

[54] **OPERATOR PLATE COMMON TO MULTIPLE PUSHBUTTON SWITCH OPERATORS ALLOWING SIMULTANEOUS ACTUATION OF PLURAL SWITCH ASSEMBLIES DURING MOMENTARY OR INTERLOCKING MODES OF OPERATION**

[75] Inventor: **Bernard J. Golbeck**, Crystal Lake, Ill.

[73] Assignee: **Oak Industries Inc.**, Crystal Lake, Ill.

[22] Filed: **Aug. 10, 1973**

[21] Appl. No.: **387,316**

[52] U.S. Cl. **200/5 B, 200/5 C, 200/5 R, 200/50 C, 74/483 PB**

[51] Int. Cl. **H01h 9/26, G05g 11/00**

[58] Field of Search..... **200/5, 50 C; 74/483 R, 74/483 PB**

[56]

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Primary Examiner—James R. Scott

Attorney, Agent, or Firm—Kinzer, Plyer, Dorn & McEachran

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ABSTRACT

A pushbutton switch array has separate switches, each with an independently operable plunger, said switches being arranged in rows and columns. A plate overlays the switch array and has an opening for each switch plunger. Movement of any one switch plunger causes movement of the plate, with movement of the plate in turn closing a separately positioned switch member.

9 Claims, 2 Drawing Figures

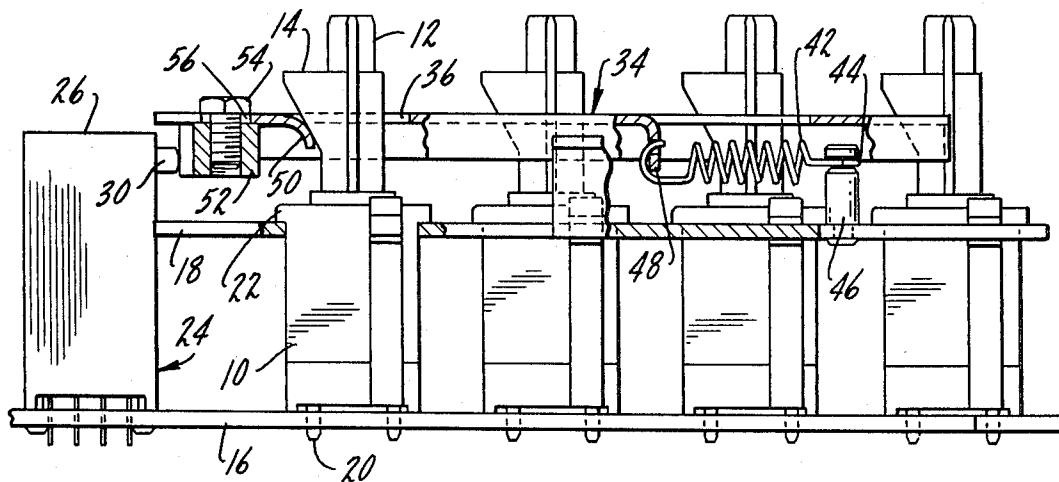


fig. 1.

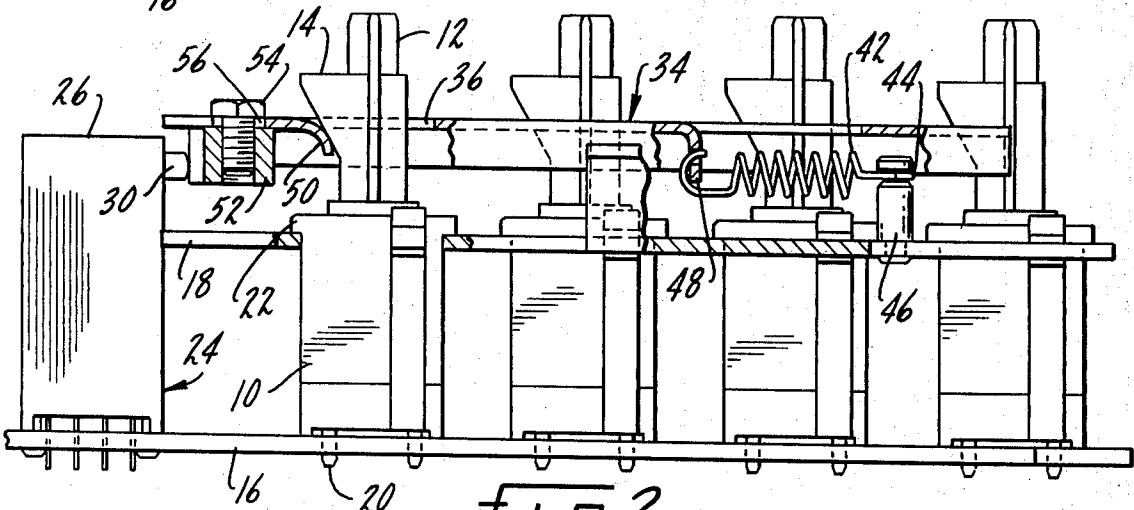
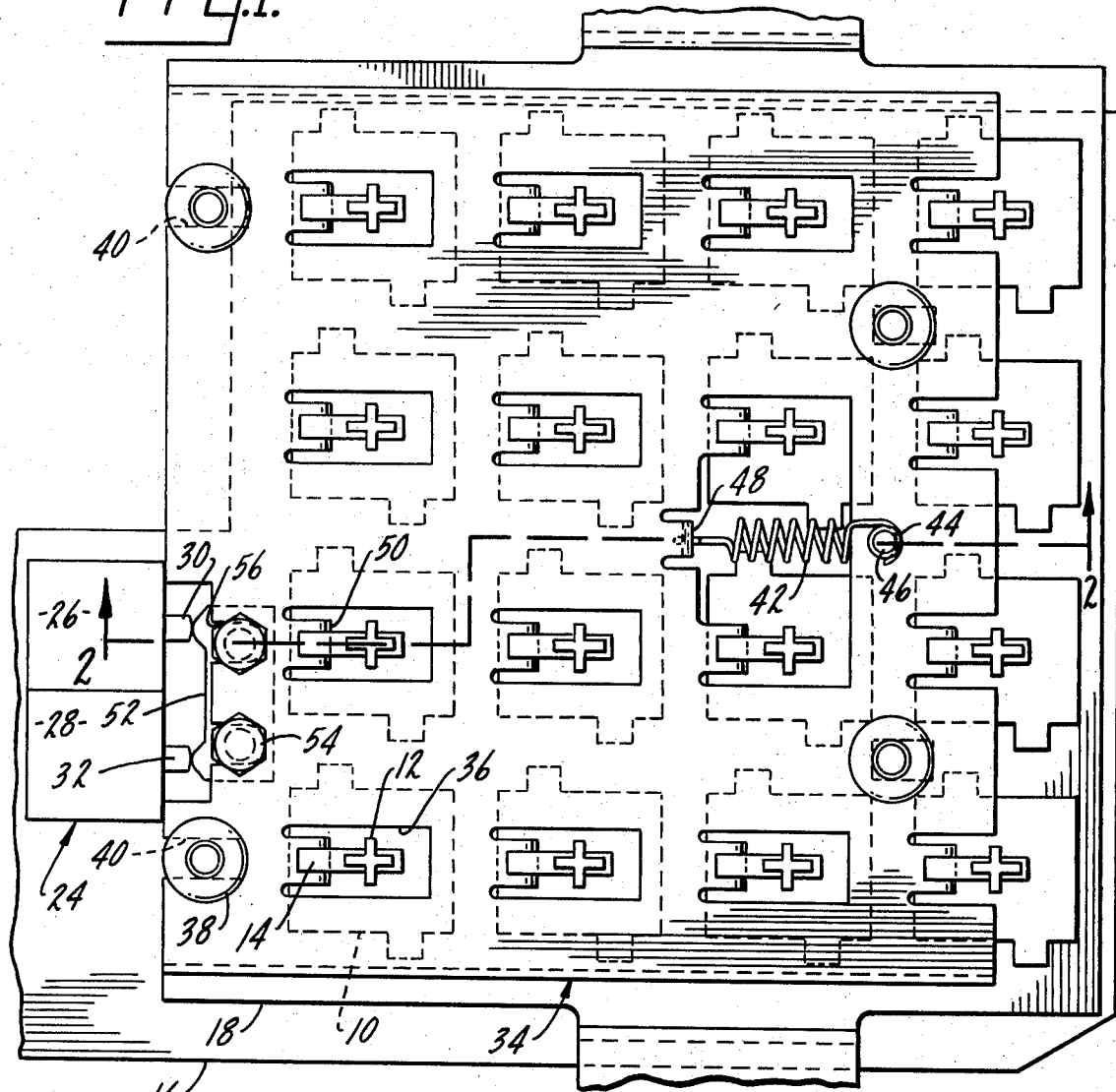


fig. 2.

OPERATOR PLATE COMMON TO MULTIPLE PUSHBUTTON SWITCH OPERATORS ALLOWING SIMULTANEOUS ACTUATION OF PLURAL SWITCH ASSEMBLIES DURING MOMENTARY OR INTERLOCKING MODES OF OPERATION

SUMMARY OF THE INVENTION

The present invention relates to pushbutton switch arrays, and in particular to such an array in which operation of any one pushbutton causes the operation of a particular switch means.

Another purpose is a switch array of the type described using a simply constructed and reliably operable switch operator to cause operation of a particular switch upon operation of any one of a number of pushbutton switches in the array.

Another purpose is a switch array of the type described including spring means normally biasing the switch operator or plate away from the switch means.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

FIG. 1 is a top plan view of a switch array of the type described, and

FIG. 2 is a section along plane 2—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to a switch array construction in which operation of any one of a number of pushbutton switches arranged in rows and columns will cause operation of a particular switch means. The switch means may control operation of a tone generator or other form of indicator or, in the alternative, the switch means may be used to cause operation of an interlock of one type or another. What is important in the invention is the switch operator which has portions in common with each switch plunger in the array, such that movement of any plunger causes the switch operator to move into operable contact with the switch means.

A plurality of pushbutton switches are arranged in rows and columns with each switch being indicated at 10. Each pushbutton switch 10 has a plunger 12 extending upwardly therefrom, with each plunger 12 having a projecting portion 14 arranged for operable contact with the switch operator as described hereinafter.

A frame for the switch array includes a printed circuit board 16 and an upper frame member 18. The lower portion of each pushbutton switch has terminals 20 which extend through and are soldered to the printed circuit board 16. Each of the pushbutton switches are physically attached to the upper frame member 18, as illustrated particularly in FIG. 2. Note the shoulder 22 on each switch 10 which rests upon frame member 18.

Mounted to the P.C. board 16, at the left-hand side thereof, is a switch housing 24 which contains a pair of switches diagrammatically illustrated in FIG. 1 at 26 and 28. Switch 26 has a plunger 30 extending out-

wardly therefrom, and switch 28 has a plunger 32 extending outwardly therefrom.

A switch operator or plate is indicated generally at 34 and has a plurality of openings 36, there being one such opening for each of the switches 10. The switch plungers 12 each extend through one of the openings 36. There may be a plurality of mounting elements 38 which extend upwardly from the upper frame member 18 to support the plate 34 upon the frame. The mounting elements 38 are fixed to the frame and pass through plate slots 40 which permits the plate 34 to move back and forth upon the frame.

A spring 42 may have one end 44 attached to a post 46 which is mounted on the upper frame member 18. The opposite end of spring 42 is attached to a down-turned ear 48 which is integral with the plate 34. Thus, spring 42 biases plate 34 away from switch plungers 30 and 32.

Plate 34 has a down-turned projection 50 adjacent each opening 36, with said projections 50 being formed and adapted to be contacted by projecting portions 14 of each plunger 12. As clearly indicated in FIG. 2, downward movement of any one switch plunger 12 will cause plate 34 to be moved to the left. Thus, each plunger is positioned to operate independently of all other switches, but operation of any one plunger is effective to cause the switch operator or plate 34 to be moved to the left.

A switch actuator 52 is fastened to plate 34 by mounting studs or the like 54. Studs 54 pass through slots 56 in plate 34, with the cooperation of the slots and studs permitting adjustment of the relative position of switch actuator 52 and plungers 30 and 32. Thus, to overcome any variation in the actual size of the members due to manufacturing tolerances, and to adjust for the proper applied pressure to plungers 30 and 32, the position of switch actuator 52 may be adjusted when the switch array is assembled.

In operation, depression of any one of the plungers 12 will cause the plunger portion 14 associated with that plunger to strike portion 50 of plate 34. The force of the moving plunger will move plate 34 to the left, against the force of spring 42, causing switch actuator 52 to operate switch plungers 30 and 32. Note that each switch plunger may operate independently of the others, but operation of any one switch plunger will cause switch operator or plate 34 to cause operation of switches 26 and 28.

The shape of plunger portions 14 and the relative positions of portions 14 and portions 50 of plate 34 cause operation of switches 26 and 28 just prior to operation of the contacts associated with the particular operated plunger. The adjustment of switch actuator 52 insures the proper sequence of operation.

Although the plate 34 has been shown as positioned above each of the pushbutton switches 10, the invention should not be limited to this particular configuration. What is important is to provide an arrangement whereby operation of any one switch plunger will cause operation of the switch operator or plate which in turn can cause operation of one or two switch members associated with the entire array.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there may be many modifications, substitutions and alterations thereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A pushbutton switch array including a plurality of independent pushbutton switches, each having independently operable switch plungers, a frame for supporting said switches in spaced relationship with each other,

a common switch operator movably positioned on said frame, said switch operator having a plurality of openings, with integral turned-down projections adjacent each opening, said switch plungers having portions extending through said openings, said switch operator projections being formed for contact by a switch plunger when the same is moved to operate a particular switch, spring means connected between said operator and frame urging said switch operator projections toward said switch plungers,

switch means adjacent said frame and having an operating portion thereof positioned to be contacted by said switch operator,

inward movement of a switch plunger causing said plunger to contact a switch operator projection to move said switch operator, against the action of said spring, to cause actuating movement of said switch means operating portion.

2. The structure of claim 1 further characterized in that said switch operator is a plate, said pushbutton switches being arranged in rows and columns, with said switch operator openings being similarly arranged.

3. The structure of claim 2 further characterized in that said plate is positioned above said pushbutton switches, with portions of said plungers extending up-

wardly through the openings in said plate.

4. The structure of claim 1 further characterized by and including means for adjusting the effective distance between said switch means operating portion and said switch operator.

5. The structure of claim 4 further characterized in that said switch operator is a plate, said adjusting means including a switch member attached to said plate and positioned to contact said switch means operating portion.

6. The structure of claim 1 further characterized in that said frame includes a frame member and a spaced printed circuit board, said switch operator being a plate, means for supporting said plate upon said frame member.

7. The structure of claim 6 further characterized by and including a mounting post extending upwardly from said frame member, said spring means being attached to said mounting post at one end and having the opposite end in engagement with said plate.

8. The structure of claim 6 further characterized in that said support means include studs extending upwardly from said frame member, slots formed in said plate with said studs passing through said slots to permit movement of said plate or said one frame member.

9. The structure of claim 1 further characterized in that said switch plungers each have projecting portions positioned to contact said switch operator projections causing movement of said switch operator and consequent operation of said switch means prior to operation of a switch associated with an operated plunger.

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