

Oct. 20, 1942.

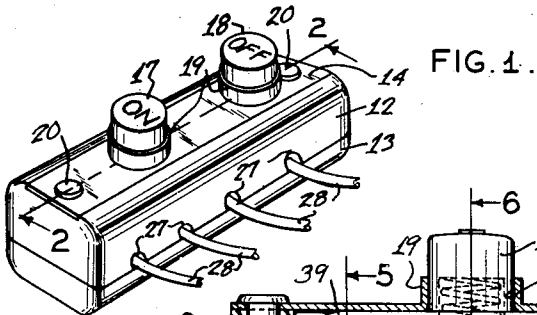
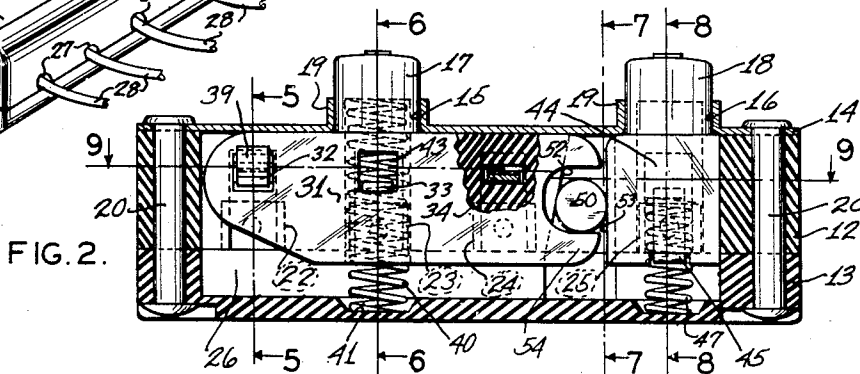
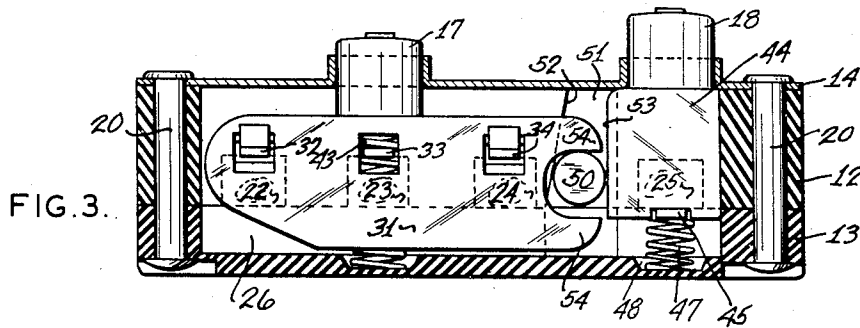
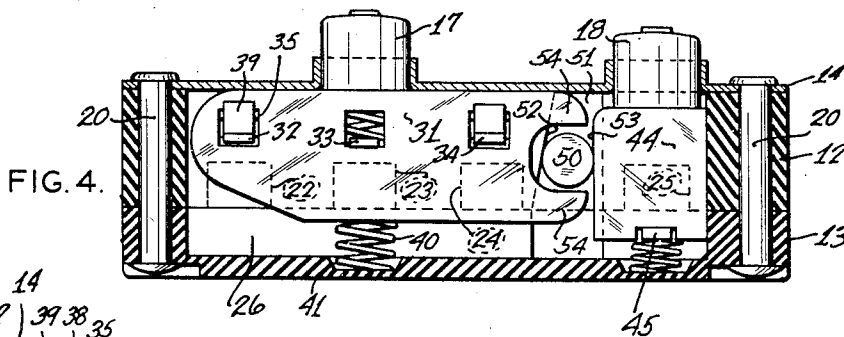
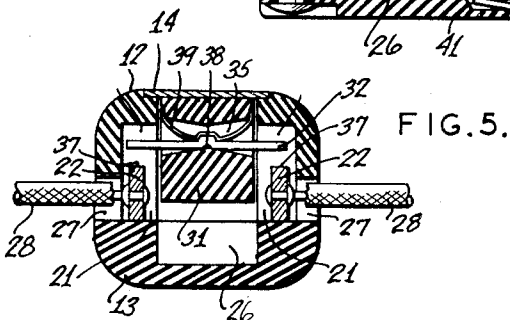
A. C. PERBAL

2,299,250

ELECTRICAL SWITCH

Filed Nov. 12, 1940

3 Sheets-Sheet 1



BY

INVENTOR.
ALBERT C. PERBAL
Lawrence H. Cohn
ATTORNEY.

Oct. 20, 1942.

A. C. PERBAL

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ELECTRICAL SWITCH

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3 Sheets-Sheet 2

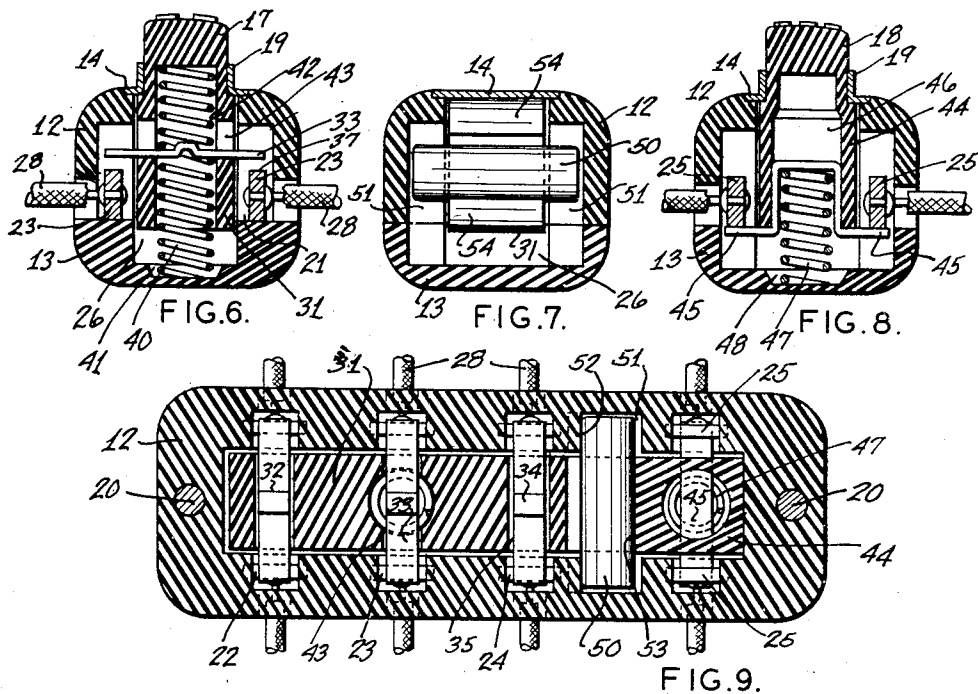
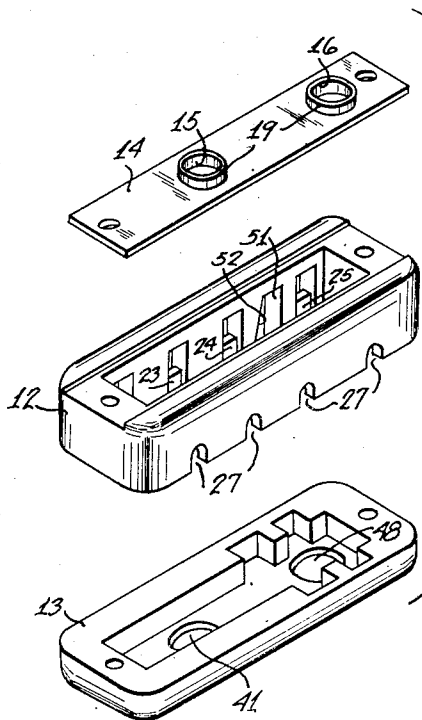


FIG. 10.

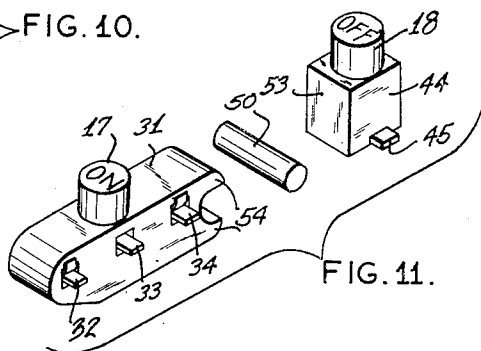


FIG. 11.

BY

INVENTOR.
ALBERT C. PERBAL

Lawrence H. Cohen
ATTORNEY.

Oct. 20, 1942.

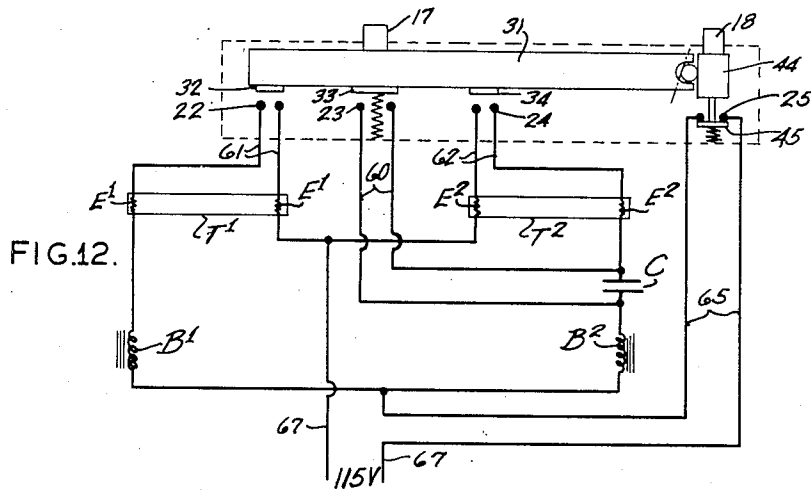
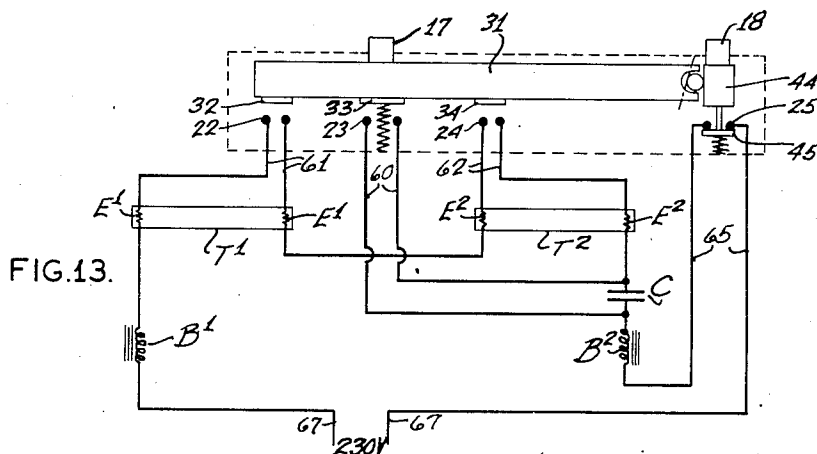
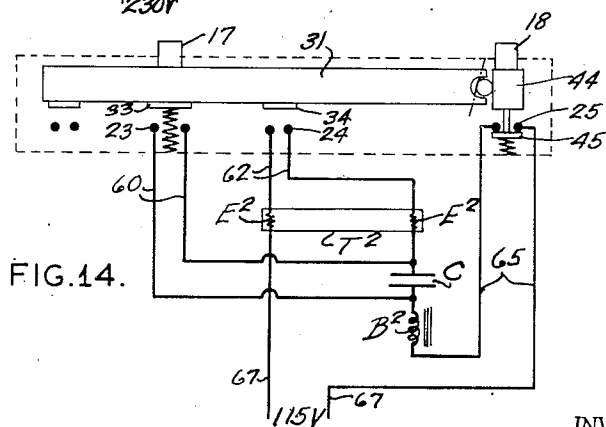
A. C. PERBAL

2,299,250

ELECTRICAL SWITCH

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3 Sheets-Sheet 3



INVENTOR.

ALBERT C. PERBAL

BY

Lawrence H. Cohn

ATTORNEY.

UNITED STATES PATENT OFFICE

2,299,250

ELECTRICAL SWITCH

Albert C. Perbal, University City, Mo.

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5 Claims. (Cl. 200—5)

This invention relates to improvements in electrical switches and more particularly to those of multiple-contact push-button type.

The principal object of the invention is to provide improved control means especially applicable for fluorescent luminaries of the single or double tube variety, and which, in the latter instance, is suitable whether the tubes be connected in series or parallel circuit relation.

As is known, fluorescent discharge tubes now commonly used for lighting purposes have electrodes which are required to be heated as a preliminary or starting operation. In tubes of prevailing type, during starting the electrodes are connected to the supply lines in series circuit relation and current of relatively high value raises their temperature to a suitable degree. Thereafter the low resistance path between the electrodes is broken and a light-producing, electronic discharge occurs within the tube. According to prevailing practice a manual switch in connection with subordinate thermal switches are employed for obtaining full control of the tubes during the starting and running stages of operation. Such control facilities are relatively expensive and are undesirably complicated, especially so where auxiliary apparatus such as a capacitor is employed for eliminating stroboscopic effect and improving power factor.

It is an object of my invention to provide a complete, self-contained switching unit for fluorescent luminaries, of rugged, durable construction, which is compact and relatively economical of manufacture, which is susceptible of use without modification for luminaries having tubes connected for 115 volt or 230 volt supply, and which in other respects overcomes many of the disadvantages attending former control means designed for an analogous purpose.

These objects are attained in the provision of a switch assembly having two control buttons, one of which is operable to effect the momentary closure of three sets of normally open contacts, and the other of which operates to open a fourth set of normally closed contacts. When properly connected to a dual tube fluorescent unit equipped with a capacitor, the contacts under the control of the first said push button are adapted to effect a momentary energization of the tube electrodes to raise them to an electron emitting temperature, and simultaneously to short circuit or shunt out the capacitor. The contacts under the control of the second said button function to break the supply circuit when it is desired to de-energize the lighting unit. Improved means are

provided for temporarily locking the second button and its associated contacts in open condition until the first button is re-actuated, such means preventing unintended reestablishment of the arc across the tube electrodes.

The object of the invention, then, is to provide an improved switch having two groups of contacts adapted to be controlled by push buttons individual to each group and means mechanically inter-connecting the buttons of the several groups to effect coordinated operation of the contacts when one of the buttons is depressed.

Other objects are directed to an improved self-adjusting contact assembly for switches of push button type.

These and other objects and advantages will be more fully explained in the following description of a switch unit embodying my invention, reference being made to the accompanying drawings thereof.

Fig. 1 of the drawings is a perspective view of the switch unit;

Fig. 2 is a longitudinal sectional view taken at line 2—2 of Fig. 1;

Figs. 3 and 4 are sectional views similar to Fig. 2, but showing the movable parts in different operating positions;

Figs. 5, 6, 7 and 8 are transverse sectional views taken at correspondingly numbered section lines on Fig. 2;

Fig. 9 is a sectional plan view taken at line 9—9 of Fig. 2;

Fig. 10 is an exploded perspective view of the parts that make up the switch casing;

Fig. 11 is an exploded perspective view of the movable switch parts;

Fig. 12 is a wiring diagram showing preferred circuit connections for a double tube luminaire having the tubes connected in multiple;

Fig. 13 shows preferred circuit connections for a double tube luminaire having tubes connected in series, and

Fig. 14 shows the wiring arrangement for a single tube luminaire.

Referring now by characters of reference to the drawings, the contacts and other operating parts of the switch are completely enclosed in an elongated hollow body or casing, for the most part formed of molded insulating material. The casing is divided longitudinally into complementary upper and lower sections 12 and 13, the cavity in the upper section extending through the upper wall portion thereof in the formation of a slot-like opening. Such opening is covered by a metal top plate 14 having spaced apertures 15 and 16

that accommodate push buttons 17 and 18. Upstanding collars 19 formed on the top plate about the apertures serve to guide and position the push buttons. The insulating body sections 12 and 13 and the metal top plate 14 are held together in assembled relation by rivets 20 that extend vertically through the end portions of these parts.

The opposite side portions of the upper body section 12 are recessed to provide pockets 21 (Fig. 5) for the reception of fixed contact elements. In the present example four pairs of the said contacts, spaced along the body and numbered 22, 23, 24 and 25, are provided. Openings 27 in the lower side margins of the upper body section communicate with the contact pockets 21 and provide lateral passages for conductors 28 leading to the said fixed contacts.

Mounted for vertical movement in body cavity 26 is an elongated block 31 of insulating material that constitutes a carrier for bridge pieces or so-called movable contacts 32, 33 and 34 which cooperate with the pairs of fixed contacts 22, 23 and 24, respectively. Push button 17 heretofore mentioned is formed as an integral part of the contact carrier 31 and is disposed in vertical alignment with the central contact assembly 23—33 of this group. Three spaced transverse passages 35 in the carrier block 31 accommodate the movable contacts 32, 33 and 34, the ends of which extend laterally beyond the sides of the carrier and into the recesses 21 directly above the contacts 22, 23 and 24. The contacts 32, 33 and 34 are adapted to be moved by the carrier 31 into and out of bearing engagement with the upper horizontal surfaces 37 of their respective pairs of fixed contact elements.

Each of the movable contact elements 32, 33 and 34 is an elongated piece of relatively rigid strip metal and has a transverse ridge 38 formed on its upper side, which ridge is subtended by a transverse groove on the underside of the strip. As best appears from Fig. 5 the passages 35 in the carrier block for the contacts 32 and 34 are formed with arcuate or crowned lower surfaces upon which the said contact elements are adapted rockingly to seat. Bowed spring clips 39 of inverted U shape overlie and are adapted yieldingly to hold the contact elements 32 and 34 in proper position, such clips having suitable recesses to accommodate the ridged portion 38 of the said contacts. The opposite ends of the clips 39 embrace the sides of the carrier block and prevent endwise displacement of the clip and contact assembly. The described mounting expedient enables self adjustment of the contacts 32 and 34 to permit them to seat properly on the paired fixed contacts with which they coact even though the upper surfaces thereof become misaligned to a considerable degree.

The carrier block 31 is mounted on a helical compression spring 40 which seats in a shallow pocket 41 formed in the lower body section 13. The block 31 is provided with a vertical bore 42, coaxial with push button 17, which receives and positions the upper portion of spring 40. Spring 40 also provides a resilient mounting for contact blade 33 which, as appears from Fig. 6, extends transversely through adjacent coils of spring and through lateral openings 43 in the sides of the carrier block. The ridge 37 on this blade is confined within the spring coils to prevent endwise displacement of the strip.

The second push button 18 constitutes an integral, vertical extension of an insulating block

44 on which is mounted a contact element or blade 45 adapted to coact with fixed contacts 25. Blade 45 has a central portion of the shape of an inverted U (see Fig. 8), having outwardly turned extremities forming contact portions. As distinguished from the contact assemblies associated with push-button 17, heretofore described, the outwardly turned feet or contact portions of blade 45 extend below the companion fixed contacts 25 and are adapted to engage the lower horizontal surfaces thereof. Push button block 44 has a vertical bore 46 which snugly accommodates the raised central portion of blade 35 and also the upper portion of a helical compression spring 47, the lower end of which seats in a shallow recess 48 formed in the floor of the lower body section 13. Spring 47 bears upwardly against the contact element 45, tending to urge the same into engagement with its related fixed contacts. The push button block 44 is substantially square in transverse section and presents a horizontal shoulder 49 which abuts the under surface of top plate 14 when this push button assembly is in its uppermost or switch-closed condition.

Latching means are provided for holding push button 18 in a depressed condition, the associated switch contacts 25—45 then being open, the release of such latching means to effect closure of the said contacts by spring 47 being under the control of the first push button, 17. Such means comprise a cylindrical element or roller 50, preferably formed of insulating material, which extends across the body cavity between the individual switch assemblies 24—34 and 25—45. The internal side portions of the body sections are formed with recesses 51 to receive the opposite ends of roller 50. The surfaces 52 of these recesses which face toward the side surface 53 of contact block 44 are inclined with trend converging upwardly toward contact block 44 as shown. Roller 50 is confined between vertically spaced fingers 54 extending at the end of contact block 31 and is normally held thereby in lateral contact with the upwardly convergent surfaces 52, 53.

The manner in which roller 50 performs its latching function is as follows: When push button 18 is depressed from its initial or normal, switch-closed position shown in Fig. 2, no interference from roller 50 is encountered because the roller tends to move downwardly along the gradually widening portion of its guide-way. However, upon manual release of the push button 18, spring 47 tends to return the movable contact assembly to its upper position but such movement is limited by the wedgement of roller 50 between the upwardly convergent guide surfaces 52 and 53. Thus the movable switch components are retained in open condition, as appears in Fig. 4. Now, when push button 17 is depressed the roller becomes dislodged from its wedged position to release contact block 44 which then returns to its initial, switch-closed position under influence of spring 47. It will be understood that carrier 31 is not subject to latching by the described means, and that the switching assembly of which it is a part is of so-called momentary contact type, the contacts thereof being closed only so long as push button 17 is held manually depressed. The push buttons 17 and 18 may be provided with suitable indicia such as the words "off" and "on" as shown in Fig. 1, this desirably adapting the unit for the control of fluorescent luminaires as will be hereinafter explained.

It will appear that the described constructional features of the unit make for compactness, minimization of parts, durability, simplicity, and economy of manufacture.

It is believed that features described herein may be employed to advantage and with improving results in push-button switches designed for a variety of different purposes. For purposes of providing a complete understanding of the operation of the instant embodiment of my invention a description of its use in connection with improved fluorescent discharge tube circuit follows:

In Fig. 12 there is shown, diagrammatically, circuit connections for a double tube lighting unit having standard 115 volt tubes T^1 and T^2 connected in multiple. The tubes T^1 and T^2 have the usual inductance or ballast coils B_1 and B_2 disposed serially in their respective individual circuits. In addition to ballast B_2 , the individual circuit attending tube T_2 has a capacitor C connected serially therein, such capacitor serving to produce a non-synchronous phase relationship of the tubes which eliminates or reduces stroboscopic effect, and has other beneficial results. However, since the capacitor may reduce the voltage applied to the resistance terminals E_2 of tube T_2 below a value required to cause adequate heating of said terminals, it is desirable to short-circuit the capacitor during the starting period. This is accomplished through the contacts 23—33 of the switching unit and conductors 60. During the starting period, when "on" button 17 of the switch is depressed, the resistance electrodes E_1 of tube T_1 are interconnected by wires 61 and switch contacts 22—32 which completes an entirely metallic, relatively low resistant circuit through the electrodes for heating purposes. Simultaneously, and in similar manner, electrodes E_2 of tube T_2 are interconnected by wires 62 and switch contacts 24—34. After the said electrodes are sufficiently heated, which in most instances requires only a fraction of a second, the "on" button 17 is released to allow contacts 22—32, 23—33, and 24—34 to open. Thereupon the tubes will become energized in their normal manner by an arc or space discharge across their terminals. The capacitor C , then functioning, alters the operating phase relationship of the tubes as aforesaid. The contacts 25—45 of the "off" button are connected in series by wires 65 in one of the supply lines 67 common to both of the individual tube circuits. If this switch was in open condition prior to depression of the "on" button such operation would have operated to release its holding latch, as has been previously described, to close switch 25—35. In any event after pressing the "on" button to energize the tubes the "off" switch will be closed. It will now appear that pressing the "off" button interrupts the energy supply to both tubes and that the main circuit will remain broken at the "off" switch until the "on" button is again pressed. The desirability for latching the "off" switch in open condition is that unintended reenergization of the tubes is prevented as might otherwise be the case should the "off" switch re-close before the terminals had time to cool. Further, continued energization of the electrodes when cold, even though no visible arc or discharge is manifest, is believed to be deleterious and shorten tube life. Such is prevented by the switch of my invention.

Fig. 13 illustrates a preferred circuit arrangement when the tubes are connected in series

relation, as where standard 115 volt tubes are supplied by a 230 volt line. It will appear that only minor changes in the circuiting arrangement from that shown in Fig. 12 is required. In Fig. 14 showing connections for a single tube, contacts 21—31 are not used.

What I claim and desire to secure by Letters Patent is:

1. In an electrical switch of push button type, a casing, a plurality of switching means in the casing, each of said switching means including a pair of fixed contacts, a movable contact blade, a carrier of insulating material for the movable contact blade, said carrier being adapted to reciprocate vertically in the casing to move the blade into and out of bridging relation with the fixed contacts, a push button member extending through the upper wall of the casing for depressing the carrier, and a spring acting upwardly on the carrier; latching means under the control of a first said push button for holding a second said blade carrier in depressed position, said means comprising a wedging element confined between upwardly convergent surfaces of the casing and the second said blade carrier, and a projection on the first said blade carrier adapted to engage said element and displace the same out of wedged engagement with said convergent surfaces when the first push button is depressed.

2. In an electrical push button switch, a casing, first and second switching means in the casing, each of said switching means including a pair of fixed contacts, a movable contact carrier of insulating material positioned between the fixed contacts and adapted for vertical reciprocating movement in the casing, a contact blade mounted on the carrier for movement into and out of bridging relation with the fixed contacts, a spring acting on the carrier to urge the same toward the upper casing wall and a push button extending through the upper casing wall for depressing the carrier; latching means under the control of the push button of said first switching means for holding the blade carrier of said second switching means in depressed position, said latching means comprising a cylindrical element extending transversely of the casing between said blade carriers, the casing and second blade carrier having opposed surface portions of upwardly convergent trend between which said element is adapted wedgingly to lodge when the second blade carrier is in depressed position, and means on the first blade carrier for dislodging said element.

3. In an electrical switching unit of push button type, a casing, a plurality of switch sets in the casing, each of said sets including a pair of fixed contacts, a movable contact blade, a reciprocable carrier of insulating material for said blade positioned between the fixed contacts and adapted to move said blade into and out of bridging relation with said fixed contacts, a push button for depressing said carrier and a spring acting on said carrier to oppose depression thereof, latching means for holding one of said carriers in depressed position, comprising a wedging roller positioned between opposing surfaces of relatively convergent trend formed on that carrier and the casing, said roller being adapted wedgingly to engage said carrier and oppose movement thereof by its associated spring, and means on another of said blade carriers adapted to engage and displace said roller to effect the

release of said first carrier when the second said carrier is depressed.

4. In an electrical push-button switching unit, a casing, a plurality of switch sets in said casing, each of said switch sets comprising a pair of fixed contacts, a movable contact blade, a reciprocable carrier for said blade positioned between the fixed contacts and adapted to move the blade into and out of bridging relation with the fixed contacts, a push-button for depressing said carrier, extending through the upper casing wall, and a spring acting on the carrier to oppose depression thereof by the push button, one of the said blade carriers having a horizontally extending recess formed in an end face thereof, a roller element loosely disposed in said end recess and contacting the end face of an adjacent blade carrier, recesses formed in the side walls of the casing into which the ends of said roller extend, said casing recesses and said last mentioned blade carrier having opposed surfaces of upwardly, relatively convergent trend, said roller

being adapted wedgingly to lodge between said convergent surfaces to retain said last mentioned blade carrier in depressed position until released through dislodgment of the roller by depression of the said recessed blade carrier.

5. In an electrical switching device, a housing, two switches therein, each of said switches comprising fixed and movable contacts, a carrier for the movable contacts, a plunger for depressing the carrier to effect actuation of the switch, and a spring arranged to oppose depression of the carrier; means for temporarily holding the carrier of one of said switches in depressed position, comprising a movable element confined between opposed, relatively convergent surfaces of the housing and said carrier, means on the second carrier normally holding said movable element for wedged disposition between said surfaces, and means operable by the depression of the second carrier to dislodge said element to effect the release of the first carrier.

ALBERT C. PERBAL.