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3,085,746

KEYBOARD OPERATED SWITCHING UNIT

Filed Dec. 28, 1961

3 Sheets-Sheet 1

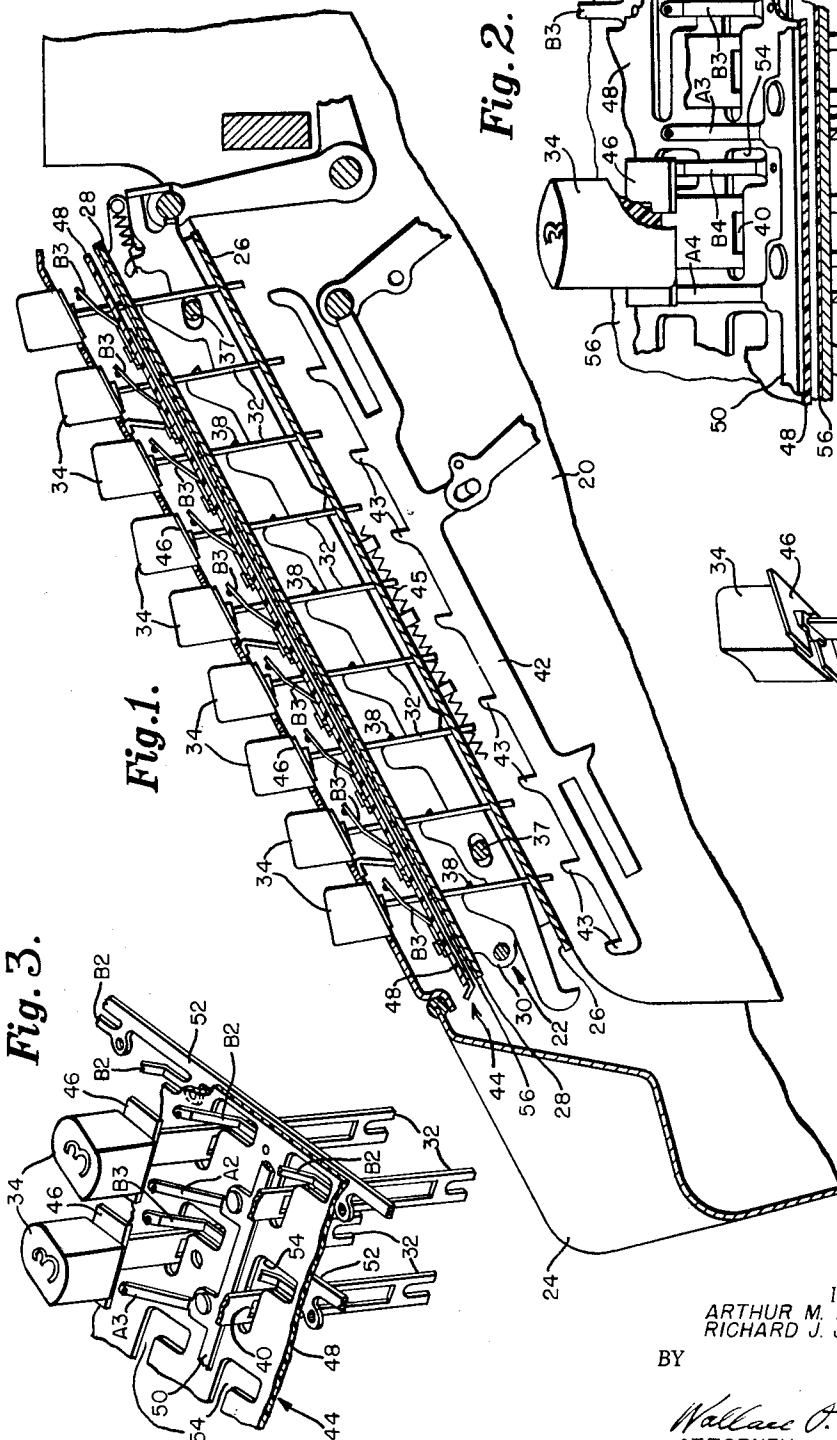


Fig. 2.

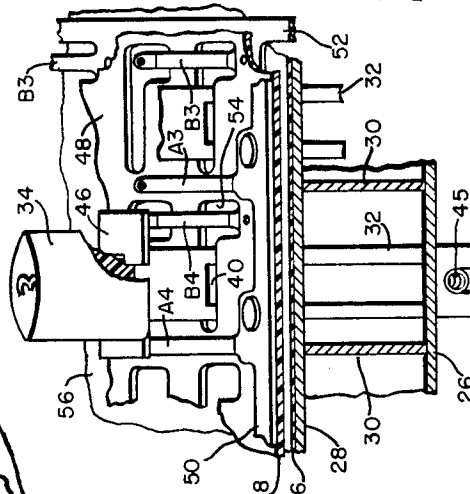


Fig. 4.

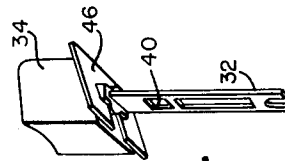
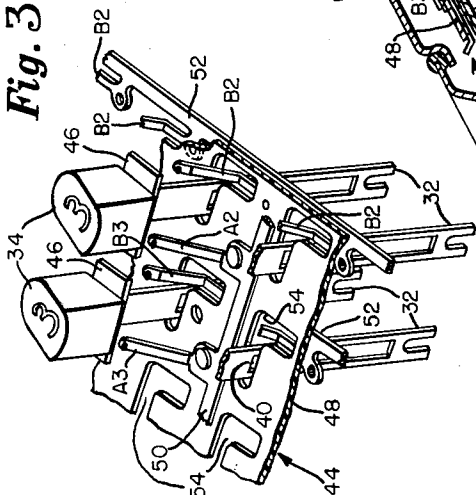


Fig. 3.



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Fig. 8.

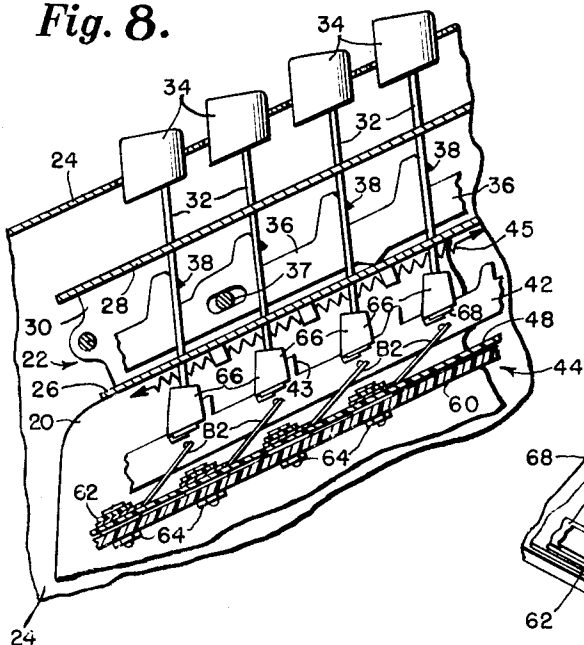


Fig. 10.

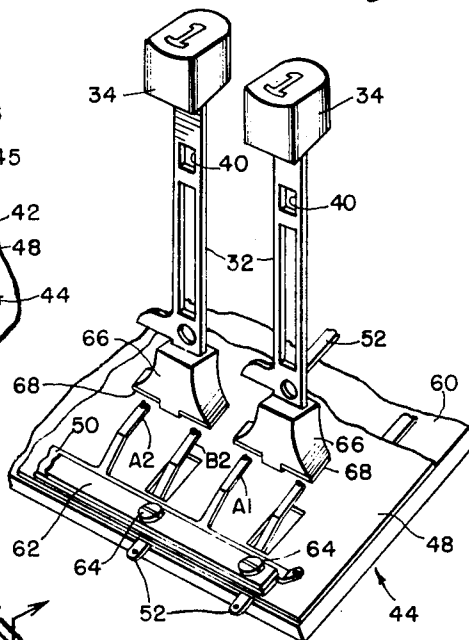


Fig. 9.

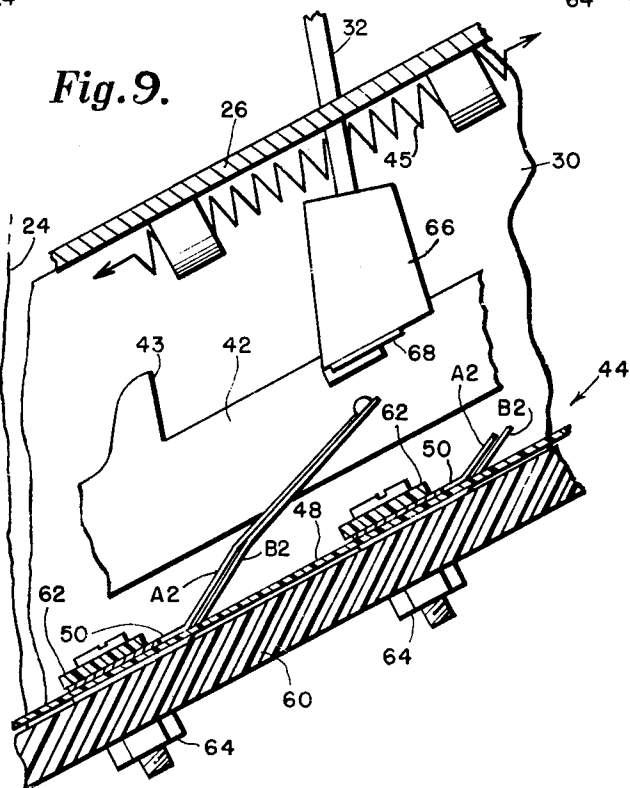
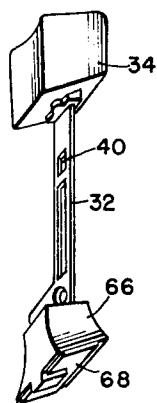


Fig. 11.



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KEYBOARD OPERATED SWITCHING UNIT

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5 Claims. (Cl. 235-145)

This invention relates generally to business machine keyboards and particularly to keyboard operated switch devices.

One of the objects of the invention is to provide an improved keyboard operated electrical switching unit.

Another object of the invention is to provide for the keyboard of a calculating machine, an inexpensively constructed electrical switching unit in which contact carrying spring fingers of a matrix of pairs of individual switches are respectively mounted on opposite sides of an electric insulating sheet with the switch contact members on the same side of the sheet.

A further object of the invention is to provide a switching unit of the above mentioned character in which conductor strips arranged in spaced parallel relation on one side of an insulation sheet and other spaced parallel conductor strips arranged in spaced parallel relation on the other side of the sheet in crossed relation to the first, each carry longitudinally spaced spring fingers arranged in pairs on the same side of the sheet in parallel with the conductor strips on one side of the sheet and overlying the conductor strips on the other side of the sheet.

Other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary side view partly broken away and in section of a calculating machine keyboard construction embodying features of the invention;

FIG. 2 is a fragmentary cross sectional view of the keyboard;

FIG. 3 is a fragmentary perspective view;

FIG. 4 is a perspective view of one of the keys;

FIG. 5 is a plan view of a switching unit associated with the keyboard;

FIGS. 6 and 7 are fragmentary perspective views of certain details of the electrical switching unit of FIG. 5;

FIG. 8 is a fragmentary sectional view shown partly in side elevation of a modification of the device of FIGS. 1 to 7;

FIG. 9 is an enlarged sectional view, similar to FIG. 8;

FIG. 10 is a fragmentary perspective view of a key operated electrical switching device, and

FIG. 11 is a perspective view of one of the keys and its electrical contact.

Referring to the drawings by characters of reference and first to FIG. 1, there is shown a fragment of a business or calculating machine including one of the side plates 20 of a supporting frame, a keyboard framework structure, designated generally by the numeral 22, and a keyboard housing 24. The keyboard framework structure 22 is mounted between and on the side plates 20 near the top of the keyboard housing. The keyboard framework structure 22 comprises a lower base plate 26, an upper plate 28, and parallel spacer members 30. The plates 26, 28 and spacer members 30 may be rigidly secured together by any suitable means, the upper plate 28 being spaced in parallel relation to the lower plate by the spacers.

Extending downwardly through both the upper and lower keyboard plates 26 and 28 are the stems 32 of a plurality of keys which may be amount keys arranged both in columnar and cross rows. Suitable key tops 34, secured to the upper ends respectively of the keystems 32

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are provided and project upwardly through clearance apertures in the top of the keyboard housing 24.

A plurality of key locking slide members 36, of which only one is shown, are provided respectively for the columnar rows of keys, the slide members being located between the keyboard plates 26 and 28 on transverse guide rods 37. Each of the locking slide members 36 has a plurality of hooks 38, and the keystems 32 have clearance slots 40 respectively to receive the hooks to hold down depressed keys when the slide members 36 are moved rearwardly. A plurality of amount indexing slide members 42, of which only one is shown, are mounted on the side frame members 20 below the keyboard base plate 26. The indexing slide members 42 each have longitudinally spaced upwardly projecting stop abutments 43, one for each of the key stems 32, to limit rearward movement of the indexing slides. Each columnar row of keys is provided with a key restoring spring 45. The above described keyboard is well known in the art and therefore has not been herein described in detail, but for a more detail description of the keyboard and its operation in connection with a calculating machine, reference may be had to the patent of Thomas M. Butler, Pat. No. 2,629,547, issued February 24, 1953.

In accordance with the present invention, a keyboard operated multiple control system is provided for individually controlling multiple circuits and comprises, in general, an electrical switching device 44, and individual bridging contacts 46 carried by the keys. The electrical switching device 44 is mounted on and secured to the upper plate 26 of the keyboard structure and the bridging contacts 46 may be suitably secured to the undersides respectively of the key tops 34, electrically insulated from the key stems.

The switching device 44 is a unitary structure and includes an electric insulating base 48, preferably a rectangular sheet of dielectric material which may be secured to and on the upper keyboard plate 28 by rivets or other suitable means. To one side or top of the sheet 48 there is riveted a plurality of metal conductor strips or busses 50 which are equally spaced apart in parallel relation and extend crosswise of the sheet 48 or parallel to the rows of keys. Each of the conducting strips 50 has, integral therewith, a plurality of transversely extending spring fingers, designated respectively by the reference characters A1 to A10 respectively, the fingers being equally spaced apart longitudinally of the strips and arranged with the corresponding fingers in rows parallel with corresponding columnar rows of the keys. Further, the fingers A1 to A10 extend rearwardly and upwardly at the same acute angle to the sheet 50, and on their free ends, each of the fingers has a contact beneath its respective key carrying bridging contact 46 for engagement thereby. Each of the strips 50 and its spring fingers may be integrally formed by stamping them out of suitable resilient sheet metal.

To the other side or bottom of the sheet 48 there is attached a second plurality of spaced apart parallel busses or conducting strips 52 which extend crosswise of the strips 50 or parallel to the cross rows of keys. Each of the conducting strips 52 has a plurality of spring fingers, designated respectively by the reference characters B1 to B10 respectively. The spring fingers of each of the strips 52 are laterally positioned therefrom such that the fingers extend generally longitudinally of the strips in aligned spaced relationship therealong. Further, the spring fingers B1 to B10 project through respective apertures 54, provided in the insulating sheet 48, to the other or top side of the sheet in substantially parallel relationship to the spring fingers A1 to A10, the spring fingers extending upwardly and rear-

wardly to the sheet 48 at the same acute angle of inclination and having contacts on the free ends thereof. Thus, pairs of contacts are provided for cooperating with the key carrying bridging contacts 46, providing a matrix of selectable, manually settable switches. As shown in the drawings, the spring fingers are extended in length so as to reduce bending stresses on the fingers when they are bridged and flexed downwardly by the key carrying bridging contacts 46, the fingers being extended such that the free ends thereof overlie the adjacent ones of the strips 50 from front to rear of the switch unit. Depression of a key moves the bridging contact 46 into engagement with its corresponding pair of the spring finger contacts, the downward movement of the key being limited so that the spring fingers are not pressed down to the conducting strip, but instead is tensioned just sufficiently to insure and maintain good contact between the switch component contact members. Interposed between the insulating sheet 48 and the upper metal plate 28 of the keyboard structure there is an additional sheet 56 of dielectric material to insulate rivets and any other metallic parts on the underside of sheet 48 from the keyboard structure.

Referring now to FIGS. 8 to 11 inclusive, the modification shown is similar to the device of FIGS. 1 to 7 and therefore like parts have been designated by like reference characters to avoid repetitious description. The modification differs from the previously described device in that the electrical switching unit 44 is located below the bottom plate 26 of the keyboard frame structure and the lower ends of the key stems 32. As shown in FIGS. 8 and 9, the switching unit 44 is mounted flat on a support or insulating board 60 which is mounted between and on the machine frame side plates 20 in parallel relation to the inclined keyboard plate 26, the board 60 being suitably mounted by brackets or other suitable means. The switching unit 44 may be secured to the board 60 with the aid of retainer strips 62 by bolts and nuts 64, or other suitable means. Insulating members 66 are respectively secured to the lower ends of the keystems 32, the insulating members preferably being made of a synthetic resin or plastic material and affixed respectively to the undersides of the insulating members are bridging contact members 68 cooperable on depression of the keys to engage their respective pairs of spring finger contact members.

While the keyboard switching device is shown and described in considerable detail, it will be understood that many changes and variations may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. An electrical switching unit comprising, a sheet of electrical insulating material having a matrix of equally spaced holes arranged in longitudinal and transverse rows, a plurality of conductor strips attached to one side of said sheet and extending respectively along the longitudinal rows of holes, a plurality of contact carrying spring fingers carried by and electrically connected to each of said conductor strips, said spring fingers extending transversely to said strips with the free ends in spaced relation to the said one side of said sheet, a second plurality of conducting strips attached to the other side of said sheet and extending respectively along the transverse rows of the holes, a plurality of contact carrying spring fingers carried by and electrically connected to each of said second mentioned plurality of conducting strips, said second-mentioned spring fingers extending in the same general direction as said second-mentioned conducting strips laterally thereto, said second-mentioned spring fingers projecting respectively through said holes forming parallel pairs respectively with said first-mentioned spring fingers on the said one side of said sheet and inclined thereto.

2. An electrical keyboard switch construction for a data entry device having a key bank support and a plu-

5 rality of keys arranged in spaced rows and columnar banks intersecting said rows, each of said keys including a key button and a key stem mounted for reciprocatory movement in said support, said switch construction comprising a plurality of rows of conducting strips extending in the direction of said key rows and spaced laterally of each other a distance corresponding to the spacing between adjacent key rows, each of said strips being of continuous formation between the ends thereof and having a plurality of integrally formed spring contact fingers projecting laterally and inclined to the plane thereof and spaced apart a distance corresponding to the spacing between adjacent ones of said columnar banks of keys, a plurality of conducting strips extending in the direction of said columnar banks of keys transversely of said rows of conducting strips and spaced laterally of each other a distance corresponding to the spacing between adjacent columnar key banks, each of said columnar extending strips being of continuous formation between the ends thereof and having a plurality of integrally formed, uniformly spaced spring contact fingers corresponding to the number of key rows, each of said contact fingers of said columnar strips being aligned with the contact fingers of a different one of said row strips, electrical insulating means separating said strips, and an electrically conducting bridging plate secured to the bottom of each key button and electrically insulated from the key stems.

3. An electrical keyboard switch construction for a data entry device having a key bank support and a plurality of keys mounted for reciprocatory movement in said support and arranged in spaced rows and columnar banks intersecting said rows, said switch construction comprising a plurality of coplanar conducting strips extending in the direction of said key rows and spaced laterally of one another a distance corresponding to the spacing between adjacent key rows, each of said strips being of continuous formation between the ends thereof and having a plurality of integrally formed spring contact fingers projecting laterally thereof and spaced apart a distance corresponding to the spacing between adjacent ones of said columnar banks of keys, each of said fingers having a contact carrying free end spaced from the plane of said strips and overhanging the strip of the adjacent row spaced therefrom, a plurality of coplanar conducting strips extending in the direction of said columnar banks of keys transversely of said rows of conducting strips and spaced laterally of one another a distance corresponding to the spacing between adjacent columnar key banks, each of said columnar extending strips being of continuous formation between the ends thereof and having a plurality of integrally formed, uniformly spaced spring contact fingers corresponding to the number of key rows and extending in the same direction as and parallel to the fingers of the row strips, each of said contact fingers of said columnar strips being of substantially the same length as the contact fingers of said row strips and having a contact carrying free end spaced from the plane of the strips and aligned with the contact fingers of a different one of said row strips, electrical insulating means separating said strips, and an electrically conducting bridging plate carried by each key and movable upon depression of a key into sliding contact relation with the contact fingers of a columnar extending strip and row extending strip to complete an electrical circuit therebetween.

4. An electrical keyboard switch construction for a data entry device having a key bank support and a plurality of keys arranged in spaced rows and columnar banks intersecting said rows, each of said keys including a key stem and a key button on the upper end thereof mounted for reciprocatory movement in said support, said switch construction comprising a plurality of rows of conducting strips extending in the direction of said key rows and spaced laterally of each other a distance corresponding to the spacing between adjacent key rows, each of

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said strips being of continuous formation between the ends thereof and having a plurality of integrally formed spring contact fingers projecting laterally and inclined to the plane thereof and spaced apart a distance corresponding to the spacing between adjacent ones of said columnar banks of keys, a plurality of conducting strips extending in the direction of said columnar banks of keys transversely of said rows of conducting strips and spaced laterally of each other a distance corresponding to the spacing between adjacent columnar key banks, each of said columnar extending strips being of continuous formation between the ends thereof and having a plurality of integrally formed, uniformly spaced spring contact fingers corresponding to the number of key rows, each of said contact fingers of said columnar strips being aligned with the contact fingers of a different one of said row strips, electrical insulating means separating said strips, and a conducting bridging plate secured to the lower end of each key stem and electrically insulated therefrom.

5. An electrical switching unit comprising, a sheet of electrical insulating material, a plurality of spaced apart parallel conducting strips attached flat to one side of said

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sheet, a second plurality of spaced apart parallel conducting strips attached flat to the opposite side of said sheet in crosswise relationship to said first mentioned plurality of conducting strips, first pluralities of spring switch contact fingers integral respectively with said first mentioned plurality of conducting strips, said spring fingers substantially parallel and extending at an acute angle to the said one side of said sheet, second pluralities of spring switch contact fingers integral respectively with said second mentioned plurality of conducting strips, said second plurality of fingers extending through said sheet and laterally positioned in parallel relation to corresponding ones of said first mentioned fingers forming similarly directed pairs of resilient bridgeable contacts on the said one side of said sheet.

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