

Sept. 22, 1959

R. E. GUILLEMANT

2,905,773

ELECTRIC SWITCHES

Filed Nov. 13, 1957

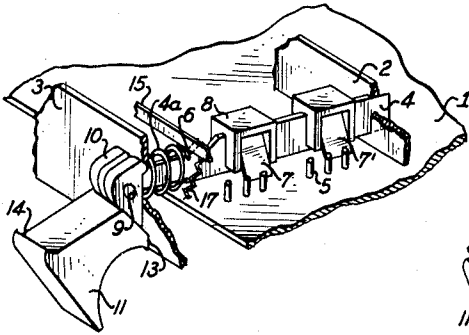


Fig. 1

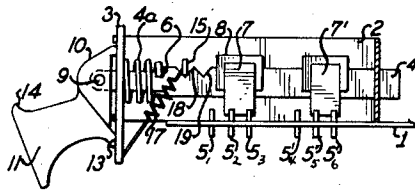


Fig. 2

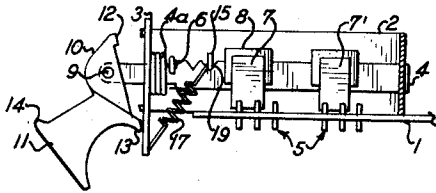


Fig. 3

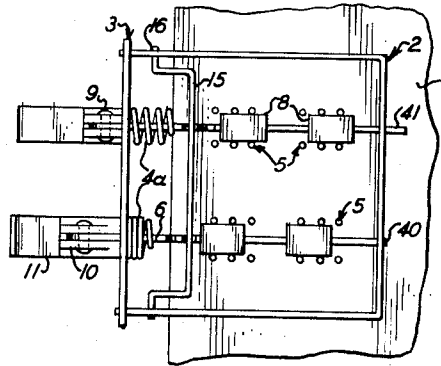


Fig. 4

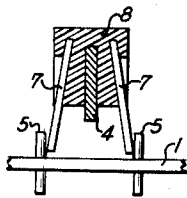


Fig. 5

1

2,905,773

ELECTRIC SWITCHES

René Edouard Guillemant, Paris, France

Application November 13, 1957, Serial No. 696,282

Claims priority, application France November 16, 1956

3 Claims. (Cl. 200—5)

My invention relates to improvements in electric switches, particularly in those of the so-called keyboard type, intended for use in radios and the like, and wherein a plurality of key operated switches are arranged to form a keyboard with each key forming a control member to be depressed with one's finger for actuating the corresponding switch while any other previously operated key is then released automatically and returned to its outwardly projecting position.

My invention has for its object to provide an economical embodiment of switches of the described type.

In accordance with an aspect of my invention, the movable section of the switch is constituted by a bar carrying the movable contact or contacts of the switch and mounted for sliding movement along a suitable guide-way and by a control key pivotally carried at the front end of the sliding bar and having a lower edge engageable with the front surface of a flat wall forming the front of the switch housing. The engagement thus provided between the wall and the key allows the front end of the slidable bar to be shifted slightly forwardly with respect to the switch housing to obtain a particularly simple mechanism adapted for transformation of movements whereby the mere shifting of the operator's finger downwardly produces a forward sliding of the bar carrying the movable contact or contacts with respect to the fixed contacts of the switch.

According to a further feature of my invention, the closing or opening of the electrical circuits associated with the fixed contacts of the switch is obtained through the agency of an elastic metal blade or blades forming the movable contact and being carried by the sliding bar.

Such movable contact blades are preferably arranged in pairs and are carried by insulating parts secured to the sliding bar to cooperate with corresponding fixed contacts, thereby to form a double-switch with a single operating key.

Such blades are slidable past rigid vertical metal studs forming the corresponding fixed contacts and secured to an insulating member forming the lower wall of the switch body or housing and they elastically engage two said studs simultaneously so as to produce an electrical contact between the two studs thus engaged.

Other features of my invention will appear in the following detailed description which is to be read in connection with the accompanying drawings wherein:

Fig. 1 is a perspective view of a single switch unit with its control key.

Fig. 2 is a side view of the key and switch unit of Fig. 1, with the key being shown in its non-depressed position.

Fig. 3 is a view similar to Fig. 2, but after depression of the key.

Fig. 4 is a plan view of a keyboard including two switch units of the kind illustrated in Figs. 1-3.

Fig. 5 is a detail view showing the cross-section of the switch bar together with two stationary contact-pieces and elastic blades.

2

In the several views of the drawings, the same reference numbers designate the same parts.

The lower part of the housing of a keyboard embodying the invention is constituted mainly by a bent lower insulating plate 1 to which are secured a metal strip 2 forming the rear and side walls adapted to guide the mechanism and a front wall 3. The walls 2 and 3 are preferably made of stamped shaped sheet metal and are provided with openings adapted to guide the sliding bar 4 of each switch unit. This sliding bar is illustrated in Figs. 1 and 2 as being urged rearwardly by a spring 4a acting under compression and bearing, at one end, against the rear surface of the wall 3 and, at its other end, against shoulders 6 formed on the upper and lower surfaces of the bar 4.

Each switch unit may occupy selectively two positions and the keyboard includes any desired number of such switch units.

According to the invention, the making or the breaking of each circuit controlled by the switch unit is performed by a series of three fixed contacts constituted by cylindrical studs 5 secured to the carrier plate 1 and extending perpendicularly to the plane of the latter along a line parallel with the longitudinal axis of the sliding bar 4 and by an elastic movable contact blade 7 which is substantially flat and engages elastically with the cylindrical studs 5. The blade 7 is adapted to move in unison with the sliding bar 4 of the switch so as to move past the contact pins as described hereinafter.

Furthermore, pairs of the series of fixed contacts, each constituted by the three studs 5, and associated blades 7 are arranged at opposite sides of the sliding bar of the switch, and the electric circuits associated with such pairs are independent of each other.

I have illustrated by way of example and by no means in a limiting sense switch units which are each provided with two groups of pairs of series of fixed contacts, and associated contact blades. Furthermore the keyboard shown in Fig. 4 includes two switch units, but it is obvious as will be shown hereinafter that the invention is independent of the number of pairs of contacts provided in each switch unit and also of the number of switch units provided on the keyboard.

The blades 7 and 7' for the two groups of contact pieces are carried by insulating parts 8 secured to the bar 4; and each switch unit includes as already mentioned, two groups of pairs of contact systems arranged at the opposite sides of the bar 4, although Figs. 1, 2 and 3 show only those contact systems located on the right hand side.

In the normal position of the switch unit, the blade 7 (Fig. 2) provides for connection between studs 5₂ and 5₃, while the stud 5₁ is inoperative. Similarly the blade 7' provides for the connection between the studs 5'₂ and 5'₃ while the stud 5'₁ remains inoperative. On the other hand, in the position illustrated in Fig. 3, where the bar 4 is drawn forwardly, the blades 7 and 7' effect a connection between studs 5₁ and 5₂ and also between studs 5'₁ and 5'₂, the studs 5₃ and 5'₃ being then inoperative.

The longitudinal sliding of the bar 4 from the position of Fig. 2 to the position of Fig. 3 is effected by a control member 10 which is eccentrically pivoted on a transverse pin 9 carried by the bar 4 at the front end of the latter, and which is made preferably of synthetic material. The control member 10 is formed integral with a key 11 which may be depressed by the operator's finger so as to control the switch by moving bar 4 against the action of spring 4a to the position of Fig. 3.

The control member 10 is provided at its rear upper and lower edges with projections 12 and 13 which both bear against the front surface of wall 3 when the bar 4 is in its rear operative position illustrated in Figs. 1 and 2,

and thereby provide for the accurate positioning of the switch in its rear location.

It is readily apparent that depression of the key 11 with one's finger produces a pivotal movement of the member 10 round its pin 9 while the projection 13 remains in contact with the front surface of wall 3 and this consequently draws the bar 4 outwardly from the position illustrated in Figs. 1 and 2 into the position illustrated in Fig. 3.

According to a further feature of the invention, the line connecting the point 14 on the upper forward edge of the key 11 with the point of contact between the projection 13 and the wall 3 is such that it is substantially horizontal in the position illustrated in Fig. 2 so that the movement of the operator's finger for effecting depression of the key exerts a pressure directed mainly downwardly and slightly rearwardly and which can be absorbed readily by the device or structure, for example, a radio incorporating the keyboard. The fact that the line of force applied to the key is only slightly inclined with reference to the vertical prevents the radio or the like from sliding over the surface on which it is laid during operation whereas otherwise it would be necessary to hold the set fast with one hand or to secure it in any other suitable manner while operating the keys with a finger of the other hand. The direction provided for the line of action of the operator's finger furthermore permits the employment of a circuit-making and breaking mechanism operating in a very smooth manner.

This arrangement avoids the shifting of the radio or the like which may occur when using mere pusher knobs arranged horizontally and which can be operated only through a horizontal thrust.

Locking of the switch in its depressed position after the key has been actuated and the simultaneous release of the associated switch which has been previously actuated are performed by a well known device which includes a locking member 15 (Fig. 4) in the shape of a rod with offset ends, pivoting round an axis defined by its ends received in perforations 16 in the side walls formed by the metal strip 2 of the switch housing or body. The locking member 15 includes a central rectilinear section which is urged downwardly by two springs 17 (Figs. 2 and 3) and cooperates selectively with one or the other of two notches 18 and 19 formed in the upper surface of the bar 4 so as to hold bar 4 in either of its extreme positions. When a switch is operated, the movement of its bar 4 causes an upward pivotal movement of the central section of member 15 so as to release the bar 4 of any switch which has been previously operated. Such upward pivotal movement of the member 15 is produced by engagement of the latter with the raised section between the notches 18 and 19 of the bar 4 then being displaced. This being done, the member 15 engages the notch 18 in the bar which has been returned to the position of Fig. 2 and the notch 19 of the bar has been displaced to the position of Fig. 3.

In Fig. 4 which shows a keyboard with two switch units, the bars of such units are designated by the reference numerals 40 and 41, respectively, the bar 40 is drawn forwardly while the bar 41 is in its rearmost position, with the locking member 15 engaging the rear notch of bar 40 and the front notch of bar 41.

According to a further feature of the invention, my improved keyboard is particularly adapted for use in co-operation with printed circuits. As is well known, the different circuits required for a radio receiver or the like, and also optional members such as induction coils, condensers, and the like, may be printed on one or on both of the surfaces of insulating plates.

The use of fixed contacts constituted by round and rigid studs is extremely advantageous in connection with such printed circuits, since it allows the simultaneous introduction in an easy and speedy manner, by means of a suitable mounting, of the different studs 5 through the

insulating plate 1 on the lower surface of which such circuits have been printed and which forms also the lower wall of the switch housing or body. The insulating plate is provided with openings which are dimensioned so that the studs 5 forming the stationary or fixed contacts have a forced fit therein, such studs cooperating on the one hand with the corresponding movable contact blades so as to form the contact systems and being on the other hand connected directly through soldering with the circuits printed on the lower surface of the plate 1.

The plate 1 forming the bottom wall of the switch housing or body may have printed thereon only a fraction of, or the entire printed circuit of the associated radio or the like, with consequent simplification of the manufacture since the studs 5 are connected directly through their lower ends with the printed circuits leading to the switches. Furthermore, the conventional soldering by means of a bath of solder material which is resorted to in the case of printed circuits for connecting the actual printed circuit with the parts to be connected therewith provides both the electrical connection of the studs 5 with said circuit and a rigid mechanical connection of a permanent and resistant character between the studs and the insulating plate.

It is general practice to make the insulating plate carrying the printed circuits also perform the function of the frame of the radio or the like. It is apparent that, in this case, the contact systems of the switches forming the keyboard are secured directly to the plate forming the frame of the set while the remainder of the keyboard, including the walls 2 and 3, the bars 4 and the parts carried by the latter, may form a prefabricated element to be secured to the plate 1 forming the frame.

It should be understood that the technique of printed circuits may also be used in a highly advantageous manner, for the production of the adjustable and trimmer condensers which are required for the adjustment of the different high frequency circuits. As a matter of fact, in such a case, one of the electrodes of each condenser is constituted by a circuit printed on the lower surface of the plate while the other electrode is constituted by a yielding blade secured to the insulating plate with a suitable insulation being inserted between such electrodes. The spacing of the yielding blade electrode with reference to the printed electrode may be adjusted by means of a short pitch screw received in a tapped opening formed in the plate so as to modify as desired the capacity of the condenser.

Thus, in the case of a radio or television receiver set, the high frequency system may be formed integrally by the printed circuits. Furthermore, the auxiliary connections which are to electrically interconnect a number of the studs 5 are also in the form of a printed circuit.

Thus my invention allows the production of a miniature arrangement of circuits and switching members.

The movable contact blades are preferably made of beryllium bronze and the fixed contact studs of silver coated or filled metal, but the blades may also be silver coated or silver filled.

According to a further feature of my invention, the movable contact blades are self-centering and, for this purpose, they are preferably formed, as shown in Fig. 5, wherein the blades 7₁ and 7₂ are integral parts of an inverted, U-shaped member carried by an insulating cap-shaped member 8 and are insulated electrically with reference to the bar 4 and to engage elastically with the studs 5 forming the fixed contacts.

In order to obtain this self centering, the bar 4 engages the guides formed by the walls 2 and 3 with a slight lateral play, so as to permit lateral centering of the blades through the automatic balancing obtained by the resilient engagement of the blades 7₁ and 7₂ with the fixed contacts at the opposite sides of the related bar.

Obviously many detail modifications may be effected in the embodiments described above without unduly widen-

ing the scope of the invention as defined in the accompanying claims.

What I claim is:

1. A switch keyboard comprising a housing having a front wall and a horizontal, insulating support plate, a plurality of parallel bars, means mounting said bars for individual, longitudinal sliding movement above said plate between two extreme positions, at least one contact system associated with each of said bars, each contact system including a series of studs extending through said plate perpendicular to the plane of the latter and arranged in a line parallel to the direction of the sliding movement of the related bar and a movable contact blade carried by said bar and insulated with respect to the latter to slidably engage said studs for selectively interconnecting the latter in said extreme positions, each of said bars carrying an individual lateral pin at the forward end thereof, and an operating key for each bar pivotally mounted on said lateral pin of the related bar, said key being engageable with said front wall during pivotal movement with respect to the related bar to move the latter from one of said extreme positions to the other of said extreme positions.

2. A switch keyboard comprising a housing having a horizontal, insulating support plate and front and back walls with aligned openings in the latter, a plurality of parallel bars slidably received in said aligned openings for individual, longitudinal movement with respect to said housing between two extreme positions, each bar having a loose fit in the related openings of said front and back walls to permit lateral play of said bars with respect to

said support plate, at least two contact systems associated with each of said bars and including two series of cylindrical contact studs extending through said plate perpendicular to the plane of the latter and arranged along lines parallel to the axis of the related bar at the opposite sides of the latter and integral contact blades of resilient material mounted on said bar and lying in planes parallel to said axis of the latter at the opposite sides of the bar to slidably engage said studs of the series at the same side of the bar so that the resilient engagement of said blades with the related series of studs serves to center each bar, and control keys connected to said bars to control the movements of the latter between said extreme positions.

3. A switch keyboard as claimed in claim 1, comprising a printed circuit on said support plate, said studs being connected with said printed circuit.

References Cited in the file of this patent

UNITED STATES PATENTS

1,084,813	Murray	Jan. 20, 1914
1,244,110	McNary	Oct. 23, 1917
1,290,701	Berger	Jan. 7, 1919
2,234,405	Hall	Mar. 11, 1941
2,491,168	Dusek	Dec. 13, 1949
2,649,513	Luhn	Aug. 18, 1953
2,682,643	Thias	June 29, 1954

FOREIGN PATENTS

1,121,060	France	Apr. 30, 1956
945,264	Germany	July 5, 1956