March 12, 1957 A. J. BISSONETTE ET AL 2,785,238

TONE COLOR ASSEMBLY FOR ELECTRIC ORGANS

Filed Jan. 28, 1954

2 Sheets-Sheet 1

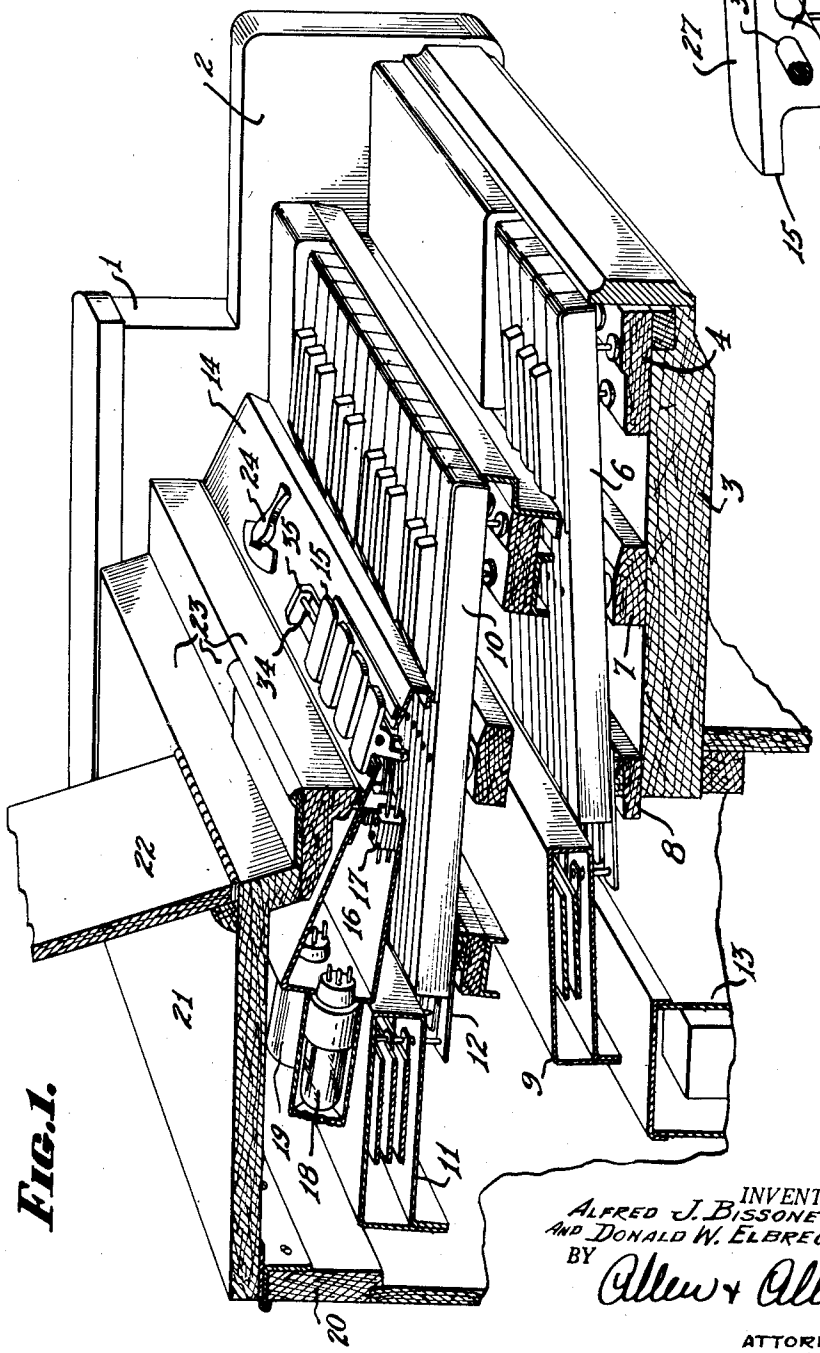


FIG. 1.

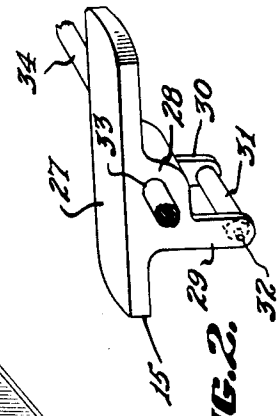


FIG. 2.

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2 Sheets-Sheet 2

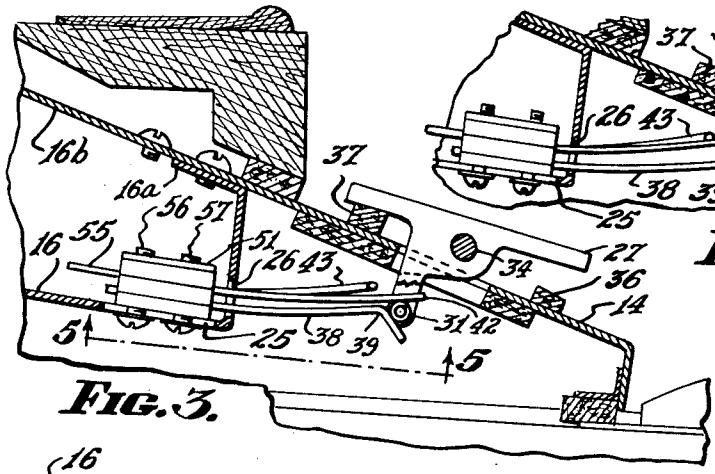


FIG. 3.

FIG. 4.

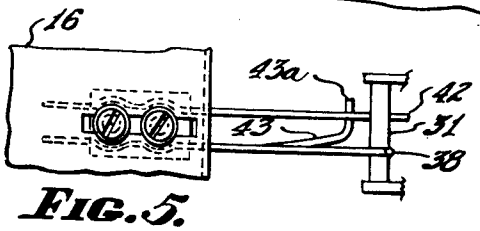


FIG. 5.

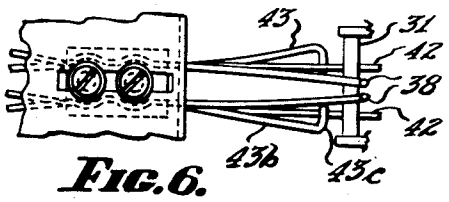


FIG. 6.

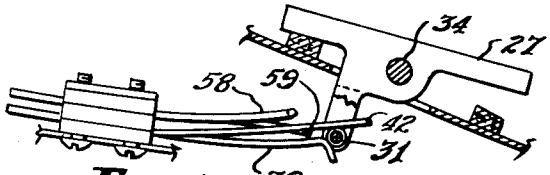


FIG. 7.

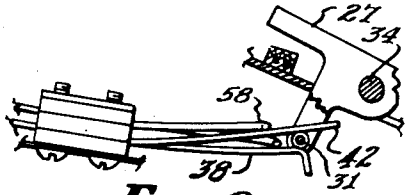


FIG. 8.

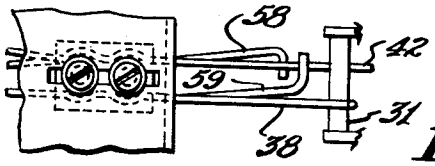


FIG. 9.

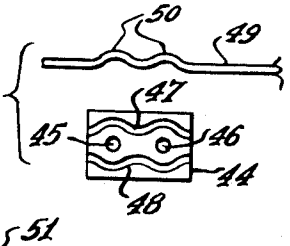


FIG. 10.

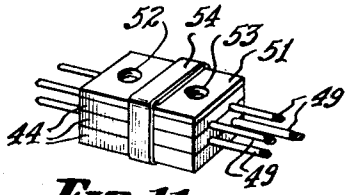


FIG. 11.

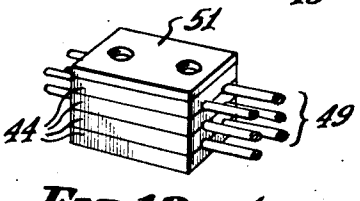


FIG. 12.

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TONE COLOR ASSEMBLY FOR ELECTRIC ORGANS

Alfred J. Bissonette and Donald W. Elbrecht, Milford, Ohio, assignors to The Baldwin Piano Company, a corporation of Ohio

Application January 28, 1954, Serial No. 406,642

20 Claims. (Cl. 200—5)

Our invention relates to the combination of a tone color panel structure and a casing, housing or supporting various elements of a tone color system for electrical musical instruments. An exemplary type of electrical musical instrument to which the present invention may be applied is one in which electrical oscillations rich in harmonics are generated by suitable means, the oscillations being fed selectively to headers or collectors through switches operated by playing keys. The timbres or tone colors of the various oscillations are then selectively modified by means comprising filter circuits but in some instances embodying electronic means for phase inversion or incidental amplification. These various means are preferably included in or mounted upon a structure conveniently termed a voice box, preferably having plug-in connections with the other electrical devices of the instrument, the voice box itself being preferably removable as a unit for replacement or repair. The selection of the filter or other circuits used in voicing is accomplished by switches operated through stop tabs mounted in a position of convenient access to the player of the instrument.

Our invention will be described in an exemplary embodiment having to do with an instrument of the type just outlined; but its utility is not confined thereto.

One of the objects of this invention is the provision of an improved, simplified and more economical stop tab and switch construction which may be employed with any type of instrument in which changes in tone color are achieved through the operation of switches.

It is an object of the invention to provide an integral removable assembly comprising a voice box or its equivalent, a voicing panel including stop tabs and other control means, and the electrical elements pertinent thereto.

It is an object of the invention to provide a construction in which the tone color panel, presenting the stop tabs in an accessible position for the player of the instrument can be located in a position at a relatively small angle to the horizontal, whereby the over-all height of the instrument may be diminished.

It is an object of the invention to provide a structure in which the voice box lies immediately behind the tone color panel, and in a preferred embodiment of which a rearward extension of the tone color panel forms the top side of a rearwardly elongated voice box of substantially reduced vertical dimensions.

It is an object of the invention to provide means controlling the operation of the stop tabs so as to give them a smooth, easy, non-jarring, but at the same time a positive action.

It is an object of the invention to provide a tone color panel and voice box assembly which is more easily disposed in an electrical musical instrument of reduced height.

It is an object of the invention to provide substantial economies in the construction of tone color panels and voice box combinations.

These and other objects of the invention which will

be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, we accomplish by that construction and arrangement of parts of which we shall now describe the aforesaid exemplary embodiment.

Reference is made to the accompanying drawings wherein:

Figure 1 is a partial sectional view of an exemplary electrical musical instrument embodying our invention.

Figure 2 is a perspective view of a stop tab.

Figure 3 is a partial sectional view through the tone color panel and voice box showing the relationship of a stop tab and switch.

Figure 4 is a similar view showing the stop tab in the "on" position.

Figure 5 is a view of the switch device from beneath taken along the line 5—5 of Figure 3. The switch in this instance is a single pole, single throw switch.

Figure 6 is a similar view of a construction embodying two single throw, single pole switches operated by a single stop tab.

Figure 7 is an elevational view with parts in section of a stop tab operating a single pole, double throw switch.

Figure 8 is a similar view showing the same switch in a different position of operation.

Figure 9 is a bottom view of the switch assembly of Figures 7 and 8.

Figure 10 is an exploded view showing one of the switch base laminae and a wire element.

Figure 11 is a partial perspective view showing one form of switch assembly.

Figure 12 is a similar view showing a more elaborate switch base assembly.

Referring first to Figure 1, we have shown certain portions of the exemplary musical instrument. These portions include a side frame member **1** and a side arm **2**, the latter housing the manuals. Between the side arm **2** and the opposite side arm (not shown), there extends a key bed **3**. This bed supports a front rail **4** bearing the usual guide pins for the keys of the lower manual of the organ, indicated at **6**. The key bed also bears a middle rail **7** bearing the pivoting pins for the keys and a rear rail **8** bearing a felt pad or other suitable means to determine the unactuated or rest position of the keys.

Immediately behind the keys of the lower manual **6** we have shown a box-like construction **9** containing suitable key switches. These are preferably of the type shown in United States Letters Patent No. 2,215,124 in the names of Kock and Jordan, but may be varied in accordance with the requirements of particular musical instruments.

In the exemplary embodiment there is an upper manual, the keys of which are indicated at **10**. These keys may be mounted on similar rails and provided with a box **11** containing suitable key switches. The keys of the manuals operate the key switches through the medium of spring fingers **12**.

The console contains means for the generation of electrical oscillations; and an oscillator assembly is diagrammatically illustrated as comprising a removable casing or housing **13**.

The tone color panel of the instrument is a member **14** which, as shown lies at a relatively small angle to the horizontal. The tone color panel bears a series of stop tabs indicated generally at **15** and hereinafter more fully described. It may be noted that the main body portions of these stop tabs lie also in positions at relatively small angles to the horizontal. They are presented in positions of ready access to the player of the instrument.

Immediately behind the tone color panel **14** we have shown a voice box **16**, the top surface of which lies sub-

stantially in the plane of the tone color panel. No attempt has been made to illustrate the various filter and other circuit elements which may be located in the voice box 16 since their nature and disposition forms no limitation on the present invention. The voice box, however, contains the bases 17 of switch elements hereinafter described, which switch elements are operated by the stop tabs. Figure 1, however, illustrates that where desired electronic tubes 18, condensers 19, transformers or like apparatus may be mounted to the rear of the voice box and supported by it. These elements may, where necessary, have their own metallic shields as shown. Space is conserved by causing these elements to extend rearwardly so as to overlie the upper manual key switch box 11.

The console has a rear upper rail 20 and a top board 21, usually hinged to the rail 20. The top board may carry a music desk 22 and certain downwardly extending front panel elements 23, the lowermost one of which may be caused to rest upon the tone color panel 14 through the intermediary of a felt pad or the like.

It will be understood that the instrument may have a pedal clavier, a volume control pedal or pedals and other ancillary apparatus not shown. The tone color panel 14 may also be employed to present to the player of the instrument other control devices besides the stop tabs 15. One of these is illustrated at 24 and may be a switch for controlling or varying an effect such as a tremolo, an echo organ, the brilliance or lack of brilliance of the over-all tone of the insrtument, and the like. The tone color panel may also carry an on-off switch and pilot lamp.

The tone color panel 14 may be, and preferably is, formed of metal suitably decorated as to its outer surface. It may, however, be formed of other substances such as a resinous laminate or wood. A rearward prolongation of the tone color panel may constitute the top side of the tone color box 16 or, as shown in Figure 3, the tone color box may have a front top ledge 16*a* to which the panel 14 is held by screws, welding or other fastening means. The tone color box may also be provided if desired with a removable cover 16*b*. Preferably the tone color box is made of metal for its shielding effect on the electrical instrumentalities which it contains.

The lower side of the tone color box will be provided with a series of slots 25 through which screws pass for the holding of the switch assemblies later described; and the front face of the voice box will be provided with openings 26 to clear the wire elements which form part of the switch assemblies. This is illustrated in Figures 3 and 4.

The stop tabs are preferably structures molded from suitable plastic. One of them is shown in perspective in Figure 2. It comprises an elongated body portion 27 at the top, there being a dependent portion 28 beneath the body. Spaced legs 29 and 30 extend downwardly from the dependent portion 28; and a rod-like operating member 31 extends across between the lower ends of the members 29 and 30. Although it may be otherwise formed, the operating member 31 is preferably made of a hollow sleeve of nylon or other plastic reinforced with an internal metallic wire or rod 32. The combination of sleeve and rod may be cut to suitable lengths. One of these lengths is positioned across between the members 29 and 30, its ends lying in perforations therein. The operating member 31 is conveniently fastened in place by touching the ends thereof with a hot iron. The use of nylon is advantageous in that it has a lubricating effect to counteract friction when the operating member slides against certain wire elements hereinafter described.

The dependent portion 28 of the stop tab is transversely perforated as at 33 beneath substantially the central portion of the body member 27, the perforation accepting a metallic rod 34 as a pivot. The stop tabs are mounted in groups upon pivot rods 34, with felt washers (not shown) between the stop tabs to space them. The pivoting rods 34 extend across between supports fastened to the tone color panel at each side of each stop tab group. One of these supports is illustrated in Figure 1 at 35. Ordinarily there will be a stop tab group or series for each of the manuals of the instrument and for the pedal clavier, there being, of course, a stop tab for each voice within the range of the instrument. Stop tabs may also be provided for other purposes including the coupling of manuals and other special effects.

It may be noted in Figure 2 that the operating member 31 is offset rearwardly from the position of the pivoting rod 34. The tone color panel 14 will bear felt pads or the like 36 and 37 fixing the on-off positions of the stop tabs and acting as cushioning means. These are shown in Figures 3 and 4.

In forming the stop tab switches, we employ combinations of elements which are preferably in the form of spring wires. One of these elements is a cam member having contact with the operating element 31 from beneath. Such a cam member is indicated at 38 in Figure 4; and it will be noted that it is bent as at 39 near its end to form an upwardly extending hump, so related to the operating member 31 of the stop tab that this member can lie on either side of the hump. The cam wire 38 exerts upward pressure on the operating member 31; and as the operating member passes from one side to the other of the hump when the stop tab is actuated, a dead center effect is produced, the cam member tending to retain the stop tab either in the on or off position. The downwardly extending portions 29 and 30 of the stop tabs extend through slot-like perforations 40 in the tone color panel 14, these perforations being common to a group of the stop tabs. Beneath the panel 14, especially where that panel is of metal, there may be a similar perforated sound deadening felt pad 41 cemented to the panel. The stop tabs are actuated by tilting as will be evident from a comparison of Figures 3 and 4. The "on" position of the stop tab is normally that in which the front end of the body 27 is depressed, as shown in Figure 4.

It has been found that while the cam element 38 provides a good dead center action for the stop tabs, this action, if uncontrolled, is likely to be too abrupt and to produce an undesirable jar as the stop tab reaches its final position. Accordingly, another necessary element of our switch combination is a wire member 42 which lies on the opposite side of the operating member 31 and exerts downward pressure thereon. The element 42 and an additional force exerted thereon by an element 43 described below, serve to control the stop tab action in such a way as to make it less abrupt as the tab comes into the "on" position. The shape of the bent end of the cam element 38 can be controlled to make the action smoother and less abrupt as the stop tab comes into the off position.

The position of the wire element 42 will be varied by the position of the stop tab as will be seen by comparing Figures 3 and 4. The element 42 may thus be employed as one contacting element of a switch combination by providing another wire element 43 which will be contacted by the element 42 when the stop tab is in the "on" position, as illustrated in Figure 4.

It will be seen that the element 42 in contacting the element 43 is acted on by a force which is applied just before the stop tab reaches the "on" position. By virtue of the spring action of the element 43, this force actually increases as the stop tab snaps into the "on" position thus providing the cushioning effect which makes the tab action less abrupt, as pointed out above.

The term wire is used herein in a broad sense in view of the fact that relatively narrow strip materials may be employed by us, while the particularly cross sectional shape of the strand-like elements is not a necessary limitation. However, in actual practice we have found it entirely satisfactory to employ round wires made of suitable spring metal such, for example, as beryllium-copper. Where the wires are used as contact members we pref-

erably plate them with silver or with some other metal which is either not subject to corrosion or will serve to effect good electrical contact in spite of it.

Figure 5 presents a view of the switch of Figures 3 and 4 from beneath; and it will be noted that the contact wire **43** has its end portion bent transversely to the axis of the control wire **42** as at **43***a*. This insures contact of the elements when the stop tab is in the "on" position.

The various wires making up the contact and control elements of the switch are held at their opposite ends in a switch base which comprises a plurality of laminae of insulating material. One such lamina is shown at **44** in Figure 10. It may be a piece cut or molded from suitable insulating material such as hard rubber or resin. It is perforated as at **45** and **46** for the passage of screws hereinafter described; and one surface of the member **44** is provided with sinuous or non-rectilinear grooves indicated at **47** and **48**. These grooves are of such dimensions as to accept tightly a wire element such as shown at **49** in the same figure, this wire element being curved or bent as at **50** to conform with the shape of the grooves. The sinuosity of the grooves and the conforming shape of the wires prevents axial rotation of the wires.

With elements such as those shown in Figure 10, various switch base combinations may be made up. For example, Figure 11 illustrates a switch base made up of three of the laminae **44**. This switch base holds four wire elements indicated at **49**. It is surmounted by a metal or other plate **51** provided with threaded perforations **52** and **53** aligned with the perforations **45** and **46** of the laminae. For convenience in assembly, the structure may be temporarily held together by an adhesive band **54**.

In Figure 12 we have shown a switch base combination made up of four laminae **44** and holding six wires **49**. Projections of the wires or certain of them at the rear side of the switch base may be employed for the purpose of soldered connections with lead wires and the like as will be readily understood. One such projection is illustrated at **55** in Figure 3.

The switch base assemblies are permanently held together and mounted on the voice box by a pair of screws **56** and **57**. These screws pass through the slots **25** in the voice box, through the perforations in the laminae **44**, and are threaded into the perforations in the plate **51**.

Various switch combinations may be made up using the elements aforesaid. For example, in Figure 6 we have shown a combination in which the operating element **31** is contacted by two of the cam wires **38** on the lower side and by two of the control wires **42** on the upper side. Each control wire is provided with its contacting element **43** or **43***a*. As specifically illustrated in Figure 6, two single pole, single throw switches are thus arranged to be actuated by one stop tab. One of these switches is closed and the other opened when the stop tab is in the "on" position. Clearly, by varying the position of the contact wire **43***b* it could be arranged to have both switches closed when the stop tab is in the "on" position.

Figures 7, 8 and 9 illustrate an arrangement of a single pole, double throw switch. This arrangement comprises a cam wire **38**, a control wire **42** and two contact wires **58** and **59**, with bent over ends as shown in Figure 9, these ends being located respectively on each side of the contact wire **42**. Thus, the contact wire will make contact with element **58** when the stop tab is in the "on" position, but will make contact with the tab **59** when the stop tab is in the off position.

Other combinations may be effected using the elements as herein taught, such, for example, as double throw, double pole switch combination.

It is within the scope of the invention to employ the cam member **38** as a contact, if desired. For example, by extending the bent portion **43***c* of Figure 6, it could be adjusted to contact the cam **38** in the position shown in Figure 8, in order to complete an electrical circuit. Because the cam element has an up and down movement for each actuation of the stop tab, it is ordinarily preferred to employ the element **42** for contact purposes.

Modifications may be made in our invention without departing from the spirit of it.

Having thus described our invention in certain exemplary embodiments, what we claim as new and desire to secure by Letters Patent is:

1. In voicing means for an electrical musical instrument the combination of a tone color panel and a voice box, the said tone color panel lying substantially in a prolongation of the plane of one of the sides of the voice box, switch elements having bases mounted on said voice box and actuatable elements projecting therefrom so as to lie roughly in parallelism with one side of said tone color panel, stop tabs of substantially flat, tablet-like form mounted substantially centrally for tilting movement on the other side of said tone color panel, said stop tabs having actuating means extending through a perforation in said panel to and beyond the first mentioned side thereof, said actuating means arranged and located to actuate the actuatable elements of said switches.

2. The structure claimed in claim 1 so located in an electrical musical instrument that the said tone color panel lies at a small angle to the horizontal with the said voice box located therebehind.

3. The structure claimed in claim 1 wherein the actuatable elements of said switches include a resilient cam element presenting a projection to the actuating element of the associated stop tab and exerting a dead-center effect thereon to retain the stop tab in a plurality of positions.

4. In an electrical musical instrument a tone color panel located in an off-set position to a manual of playing keys and lying at a small angle to the horizontal, and a voice box lying behind said tone color panel and substantially in a prolongation of its plane, said voice box being rearwardly elongated, the aforesaid arrangement serving to minimize height requirements in the said instrument, the said tone color panel bearing a series of rockable stop tabs and the said voice box bearing switches actuated by the said stop tabs.

5. The structure claimed in claim 4 wherein said switches have actuatable elements extending beneath said tone color panel, said stop tabs having actuators therefor extending through a perforation in said tone color panel.

6. A stop tab and switch construction comprising a stop tab of substantially flat-tablet-like form having a body mounted substantially centrally for pivotal rocking movement wholly at one side of a tone color panel, said stop tab having spaced leg portions extending through a perforation in said panel, said spaced leg portions being interconnected at the opposite side of said panel by a bar-like actuating member, a switch having a base with resilient strand-like actuatable elements projected therefrom in general parallelism with said panel, one of said elements being a cam member presenting a hump to the actuating element of said stop tab so as to provide a dead center effect for maintaining said stop tab in a plurality of positions, and another of said resilient elements serving as electrical contact means.

7. The structure claimed in claim 6 wherein said strand-like elements are held near one of their ends between insulating laminae held together to form the said switch base.

8. The structure claimed in claim 7 including a control element forming one of said resilient strand-like elements, said control element lying on a side of said actuating element opposite from the side contacted by said cam element, said control element having at all times resilient contact with said actuating element.

9. The structure claimed in claim 8 wherein said control element has its end portion moved to different positions depending upon the position of the said stop tab, said resilient strand-like elements including another element

positioned to make selective electrical contact with said control element depending upon its position.

10. The structure claimed in claim 9 wherein the said actuating element is off-set from a plane passing through the pivot of the said stop tab and normal to the plane of the body thereof.

11. The structure claimed in claim 10 wherein a fourth strand-like element is arranged on the opposite side of said control element to make selective contact therewith depending upon the position of said stop tab.

12. The structure claimed in claim 10 wherein said resilient strand-like elements are formed of wire.

13. The structure claimed in claim 10 wherein said resilient strand-like elements are formed of wire, the said strand-like elements which make electrical contact with each other being plated with a non-corrosive metal.

14. In a switch and stop tab combination a panel, a rockable stop tab having an elongated body portion pivoted at one side of said panel and spaced depending legs extending through a perforation in said panel to the opposite side thereof, an actuating element of rod-like form interconnecting the said depending legs, a switch element having a base comprising a plurality of insulating laminae, resilient wire elements engaged between said laminae and projecting therefrom, means for holding said laminae in assembled position to form a switch base and for mounting said switch base in a fixed position with respect to said panel, at least two of said wire elements projecting to a position of contact with said actuating element, one of said wire elements being bent to form a dead-center cam, and the other of said wire elements being substantially straight, said wire elements having resilient contact with said actuating element at substantial opposite sides thereof.

15. The structure claimed in claim 14 wherein said laminae are perforated to receive fastening means and are grooved on one of their contacting faces to receive said wire elements, said grooves being non-rectilinear in conformation, and the portions of said wire elements engaged between said laminae being bent to conform to the configuration of said grooves, whereby rotation of said wire elements is prevented.

16. The structure claimed in claim 15 wherein a third wire element makes selective contact with said straight wire element depending upon the position thereof as determined by the position of said actuating element.

17. The structure claimed in claim 16 wherein said third wire element has its end transversely bent to insure electrical contact with said straight wire element.

18. The structure claimed in claim 17 including a plurality of said stop tab and switch combinations, said stop tab being pivoted on a common rod mounted at its ends in bosses on said panel, the depending leg portions of said stop tabs extending through a common perforation in said panel, and said stop tabs being separated one from another by intermediate washers embracing said pivoting rod.

19. The structure claimed in claim 18 wherein said switch bases are mounted on a tone color box attached to and lying substantially in a prolongation of the plane of said panel.

20. In apparatus for the purpose described, a stop tab having an elongated body pivoted substantially centrally to a panel and wholly to one side thereof for rocking movement, said body having a pair of spaced projections extending through a perforation in said panel and interconnected by a rod-like actuating means, said actuating means being off-set from the pivot axis of said stop tab body in such fashion that as the stop tab body is tilted from one position to another said actuating means approaches and recedes from said panel, a switch having a base from which resilient strand-like means project in substantial parallelism to said panel, one of said resilient strand-like means being bent to form dead-center means engaging said actuating member on one side, another of said resilient strand-like members being substantially straight and engaging said actuating member on substantially the opposite side whereby to cushion the movements of said stop tab body while being moved to selective positions depending upon the positons of said stop tab body, and electrical contact means coacting with said substantially straight resilient strand-like element.

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