Dec. 27, 1966 G. A. HILL 3,294,927

FLAP ELEMENT FOR SWITCH APPARATUS

Filed Feb. 1, 1965 2 Sheets-Sheet 1

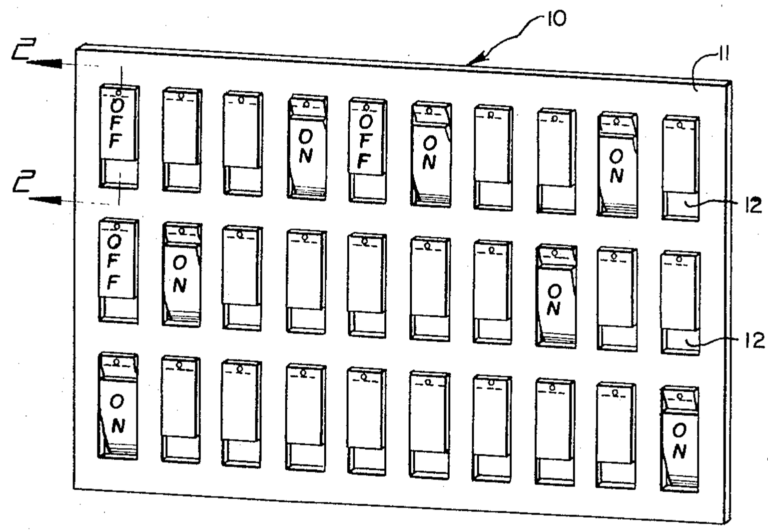

Fig.1

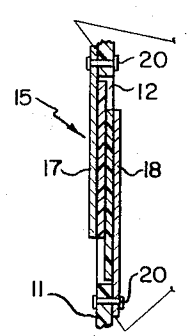

Fig.2

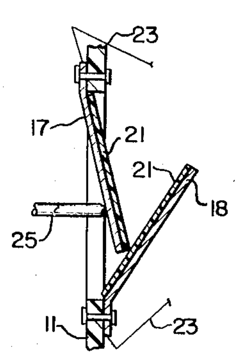

Fig.3

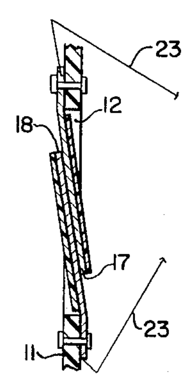

Fig.4

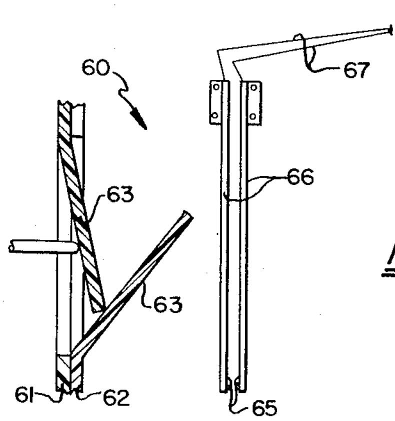

Fig.7

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FLAP ELEMENT FOR SWITCH APPARATUS

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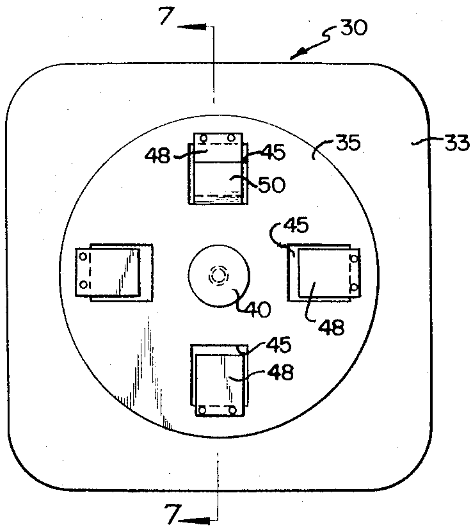

Fig. 5.

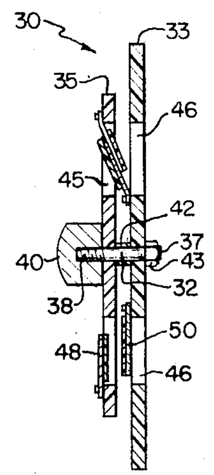

Fig. 6.

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RESILIENT FLAP ELEMENT FOR SWITCH APPARATUS

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5 Claims. (Cl. 200—5)

This invention relates to electrical switch apparatus for controlling electrical circuits.

The automation of industrial apparatus and the consequent necessity for centralized control both of processes and the apparatus, have resulted in the use of extensive electrical circuitry controllable by means of a multiplicity of electrical switches usually mounted on a single console. These consoles and switches associated therewith are usually expensive to manufacture and install and, in view of the fact that the elements of the switches are usually raised above the console, some of the switches may be accidentally moved during the movement of a selected switch element. It is also to be found that the switches usually have their contact point hidden from view and therefore in the event of their malfunction the operator may not know that one of the switches is defective. The present invention seeks to overcome the objection of the standard former switches by providing a switch apparatus which is inexpensive to produce, and in which the movable elements of the switch are so located that they are not likely to be accidentally moved.

The present invention also provides a switch apparatus in which the contact elements themselves are always in view and make defective operation of any of them quickly apparent.

The present invention further provides a switch apparatus in which the movable elements may be located close together, a feature which will enable the construction of compact switch consoles and therefore efficient control of a multiplicity of electrical circuits.

The present invention comprises a pair of resilient flap elements each fixedly mounted at one of their ends on spaced supports and fixedly swingable in the same plane, said elements normally extending towards and parallel to each other with a free end portion of one of them overlapping a free end portion of the other, the overlapping element being adapted to be swingably moved against the overlapped element to move the latter out of the path of the former to thereby permit the overlapped element to return to its normal position ahead of the overlapping element, and electrical switch contact means operatively associated with the flap elements for movement between open and closed positions as overlapped disposition of said flap elements is reversed.

In the drawings which illustrate embodiments of the invention,

FIGURE 1 is a view of a form of switch console having a multitude of switches of one embodiment of this invention,

FIGURE 2 is a section along line 2—2 of FIGURE 1 illustrating one embodiment of the switch apparatus,

FIGURES 3 and 4 illustrate the operation of the embodiment of the switch of FIGURE 2,

FIGURE 5 illustrates a different type of console from that illustrated in FIGURE 1, utilizing the switch of FIGURE 2,

FIGURE 6 is a section taken along line 6—6 of FIGURE 5, and

FIGURE 7 illustrates another embodiment of the switch apparatus.

Referring to the drawings, specifically to FIGURES 1 to 4 thereof, there is illustrated one embodiment 10 of the switch apparatus.

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Switch apparatus 10 is preferably formed of a single sheet 11 composed of a stiff non-conductive material, such as a thermoplastic, and which is provided with a series of rows of elongated rectangular apertures 12. This sheet 11 forms the base for the switch console, each of the apertures 12 being formed for the purpose of providing operative space for individual switch elements as hereinafter to be described.

FIGURES 2 to 4 illustrate such an individual switch element 15 and comprises a pair of tongues or flaps 17 and 18 secured on opposite sides of the sheet and at opposite ends of the apertures 12. These tongues are formed of a stiffly resilient electro-conductive material, such as phosphor-bronze, each of them being secured at one of their ends to the sheet 11 by rivets 20, and each being of sufficient length that each extends more than halfway across the aperture so as to overlap the other. Each of the tongues are also a little narrower than the width of the aperture so that their free ends may be swung through the aperture.

One side of each of the tongues is provided with a coating of non electro-conductive material, such as a thermoplastic material, herein designated with the number 21, said sides being adjacent surfaces of the tongues when the latter are arranged in their normal position, as shown in FIGURE 2, and to each of the tongues 17 and 18 are connected leads 23 of an electrical circuit which, it is contemplated, the switch element 15 shall control. The other sides of the tongues may be coated with silver cadmium oxide to ensure positive contact surfaces.

The operation of the switch apparatus 15 may be best described with reference to FIGURES 2 to 4, which illustrate in sequence the movement of the tongues 17 and 18 relative to each other between a non contact and contact position. As has been hereinbefore explained, the tongues 17 and 18 in their normal position extend parallel to each other and in planar parallelism with the sheet, with the non electro-conductive coating of each of them facing each other so as to ensure that their electro-conductive surfaces do not make contact. In this position as illustrated in FIGURE 2, the circuit, which the switch element controls is, or course, open. In order to effect closure of the circuit, tongue 17 is swung, preferably with the use of a rod 25 made of a non conductive material, such as a thermoplastic, against tongue 18. This, as shown in FIGURE 3, will swing tongue 18 outwardly until the free ends of each of the tongues are clear of each other. Tongue 18 will, by reason of its resiliency, snap back to a normal position ahead of tongue 17, and then by simply relieving the pressure on tongue 17, the latter tongue will then attempt to return to its normal position and, in doing so, will press upon tongue 18, both tongues assuming a position as shown in FIGURE 4. It will be seen in this position that their electro-conductive surfaces are pressed tightly together, thereby closing the circuit which they control.

In order to return the circuit to an open position, the above procedure may simply be reversed, that is, by pressing tongue 18 against tongue 17 until both their free ends are clear of each other to allow tongue 17 to again return to its normal position with its non conductive coating 21 facing the non conductive coating of tongue 18.

FIGURES 5 and 6 illustrate another embodiment 30 of the switch apparatus. Switch apparatus 30 comprises a thin sheet 33 of non electro-conductive material, such as thermoplastic or the like, which is to serve as the base for the switch apparatus. Secured over this sheet 33 and in planar parallelism therewith, is a disc 35 again formed of a dielectric material, such as thermoplastic or the like. This disc is non rotatably mounted on a shaft 36, one end 37 of which extends through the sheet 33 and the other end 38 of which is provided with a knob 40. A washer 42 is fitted over the shaft between the disc and the sheet, and the disc is tightened down over the sheet by a nut 43 threaded over the end 37 of the shaft. With this construction, it will be seen that by rotating the knob, the disc 35 may be rotated relative to the sheet 33.

The disc 35 is provided with a plurality of rectangularly shaped apertures 45 spaced concentrically about the shaft 36 with their longitudinal axes extending radially from the latter. The sheet 33 is also provided with a series of apertures 46 of the same size as apertures 45, and being spaced concentrically about the shaft 36 and the same distance outwardly therefrom as apertures 45. It will be seen that with this construction, a selected one of the apertures 45 may be brought into registry with a selected one of apertures 46.

Both the disc 35 and sheet 33 are provided with tongues or flaps, the tongues on disc 35 being afforded the numeral 48 and the tongues on sheet 33 being afforded the numeral 50. The tongues 48 are secured to the disc 35 in the same manner as tongues 13 are secured to the sheet 11 of switch apparatus 10, and are formed of a similar electro-conductive material as the latter. Tongues 48 are secured to the disc 35 on its surface opposite its surface facing the sheet 33, and extend in their normal position in planar parallelism with disc 35 from the radially outer end of each of the apertures 45 towards the opposite end of said apertures, whereas tongues 50 extending from the radially inner end of the apertures 46 towards the radially outer ends thereof, and are secured to sheet 33 on its surface facing disc 35. It is also to be noted that the tongues 48 and 50 are of sufficient length that when a selected one of the apertures 45 and 46 are brought into registry, said tongues will overlap each other at their free ends.

The tongues 48 are provided on their surfaces facing the sheet 33 with a non electro-conductive coating, and the tongues 50 are similarly coated on their surfaces facing the disc 35, and each of the tongues is connected by leads, not shown, in an electrical circuit which, it is intended, the switch apparatus 30 shall control.

The tongues 48 and 50, as hereinbefore noted, extend parallel to each other with their non electro-conductive surfaces facing each other so as to ensure open circuit. When it is desired to close a specific circuit, it is only necessary to rotate disc 35 to a position in which one of the tongues 48 is located over a selected one of the tongues 50 of the sheet 33. The relative positions of tongues 48 and tongues 50 are then changed by the use of a thin non conductive rod in the same manner as tongues 17 and 18 of switch apparatus 10 are changed so as to bring their electro-conductive surfaces into contact with each other. It will be seen that when the positions of the tongues are reversed in the manner hereinbefore described, the tongue 48 of disc 35 will extend towards the adjacent aperture 46 in sheet 33, whereas tongue 50 of the sheet 33 will extend into the adjacent aperture 45 of disc 35. With one of the switch elements in this position, it will be seen that the disc and sheet are interlocked against relative rotational movement so as to prevent accidental opening of the circuit which has been closed by the reversal of the selected tongues as hereinbefore mentioned.

FIGURE 7 illustrates another form or embodiment 60 of the apparatus. However, in apparatus 60 two sheets 61 and 62 of a thin stiffly resilient non electro-conductive material is used. These sheets 61 and 62 each have a plurality of U-shaped elongated tongues or flaps formed internally thereof, the tongues or flaps being formed by making a series of U-shaped cuts in the material. The tongues or flaps 63 in each of the sheets 61 and 62 are arranged in rows similar to the manner in which the switch elements 15 of apparatus 10 are arranged, and the sheets are fastened back to back with the tongue of one of them extending in an opposite direction to and overlapping the free end portion of the tongue of the other. The sheets 61 and 62 are relatively located so that the apertures formed, when the tongues are bent out of the plane of their respective sheets, lie in registery with each other.

Behind the tongues 63 are arranged a pair of normally spaced apart contact points 65 carried at the free ends of spring arm members 66, the latter being connected by leads 67 in an electrical circuit which the apparatus 60 is designed to control. The arm members 66 are formed of springy electro-conductive material, such as copper or brass, and extend in planar parallelism with the sheets 61 and 62, and are located adjacent the tongue 63 in a position whereby, when one of the tongues is moved outwardly of the plane of its sheet, as shown in FIGURE 7, the free end of the tongue will contact one of the arms and swing it towards the other to thereby close the contact points. The movement of the tongues 63 is again accomplished by way of pressing one of them against the other with a rod 68 to a point where their free ends swing clear of each other. This will permit the underlying tongue or flap to snap back into position ahead of the previously overlying flap and, at the same time, contacting the arms 66 to close the contact points 65. It is contemplated that the tongues 63 shall have inprinted thereon suitable indicia which may be interchanged during the reversal of overlap of the tongues to provide visual evidence of their reversed condition and of the fact that the circuit has been closed.

It is to be noted that switch apparatus 10, 30 and 60 have been illustrated and described only in their most simplified form and that many and varied forms of tongues or flaps may be employed. It is therefore to be understood that the invention hereinbefore set out is not limited to its specific construction as hereinbefore described, but shall extend to any form of switch apparatus embodying the broad concept of reversible overlapping tongue and flap elements.

What I claim as my invention is:

1. Electrical switch apparatus comprising a pair of resilient flap elements each fixedly mounted at one of its ends on spaced supports and swingable in the same plane, said elements normally extending towards and parallel to each other with a free end portion of one of them overlapping a free end portion of the other, the overlapping element being swingably movable against the overlapped element to move the latter out of the path of the former so as to permit the overlapped element to return to its normal position ahead of the overlapping element, and relatively fixed electrical switch contact means operatively associated with the flap elements for movement therewith between open and closed positions as overlapped disposition of said flap elements is reversed.

2. Electrical switch apparatus as claimed in claim 1 in which the electrical switch contact means comprises a pair of swingably mounted arms having contact elements at their free ends, arranged in the path of the flap elements, to move their contact elements together when one of the arms is moved by its engagement with one of the flap elements as the overlapping disposition of the latter is reversed.

3. Electrical switch apparatus comprising a pair of resilient flap elements each formed of an electro-conductive material and being contact points in an electrical circuit and mounted at one of their ends on spaced supports and swingable in the same plane, said elements normally extending towards and in spaced planar parallelism to each other with a free end portion of one of them overlapping a free end portion of the other, the overlapping element being swingably movable against the overlapped element to move the latter out of the path of the former to thereby permit the overlapped element to return to its normal position ahead of the overlapping element, whereby said overlapping element, upon attempting to return to its normal overlapping position, will engage the formerly overlapped element so as to form a closed circuit.

4. Electrical switch apparatus as claimed in claim 3 including a non electro-conductive coating on the adjacent surfaces of the flap elements when the latter are disposed in their normal position.

5. Electrical switch apparatus as claimed in claim 3 in which the flap elements are movable laterally of each other and including abutment means associated with one of the flap elements engageable by the other of the flap elements to prevent said lateral movement when said elements are moved from their normal position to a reversed overlapping position.

No references cited.

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