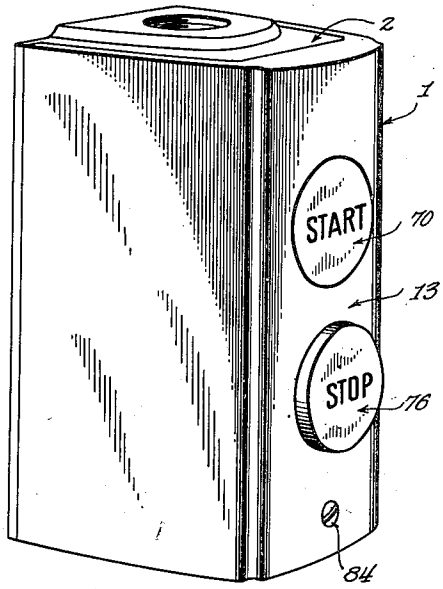
Jan. 5, 1943. W. A. DE SMIDT ET AL 2,307,258

PUSH BUTTON CONTROL STATION

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Fig. 1



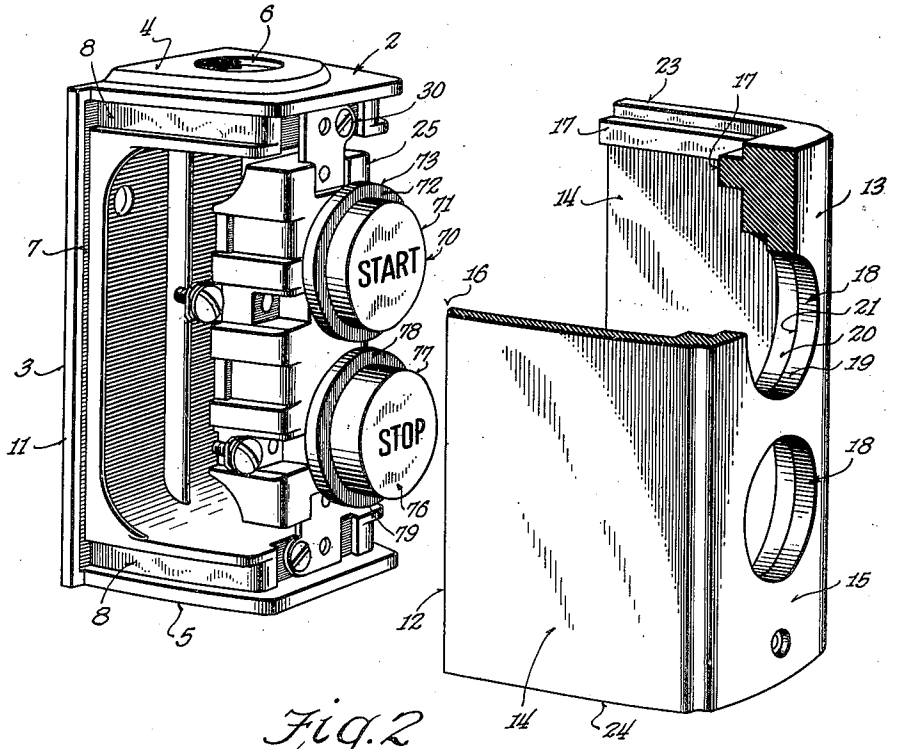


Fig. 2

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PUSH BUTTON CONTROL STATION

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Fig. 3

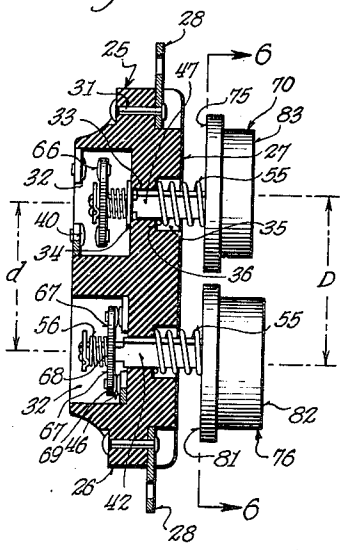


Fig. 4

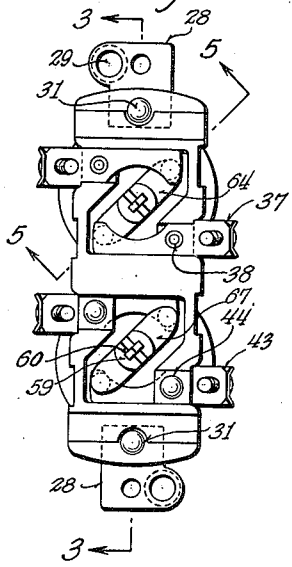


Fig. 5

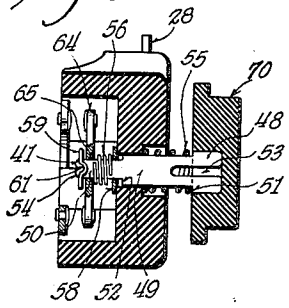
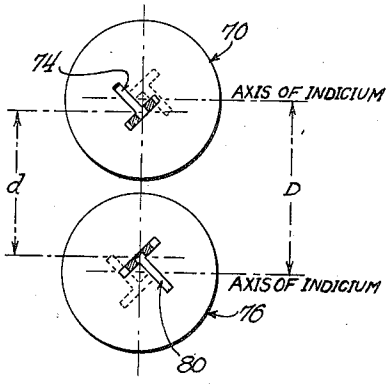


Fig. 6



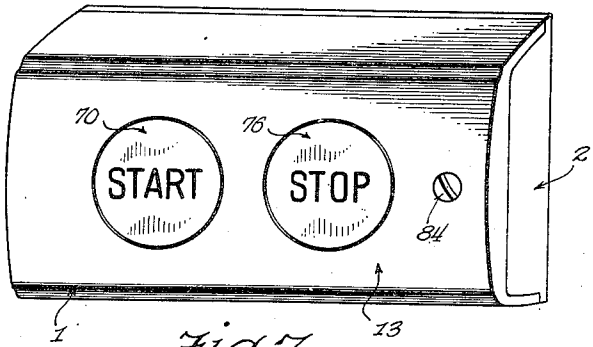


Fig. 7

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UNITED STATES PATENT OFFICE

2,307,258

PUSH BUTTON CONTROL STATION

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Application July 26, 1940, Serial No. 347,616

7 Claims. (Cl. 200—159)

This invention relates to push button control stations for use in electrical control equipment and more especially in industrial electric motor control devices.

The general object of this invention is to procure an improved push button control station having greater utility and reliability because of structural improvements and arrangement of parts described in detail below.

Another object is to effect economies in manufacturing by new arrangements of component parts and new uses of materials.

A further object is the obtainment of a substantially dust-tight push button control station without the normally attendant expensive structure.

A still further object is to procure a structure that can be used in a variety of ways, such as, horizontally or vertically and providing for simple installation, ample wiring space and easy inspection.

The objects of this invention together with other improvements in the structure and operation of push button control stations are completely described and shown in the following specification and attached drawings.

Referring to the drawings:

Figure 1 shows a perspective view of the complete push button control station with the Start and Stop buttons arranged for vertical installation of the control station;

Figure 2 is a perspective view showing the method of assembling the base, push button switching device and cover;

Figure 3 is a partially sectioned view of the push button switching device without the base or cover taken along the lines 3—3 in Figure 4;

Figure 4 is a rear view of the push button switching device without the base or cover;

Figure 5 is a sectioned view taken along the lines 5—5 in Figure 4;

Figure 6 is a rear view of the two contact buttons showing the center-to-center spacing of the buttons and the center-to-center spacing of the push button actuating levers and a T-shaped recess for engaging the switch actuators; and

Figure 7 shows an assembled view of the push button control station with the "start" and "stop" buttons arranged for horizontal installation of the control station.

The push button control device 1 is shown completely assembled in Figure 1. This device has the general exterior design of a control station enclosure as shown in Design Patent No. 118,987 issued February 13, 1940, to Jean Otis Reinecke and assigned to the Allen-Bradley Company. The structural arrangement of the three basic parts that make up this device are shown in Figure 2 and consist of base 2, push button switching device 25 and cover 13. In this figure the push button switching device 25 is shown mounted to base 2 with the U-shaped cover 13 removed and in part section to show the cross section of side wall 14 and front wall 15. The cover 13 has two side walls 14 having the same cross section.

The base 2 is a U-shaped die casting consisting of a back 3, an end 5 and an end 4 which includes an opening 6 for a conduit. The back 3 has a rectangular groove 7 extending along each of the two open edges 11 and meeting at each end with a groove 8 which extends effectively around three sides of each of the ends 4 and 5 thus forming a groove extending effectively around the entire outer edge of the base 2. The molded insulating cover 13 includes a rectangular tongue 16 extending along an edge of each of the two side walls 14 and a rectangular U-shaped tongue 17 extending around three sides of each of the ends 23 and 24. These tongues 16 and 17 are disposed to fit into the grooves 7 and 8 respectively in base 2. By this arrangement a substantially dust-tight enclosure is obtained when cover 13 is placed on base 2. The close engagement of the rectangular tongues of the cover with the rectangular grooves in the base permits the use of a single mounting screw 84 for locking the cover on the base.

In order to provide for a substantially dust-tight arrangement for start button 70 and stop button 76 the following structure is employed. Start button 70 includes a cylindrical portion of small diameter 71, a cylindrical portion of large diameter 73 and a shoulder 72 therebetween. Likewise stop button 76 includes a cylindrical portion of small diameter 77, a cylindrical portion of large diameter 79 with a shoulder 78 therebetween. The cover 13 includes two holes 18 in the front wall 15, each of which has a small diameter 19 with a counterbored portion of large diameter 20 with a shoulder 21 therebetween. The counterbored holes 18 in the cover 13 correspond with the start and stop push buttons 70 and 76 so that when the cover 13 is mounted on the base 2 in either position, each button fits into its corresponding opening with the shoulder 72 of the start button 70 engaging a shoulder 21 of cover 13 and the shoulder 78 of stop button 76 engaging a shoulder 21 of the cover 13. In the assembled position the corresponding shoulders of push buttons and cover are maintained in engagement when in the unoperated position. Thus in this position of the start or stop button, the entire enclosure of cover 13 and base 2 is substantially dust-tight.

The push button switching device 25 is shown in detail in Figures 3, 4 and 5. This device includes a molded base 26 having a front face 27. Two mounting lugs 28 are secured to the base 26 by means of rivets 31. Two recesses 32, op-

posite the front face 27, provide space for the switch contacts and joining each recess is a rectangular hole 33 for an actuating lever 47 or 42. A counter bored hole 35 in the front face 27 joins with hole 33. Two stationary contact terminals 37 are each attached to molded base 26 by means of rivet 38 and disposed within the top recess 32 to provide contacts 40 for the normally open contacts of the start button 70. Two stationary contact terminals 43 are each attached to molded base 26 by means of rivet 44 and disposed within the lower recess 32 to provide contacts 46 for the normally closed contacts of the stop button 76.

In the particular form disclosed, the start button 70 operates a pair of normally open contacts and the stop button 76 operates a pair of normally closed contacts.

The actuator 47 for the normally open contacts, best shown in Figure 5, is a flat strip of steel of the same thickness throughout having at one end a wide section 48 for engaging the push button, adjacent thereto a reduced section 49 for fitting within the rectangular hole 33 of molded base 26, a slot 53 extending throughout the entire length of section 48 and a portion of section 49, a further reduced section 50 adjacent to section 49 for engaging the bridging contact member 64 and a further reduced section 54 adjacent to section 50 which serves as a rivet for attaching the washer 59. In assembling, the coil spring 55 is slipped over section 49 of actuator 47 and the actuator 47 placed in the small rectangular hole 33 of base 26 so that coil spring 55 engages shoulder 51 of actuator 47 and shoulder 36 of base 26 which is the juncture between the small rectangular hole 33 and the large counter bored hole 35. A small flat washer 58 is slipped over the reduced section 50 of actuator 47 engaging shoulder 34 which is the juncture between the small rectangular hole 33 and recess 32 in the molded base 26. A coil spring 56 and bridging contact member 64 with rectangular hole 65 and with contacts 66 facing stationary contacts 40 are slipped over the reduced section 50 of actuator 47 so that the coil spring 56 engages the face of the flat washer 58. The bridging contact 64 is free to move on the reduced section 50 of actuator 47. The bridging contact 64 and coil spring 56 are held in place by means of washer 59 that fits on the reduced end 54 of actuator 47 and locked by riveting the end of section 54. The washer 59 is formed with a ridge 61 that is placed adjacent to the bridging contact member 64 thus allowing the bridging contact member to rock on ridge 61. By this construction the actuator 47 is biased by means of spring 55 to the unoperated position and serves to hold the shoulder 72 of start button 70 in positive engagement with the shoulder 21 of opening 18 in cover 13, when in the assembled position. When the button is operated to cause the bridging contact member 64 to engage contacts 66 with contacts 40 of the stationary terminal 37, contact pressure is obtained from spring 56.

The construction of the normally closed contacts and actuating mechanism for the stop button 76 is exactly the same as that described above for the start button 70 except that the flat washer 58 is omitted and the bridging contact member 67 and coil spring 56 are reversed when placed on the small section 50 of actuator 42.

The spacing shown in Figure 3 between the back face 75 of start button 70 and the back face 81 of stop button 76 to the front face 27 of the molded base 26 is such that when either button is in the operated position the cylindrical portions 71 and 73 of start button 70 and cylindrical portions 77 and 79 of stop button 76 do not emerge entirely from the corresponding openings 19 and 20 in the cover 13. Thus in the operated position, which is only momentary, the opening to the interior of the enclosure is a tortuous path that restricts the movement of dust particles to the interior of the enclosure.

It is desirable in a push button control station of this type that the operating buttons be relatively large in diameter for ease of operation and appearance. This is obtained without increasing the overall size of the control station by offsetting the button with respect to the actuator.

The center-to-center spacing of the actuator 47 and actuator 42 is shown on Figure 3 and Figure 6 as d and the center-to-center spacing of the start button 70 and stop button 76 is shown on Figure 3 and Figure 6 by D. By offsetting the centers of the operating buttons with respect to the actuators so that D is greater than d, it is possible to increase the diameter of the button without increasing the center-to-center spacing of the two actuators.

By placing the two bridging contact members 64 and 67 and corresponding stationary contacts at an angle of 45° to the vertical axis of the push button switching device 25, as shown in Figure 4, it is possible to obtain a closer center-to-center distance d without reducing spacing between contacts. This in connection with offsetting the centers of the push buttons, permits the use of push buttons of large diameter without unduly increasing the size of the device.

A further advantage is obtained by molding each button with a T-shaped recess 74 or 80 so placed that both the start button 70 and the stop button 76 can be attached to its corresponding actuator in either of two positions without altering the center-to-center spacing D. Each actuator 47 and 42 has a slot 53 cut into the end that engages the push button. The large rectangular section 48 of the actuator 47 or 42 can be sprung by virtue of slot 53 so that a very tight fit can be obtained when the push button is attached to the actuator. By this arrangement it is possible to place the start and stop buttons on the actuators so that either vertical or horizontal installation as shown in the Figures 1 and 7 can be obtained.

The dimensions of section 48 of actuators 47 and 42 and the T-shaped recesses 74 and 80 are made so that it is only possible to place the start button 70 on actuator 47 and the stop button 76 on actuator 42.

The portions of the T-shaped recesses 74 and 80 used for engaging the actuators 47 and 42 in the selected position are placed at an angle of 45° to the axis of indicium as shown in Figure 6. In the particular form disclosed, the indicium is shown with its axis passing through the center line of the push button and the attaching recess spaced eccentrically with respect to the axis of the push button.

The push button control station described in detail above, is the preferred form of this invention. There are disclosed in this device a number of novel inventive features. The assembly of the base and cover forms a substantially dust-tight enclosure that is practical to manufacture, easy to assemble and disassemble and particularly

adapted for enclosing a push button control station. The structural arrangement of the push buttons in the cover provide for a substantially dust-tight joint between the push buttons and the openings in the cover that is practical to manufacture and easy to assemble and disassemble. The structure and arrangement of the switch contacts, switch actuators and push buttons permit the use of large diameter buttons without increasing the size of the push button station. The detachable push buttons with indicium thereon are arranged with a simple attaching means that permits installation of the push button control station in either a horizontal or vertical position with the indicium reading in proper position.

It is particularly advantageous to use a cast or molded base and a cast or molded cover. The large amount of detail required in the base and cover such as conduit openings to the interior of the base, push button openings in the face of the cover, mounting means for the switch and the provision for tongue and groove engagement between the cover and the base, are very easily included in the base and cover when the parts are either cast or molded. In a push button station enclosure it is advantageous that the base be die cast and the cover molded from an insulating material. The enclosure formed by the base and cover has extending completely around the juncture existing between the two parts, an effective tongue and groove joint that serves as a substantially dust-tight seal.

The tongue and groove engagement of the cover and the base is arranged so that the cover is attached to the base in a direction at right angles to the back of the base. This permits simple assembly and allows for the anchoring of the two sides of the cover by means of tongue and groove engagement with the base. By this arrangement the cover can be attached to the base by means of a single mounting screw.

The particular structure forming the enclosure of base and cover could easily be modified to include a gasket extending around the tongue and groove joint described above. Thus it would be very easy to form a water-tight enclosure without the attendant expensive structure now employed.

A substantial dust-tight seal is obtained between the push button and the corresponding opening in the cover by providing the cover and the button with shoulders held in engagement by a biasing means when the button is in the unoperated position. The juncture between the push button and opening in the cover includes two cylindrical openings of different diameter having sufficient length so that when the button is operated to the extreme position the cylindrical portions of the push button do not emerge entirely from the corresponding cylindrical openings in the cover and a tortuous path is presented to the entry of dust to the interior of the enclosure.

The push button switching device is simple in structure and utilizes a number of identical parts. This is possible because the two switch cavities and associated stationary contact terminal openings are identical and can be equipped with either normally open or normally closed contacts. The stationary contact terminals are interchangeable on either the normally open or normally closed switch. This is likewise true with the bridging contact, the contact spring, the mounting lugs, contact spring retaining washer and the push button biasing spring. The recess in the push buttons and the switch actuating members are of slightly different dimension for the normally open or normally closed switching devices to prevent confusion in attaching push buttons thereto.

By arranging the contacts of each switching device along lines spaced and parallel to each other, and at an angle of 45° to the vertical axis of the push button control station, and offsetting the buttons so that the center-to-center spacing of the operating axes of the two push buttons exceeds the center-to-center distance between the operating axes of the two actuating members, an optimum center-to-center spacing between the two push buttons can be obtained for a given spacing of switch contacts. This feature is especially important in permitting the use of large diameter push buttons.

The push buttons have a recess molded into the button that engages a projecting portion of the actuating member. The recess is made up in two parts both being placed off-center with respect to the push button and at right angles to each other. These two recesses are so arranged that the button can be placed on the actuating member in either of two positions without altering the eccentricity of the button with respect to the actuating member or the direction of the eccentricity. It is apparent that the same arrangement could be used to provide for more than two positions of the push button.

In Figure 6 there is shown in broken line two additional alternative positions that could be employed whereby the buttons could be attached to the actuating member in four positions without altering its eccentricity. As push button control stations are ordinarily employed, it is only necessary that two alternate positions be provided so that indicium on the face of the button can be properly read when the station is mounted in either a horizontal or vertical position.

The base, push button switching device and cover are arranged symmetrically. The push button switching device can be mounted in the base in either of two positions. Likewise, the cover can be attached to the base and push button switch device in either of two positions regardless of the position of the push button switching device. This arrangement in connection with the multiposition feature of the push buttons permit mounting the push button station enclosure so that the single conduit opening can be arranged in one of four directions and still have the indicium on the buttons in position for proper identification.

The open structure of the control station base and the arrangement of the stationary contacts permits easy wiring of the switch device. With the control station base mounted in place, the push button switching device can be completely wired and then mounted in the base, or if desired can be first mounted in the base and then the wires easily attached to the contact terminals. The control station cover can then be attached directly from the front.

What we claim as our invention is:

1. A push button control station comprising two push button operated switching devices each including an actuating member having an operating axis and a detachable push button having an operating axis, each of said actuating members having a male engaging member and each of said push buttons having indicium on its operating face and a multiposition recess on the opposite face for engagement with said male engaging member; said multiposition recesses and

male engaging members being so disposed that the operating axes of said actuating members and said push buttons are parallel to each other with the center-to-center spacing of the operating axes of said push buttons greater than the center-to-center spacing of the operating axes of said actuating members, and said multiposition recesses and male engaging members being arranged to permit multiposition attachment of each of said push buttons to its actuating member to alter the position of said indicium relative to its actuating member without altering the parallel and center-to-center relationship of said operating axes.

2. A push button control station comprising two closely spaced push button operated switching devices arranged in side-by-side relation, a base with said switching devices mounted thereon, and a wall of insulating material in said base arranged between said switching devices, each of said switching devices including an actuating member and arranged to move in substantially a straight line and in parallel relation to the movement of the other actuating member, a push button for each of said actuating members, each of said actuating members having a male engaging part and said push buttons each having a recess for engagement with its corresponding male engaging part, and said recesses each spaced eccentrically toward the center of the other push button to provide a greater spacing between centers of the push buttons than the spacing between the actuators.

3. A push button control station comprising two push button operated switching devices, a base with said switching devices mounted thereon, each of said switching devices including a pair of stationary contacts attached to said base and a complementary bridging contact therefor, an actuating member operatively supported by said base for each of said bridging contacts and having a push button attached thereto, said switching devices being spaced apart with the actuating members each arranged to move in substantially a straight line and in parallel relation to the movement of the other actuating member, the spacing of the centers of said push buttons being greater than the center-to-center spacing of the operating axes of said actuating members and the stationary contacts so positioned that lines drawn through each pair of stationary contacts and the complementary bridging contact are parallel to each other and at an angle of substantially 45° to a plane including the operating axes of said two actuating means.

4. A push button control station of the type mounted in a restricted space between two spaced supports comprising two closely spaced push button operated switching devices, a base with said switching devices mounted thereon, each of said switching devices including a pair of spaced stationary contacts attached to said base and a complementary bridging contact therefor, an actuating member operatively supported by said base for each of said bridging contacts and having a push button attached thereto and a wall of electrical insulating material in said base arranged between said two spaced switching devices, said two switching devices arranged with their operating axes parallel to each other and with the switching devices each to be adjacent a single support; said stationary contacts so positioned that lines drawn through each pair of stationary contacts and the complementary bridging contact are parallel to each other and at an angle of 45° to a plane including said operating axes, said positioning of the contacts permitting close spacing of said two switching devices and increased spacing of each switching device away from its adjacent support to provide adequate electrical clearance and wiring space between each switching device and adjacent support.

5. A push button control station of the type mounted in a restricted space between two spaced supports comprising two closely spaced push button operated switching devices, a base with said switching devices mounted thereon, each of said switching devices including an actuating member having an operating axis and a push button attached to said actuating member having an operating axis and a wall of electrical insulating material in said base arranged between two said closely spaced switching devices, said two switching devices mounted within said restricted space between said two spaced supports with each of said switching devices adjacent a single support, said actuating members and push buttons having their operating axes spaced in the same plane and parallel to each other, the center-to-center spacing of the operating axes of said actuating members being less than the center-to-center spacing of the operating axes of said push buttons to permit close spacing of said two switching devices without reduction of the center-to-center spacing of the operating axes of said two push buttons and said close spacing of said two switching devices permitting increased spacing of each switching device away from the adjacent support to provide adequate electrical clearance and wiring space between each switching device and adjacent support.

6. A push button control station of the type adapted for multiposition mounting comprising two push button operated switching devices, a base with said switching devices mounted thereon, each of said switching devices including an actuating member and a detachable push button with indicium on its operating face, each of said push buttons located eccentrically on its actuating member and said push buttons and actuating members including multiposition attaching means to permit multiposition attachment of each of said push buttons to its actuating member to alter the position of said indicium relative to the actuating member without altering the degree of eccentricity of the push button relative to the actuating member.

7. A push button control station of the type adapted for vertical or horizontal mounting comprising two push button operated switching devices each including an actuating member, a detachable push button eccentrically located on the actuating member, a base with said switching devices mounted thereon, each of said actuating members having a male engaging member, each of said push buttons having indicium on its operating face and two recesses on the opposite face for engagement with said engaging member, said two recesses on each button having the same degree of eccentricity relative to the operating axis of the push button and said two recesses on each push button being positioned at an angle of 90° to each other permitting altering the position of said indicium relative to the control station to render said indicium readable when said control station is mounted in vertical or horizontal position.

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