

Feb. 9, 1932.

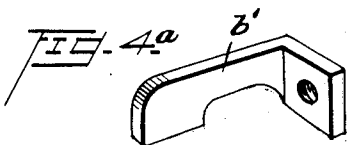
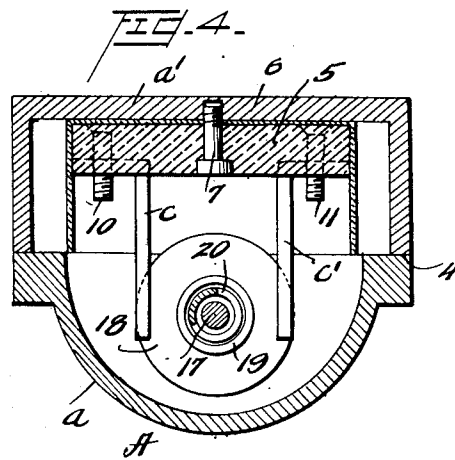
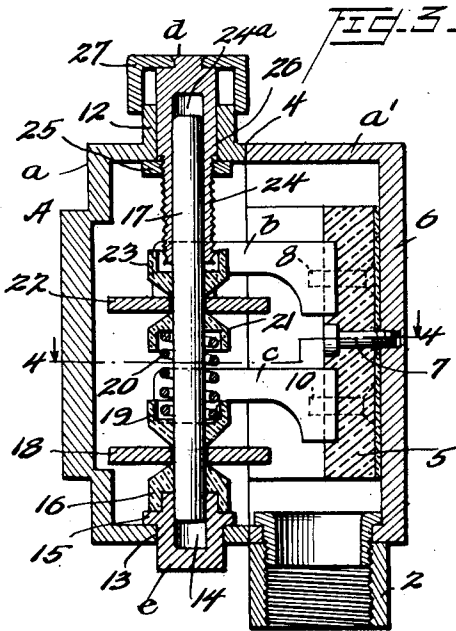
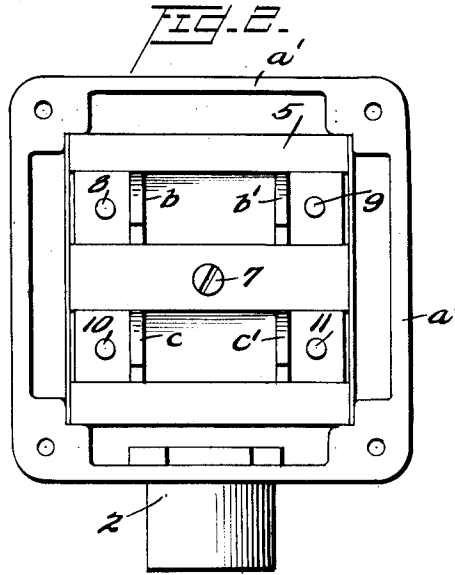
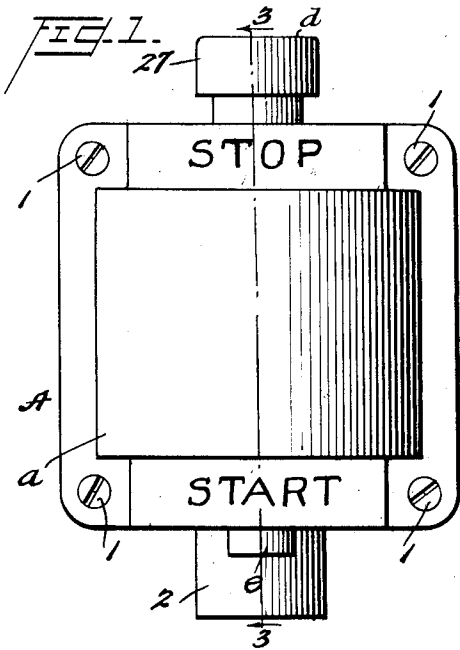
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1,844,731

PUSH BUTTON SWITCH MECHANISM

Filed Dec. 7, 1929

2 Sheets-Sheet, 1



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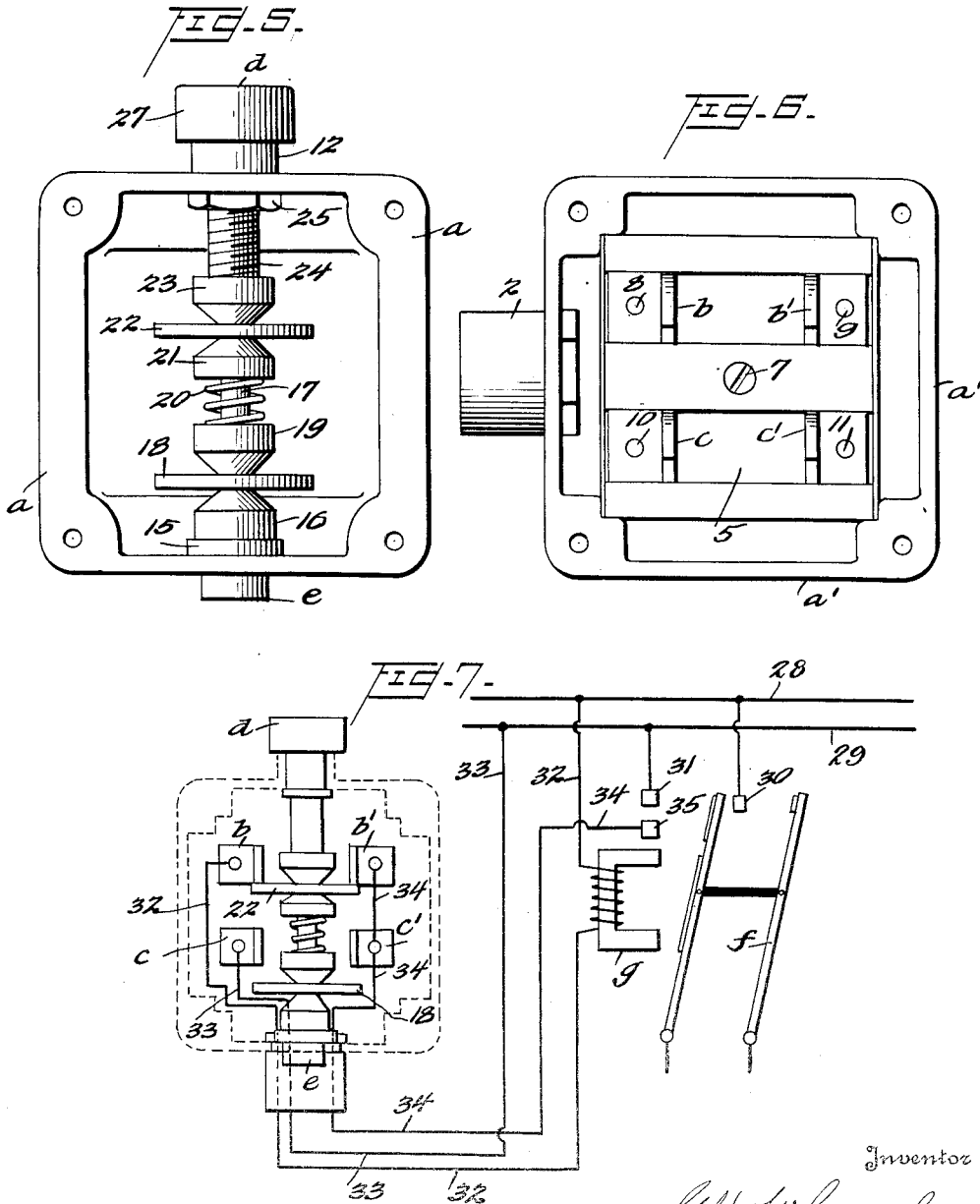
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PUSH-BUTTON SWITCH MECHANISM

Application filed December 7, 1929. Serial No. 412,419.

This invention relates to a push button switch adapted particularly for use in connection with electromagnetically controlled switches for starting and stopping electric motors. In factories, printing establishments, and elsewhere, it is common practice to operate individual tools and machines with individual motors, and to provide automatic starters for the motors and push button switches for controlling the circuits of the main switches of the starters. The push button switch, for causing the motor to start and stop, is usually placed at some point adjacent the machine and convenient to the operator. With some forms of push button switches, the arrangement of the buttons is such that the start push button may accidentally be struck by passing individuals or objects, or by the operator working around the machine, with the result that the motor is unintentionally started, and in some cases where the push buttons project laterally from the switch casing they have been damaged or broken by passing objects, such as trucks or the material carried by the trucks. Also, where the push buttons are arranged side by side the operator may, at times, press one button when his intention was to press the other.

One purpose of the present invention is to provide a switch in which the stop push button is arranged at the top of a casing where the operator can most conveniently reach it and depress it by merely laying his hand upon it, while the start push button is arranged at the underside of the casing where it is more or less inaccessible, and is movable upwardly, so that a deliberate action on the part of the operator is required to press the latter button. Both buttons are arranged in positions where they are not liable to be operated or injured by passing objects, and while the upper push button is readily accessible and might be accidentally operated no harm can result since the depression of this push button merely causes the motor to stop.

The invention embodies novel structural features, the details of which will be clear from the following specification taken in connection with the accompanying drawings, in which:

Fig. 1 is a front elevation of the complete switch;

Fig. 2 is a front elevation of the rear part of the switch;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 4^a is a perspective view of one of the stationary switch contacts;

Fig. 5 is a rear elevation of the front part of the switch;

Fig. 6 is a front elevation of the rear part of the switch, the casing being turned 90° from the position shown in Fig. 2; and,

Fig. 7 is a diagrammatic view illustrating the connections between the push button switch and the main switch of an automatic motor starter.

Referring to Figs. 1-5, inclusive, of the drawings, A indicates the casing of the switch comprising two sections *a* and *a'* which are connected together by screws 1. The part *a'* of the casing is of rectangular form, as shown in Fig. 2, and at one side has a tubular fitting 2 which is internally threaded so that it can be coupled to a metal tube or conduit through which the connecting wires may be led to the switch contacts. The pipe through which the wires extend will ordinarily be the supporting means for the switch. The meeting edges of the two halves of casing are faced off so that they fit closely together along the line 4, Figs. 3 and 4, and the holes in the four corners of the casing through which the screws 1 pass are spaced equidistantly so that the part *a*, which always stands in one position, can be applied to the part *a'* when said latter part is turned 90° or 180° from the position shown in Fig. 2. In some cases, the pipe which supports the switch may extend vertically upward and in that event the tubular projection 2 will extend downwardly, as shown in Fig. 2; whereas if the pipe extends horizontally the part *a'* of the casing will be turned so that the tubular projection will extend horizontally, as shown in Fig. 6; or if the pipe extends downwardly to the switch the tubular projection will extend upward. In all of these positions, however, the front part of the casing will stand in the same position so that the word "Stop"

will appear at the top of the switch and the word "Start" at the bottom, as illustrated in Fig. 1.

A base 5 of insulating material, which is substantially square in outline, is removably secured to the back wall 6 of the rear part of the casing by a screw 7, which passes centrally through the insulating base. Secured to this insulating base are two pairs of stationary switch contacts *b*, *b'*, and *c*, *c'*, respectively. These contacts are alike, each comprising a metal arm which projects at right angles to the base into the part *a* of the casing, and each arm has a foot which is secured to the base by a screw which also serves as a binding post. Thus, the screws 8 and 9 secure the contacts *b* and *b'*, respectively, to the base and the screws 10 and 11 secure the contacts *c*, *c'*, respectively, to the base. As shown in Fig. 2, the contacts *b* and *b'* are above the contacts *c* and *c'*. If the rear part of the casing is to be set with the tubular projection 2 in the horizontal position as shown in Fig. 6, the screw 7 will be taken out and the switch base and contacts will be turned 90° with respect to the casing and then secured within the casing with the contacts *b*, *b'* in the upper position and the contacts *c*, *c'* in the lower position, as shown in Fig. 6. The front part *a* of the casing carries all of the movable parts of the switch, including the stop push button *d* and the start push button *e*. As shown, this part of the casing has a tubular projection 12 in its top wall and has an opening 13 in its bottom wall in line with the bore of said tubular part. The start push button *e* has a cylindrical bore or socket 14 and an annular shoulder 15. In assembling the switch mechanism in the front part of the casing, this start push button is first inserted in the opening 13 and its shoulder 15 forms a stop which limits the outward movement of the push button. A cupped insulator 16 fits over the inner end of the stop push button and has a central opening in line with the bore 14 in the push button. A rod 17 of insulating material serves as a core upon which perforated movable contact members and insulators are loosely mounted. Thus, a metal disk 18 rests upon the insulator 16; a cupped insulator 19 rests upon the contact disk 18; a helical spring 20 is interposed between the insulator 19 and a reversely arranged cupped insulator 21; a disk contact member 22 rests upon the insulator 21 and a cupped insulator 23 rests upon the disk 22. In assembling, a nut 25 is placed over the insulator 23 and the core rod is passed downwardly through the tubular boss 12 and through the nut and the several parts referred to, until the lower end of the rod rests within the socket 14 of the start push button. The stop push button is then placed in position. This button comprises a relatively long exteriorly threaded stem 24 having an axial

bore 24^a to receive the core rod. The stem is inserted through the tubular boss 12 and the nut 25 is threaded on to it and tightened against the upper wall of the casing. The nut forms a stop which limits the outward movement of the push button. The ends of the rod are slidable in the sockets of the push buttons, which form guides for the rod, and the rod is shorter than the distance between the bottoms of the two sockets, so that the rod will not interfere with the movements of the push buttons. When the nut is tightened the lower end of the tubular stem 24 fits within the socket in the recessed insulator 23. The openings in the contact members 18 and 22 are relatively large so that these members fit loosely around the stem, and as the insulators which bear against these members are conical, as shown, the contact members may rock to a limited extent to adjust themselves to the stationary contacts when engaging the latter. The spring 20, which loosely surrounds the rod, presses the contact members 22 and 18 in opposite directions.

When the parts are assembled, the movable contact member 22 will be held against the undersides of the upper stationary contacts *b*, *b'* by the spring 20, and the lower movable contact member 18, which is below the stationary contacts *c*, *c'*, will be held out of engagement with the latter contacts by the same spring. A downward pressure on the stop push button *d* will compress the spring and force the contact member 22 out of engagement with the upper stationary contacts while the lower contact member 18 will not be disturbed. When the pressure on the stop push button is relieved the spring will return the contact member 22 into engagement with the upper stationary contacts. When the start push button *e* is pressed upwardly, the movable contact member 18 will be carried into engagement with the lower stationary contacts *c*, *c'*, where it will remain only as long as the operator maintains finger pressure on the push button. When this pressure is released, the member 18 will be returned by the spring to its lower position where it is dis-engaged from the lower contacts.

A hood or sleeve 27 is secured to the start push button *d* and this sleeve surrounds the boss 12, its purpose being to prevent oil and dirt from the operator's hand from passing into the switch casing through the opening in the boss.

It is to be noted that the start push button switch is located at the bottom of the casing and projects only a short distance beyond the casing so that this push button cannot be operated except by the deliberate act of an individual who must place his finger beneath the casing and push upwardly to start the motor. The stop push button is located at the top of the casing so that the operator can reach it readily at all times and stop the

motor quickly in case of an emergency. If the stop push button is accidentally struck no harm can result because it will cause the motor to stop.

In Fig. 7, the connections of the push button switch to the main switch of an automatic motor starter are illustrated. In this figure, *f* indicates the main switch of an automatic motor starter and *g* indicates a magnet for closing this switch. The wires through which current is supplied to the motor are indicated at 28 and 29 and the stationary contacts of the main switch are indicated at 30 and 31.

When it is desired to start the motor the push button switch *e* is moved upwardly until the contact member 18 connects the stationary contacts *c* and *c'*. This completes a circuit through the magnet coil as follows: from supply wire 28 through conductor 32 and the coil of the magnet to contact *b*, thence through contact member 22 to contact *b'*, thence by conductor 34 to contact *c'*, thence through the contact member 18 to contact *c*, and thence through conductor 33 to the supply wire 29. As soon as this circuit is completed the magnet closes the main switch and a holding circuit for the magnet is completed from supply wire 29, through contacts 31 and 35 and the main switch to conductor 34, thence through contact *b'*, member 22, contact *b*, conductor 32 and the magnet coil to the supply wire 28. This circuit will remain closed after the release of the start push button and until the stop push button is depressed when the circuit will be broken by the movement of the contact member 22 out of engagement with the stationary contacts *b* and *b'*. The main switch will then open and the contact 35 will thus be disconnected from the supply wire 29 and the holding circuit for the magnet will remain open at the main switch after the stop push button returns to normal position.

What I claim is:

1. In a push-button switch mechanism, a casing, adapted to be supported in fixed position and having top and bottom walls, a normally closed switch and a normally open switch within the casing, a push-button vertically movable through the top wall of the casing and adapted, when depressed, to open the normally closed switch, and a push-button vertically movable through the bottom wall of the casing and adapted, when moved upwardly, to close the normally open switch.

2. In a push-button switch mechanism, a casing comprising a rear part adapted for connection to a supporting means and a separable front part, a normally closed switch and a normally open switch within the casing, a push-button vertically movable through the top wall of the front part of the casing and adapted, when depressed, to open the normally closed switch, and a push button vertically movable through the bottom wall of

the front part of the casing and adapted, when moved upwardly, to close the normally open switch.

3. In a push-button switch mechanism, a casing comprising a rear part adapted for connection to a supporting means and a separable front part, upper and lower pairs of stationary contacts mounted in the rear part, upper and lower movable contact members mounted in the front part, the upper member normally engaging the upper contacts and the lower member adapted to engage the lower contacts but normally disengaged therefrom, a push-button vertically movable through the top wall of the front part and adapted, when depressed, to disengage the upper member from the upper contacts, and a push button vertically movable through the bottom wall of the front part and adapted, when moved upwardly, to engage the lower member with the lower contacts.

4. In a push-button switch mechanism, a casing comprising a rear part adapted for connection to a supporting means and a separable front part, upper and lower pairs of stationary contacts mounted in the rear part and projecting into the front part, upper and lower movable contact members mounted in the front part, the upper member normally engaging the upper contacts, a push-button vertically movable through the top wall of the front part and adapted, when depressed, to disengage the upper member from the upper contacts, and a push button vertically movable through the bottom wall of the front part and adapted, when moved upwardly, to engage the lower member with the lower contacts.

5. A push-button switch comprising a casing, aligned push buttons mounted in opposite walls of the casing, a rod of insulating material within the casing and having its ends slidably mounted in the push-buttons, two contact members slidably mounted on the rod, a spring pressing said members apart and toward the respective push-buttons, and stationary contacts in the casing adapted to be engaged by said members.

6. A push-button switch comprising a casing, aligned push-buttons mounted in opposite walls of the casing, a rod of insulating material within the casing and having its ends slidably mounted in the push-buttons, two contact members slidably mounted on the rod, a spring surrounding the rod between said members, insulators between said spring and members, insulators between said members and the push-buttons, and stationary contacts adapted to be engaged by said members.

7. A push-button switch comprising a casing, aligned push-buttons mounted in opposite walls of the casing, a rod of insulating material within the casing and having its ends slidably mounted in the push-buttons, two

contact disks loosely mounted on the rod, insulators on the rod at opposite sides of the disks and having conical ends bearing against the disks, a spring surrounding the rod between the disks and bearing against adjacent insulators, and stationary contacts adapted to be engaged by said members.

8. In a push-button switch mechanism, a casing having a tubular boss projecting above its upper wall and an opening in its lower wall in alinement with the bore of the boss, a normally closed switch and a normally open switch within the casing, a push-button vertically movable in said boss and adapted, when depressed, to open the normally closed switch, a hood secured to the upper end of said push-button and extending around said boss, and a push-button vertically movable through the bottom wall of the casing and adapted, when moved upwardly, to close the normally open switch.

9. In a push-button switch mechanism, a casing comprising a rear part having a tubular fitting adapted for connection to a supporting means, and a separable front part, a block of insulating material removably secured within the rear part, upper and lower pairs of stationary contacts mounted on said block and projecting into the front part, said block, with the contacts thereon, adapted to fit within the rear part in various angular positions with relation to the position of said tubular fitting, and said front part adapted to fit on the rear part in corresponding angular positions, upper and lower movable contact members mounted in the front part, the upper member normally engaging the upper contacts, a push-button vertically movable through the top wall of the front part and adapted, when, depressed to disengage the upper member from the upper contacts, and a push-button vertically movable through the bottom wall of the front part and adapted, when moved upwardly, to engage the lower member with the lower contacts.

In testimony whereof I affix my signature.
GEORGE H. WHITTINGHAM.

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