April 26, 1955 N. H. KOERTGE ET AL 2,707,213

OILTIGHT PUSHBUTTON SELECTOR SWITCH

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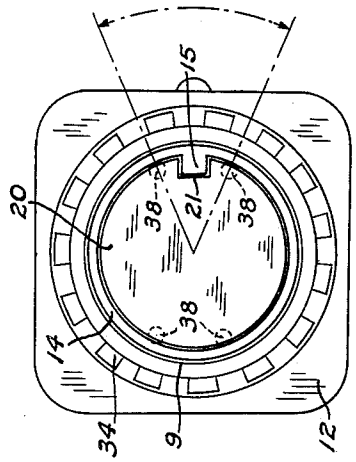


FIG. 3.

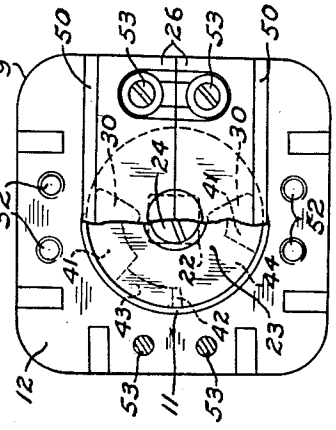


FIG. 4.

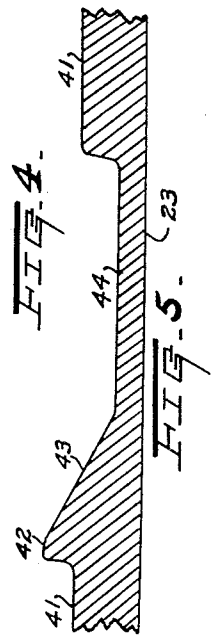


FIG. 5.

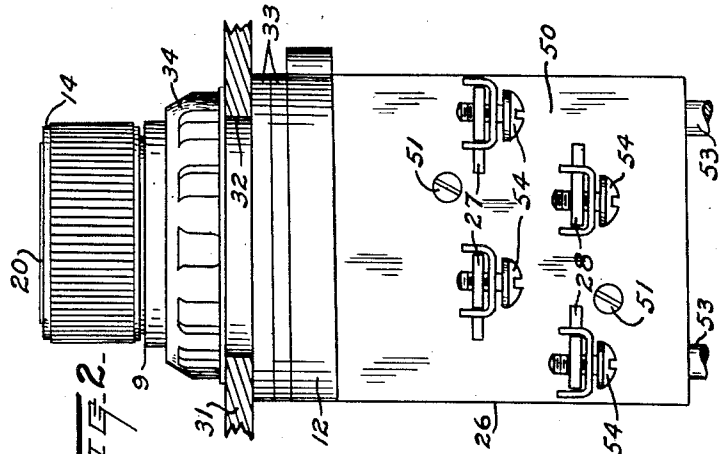


FIG. 2.

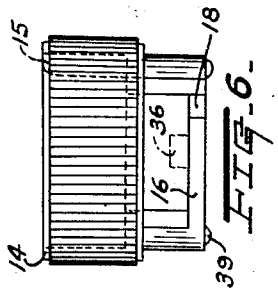


FIG. 6.

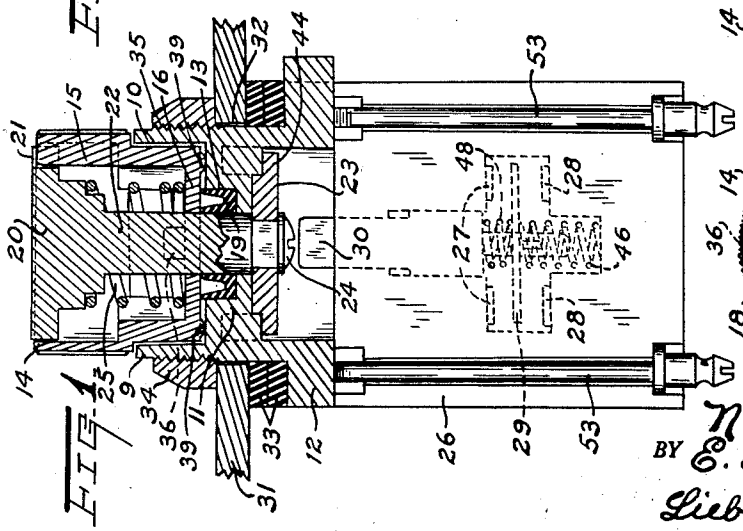


FIG. 1.

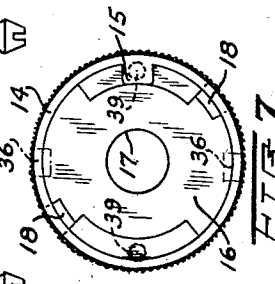


FIG. 7.

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# OILTIGHT PUSHBUTTON SELECTOR SWITCH

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6 Claims. (Cl. 200—18)

Our present invention relates in general to improvements in electric switches, and relates more specifically to improvements in the construction and operation of oiltight selector switch units of the pushbutton type.

The primary object of this invention is to provide an oiltight pushbutton selector switch assembly which is simple and compact in construction, and which is also flexible and dependable in use.

It is quite customary when controlling electrically actuated machine tools and similar systems wherein diverse functioning of electrical equipment is desirable, to provide a number of small and compact units and pilot lights usually cooperable with magnetic starters and located at a common control station, in order to permit one or a limited number of attendants to safely and effectively manipulate these systems. In such systems it is frequently desirable to provide means for jog-starting the electrical equipment; and since these stations are usually located in rather messy and damp surroundings, the switch contacts must be effectively protected against entry of foreign matter and especially oil and other liquid. The small control switch units are therefore preferably mounted in oiltight casings, and in order to simplify operation and to conserve on space it is desirable to confine a number of the compact units in a common casing and to have each unit adapted to interchangeably perform two or more different functions by simple manipulation thereof.

It is therefore an important object of our present invention to provide an improved switch unit which is conveniently selectively operable to perform various distinct functions, without altering the construction of the assemblage, but in a most effective manner.

Another important object of this invention is to provide an exceedingly compact and durable selector switch embodying a combined rotary and pushbutton actuator of simple and efficient structure.

A further important object of the invention is to provide an oiltight selector switch of the pushbutton type, adapted to cooperate with one or more sets of thoroughly sealed and protected switch contacts.

Still another object of the present invention is to provide a pushbutton selector switch assembly embodying relatively few simple parts which can be readily manufactured, assembled or dismantled, and which are easily accessible either for inspection, adjustment, or attachment of electrical conductors.

An additional object of our invention is to provide an improved compact switch unit in which the contact actuating means may be either rotated or reciprocated to vary the switch functioning and which is especially adapted for installation in a common oiltight casing together with other switches at a central control station, and is also particularly adapted to be utilized as a jogging switch in conjunction with magnetic starters or the like.

These and other more specific objects and advantages of the invention will be apparent from the following description, but the gist of the invention is the provision of an oiltight pushbutton selector switch unit comprising few simple parts and which may be grouped with other switches and pilot lights within a common sealed casing and operated for selectivity by a twist of the wrist and for making and breaking of circuits by pushing or releasing a button in order to alter the functioning of the switch; and while only a single typical embodiment of the improvement has been shown and described, it is not desired to thereby restrict the utility of the improved units.



A clear conception of the features constituting the present invention, and of the construction and operation of a typical oiltight pushbutton selector switch embodying the same, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a central longitudinal section through a typical commercial pushbutton selector switch embodying the improvements, the section having been taken between a pair of contact confining housings secured to the actuator mounting base, and also illustrating a fragment of a support for the unit;

Fig. 2 is a side view of the same switch unit clamped to a fragmentary support, and showing the conductor attachment side and cover plate of one of the contact housings;

Fig. 3 is a top view of the pushbutton selector switch unit, showing the pushbutton and selector shell in midposition as in Fig. 1;

Fig. 4 is a bottom view of the selector switch with portions of the two switch contact confining housings broken away to clearly reveal the actuating cam;

Fig. 5 is an enlarged development of a portion of a typical selector and contact actuating cam;

Fig. 6 is a side elevation of the rotatably adjustable selector shell; and

Fig. 7 is a top view of the selector shell with the pushbutton removed therefrom.

With reference to the drawing, the typical oiltight pushbutton selector switch shown, comprises in general a one-piece base **9** having a central bore **10** and internal and external integral flanges **11**, **12** respectively, the internal flange **11** being disposed at the bottom of the bore **10** and provided with an annular recess **13**; a cup-shaped selector shell **14** rotatably adjustably confined within the base bore **10** and having an inwardly extending spline **15** and a bottom **16** provided with a central hole **17** and with diametrically opposite peripheral notches **18**; a distortable sealing element or ring **19** confined within the recess **13** by the shell bottom **16**; a pushbutton **20** reciprocable within the shell **14** and having a peripheral detent **21** slidably cooperable with the shell spline **15** and an integral projection **22** slidably engaging the hole **17** and the inner edge of the base flange **11** and being snugly embraced by the sealing ring **19**; an annular cam **23** detachably secured to the polygonal lower extremity of the pushbutton projection **22** by a screw **24** and having upper cam surfaces cooperable with the lower cam surfaced face of the flange **11** to limit the upward movement of the pushbutton **20**; a helical compression spring **25** confined between the shell bottom **16** and the pushbutton **20**; one or more switch contact confining housings **26** detachably secured to the external base flange **12** and each having therein spaced pairs of upper and lower fixed contacts **27**, **28** respectively, and an intervening movable contact bar **29** suspended from a plunger **30** which is guided for reciprocation in the adjacent housing **26** and is cooperable with the cam **23**; a sealed support **31** for the switch unit having an opening **32** receiving the upper annular portion of the base **9**; a distortable sealing element or gasket **33** disposed between the lower face of the support **31** and the external base flange **12**; and a ring nut **34** adapted to coact with external screw threads **35** on the base **9** and with the upper face of the support **31** to clamp the gasket **33** into sealing contact with the support and base.

The unitary base may be constructed of suitable metal as by die casting, and the internal and external flanges are formed integral with the annular wall upon which the screw threads **35** are formed. The lower face of the internal flange **11** is provided with cam surfaces which are cooperable with upper irregular surfaces of the cam **23** and which surround the recess **13** but are segregated therefrom, and the bottom of the cam **23** is flat, as shown in Figs. 1 and 4. The interior of the annular base wall also has inwardly projecting diametrically opposite lugs **36** formed integral therewith and which are spaced from the upper surface of the internal flange **11** a distance slightly greater than the thickness of the shell bottom **16**; and the upper surface of the flange **11** is provided with in-

dexing depressions 38. These radial base lugs 36 are adapted to pass through the notches 18 of the shell 14 and to be subsequently positioned above the shell bottom 16 in order to maintain the shell within the base bore 10, as shown in dotted lines in Fig. 1 and in dot-and-dash lines in Figs. 6 and 7; and the shell 14 is provided with integral lower indexing buttons 39 adapted to engage the depressions 38 of the base 9 so as to hold the shell in selectively adjusted positions, see Figs. 1, 3, 6 and 7.

The cup-shaped shell 14 may also be constructed of suitable metal as by die casting, and the upper portion of this shell which protrudes from the base bore 10 may be serrated as shown in Figs. 2, 6 and 7 in order to facilitate rotation thereof. The lower portion of the shell 14 beneath the serrated gripping portion and above the bottom 16 is open at its opposite sides so that the shell bears against the base bore 10 only along circumferential surfaces located near the indexing buttons 39. The openings at the opposite side of the shell 14 permit the latter to be rotated in either direction, to a limited extent without interference by the base lugs 36, and the buttons 39 coact with the base depressions 38 to index the selective setting while the spring 25 constantly forces the shell buttons 39 toward the base flange 11 and holds the sealing ring 19 within the recess 13.

The sealing ring 19 may be formed of rubber or rubber composition and has U-shaped transverse cross-section so that its resilient flanges may be readily spread apart, into oiltight sealing engagement with the outer surface of the recess 13 and with the pushbutton projection 22; and the pushbutton 20 with its integral projection 22 is also formed of durable metal or molded plastic material. The radial detent 21 formed in the periphery of the pushbutton 20 coacts with the spline 15 of the shell 14 so as to cause the pushbutton and the cam 23 secured thereto, to rotate about the central pushbutton axis whenever the shell 14 is selectively and rotatably adjusted in either direction; but the pushbutton 20 is freely reciprocable within the shell 14 and is constantly urged into its uppermost position by the single spring 25 which also serves to force the indexing buttons 39 into the depressions 38, and the pushbutton 20 has its upward movement arrested by the cam 23 when the latter engages the base flange 11.

The cam 23 is detachably secured to the lower polygonal extremity of the button projection 22 by means of the screw 24 in order to permit convenient substitution of differently formed cams adapted to produce different functioning of the switch. As shown in Figs. 1, 4 and 5, the cam 23 which is formed of metal and is rotatable and reciprocable with its carrying pushbutton 20, has a plane or flat bottom surface disposed perpendicular to the axis of the projection 22 and has its top provided with at least one intermediate surface 41, an upper surface 42, and a lower surface 44 connected with the upper surface 42 by an inclined camming surface 43. When two housings 26 and sets of fixed and movable contacts are embodied within the switch unit, two sets of these cam surfaces 41, 42, 43, 44 may be provided. Whenever the cam 23 is selectively adjusted, either the surfaces 41, or the surfaces 42, or the surfaces 44 will engage the adjacent cam surface at the bottom of the base flange 11 to selectively position the bottom of the cam 23, and this lower flat surface of the cam 23 is adopted to cooperate with the upper ends of the contact actuating plungers 30 either when the pushbutton 20 is depressed, or when the cam 23 is rotated to lower its bottom face.

The contact actuating plunger 30 of each housing 26 is normally urged into its uppermost position toward the flat bottom face of the cam 23 by a spring 46 coacting with the lower face of the movable contact bar 29, and when the intermediate cam surfaces 41 are active the movable contact bar 29 will be in open position out of engagement with all of the fixed contacts 27, 28, as illustrated in Fig. 1. When the upper cam surfaces 42 are active the cam 23 will push all plungers 30 downwardly to cause the movable contact bars 29 to bridge the lower fixed contacts 28, and an auxiliary spring 48 which coacts with the upper face of each bar 29 will then permit this bar to slide along the adjacent plunger 30 so as to relieve these parts of excessive stress while insuring firm closure of the contacts. When the lowest cam surfaces 44 are brought into action as in Fig. 1, the plungers 30 will rise to their extreme upper positions under the influence of the spring 46 and will cause the movable bars 29 to bridge the upper fixed contacts 27, and the spring 46 will then compress so as to prevent excessive stress while again insuring firm closure of the contacts.

The plunger 30 and the contacts confined within each housing 26 are normally concealed and protected by cover plates 50 detachably secured to the housings by screws 51; and the housings 26 may be interchangeably attached to threaded openings 52 formed in the external base flange 12 will the aid of clamping rods 53, in several different positions in order to facilitate attachment of conductors to the terminal screws 54 associated with the fixed contacts 27, 28. Each of the clamping rods 53 is also provided with a special lower end for temporarily holding the switch assemblage in position while being applied to the support 31, and the ring nut 34 is applicable to the external base threads 35 so as to distort the sealing gasket 33 into oiltight sealing engagement with the support 31 and with the base 9.

When the various parts of the improved selector type pushbutton switch have been properly constructed they may be readily assembled to produce a complete unit by merely inserting a sealing ring 19 within the recess 13, by thereafter applying the shell 14 within the base bore 10 so that the lugs 36 will pass through the shell notches 18, by thereafter positioning the spring 25 within the shell 14 and introducing the pushbutton 20 with its detent in sliding engagement with the spline 15 and its projection 22 extending through the shell bottom opening 17 and through the base flange 11, by subsequently attaching the desired type of cam onto the projection 22 with the aid of the screw 24, and by finally securing the switch contact housing assemblages to the base flange 12 with the clamping rods 53. The single screw 24 will then maintain the contact operating mechanism in assembled condition, and the shell 14 may then be rotatably adjusted to effect selective performance of the unit while the pushbutton 20 may be depressed to actuate the plungers 30 as previously described.

The assembled unit after having been properly installed in an electrical control system by attachment of the current conductors to the fixed contacts 27, 28 with the aid of the terminal screws 54, may then be clamped to the support 31, and in most cases this support 31 will constitute a cover for an oiltight casing for a number of other switch units disposed at a common control station. When thus applied to an oiltight casing, the special protruding lower ends of the housing attaching rods 53 may be utilized to temporarily hold the several units in position while the cover support 31 is being applied and the switch assemblages are being clamped thereto with the aid of the ring nuts 34, and oiltight sealing of each unit will thereafter be effected by the sealing ring 19 and the gasket 33.

Each of the improved switch units may obviously be just as easily opened for inspection or dismantled by merely manipulating a few screws, and, as previously indicated the cam 23 of each unit may be interchangeably replaced by other cams having the upper cam surfaces thereof formed to produce selective functioning of the switches while their bottom surfaces are flat so as to always present a smooth face to the upper ends of the plungers 30. These units when provided with special cams are especially useful for the purpose of jog-starting electrical equipment provided with magnetic starters, and only one housing 26 or more may be suspended from the base 9 in various positions relative to the central axis of each switch and actuated by a single shell 14 and pushbutton 20 to produce diverse functioning, thus making the improved units highly flexible in their adaptations.

From the foregoing detailed description it will be apparent that the present invention in fact provides a simple, compact and durable pushbutton type of selector switch, which is oiltight and adapted for diverse uses. The improved assemblage comprises a minimum number of accurately formed sturdy parts capable of being readily assembled, adjusted, or dismantled, and which are conveniently accessible for inspection and for terminal attachment. The operating characteristics of these simple switch units may be quickly varied throughout a considerable range, and the indexing mechanism for the selector is simple but highly effective in action. The single spring 25 which is interposed between the shell bottom 16 and the pushbutton performs the triple function of preventing displacement

of the seal ring **19**, of actuating the indexing mechanism, and of retracting the pushbutton after actuation thereof, while the cam **23** provides a stop for the outward movement of the pushbutton and also holds the shell **14** within the base **9**.

It should be understood that specific descriptive terms employed herein should be given the broadest possible interpretation and that these switch units may be disposed in any desired position; and it is not our desire to limit this invention to the exact details of construction or to the precise mode of use herein shown and described because obvious modifications within the scope of the appended claims may occur to persons skilled in the art.

We claim:

1. In an electric switch, a unitary base provided with a bore terminating at an internal cam surfaced flange and having inwardly projecting integral lugs spaced from the flange, a cup-shaped shell having cut-outs near its bottom formed to clear said base lugs and being insertable within said bore and rotatable therein to cause said lugs to overlie the shell bottom and to retain the shell within the bore, a pushbutton reciprocable within said shell and having a projection extending through and slidably confined within said base flange, a cam secured to said projection and having one face provided with a cam surface cooperable with the cam surface of said flange while its opposite face is plane and perpendicular to the axis of rotation of said shell, and a movable switch contact operable by a plunger cooperable with said plane surface and coacting with a fixed contact suspended from said base.

2. In an electric switch, a unitary base having a bore terminating at an integral inwardly directed flange and being provided with integral lugs projecting inwardly from said bore in spaced relation to said flange, a cup-shaped shell having cut-outs near its bottom formed to clear said base lugs and being axially insertable within said bore and rotatable therein to cause said lugs to overlie the shell bottom and to thereby retain the shell within the bore, a pushbutton reciprocable within said shell and having a projection extending through and slidably confined within said base flange, a cam member secured to said projection and coacting with the side of said base flange remote from said bore, and a movable switch contact having an actuating plunger operable by said cam member and being cooperable with a fixed contact suspended from said base.

3. In an electric switch, a unitary base having a bore terminating at an integral inwardly directed flange and being provided with integral lugs projecting inwardly from said bore in spaced relation to said flange, a cup-shaped shell having cut-outs near its bottom formed to clear said base lugs and being axially insertable within said bore and rotatable therein to cause said lugs to overlie the shell bottom and to thereby retain the shell within the bore, a pushbutton reciprocable within said shell and having a projection extending through and slidably confined within said base flange, a cam member secured to said projection and coacting with the side of said base flange remote from said bore, a helical spring interposed between said pushbutton and the bottom of said shell for constantly urging said cam member against said base flange, and a movable switch contact having an actuating plunger operable by said cam member and being cooperable with a fixed contact suspended from said base.



4. In an electric switch, a unitary base having oppositely directed bores separated by an integral inwardly directed flange, one of said bores having therein an inwardly directed lug spaced from one side of said flange and formed integral with the base, a cup-shaped shell having a bottom cut-out formed to clear said base lug and being axially insertable within the adjacent bore and rotatable therein to cause said lug to overlie the shell bottom and to thereby retain the shell within said adjacent bore, a pushbutton movable axially within said shell and having a central projection extending through and slidably confined within said flange, a cam member secured to said projection within the other bore and coacting with the opposite side of said flange, and switch contacts suspended from said base and being relatively movable by said cam member.

5. In an electric switch, a unitary base having oppositely directed bores separated by an integral inwardly directed flange, one of said bores having therein an inwardly directed lug spaced from one side of said flange and formed integral with the base, a cup-shaped shell having a bottom cut-out formed to clear said base lug and being axially insertable within the adjacent bore and rotatable therein to cause said lug to overlie the shell bottom and to thereby retain the shell within said adjacent bore, a pushbutton movable axially within said shell and having a central projection extending through and slidably confined within said flange, a cam member secured to said projection within the other bore and coacting with the opposite side of said flange, a helical compression spring interposed between said pushbutton and said shell for constantly resiliently urging said cam member against said base flange, and switch contacts suspended from said base and being relatively movable by said cam member.

6. In an electric switch, a unitary base having a bore terminating at an integral inwardly directed flange and being provided with an integral lug projecting inwardly from said bore in spaced relation to said flange, a cup-shaped shell having a cut-out in its bottom formed to clear said lug and being axially insertable within said bore and rotatable therein to cause said lug to overlie said shell bottom and to thereby retain the shell within the bore, a pushbutton movable axially within said shell and having a central projection slidable through said flange, a cam member secured to said projection and coacting with the side of said flange remote from said bore, and switch contacts suspended from said base and being relatively movable by said cam member either upon rotation of said shell or upon axial movement of said pushbutton.

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