

July 3, 1951

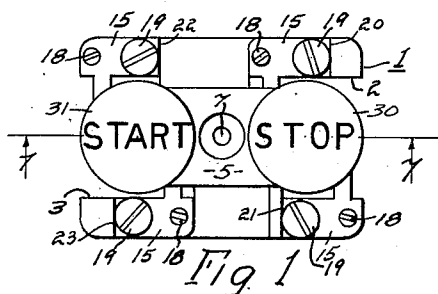
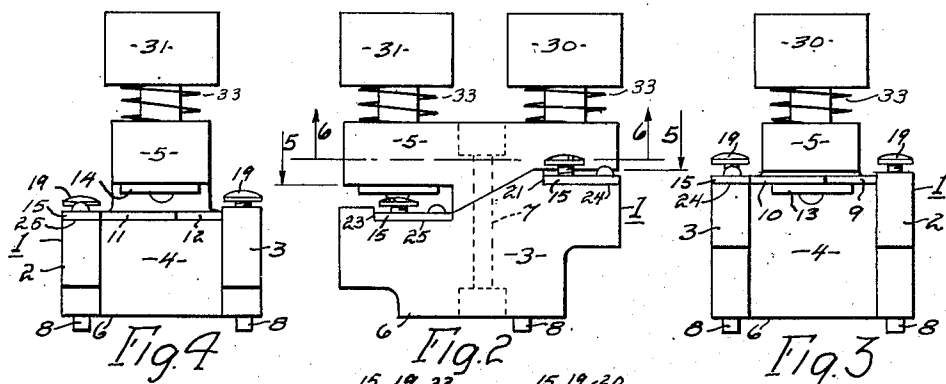
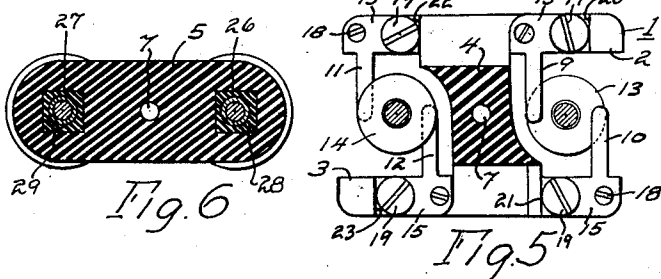
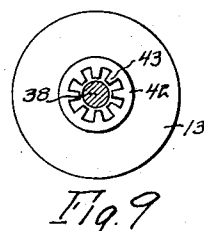
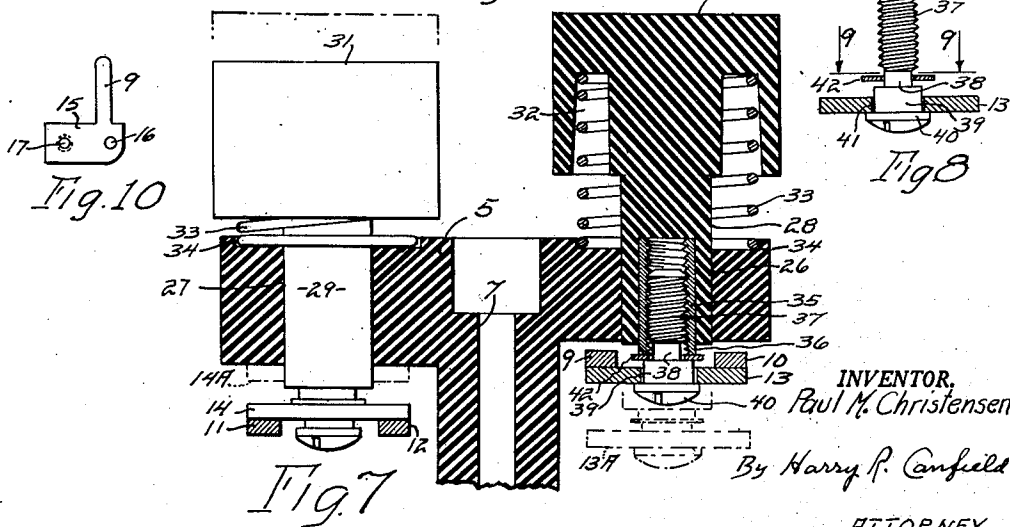
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2,559,112

PUSH BUTTON CONTACTOR

Filed April 2, 1947

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

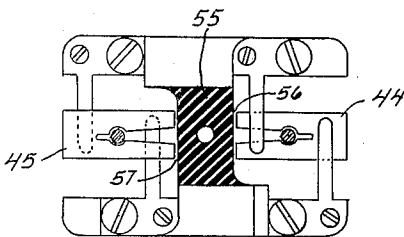


Fig. 13

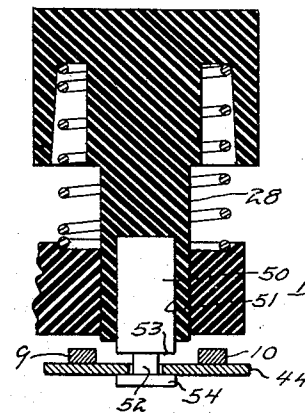


Fig. 12

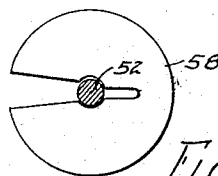


Fig. 14

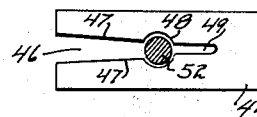


Fig. 11

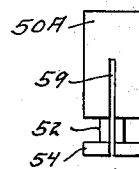


Fig. 15

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PUSH-BUTTON CONTACTOR

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3 Claims. (Cl. 200—159)

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This invention relates to electric contactors of the push-button class; and more particularly to push-button contactors of the type that are utilized in the control circuits of industrial apparatus.

Push button contactors of this type are sometimes constructed as single contactors, operable to close normally-open contacts; or in other cases, operable to open normally-closed contacts; or in other cases, operable to do both successively. Sometimes they are of dual construction, comprising, in a unitary structure, one push button to open normally-closed contacts and another to close normally-open contacts.

The invention hereof is applicable to this diversity of uses, but, in order to simplify a disclosure thereof herein, I have chosen to illustrate and describe it as applied to what is perhaps its most important use, namely: for controlling the conventional control circuit for starting and stopping an electric motor; the structure hereof accordingly comprising two push button contactors, one operating normally-open contacts to start the motor, and the other operating normally-closed contacts to stop the motor, and both built into a unitary structure.

Dual unitary contactors of this type, sometimes referred to in the trade as push button "stations," must be designed to be mounted wherever desirable or convenient; and in any position, and in some cases will be mounted with one of the two push buttons above the other, and in other cases with the two push buttons side by side.

Also, it is sometimes desirable to identify the respective push buttons with their purposes, and to this end, legends or descriptive words are provided on them. When, for example, the push buttons are used respectively to start and stop a motor, they may have the words "Start" and "Stop" thereon respectively.

It follows that these words may be positioned thereon to read normally, that is horizontally and right side up, when, as referred to, the unitary device is mounted with the push buttons side by side; but when the same structure is mounted in some other position, say upside down, or with one push button above the other, the words will be 90° or 180° out of that position and will not be readily legible.

Among the objects of the present invention are:

To provide a push button contactor having an improved construction of electric contacts;

To provide an improved construction of push button operated contact, adaptable for use with

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either a pair of stationary contacts to normally maintain them open, or with a pair of stationary contacts to normally maintain them closed;

To provide an improved unitary dual construction of normally open and normally closed contacts, operable to be closed and opened respectively by push buttons;

To provide a push button station of the dual type referred to, in which the push buttons are adjustably positionable in the unitary structure to dispose legends thereon in normal horizontal reading position, whether the push buttons are mounted side by side or one above the other;

To provide a push button contactor of the type having a plunger reciprocable by a push button and a return spring, and carrying a contact rendered free floating by an improved construction;

To provide a construction of dual push button contactor operable to close normally-open contacts and open normally-closed contacts, and utilizing duplicate parts in a manner to reduce the total number of different parts to a small number.

Other objects will be apparent to those skilled in the art to which the invention appertains.

The invention is fully disclosed in the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a top plan view of a contactor embodying the invention and with the parts thereof in normal unoperated positions, the figure being full scale;

Fig. 2 is a front elevational view of the contactor of Fig. 1;

Figs. 3 and 4 are respectively right hand and left hand elevational views of the contactor of Fig. 2;

Fig. 5 is a sectional view from the plane 5—5 of Fig. 2;

Fig. 6 is a sectional view from the plane 6—6 of Fig. 2;

Fig. 7 is a fragmentary longitudinal sectional view from the plane 7—7 of Fig. 1, and drawn to twice the scale of Fig. 1; and with some of the parts in operated positions;

Fig. 8 is an elevational view showing separately, and as a subassembly, some of the parts of Fig. 7;

Fig. 9 is a sectional view from the plane 9—9 of Fig. 8;

Fig. 10 is a view, showing separately, a contact element shown assembled in Figs. 1 and 5;

Fig. 11 is a view showing separately a modification of a movable contact shown in the preceding figures;

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Fig. 12 is a fragmentary view similar to a part of Fig. 7, and Fig. 13 is a view similar to Fig. 5, showing the contact of Fig. 11 applied thereto;

Fig. 14 is a view showing separately another form of movable contact; and

Fig. 15 is a view showing a modification of a part of Fig. 12.

Referring to the drawing, at 1 is shown generally a main frame or base, of rigid, molded insulating material, which may be any one of the several kinds well known for like purposes in this art. It may conveniently be considered as comprising a pair of parallel thick side walls 2 and 3, spaced apart (for supporting stationary contacts as will be described), connected by a central transverse wall 4, which extends upwardly and integrally joins a plunger guide portion 5, disposed above and parallel to the side walls 2—3.

The bottom of the base is preferably planar as at 6; and a bolt hole 7 extends through the transverse wall 4; by which the base bottom may be clamped upon any suitable support by a single bolt or screw, to mount the base. When it is desired to predetermine the position of the base on the support, the bottom 6 may be provided with a pair of bosses 8—8, and holes to receive them may be pre-located in the support as will be understood.

As shown in the several figures, but best shown in Fig. 5, there is a pair of stationary finger-like contacts 9—10 supported respectively on the side walls 2 and 3 at one end thereof (the right end as viewed in the drawing); and a pair of like stationary contacts 11—12 supported on these walls at the other end. Cooperating therewith are push button operated movable contacts 13—14 in the form of washers or centrally perforated discs; the disc 13 being on the under side of the contacts 9—10 and normally bridging them, and being movable downwardly to disconnect them; and the disc 14 being normally above the contacts 11—12 and being movable downwardly to bridge or connect them. These parts will now be more fully described.

The contacts 9, 10, 11, and 12 are all identical, being stamped from flat sheet metal, and having the form shown for one of them in Fig. 10; the said finger-like contact 9, 10, 11, or 12 as the case may be, extending from one side of a generally rectangular body 15 provided with a plain hole 16 and a threaded hole 17. As shown in the several figures, screws 18—18 projected through the holes 16 and threaded into the side walls 2 and 3 mount the contacts thereon; and large headed screws 19—19 threaded into the holes 17, provide means, well known, for connecting circuit wires to the contacts.

The side walls may be provided with shoulders at 20, 21, 22, and 23 to engage the ends of the contact bodies 15—15 to assist in holding them and their contact fingers in position.

The contacts 9—10 and their bodies 15 are in a common plane; and the contacts 11—12 and their bodies 15 are in a common plane; but as shown in Figs. 2, 3, and 4, the top of the side walls 2 and 3, for example at 24, upon which the contacts 9 and 10 are supported, is at a higher level than that, for example at 25, upon which the contacts 11 and 12 are supported; for a reason that will become clear.

There are two push button and plunger assemblies, identically alike, carrying respectively the said washer-like contact discs 13 and 14.

In the said plunger guide portion 5 of the base as shown in Fig. 6 and indicated in Fig. 7, is a

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pair of parallel bores 26—27, square in cross section, in which are freely reciprocable square-section plungers 28—29; and on the upper ends of the plungers are push buttons 30—31. The push buttons are annularly recessed as at 32 to receive one end of a spring 33, surrounding the plunger, its other end abutting upon the top side of the plunger guide 5, or in a shallow recess 34 therein to center it.

The lower ends of each of the plungers as shown in detail for the plunger 28, Fig. 7, has an internally threaded sleeve 35 press-fitted in a bore in the end of the plunger tightly enough to prevent its rotating in the bore, and at its lower end projecting somewhat out of the end of the plunger, as at 36.

Into this sleeve 35 is threaded a screw 37 which is part of a self-contained sub-assembly shown separately in Figs. 8 and 9. It comprises the screw 37; a small diameter neck 38; a large diameter shank 39; a head 40; the aforesaid disc 13 having a central perforation 41 loosely surrounding the shank; a washer 42 loosely mounted on the neck 38, and trapped between the shank 39 and threaded screw 37; and the disc 13 being trapped between the head 40 and the washer 42.

In order to get the washer 41 into this position, a washer is employed which preferably has teeth 43 on its hole periphery, as shown in Fig. 9, and a well known type of lock-washer may be used for the purpose. Its teeth may be forced to mesh with the thread at the outer end of the screw 37, like a nut, and it may manually be screwed down until it surrounds the neck 38. Thereafter it will be loose on the neck but cannot of itself go back up the threads and come off.

In Fig. 7, the screw 37 is screwed into the sleeve 35 (by turning the head 40 with a screw-driver) until the washer 42 is tightly clamped between the end of the sleeve and the end of the shank 39. It then functions as a lock washer.

The disc 13 is thereby mounted on the end of the plunger and reciprocable therewith, and trapped between the washer 42 and head 40, and loose on the shank 39, so it can freely rotate in both directions and move axially and tip from side to side in all directions; and therefore may be described as free floating.

The disc 13 on the plunger 28 is below the contacts 9—10, Figs. 5 and 7, and is held in contact with them by the spring 33, and can be moved downwardly by the push button 30 to the broken line position 13A. The disc 14, for an identical construction of plunger, etc., is above the contacts 11—12, and the spring 33 normally holds the disc against the underside of the plunger guide 5 where it is shown in broken line at 14A, and it can be moved downwardly to the solid line position into engagement with the contacts 11—12 by the push button 31.

The head 40 and washer 42 are in the nature of spaced annular abutments on opposite sides of the disc, and carried by the plunger. In the case of either disc 13 or 14, the screw head 40 pushes the disc up, and the washer 42 pushes it down; and the head and washer being of small diameter and at the center of the disc, allows the disc to tip if necessary, take up a position of firm current carrying engagement with both contacts, and compensate for inaccuracies of alignment of parts.

While it is not essential that the sleeve 35 project beyond the end of the plunger as at 36, Fig. 7, this is preferred as providing a better point of

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pressure engagement upon which to clamp the washer 42.

In the conventional control circuit for starting and stopping a motor as referred to, current is broken only at the contact disc 13; and as will be observed, when going from the solid line to the broken line position for the contact 13, to break current, the insulating material of the plunger 23 is interposed between the contacts 9—10 as a barrier to extinguish an arc that might tend to bridge the contacts in the event of abnormally great current due to abnormal circuit conditions.

The construction above described provides an open unobstructed space between the ends of the side walls 2—3 and under each disc and its associated pair of stationary contacts, whereby the screw heads 40—40 are readily accessible to a screwdriver to remove either disc and its said sub-assembly for any purpose, such as for renewing the disc contact.

As shown in Fig. 1, the push buttons bear the legends "Start" and "Stop" respectively, and are side by side, and the words read normally in this position of the push buttons. Either or both push buttons may be rotated through 90° or 180° to bring its legend into normal reading position when the contactor is mounted with the push buttons one above the other or upside down. To this end, the screw 40 and its associated sub-assembly is removed, the square section plunger is drawn out of its square section bore and rotated through 90° or 180° and returned, and the screw 40 and sub-assembly replaced.

Among several advantages of the invention is this: that the two push button contactor device as a whole comprises only fifteen fabricated parts (exclusive of the screws 18 and 19 and the washer 42 that can be purchased in the open market) and this number is reduced to only seven different kinds of parts, by duplicate use of identical parts.

Another advantage is that the two push button-plunger-and-movable-contact assemblies can be identical, and the two push buttons disposed at the same level, and at the same time one may operate to open contacts and the other to close contacts, this being made possible by disposing the two sets of stationary contacts 9—10 and 11—12 at different levels.

While the invention has been illustrated and described as embodied in a unitary, dual structure, a part of the invention resides in each of the push button and spring reciprocated plungers and its associated contacts; and it is believed to be apparent without complicating this disclosure, that the invention in some of its aspects may be embodied in other structures than that shown; for example, in a single push button contactor as in the right hand half or in the left hand half of Figs. 1, 2, 5, 6, and 7; or as another example, a dual unitary structure in which both the right hand and left hand halves of the device are alike.

A part of the invention resides in the construction of the movable contacts 13 and 14 and their mounting upon the ends of the plungers 28—29.

In Figs. 11, 12, and 13 is shown a modification of this construction.

The movable contacts 44 and 45 in this form (one of which, 44, is shown separately in Fig. 11) are elongated rectangular pieces, this shape enabling them to be economically cut off from a metal strip. A deep notch 46 is cut in one end of the piece comprising inwardly converging edges, 47—47, opening into a circular perforation 48 and continuing into a slot 49.

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At the lower end of the plunger 28, Fig. 12, a solid round plug 50 is press-fitted into a suitable bore 51 in the plunger; and has a neck 52 thereon the reduced diameter of the neck providing an upper shoulder 53 and a head 54, both outwardly of the bore 51.

The contact 44 is mounted by positioning the contact to straddle the neck 52 by the notch edges 47—47 of the contact and pushing on the contact, causing the edges to spread apart enough to allow the neck 52 to move into the circular perforation 48 of the contact, resilience of the contact metal, developed by the slot 49, causing the spread edges 47—47 to snap back to their original positions and causing the neck 52 to be loosely encircled by the perforation 48. The spaced shoulders 52 and 53 perform the functions of the parts 42 and 40 of the first described form; the length of the neck 52 being greater than the thickness of the contact for the purposes referred to.

Preferably the contacts 44 and 45 (which may be identical) are prevented from rotating on the plunger in this form, and this is done by shaping the central transverse wall, here 55, Fig. 13, to have faces 56—57 parallel to but slightly spaced from the inner ends of the contacts 44 and 45 respectively. Fig. 13 otherwise corresponding to Fig. 5 of the first described form.

In Fig. 14 is shown at 58 a further modification of the movable contact. This contact is, again, a circular disc; and has a deep notch in it substantially like the notch 47—48—49 of Fig. 11 and is mounted on the plunger as described for Fig. 12 and the contact of Fig. 11.

As a further modification for use with either the contact of Fig. 11 or that of Fig. 14, the plug 50 of the plunger of Fig. 12 (as shown in Fig. 15 at 50A) has a slot 59 cut longitudinally in it from its lower end part of the way to its upper end. This makes the neck 52 resilient to facilitate mounting the contacts 58, or 44—45, thereon by the above described method, as will be understood.

Other changes and modifications may be made, and the invention comprehends all of the same which come within the scope of the appended claims.

I claim:

1. As an article of manufacture, a unitary permanently assembled contact assembly for mounting on one end of the reciprocable plunger of a push button type contactor, the assembly comprising: a screw having a threaded body, a head for screwing it into the plunger end, a shank inwardly of the head of smaller diameter than the head, a neck between the shank and the threaded body smaller in diameter than the threaded body and shank; a washer surrounding the neck; a contact element loosely surrounding the shank; the hole in the washer being of smaller diameter than the threaded body and shank, whereby the washer is maintained trapped on the neck, and the contact is maintained trapped on the shank between the head and washer, and in a unitary assembly with the screw.

2. In a push button contactor, a frame; a plunger reciprocally supported on the frame; a push button at one end of the plunger for reciprocating it in one direction; a spring for return reciprocation; a screw having a threaded body and a head, and an unthreaded shank inwardly of the head of smaller diameter than the head, and a neck between the shank and threaded body of smaller diameter than the shank and

of smaller diameter than the threaded body; a washer surrounding the neck; the threaded body being screwed into the other end of the plunger and clamping the washer rigidly between the shank end and the end of the plunger; a contact element loosely surrounding the shank and supported thereon between the screw head and the rigid washer; the hole in the washer being of smaller diameter than that of the shank and threaded body; whereby upon unscrewing the threaded body out of the end of the plunger to remove the contact element, the washer is maintained trapped on the neck and the contact element is maintained trapped on the shank in a unitary assembly with the screw.

3. In a push button contactor, a base of molded material having a bore of square cross section therein; a plunger of molded material of square cross section reciprocable in the bore and provided with a push button on one end and a return spring reacting between the plunger and base by which the plunger may be reciprocated; a visible legend on the end of the push button; a contact in the form of a disc with a hole in it mounted on the other end of the plunger beyond the bore and larger transversely than the bore; stationary contacts on the base bridgeable by the disc contact; the mounting of the disc comprising a screw screwed into the said other end of the plunger and having a shank in the disc hole on which the disc is rotatable and the

screw having spaced abutments thereon limiting axial movement of the disc on the screw; the screw being readily unscrewable from the end of the plunger to remove the disc therewith; the plunger being then removable from the bore and rotatable to any one of four selected positions determined by said square cross sectional form, and again insertable into the bore in said selected position and prevented from rotation in the bore by said square cross sectional form, to maintain the legend in a right-side-up legible position; and the disc being re-assemblable with the plunger end by the screw in all rotated and re-inserted positions of the plunger.

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