said lever for engaging and operating said member in response to movement of said lever to operate said switch, and means operable to disengage said plunger from said member for return of said member to normal position while said lever occupies an advanced position.

3. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch spring pressed to a normal position and movable to an abnormal position, an operating lever rotatable about a fixed center, spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate the same, an overtravel plunger comprising a plunger carried on and longitudinally movable with respect to said lever positioned for engagement with said member upon movement of said lever to an advanced position, and a spring between said lever and said plunger having a strength to hold said lever and plunger against relative movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said plunger after said member reaches said abnormal position, and means operable to move said plunger laterally free from said member for return of the latter to said normal position while said lever occupies an advanced position, said spring acting to reposition said plunger and said lever upon return of said lever to said inoperative position.

4. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch spring pressed to a normal position and movable to an abnormal position, an operating lever rotatable about a fixed center, spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate the same, an overtravel plunger comprising a plunger carried on and longitudinally movable with respect to said lever positioned for engagement with said member upon movement of said lever to an

advanced position, and a spring between said lever and said spring having a strength to hold said lever and plunger against relative movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said plunger after said member reaches said abnormal position, and means operable on said plunger to tilt the same to disengage it from said member for return of the latter to said normal position while said lever occupies an advanced position.

5. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch spring pressed to a normal position and movable to an abnormal position, an operating lever rotatable about a fixed center, spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate the same, an overtravel plunger comprising a plunger carried on and movable longitudinally with respect to said lever positioned for engagement of an end thereof with said member upon movement of said lever to an advanced position, and a spring between said lever and said plunger having the strength to hold said lever and plunger against relative movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said plunger after said member reaches said abnormal position, and a release rod disposed adjacent said plunger movable to engage the same and disengage said plunger from said member while said lever occupies an advanced position for return of said member to said normal position to reposition the switch, said spring being disposed to reposition said plunger with respect to said lever upon return thereof to said inoperative position.

6. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch spring pressed to a normal position and movable to an abnormal position, an operating lever rotatable about a fixed center spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate the same, an overtravel plunger comprising a plunger carried on and movable longitudinally with respect to said lever positioned for engagement with an end thereof with said member upon movement of said lever to an advanced position, said plunger having an annular projection and a compression spring acting between said lever and said annular projection, said spring having the strength to hold said lever and plunger against relative movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said plunger after said member reaches said abnormal position, and a release rod disposed adjacent to and transversely of said plunger, said rod having an annular recess for reception of said projection defining a spaced shoulder adapted to abut said projection and tilt said plunger upon longitudinal movement of said release rod to disengage the plunger from said member while said lever occupies an advanced position for return of said member to said normal position to reposition the switch.

7. The combination in a switch mechanism of a unitary switch having a self-returning actuating

member to actuate said switch, spring pressed to a normal position and movable to an abnormal position, an operating lever spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate said member, said lever having an opening, an overtravel plunger disposed in said opening and carried on said lever for longitudinal and tilting movement with respect thereto positioned for engagement with said member upon movement of said lever to an advanced position, and a compression spring acting between said lever and said plunger to maintain the plunger in upright position, said spring having a strength to hold said lever and plunger against movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said member after said member reaches said abnormal position, and a release rod manually movable in one direction to tilt said plunger against the action of said compression spring to disengage the plunger from said member for return of the latter to said normal position while said lever occupies an advanced position.

8. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch, spring pressed to a normal position and movable to an abnormal position, an operating lever spring pressed to an inoperative position away from said member and movable to an advanced position toward said member against the spring pressure to operate said member, said lever having an opening, an overtravel plunger disposed in said opening and carried on said lever for longitudinal and tilting movement with respect thereto positioned for engagement with said member upon movement of said lever to an advanced position, and a compression spring acting between said lever and said plunger to maintain the plunger in upright position, said spring having a strength to hold said lever and plunger against movement while said member is moved to said abnormal position by said plunger and to provide relative overtravel movement between said lever and said member after said member reaches said abnormal position, a release rod manually movable in one direction to tilt said plunger against the action of said compression spring to disengage the plunger from said member for return of the latter to said normal position while said lever occupies an advanced position, and spring means for returning said release rod.

9. The combination in a switch mechanism of a unitary switch having a self-returning actuating member to actuate said switch, spring pressed to a normal position and movable to an abnormal position, a frame for supporting said unitary switch having spaced side members for securing said switch therebetween, an operating lever disposed between said side members and rotatably supported thereon in spaced relation to said operating member, spring means to bias said lever to an inoperative position remote from said actuating member, said lever being rotatable against the tension of said spring toward said actuating member to an advanced position, stop means on said frame for limiting rotation of said lever under the action of said spring to prede-

termine said operative position, means on said lever for engaging and operating said actuating member upon movement of said lever to an advanced position, said means having overtravel connection with said lever to permit continued movement of said lever after operation of said actuating member, and release means operable to engage the last mentioned means to disengage the same from said actuating member and thereby permit return thereof to said normal position while the lever occupies an advanced position.

10. The combination in a switch mechanism of a bracket for supporting the switch mechanism in operative position, means for supporting a plurality of unitary switches on said bracket in side by side spaced relationship, each of said switches having a self-returning actuating member to actuate the same spring pressed to a normal position and movable to an abnormal position, an operating lever for each of said switches rotatable about a fixed center spring pressed to an inoperative position and movable against the spring pressure to an advanced position to operate said member, overtravel means on each of said levers for engaging and operating said members in response to movement of said levers to an advanced position, and means operative to simultaneously disengage said overtravel means from those of said members the operating levers of which occupy advanced positions, to permit return of said members to their normal positions.

11. The combination in a gang switch assembly of a plurality of switch mechanisms each comprising a unitary switch having a self-returning actuating member to actuate said switch, spring pressed to a normal position and movable to an abnormal position, a frame for supporting said unitary switch having spaced side members for securing said switch therebetween, an operating lever disposed between said side members and rotatably supported thereon in spaced relation to said operating member, spring means to bias said lever to an inoperative position remote from said actuating member, said lever being rotatable against the tension of said spring toward said actuating member to an advanced position, stop means on said frame for limiting rotation of said lever under the action of said spring to pre-determine said operative position, means on said lever for engaging and operating said actuating member upon movement of said lever to an advanced position, said means having overtravel connection with said lever to permit continued movement of said lever after operation of said actuating member, and a release rod seated in said side members for longitudinal movement transversely with respect thereto, said rod being located adjacent the last mentioned means to disengage said last mentioned means from said actuating member to permit return movement thereof to the normal position upon movement of said rod in one direction, means for supporting said switch mechanisms in side by side spaced relationship with the ends of said rods in abutting relationship for simultaneous longitudinal release movement of all of the rods in response to movement of one rod in one direction, and spring means acting on one of said rods to return all of the rods in the opposite direction.

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