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PUSH BUTTON ASSEMBLY

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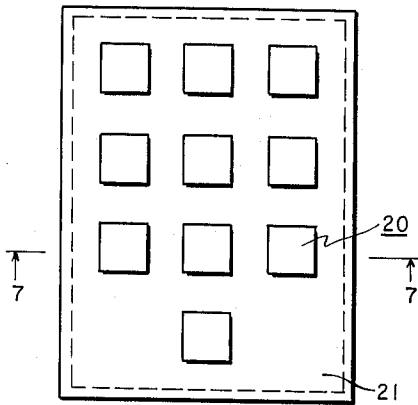


FIG. 1

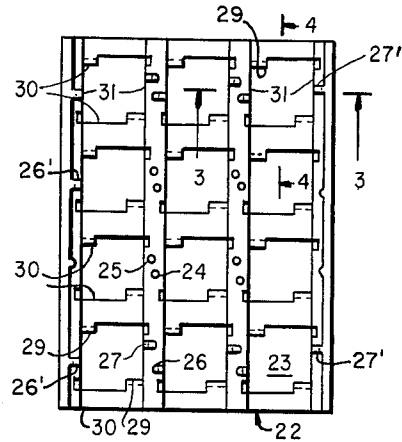


FIG. 2

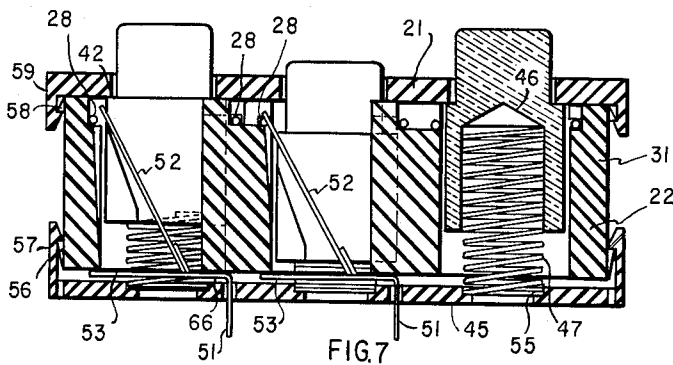


FIG. 7

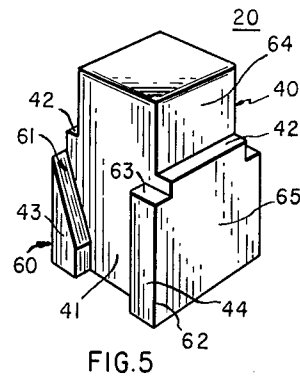


FIG. 5

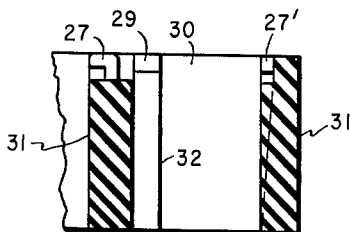


FIG. 3

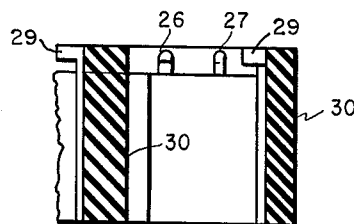


FIG. 4

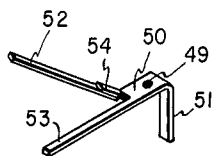


FIG. 6

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PUSH BUTTON ASSEMBLY

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6 Claims. (Cl. 200—5)

This invention relates in general to signal control apparatus as may be used, for example, in a telephone subset to signal a subscriber.

More particularly, the invention relates to an improvement in the construction of signal control units of the general type disclosed in copending application Serial No. 313,214, Push Button Control Unit, by W. A. Reimer, which includes an array of keys or push buttons which actuate contacts and close corresponding conductive paths for signals. By way of example, such a control unit can be connected to a frequency generator whereby upon depressing a select button, a particular frequency combination is transmitted over a path provided by the control unit.

The principal object of the invention is to provide an improved and simplified structure for a push button-type signal control unit.

Another object of the invention is to provide a control unit whose component parts interlock together and whose cost of manufacture is minimized.

Still another object of the invention is to provide a signal control unit with push buttons which are supported primarily by the sides of the frame structure.

In accordance with these objectives the invention features an integrally molded frame structure having a plurality of individual rectangular shaped compartments and a corresponding number of push buttons located therein. The push buttons move in an up and down direction and after being depressed are restored by means of a restoring spring. Another feature of the invention is the unique configuration of both the individual push buttons and the individual contact springs. On two opposite sides of each button there is a pair of embossed sections and the other two sides having an upper and lower section offset with respect to each other. Each spring includes a contact portion which extends alongside and diagonally across the button and is pre-tensioned against one embossed section in such a manner that in response to depressing the particular button, the contact portion is allowed to move against a fixed conductor wire and thereby provide a completed path for a signal.

These and other objects and features of the invention will become more apparent after a perusal of the following detailed description which makes reference to the accompanying drawings of which:

FIG. 1 is a plan view of the control unit according to the invention using ten push buttons.

FIG. 2 is a top view of the frame structure used in the control unit of the invention.

FIG. 3 is a cross-sectional view of the frame structure taken substantially along the line 3—3 of FIG. 2.

FIG. 4 is a cross-sectional view of the frame structure taken substantially along the line 4—4 of FIG. 2.

FIG. 5 is a perspective view of the push button element used in the control unit.

FIG. 6 shows a perspective view of the contact springs used in the control unit according to the invention.

FIG. 7 is a cross-sectional view of the control unit showing three push button assemblies in both the restored and depressed positions.

Referring now to the drawings, FIG. 1 shows one scheme for arranging a number of push buttons of a signal control unit. This particular scheme has ten keys

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or buttons 20, each of which, for example, could represent a distinct frequency combination. By depressing one or more buttons in a particular sequence the required signal is transmitted to the desired apparatus or subscriber as the case may be. The buttons extend through apertures in a top plate or face plate 21.

FIG. 2 shows frame structure 22 which is located below the top plate 21 in assembly and is preferably molded as an integral component. This results in reducing the cost of manufacture even though incorporating many structural details. The structure in particular consists of cross-members 30 and 31 which form the side supports for buttons 20. Lips 29 are integrally molded portions of the top edge of cross-members 30. They project perpendicularly from opposite corners of each of the compartments formed by the intersecting cross-members 30 and 31, and are used as stops for buttons 20. At the top edge of certain members are guide studs 24 and 25, and hook clamps 26, 26', 27, and 27'. These elements, which are integrally molded portions of the top of the frame structure and which are made flush with the top edge of members 30 and 31, are used to secure conductor wires 28 to the frame structure as shown in FIG. 7. The base portion of each of the hook clamps 26 and 27 is centered on cross-members 31 with the hooked portion extending toward one of the apertures 23. Each of clamps 26' and 27' extends toward one of the apertures 23 from the outer cross-members 31.

FIGS. 3 and 4 show the hook clamps 26, 27', and 27 in more detail. Here it can be seen that clamps 26 extend in one direction and clamps 27 in the opposite direction, both forming a slot for reception of conductor wire 28. However, it is to be understood that on the members serving as side supports, the clamps 26' and 27 extend in one direction only. Thus, the clamps formed on the top edge of the middle members secure two parallel conductor wires whereas those formed on the side members only secure a single conductor wire. To keep contact spring portion 52, see FIG. 7, from hitting the corner 58 of the frame structure and disrupting the engagement of contact portion 52 and conductor wire 28, the portion just below where the conductor wires are positioned is cut away as shown in FIGS. 3 and 7. Adjoining lip 29 is a rib 32 which provides an offset to that side of the compartment. This ineffect defines a groove in which button 20 can move more smoothly and with less tendency to tilt.

FIG. 5 shows details of push button 20. To keep the cost of manufacture down the button is preferably molded of a plastic material, such as a nylon plastic. Where it is desired to have the finger portion or top surface of the buttons illuminated or lit up, the button can be made of transparent plastic and an incandescent lamp placed just below the unit. This will allow light rays to be transmitted to the top surface of the push buttons. As for the physical attributes of the button each has a finger portion 40 and a main or lower portion 41. The button is rectangularly shaped. Two sides each have an upper portion 64 and a lower portion 65 that are offset with respect to each other forming thereby a shoulder 42. The other two parallel sides include each a pair of embossed sections 43 and 44. Section 43 has one edge 60 that is in the plane of the lower portion 65 and another edge 61 that runs diagonally to the buttons side surfaces. Section 44 on the other hand, is rectangularly shaped and edge 62 thereof is in the plane of lower portion 65. This projection defines a shoulder 63 which normally rests against the aforementioned lip 29.

FIGURE 6 shows contact springs 50 which consist of a terminal portion 51, a middle portion 53, and a pre-tensioned movable contact portion 52. The spring is pre-

formed and is preferably made of a nickel silver material. As shown contact portion 52 consists of a leaf secured to the main portion of the contact spring at 54. As an alternative the leaf could be made out of the same piece of material as the main portion of this spring, that is the middle portion 53 and terminal portion 51. To facilitate assembly of the control unit the spring further includes an aperture 49 which receives a stud 66 shown in FIG. 7. The stud is made integral with the frame structure 22 and projects therefrom to locate and receive the springs. In this connection it is to be understood that by virtue of the stud and aperture, the contact springs of the control unit can be merely snapped into place.

FIG. 7 shows the aforementioned components in assembly and in addition shows conductor wires 28, bottom plate 45, and restoring spring 47. From this view it should become apparent how shoulder 42 rests against the under side of top plate 21 and how buttons 20 are held in position by restoring spring 47 and the sides of members 30 and 31. Also, it should be apparent how the restoring springs 47 are kept from shifting and effecting the restoring force against the buttons. This is done by means of a counter bored hole 55 placed in the bottom plate 45. With the end of the spring placed in the depression formed by the counter bored hole it does not move or shift.

The aforementioned interlocking feature of the invention should also be apparent from this view. In particular it should be noted that bottom plate 45 and top plate 21 interlock with frame structure 22 by means of tabs 56 and 58 and complementary catches 57 and 59. The latter are made integral with the top and bottom plate respectively whereas the former are made integral with the frame structure 22. These means serve as the interlocking feature to the control unit. No screws or other similar fastening means are used in the structure resulting in a much simplified and inexpensive control unit.

The left side of FIG. 7 shows one of the push buttons in a restored or normal position. In this position shoulder 42 is in contact with the under side of top plate 21, and shoulder 63 is in contact with lip 29. Furthermore, contact portion 52 is in contact with angled edge 61 of embossed section 43. Edge 61 serves to keep contact portion 52 away from the conductor wire 28 while in the normal position while allowing it to move in contact with it upon being depressed. This can be observed from the center button shown in the figure. The contact portion or movable portion 52 is transferred from an open circuit state to a closed circuit state when the button is depressed by virtue of allowing it to follow its spring bias. The particular spring design has the advantage of a long contact portion which provides for better contact operation.

Conductor wires 28 are held in position by the aforementioned hook clamps 26, 26', 27, and 27' and guide studs 24 and 25. These means are positioned intermediate the side of the compartments, for example, and combined in such a way that the wires 28 can also be snapped into place. In this manner these components also are interlocked with each other.

It should be now understood that according to the invention the cost of manufacture of the control unit is maintained at an absolute minimum by the fact that it uses molded components parts wherever possible. Furthermore, the components used are interlocked with respect to each other and do not require any special fastening means. It is emphasized that these features simplify the construction and make it easier to replace any defective parts in the unit. In addition, it should be noted that a minimum amount of space exists between the members of the frame structure and the sides of the push buttons and that the restoring springs are located directly below the push buttons. This renders a very compact unit. Also these two characteristics provide for maximum stability in

the movement of the push buttons. They move down easily and most directly.

The invention has been described in detail in connection with a preferred embodiment, however, it is to be understood that this was done merely by way of example and not intended as a limitation to the spirit and scope of the invention as only defined by the following claims.

What is claimed is:

1. A push button control unit for signaling electrical apparatus comprising: an integrally formed frame structure comprising cross-members having a top edge and a bottom edge and arranged into a plurality of individual compartments; a top plate having apertures and positioned adjacent said top edge of said cross-member; a bottom plate having apertures and positioned adjacent said bottom edge of said cross-members; rectangularly shaped molded push buttons each having one portion thereof received in said compartment for vertical sliding movement, and another portion thereof protruding through one of said apertures in said top plate, two sides of said buttons each having an upper portion and a lower portion, said upper portion being offset with respect to said lower portion defining a shoulder, and two other sides of said buttons each including a pair of embossed sections formed integrally with said lower portion; one section of each pair defining a trapezoidal shaped projection with at least one edge at an angle with the central axis of said buttons and the other section defining a rectangular shaped projection; restoring spring means positioned between said buttons and said bottom plate, spring loading said button such that said shoulders normally are in contact with said top plate; parallel conductor wires positioned along the top edge of certain members, means formed integrally with said frame structure fixing said conductor wires to said top edge; and movable contact springs, including a contact portion normally pretensioned against an upper surface of said trapezoidal projection so that upon depression of said button, said contact spring is permitted to move in a direction away from the axis of said button and into contacting relationship with said fixed contact means.

2. A push button control unit as claimed in claim 1, wherein each of said movable contact springs comprises a single contact portion normally pretensioned against an upper surface of said trapezoidal projection, a terminal portion extending through said apertures of said bottom plate, and a middle portion made integral with said contact portion and said terminal portion, said middle portion located between said bottom surface and said frame structure and parallel to said bottom plate and perpendicular to said terminal portion, said contact portion forming a first angle with said middle portion and a second angle with said terminal portion.

3. The push button control unit as claimed in claim 2, wherein said top plate and said bottom plate have projecting catches formed integrally therewith; and wherein said frame structure has projecting tabs formed integrally therewith, said tabs receiving said catches and securing said top and bottom plates to said frame structure.

4. A push button assembly comprising: a frame having a compartment formed therein; a push button received in said compartment for vertical sliding movement and having a cam portion formed on one side thereof; fixed contact means secured to said frame; a movable contact spring extending upwardly in said compartment on said side of said button and generally diagonally to the axis thereof, said spring being normally pretensioned against an upper surface of said cam portion so that upon depression of said button, said contact spring is permitted to move in a direction away from the axis of said button and into contacting relationship with said fixed contact means; and restoring means urging said button upward in said compartment.

5. A push button assembly comprising: a frame structure having a compartment formed therein; a push button

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received in said compartment for vertical sliding movement, at least one side of said push button having first and second portions, said first portion having an upper cam surface and both said portions having lateral bearing surfaces formed thereon, slidably movable along the walls of said compartment; fixed contact means secured to said frame; at least one movable contact spring extending upwardly in said compartment on said side of said button between said first and second portions and generally diagonally to the axis of said button, said spring being normally pretensioned against said upper cam surface so that upon depression of said button, said contact spring is permitted to move in a direction away from the axis of said button and into contacting relationship with said fixed contact means; and restoring means urging said button upward in said compartment.

6. A push button assembly as claimed in claim 5, wherein said restoring means comprises: a restoring spring positioned between the bottom of said push but-

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ton and the bottom of said compartment, one end of said spring being received by an indentation in the bottom of said push button and the other end being received by a counterbored hole in the bottom of said compartment.

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ROBERT K. SCHAEFER, *Examiner*.