Jan. 7, 1936. H. B. JOY 2,026,980

ELECTRIC SWITCH MECHANISM

Filed Jan. 26, 1934

FIG. 1.

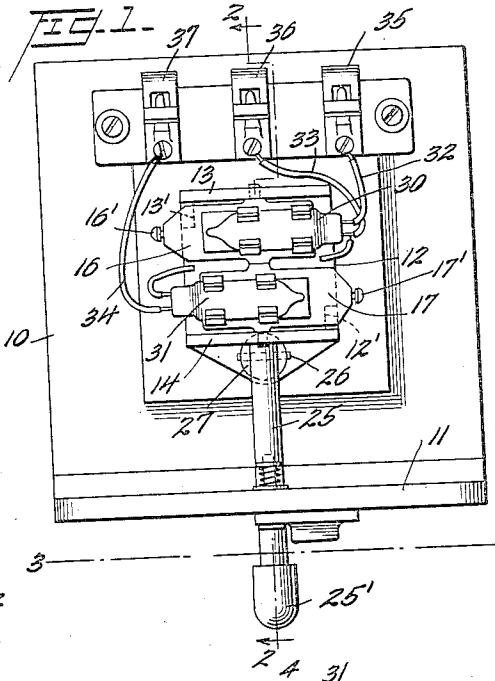


FIG. 10.

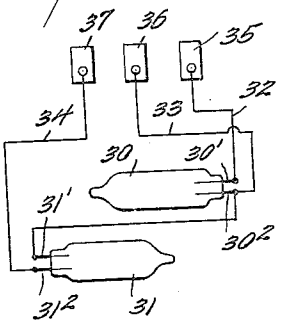


FIG. 7.

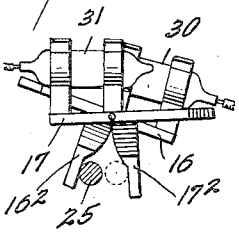


FIG. 8.

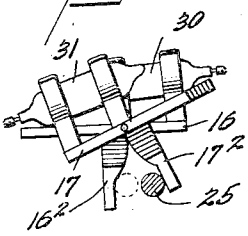


FIG. 9.

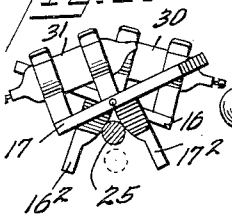


FIG. 2.

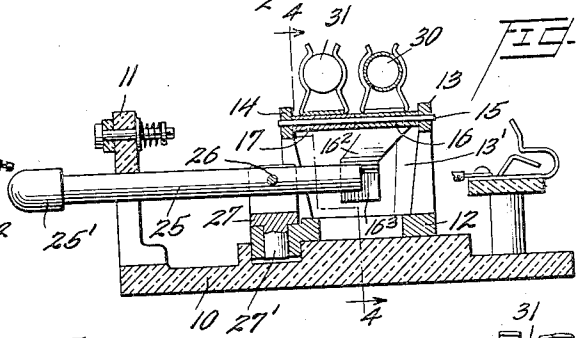


FIG. 3.

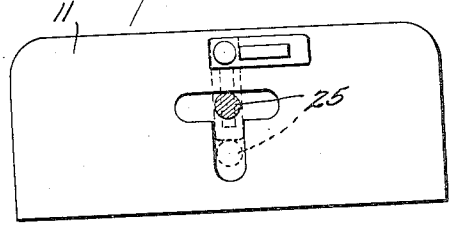


FIG. 4.

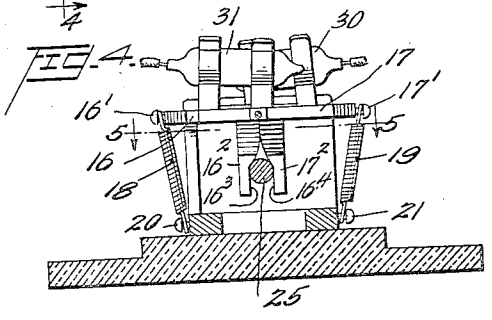


FIG. 5.

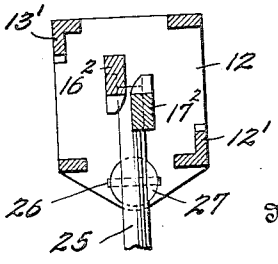
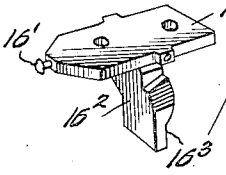


FIG. 6.



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ELECTRIC SWITCH MECHANISM

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Application January 26, 1934, Serial No. 708,508

4 Claims. (Cl. 200—5)

The present invention relates to electric switch mechanisms.

In the manufacture of various types of electrically operated apparatus, it is sometimes found desirable to provide means for bringing three or more electrical conductors into electrical communication with one another simultaneously, or simultaneously electrically connecting such conductors in selected pairs at the will of the operator. Thus, for instance, in constructing target throwing apparatus for use in the game of "Skeet", it is highly desirable to provide an electrical control mechanism by means of which the target throwing apparatus may be caused to discharge a single target from a selected trap, or a target from a second trap as desired, and to likewise occasionally effect the simultaneous discharge of targets from two mutually facing traps.

Mechanism whereby this general object may be accomplished has heretofore been designed or suggested, and certain of these mechanisms have actually been put into use. The present invention contemplates an improved mechanism of this general character which, while primarily intended for use in connection with the target throwing apparatus employed in the game of "Skeet", is of general applicability and may be profitably made use of in many other instances, where it is desired to employ means which permits the operator thereof to selectively close singly one of a plurality of circuits or to simultaneously close all of said circuits.

Apparatus of this type is most conveniently operable when there is but a single operating element to be manipulated, and in accordance with the present invention only one such operating member is utilized. This member is normally maintained in a central or non-operative position by resilient means and is so mounted as to be movable in a plurality of directions or to a plurality of positions. In the form of the mechanism selected for disclosure by way of example, such member is mounted for universal movement and is movable in three directions about its pivotal support, closing one switch when moved in one direction, a second switch when moved in a second direction, and closing both switches simultaneously when moved in the third direction. Upon release of the member either or both of the switches which have been closed thereby are automatically opened and the member returned to its initially non-operative position.

In accordance with the invention, a greater number than two switches may be operated singly or in unison if desired by the single operating member, and the method of mounting and operating this member may be considerably modified to suit various operating conditions.

In the drawing:

Figure 1 is a plan view of the embodiment of the switch mechanism selected for disclosure;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a section on line 3—3 of Figure 1;

Figure 4 is a section on line 4—4 of Figure 2;

Figure 5 is a section on line 5—5 of Figure 4;

Figure 6 is a perspective view of one of the switch carrying members;

Figures 7, 8, and 9 are diagrammatic views showing the switch carrying members and the switches carried thereby in various positions; and

Figure 10 is a diagram showing the circuits through the switch mechanism.

The switch mechanism is shown to be mounted upon a block of wood or insulating material 10 which, in the embodiment of the invention selected for illustration, is intended to be supported in a horizontal plane. To one edge of the base block 10 is secured a flat vertical member or front plate 11, also of insulating material. Other portions of the enclosing casing are not shown, but it will be understood that the apparatus hereinafter to be specificially described may be suitably enclosed in any desired manner.

Mounted centrally of block 10 upon the upper surface thereof is a frame 12 preferably formed of metal by casting, this frame carrying the operating parts of the mechanism. Thus the frame includes upwardly projecting pedestal members 13 and 14, and supported in aligned apertures formed in these members is a shaft 15 of small diameter. Shaft 15 also extends through aligned apertures formed in switch supports 16 and 17 which are adapted to rock about this shaft as an axis. Switch supports 16 and 17 are elongated flat members, which members are provided, at opposite ends thereof respectively, with elements 16' and 17' to which the upper ends of the coil tension springs 18 and 19 are secured, the lower ends of these springs being fastened at 20 and 21 to the bottom member or horizontal portion of the frame 12. The springs 18 and 19 tend, respectively, to pull switch supports 16 and 17 downwardly, and to limit this downward movement of each such switch supporting member, in one direction, a shoulder is provided on the frame, these shoulders being indicated at 12' and 13' respectively. By the cooperation of the springs and frame shoulders just described, the switch supports are normally

maintained in a horizontal position as shown in Figures 2 and 3.

Projecting downwardly from each switch support at a point closely adjacent the axis 15 is an extension, rockably mounted, these extensions being indicated at 16^2 and 17^2 respectively, the extensions being generally parallel when plates 16 and 17 are in normal position, and the lower portions thereof having mutually facing surfaces 16^3 and 16^4. While the lower portions of these surfaces are normally in parallelism as shown in Figure 4, the upper portions converge upwardly as shown in this figure and in reality comprise cam surfaces. The switch operating member is indicated at 25, this member being disposed in a generally horizontal position and being mounted for rocking movement in a vertical plane upon the pin 26, the ends of which are supported in the parallel upwardly extending pedestals of supporting member 27 which is in turn mounted for free rotation about a vertical axis, a downwardly extending cylindrical pin 27' integral with this member being rotatably received within a similarly formed cylindrical aperture in the bottom member of the frame 12. Operating member 25 projects through a T-shaped slot in front plate 11 and is preferably provided at its outer end with a handle portion 25'. Its inner end lies between the extensions 16^2 and 17^2 of the switch supports 16 and 17, as shown in Figure 4 of the drawing.

Mounted upon the tops of the switch supports 16 and 17 in any suitable manner are the mercoids or liquid contact switches 30 and 31, these mercoids being of well-known construction and both being normally positioned with their axes substantially horizontal, preferably slightly inclined to the horizontal so that the small body of mercury in each is remote from the switch terminals when the supports are in normal position. The switch terminals of mercoid 30 are indicated at 30' and 30^2 and those of mercoid 31 at 31' and 32^2. It will be observed from Figure 10 that switch terminal 30^2 is electrically connected to switch terminal 31'. In addition a conductor 32 is connected to switch terminal 30', a conductor 33 to switch terminal 30^2, and a conductor 34 to switch terminal 31^2. Conveniently, conductors 32, 33, and 34 may lead to binding posts or wire clamps 35, 36, and 37, respectively, to which binding posts further wires or conductors, not shown, may be connected.

From an inspection of Figure 10, it will be clear that when mercoid 30 is tilted, conductors 32 and 33 will be connected together electrically; that when mercoid 31 is tilted, conductors 33 and 34 will be connected together electrically; and that when both mercoids are tilted simultaneously, the three conductors 32, 33, and 34 will be interconnected electrically.

The operation of the mercoids selectively or simultaneously is brought about by suitable manipulation of the operating member 25 which, when moved to the right in the T-slot shown in Figure 3, will operate mercoid 30 by acting against extension 16^2 of switch support 16. This position of the operating member of mercoid 30 is indicated in Figure 7. When the handle of the operating member is pressed to the left (Figure 3), mercoid 31 will be operated in a similar manner, the second switch support being tilted while the first remains stationary as before. When the operating lever is pushed vertically downward, its inner end rides upwardly between the downward extensions of the switch supports and acts simultaneously upon the inclined cam surfaces of both such extensions, as indicated in Figure 9, both mercoids being tilted and the three conductors 32, 33, and 34 being simultaneously connected together.

As soon as the operating member is released from any one of its operative positions, it is immediately returned to the neutral position, as shown in Figures 3 and 4, the springs 18 and 19 being effective for this purpose, acting through the respective downward extensions of the switch supports. After a manipulation of the operating member, which results in simultaneous actuation of the switch supports and release of the member, springs 18 and 19 act simultaneously to restore the operating member to its first position, this member being squeezed downwardly by the coacting mutually facing cam surfaces formed on the downward extensions of the switch supports.

It will thus be seen that the foregoing mechanism provides a very simple, inexpensive, but thoroughly effective means for selectively connecting together either of two pairs of conductors or for simultaneously connecting together electrically all of the conductors. Naturally, in adapting the principles of the invention in the solution of various problems, the design and arrangement of the component elements of the invention may be considerably modified, and that embodiment of the invention which is illustrated is set forth by way of example only. If desired, a greater number of mercoids may be provided and a greater number of electrical conductors incorporated in the mechanism so that, by the manipulation of a single operating member, more than three such conductors may be simultaneously connected while at the same time the mechanism permits electrical connection of pairs of the conductors together as desired.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Electric switch mechanism comprising a frame, two switch actuating members mounted upon the frame for tilting movement, a switch associated with each such member and adapted to be opened and closed by the tilting movements thereof, resilient means normally maintaining said members in such positions that the switches are open, an element for operating said members, means supporting said element on the frame in such manner that it may be moved to tilt either member singly or both members in unison against the action of said resilient means, said members having oppositely facing relatively inclined surfaces both of which lie in one path of movement of said element, simultaneous tilting of said members being effected when said element is moved along said path to engage and laterally displace said surfaces.

2. Electric switch mechanism comprising a frame, two independently operable switch actuating members, each mounted on the frame for tilting movement, a switch associated with each such member and adapted to be opened and closed by the tilting movements thereof, resilient means normally maintaining said members in predetermined positions, respectively, an element for operating said members, means supporting said element on the frame in such manner that it may be moved to tilt either member singly or both members in unison against the action of said resilient means, said members having oppositely facing relatively inclined surfaces posi-

tioned to be simultaneously slidably engaged by said element when said element is moved in one direction to effect simultaneous tilting of said members, the said surfaces being so relatively inclined as to cooperate in returning said element to a neutral position when said element is released and the resilient means acts to return said members to their original positions.

3. The combination set forth in claim 2 in which said members are mounted to rock about a common axis and the relatively inclined oppositely facing surfaces are disposed substantially radially to said axis.

4. Electric switch mechanism including a frame, two switch operating members having oppositely facing relatively inclined surfaces, means supporting the said members upon the frame for limited movements relatively thereto, respectively, an operating element, means supporting said element upon the frame in such manner that it may be moved to press normally against either of said surfaces and to actuate the corresponding member, or may be moved to simultaneously press against both such surfaces to simultaneously actuate both members, and means normally urging said members to definite positions, which means, acting through said members, automatically returns said element to neutral position when released.

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