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MANUALLY OPERATED ELECTRICAL SELECTIVE SWITCHING DEVICES

Filed April 24, 1961

2 Sheets-Sheet 1

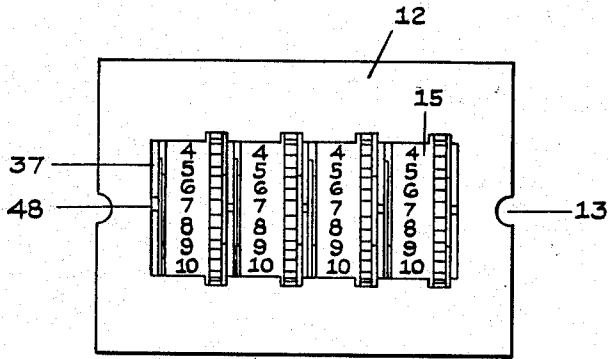


Fig. 1

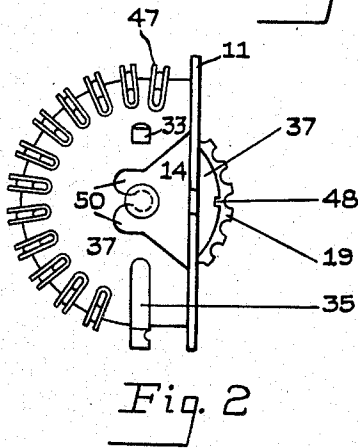


Fig. 2

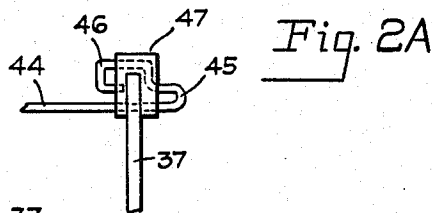


Fig. 2A

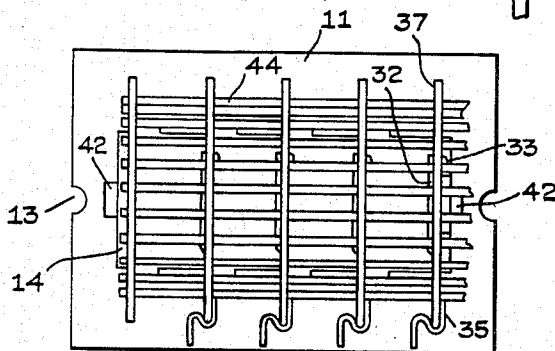


Fig. 3

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2 Sheets-Sheet 2

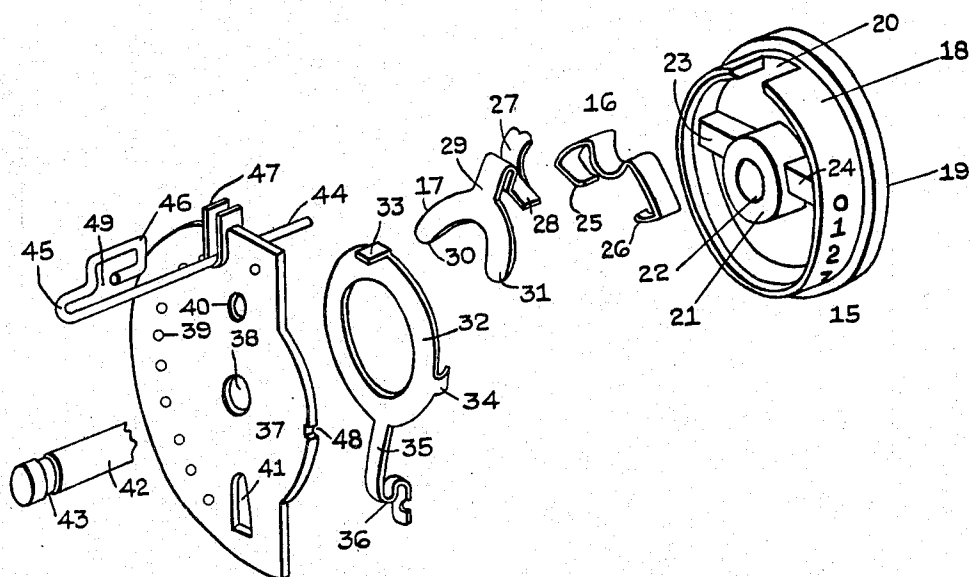


Fig. 4

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## MANUALLY OPERATED ELECTRICAL SELECTIVE SWITCHING DEVICES

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3 Claims. (Cl. 200—11)

The present invention relates to selective electrical switching devices of the hand-operated type.

So-called stud-type selective switches are well known, and these often comprise an arcuate array of contact studs, contained in a shallow cylindrical body portion, and arranged to be traversed by a wiper blade secured to a central rotatable shaft carrying a knob to facilitate rotation by hand. This type of switch, which may have say twelve contact studs, is usually secured to an instrument panel with the rotatable shaft passing through a hole in the panel. Although these switches are by no means bulky they do consume a considerable mounting space of the panel. This is particularly evident when many such switches are mounted on a panel.

The need arises in traffic signalling systems for example, for switching arrangements whereby a plurality of individually hand-controlled wipers may be connected selectively to outlet paths accessible to all the wipers. The appropriate number of the known type of stud switches may be used for this purpose but the panel space involved would be excessive and moreover multiple-wiring between contact studs of the switches would be required so that the cost of the arrangements would be high. The requirement, therefore, arises for a compact, reliable and inexpensive selective switching device which provides the same facilities as a group of multiplied stud switches arranged as outlines.

The main object of the present invention is to provide a switching device which meets the aforesaid requirement.

According to a feature of the invention is a manually operated selective electrical switching device having a plurality of separately operable selecting members, said selecting members are mounted for independent rotation on a common shaft and are each provided with a wiper blade secured for rotation therewith, the wiper blades of all the selecting members being adapted to selectively engage any one of a plurality of electrical conductors fixedly secured relative to said common shaft.

The details of the invention will be understood from the following description of the preferred method of carrying it into effect which should be read in conjunction with the accompanying drawings comprising FIGS. 1 to 4.

The drawings relate typically to a selective switching device having four hand-operable switching units each arranged for independent selective connection to a common array of contact rods. Of the drawings:

FIG. 1 is a front view of the device,

FIG. 2 is a rear view of the device with certain parts omitted for simplicity,

FIG. 2A illustrates the method of securing one of the contact rods of the device,

FIG. 3 is a side elevation of the device looking towards the right of FIG. 2, and

FIG. 4 is an exploded view of a portion of the switching device.

Corresponding parts appearing in different drawings are given identical references.

The escutcheon plate 12, which is provided with semi-circular cut-outs such as 13 for mounting purposes, has a substantially rectangular central aperture through which

the number wheels of four co-axially disposed switching units protrude frontwardly. The short sides of the aperture are each bounded by a rearward bracket 14 formed integrally with the plate.

Details of a typical switching unit are included in FIG. 4, and it comprises a number wheel 15, moulded from suitable plastic material such as "Bakelite," a pressure spring 16 and a wiper spring 17, the latter two components being formed from nickel silver strip.

The number wheel which is open at one side only and is of concentric form, has a number-bearing outer wall 18 which is provided with a serrated lip 19 to facilitate rotation. Although the serrations are not represented in FIG. 4 their form can be seen in FIGS. 1 and 2. The wall 18 is provided with a slot 20. The numbers ("0" to "11") on the number wheel correspond to the selective positions of the switching unit. The number wheel has a central bearing bush which protrudes slightly beyond the wall, and it may be taken that this bush also protrudes slightly from the remote face of the number wheel. The circular hole 22 passes through the bush and is of such diameter as to enable the number wheel to be freely mounted upon a shaft 42 common to all switch units, but with limited lateral play. Two ribs 23 and 24 extend between the bush and the wall of the number wheel, and they are symmetrically positioned with respect to slot 20. The ribs divide the number wheel into two compartments, of which the upper is slightly the smaller.

Referring again to FIG. 4 the configuration of the pressure spring 16 is such as to enable it to be snugly accommodated in the upper compartment of the number wheel with its inwardly directed feet 25 and 26 resting upon ribs 23 and 24. The wiper spring 17 is provided with three contact blades 27, 30 and 31. The first blade is the selective wiper, and latter twin blades are arranged so that their leftwardly formed tips will duly engage the surface of a contact ring 32 which is to be secured to a wafer 37 of insulating material. It is to be noted that the wiper 27 has a central V-shaped notch at its free end, and this end has its corners suitably radiused. Wiper 27 emerges from an arcuate shoe portion 28 of the wiper spring 17. The latter also has a folded section 29 extending to the blades 30 and 31, and this section, which is aligned with wiper 27, serves two purposes. Firstly it imparts the requisite degree of resilience to said blades, and secondly it assists in the location of the wiper spring with respect to the number wheel.

When the pressure spring 16 has been placed within the upper compartment of the number wheel, the wiper spring is also entered with the wiper 27 and section 29 snugly located between the edges of slot 20, the shoe portion 28 being positioned under pressure between the wall 18 and spring 16. With the wiper spring abutting the end of the compartment, the form of the blades 30 and 31 is such that their tips protrude above the wall 18.

The four switching units of the device are assembled in the manner described.

The device also includes five wafers, such as 37 of phenol fibre board, and four of these, excluding that shown at the left in FIG. 2, carry individual contact rings, such as that illustrated in detail at 32 in FIG. 4. Each contact ring, which is of nickel silver, is provided with a securing lug 33, a stop member 34, and a limb 35 which includes a swan-neck section 36 and terminates in a soldering tag.

The wafers 37 are identical with that illustrated in FIG. 4. Thus each wafer has a hole 38 corresponding with hole 22 in the number wheels, and adapted to take a common mounting shaft 42 without appreciable lateral play. The hole 40 and the slot 41 in the wafer are dimensioned to allow lug 33 and limb 35 respectively of

the contact ring to pass through them without appreciable side clearance. The wafer is also provided with twelve holes such as 39 equally spaced upon an arc which is concentric with hole 38, the holes 39 being a "push" fit for contact rods such as 44. The front curved frontal surface of each wafer, which in the assembled device extends through the aperture of the escutcheon plate, has a central notch 48 and this serves as a datum for the appropriate switching unit. These notches may be filled with colouring material if required.

As already mentioned, four of the five wafers carry individual contact rings 32 which are to co-operate with blades 30 and 31 of a relevant switching unit. In each of these cases the contact ring is secured by first passing the limb 35 through the slot 41 and then clipping the lefthand fold of the swan-neck section 36 thereof (FIG. 4) around the edge of the wafer. With the body of the ring now lying flat against the surface of the wafer, lug 33 passes through hole 40 and is then bent over to grip the wafer. A flat circular contact area will thus be presented to the tips of blades 30 and 31 of the associated switching unit.

The hole 40 and slot 41 in the fifth wafer (left of FIG. 2) are not used and could be omitted, although from a manufacturing point of view it is convenient to use identical wafers throughout.

The device incorporates twelve nickel silver contact rods such as 44 which are common to all the switching units, and one end of each rod is formed in the manner illustrated in FIGS. 4 and 2A to provide two soldering tag portions 45 and 46 for connection of external wiring. It is to be noted that the gap 49 beyond the tip of the formed end of the contact rod is sufficient to accommodate the thickness of a wafer 37. The contact rods are provided with individual U-shaped metal locating pieces 47 each having a lateral slot which enables it to embrace the appropriate wafer in the manner shown in FIGS. 4 and 2A. With the roots of the slot abutting the edge of the wafer and the locating piece suitably positioned, a contact rod may be passed between the limbs of the latter and through a hole 39 in the wafer. Under these circumstances, if the locating piece has any tendency to pivot about the rod, such pivotal movement would be very restricted.

The locating pieces are provided in association with the wafer represented towards the right of FIG. 2, although these components and the formed ends of the rods have been omitted from this drawing for simplicity. However, FIG. 2A illustrates the final interlocking relationship of the formed end of a contact rod and a locating piece in respect of the wafer. To attain the interlocking relationship it is necessary to deflect the portion 46 of the contact rod outwardly to enable it to clear the edge of the wafer as the rod is inserted. In the final relaxed position, the soldering tag portions 45 and 46 protrude from between the limbs of the locating piece.

As regards the shaft 42, which passes through all the wafers and number wheels of the device, this has a circumferential groove, such as 43, towards each end. The distance between the grooves corresponds to the distance between brackets 14 of the escutcheon plate, and the width of each groove is sufficient to take the thickness of the plate material. The rear ends of the brackets 14 each take the form of a pair of claws 50, and to secure shaft 42 to the brackets, the grooves 43 of the shaft are forced through the claws which may be additionally clenched over to permanently hold the shaft in its parallel relationship with the escutcheon plate.

In assembling the device for five wafers (four of which carry contact rings 32) and the four switching units are alternately mounted upon the shaft, the arrangement being such that the blades 30 and 31 of each unit are presented to a contact ring 32. At this stage it is necessary to ensure that the stop member 34 of each ring enters the lower compartment of the relevant number wheel.

It may be noted that the members in co-operation with the ribs 23 and 24 of the number wheels, are to determine the limits of rotation of the latter when the device is operational.

With the wafers and switching units so mounted upon the shaft, and the datum notches 42 of the wafers aligned, the components are drawn together against the pressures of blades 30 and 31. Thereupon the number wheels and the curved frontal edges of the wafer are directed into the aperture of the escutcheon plate, and the shaft 42 is secured to the brackets 14 of the latter as already described. The straight frontal edges of the wafers now abut the rear face of the escutcheon plate.

It is to be noted that each contact ring 32 now makes good electrical engagement with the relevant wiper 27 through the intermediary of blades 30 and 31 and that this engagement will persist over the whole range of permissible rotation of the switching unit. It follows that external wiring connected to the soldering tag end of limb 35 of the contact ring is permanently connected to the wiper.

The twelve contact rods such as 44, are each passed through corresponding holes 39 (FIG. 4) of all the wafers, a locating piece such as 47 being fitted, in respect of each rod, to the wafer appearing at the right-hand side of FIG. 2. As already outlined, the contact rods are secured against excessive longitudinal and rotary movement by their interlocking relationship with the locating pieces. By preventing, or at least limiting, the latter movement, short circuiting of adjacent contact rods is obviated.

The equally spaced rods now form a cage-like array which is concentric with shaft 42, and the inside radius of this array is substantially equal to the radial distance between the axis of the shaft and the roots of the V-shaped notches in the ends of wipers 27. Thus when a switching unit is selectively positioned the wiper-notch enables a two-point contact to be made with the contact rod, adequate pressure being maintained by the pressure spring 16 of the unit. In addition to providing a two-point contact, the notch in the wiper imparts an indexing effect to the switching unit.

The selected switching devices would be secured to an instrument panel by screws passing through the semi-circular cut-outs 13 in the escutcheon plate, and where the need arises several similar devices may be compactly mounted side-by-side, in which case single fixing screws would be used at the intermediate points. It will be appreciated that where the devices are to be mounted in a column, cut-outs such as 13 could be provided in the upper and lower edges of the plate.

Although in the device described the contact rods have their folded soldering-tag ends to the right when viewed from the rear (FIG. 2), it will be appreciated that all or any of the rods could be fitted in the opposite direction, the locating pieces 47 being transferred to the remote wafer as required.

It will also be understood, that by modifying the escutcheon plate, the contact rods and the shaft, a selective switching device having fewer or more switching units could be provided. However, it is considered that 4-unit and 2-unit devices according to the invention will meet present demands. Typically if it were required to provide ten switching units with access to twelve common outlets, two 4-unit and one 2-unit devices would be provided, and the contact rods would be multiplied together by external wiring. This wiring would, for instance, be soldered to tags 46 of the rods, whereas tags 45 of one of the units would be connected to wires extending to the circuits which are subject to selection.

I claim:

1. A manually operated electrical selective switching device comprising a plate having a front face and a rear face, bearing brackets attached to the rear face of said plate, a shaft supported in said bearing brackets, a plu-

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ality of electrical conductors in the form of rods arranged parallel to the axis of said shaft, said rods being electrically insulated from one another and equally spaced from the axis of said shaft so as to form an arcuate array of conductors rearwardly of said plate, a plurality of selecting members axially mounted in different positions along said shaft for independent rotation thereon, each selecting member projecting through the said plate, a recess in one end wall of each selecting member, a wiper spring individual to each selecting member and housed in the recess therein, a wiper blade formed integral with each wiper spring and extending radially from the selecting member to contact any one of said plurality of electrical conductors, a contact surface on each wiper spring, a stationary contact ring individual to each selecting member adapted to engage the contact surface of the wiper spring associated with the selecting member, insulating wafers fixedly mounted on said shaft for supporting said electrical conductors and for separating each selecting member and its associated parts from adjacent selecting members and their associated parts.

2. A manually operated selective switching device as claimed in claim 1 in which one end of each of said elec-

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trical conductors is bent and is flexed to pass over an insulating wafer to axially lock the conductor in its operative position.

3. A manually operated selective switching device as claimed in claim 1 in which stop means are provided for limiting the angular displacement of each selecting member.

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