Dec. 11, 1973 E. G. HANSEN Re. 27,836

MULTISTATION PUSHBUTTON SWITCH ASSEMBLY WITH MASTER CONTROL MEANS FOR ALTERNATIVE PUSH-PUSH OR ONLY ONE SWITCH OPERABLE AT A TIME MODES OF ACTUATION

Original Filed April 20. 1970 2 Sheets-Sheet 1

Fig. 1

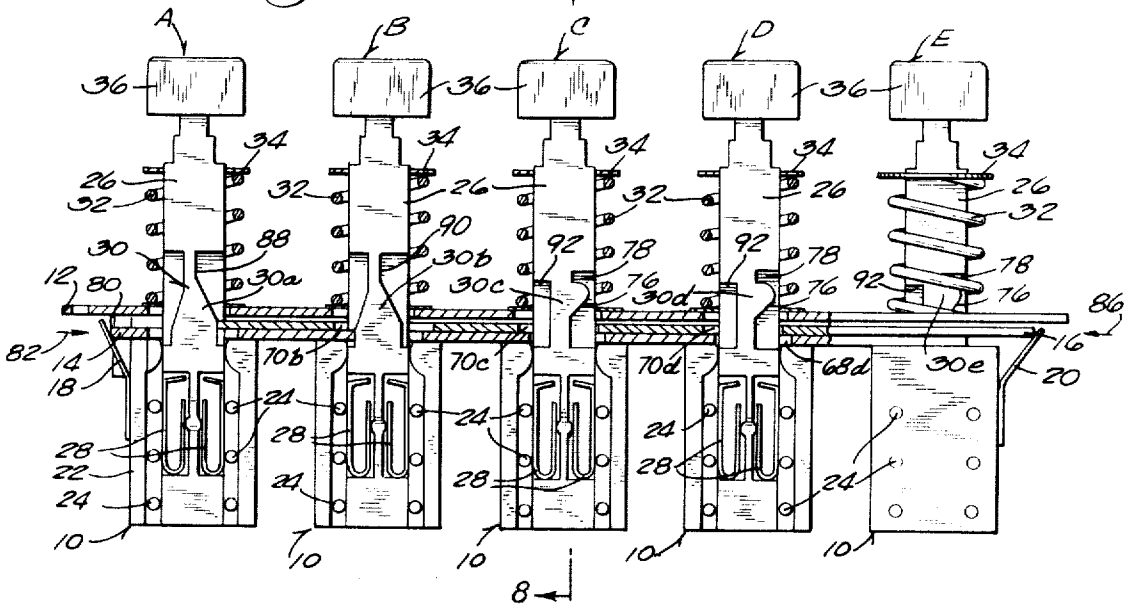


Fig. 4

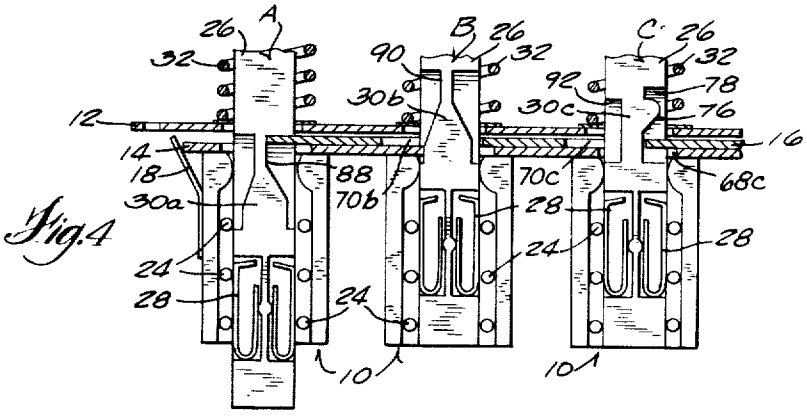
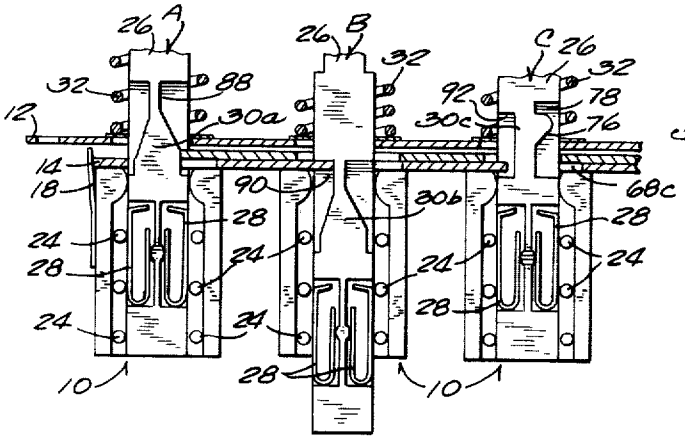


Fig. 5



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MULTISTATION PUSHBUTTON SWITCH ASSEMBLY WITH MASTER CONTROL MEANS FOR ALTERNATIVE PUSH-PUSH OR ONLY ONE SWITCH OPERABLE AT A TIME MODES OF ACTUATION

Original Filed April 20. 1970 2 Sheets-Sheet 2

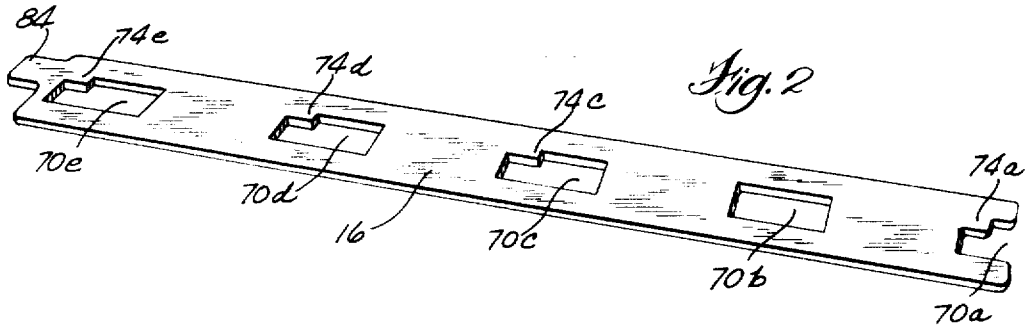
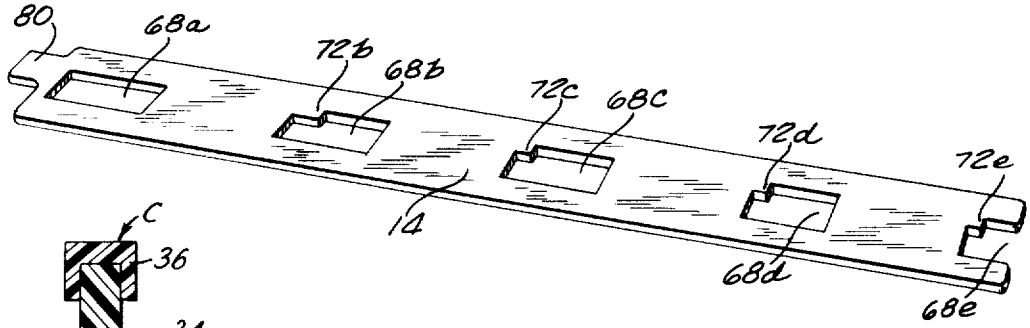


Fig. 2

Fig. 3



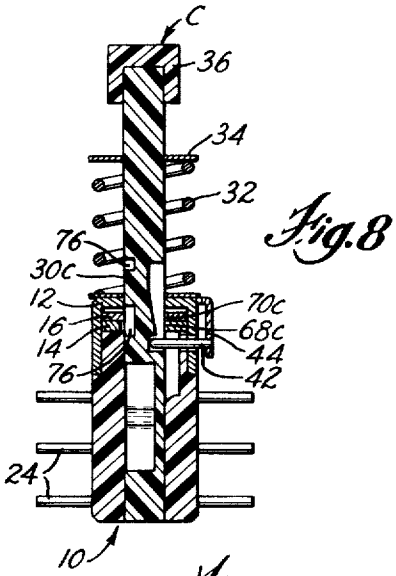


Fig. 8

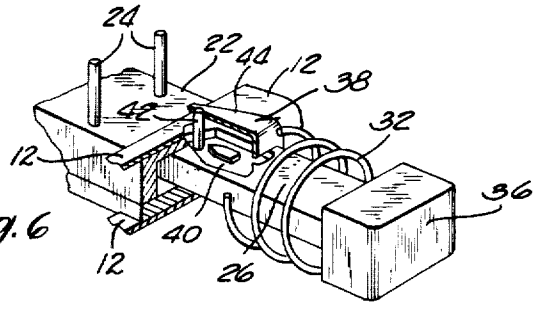
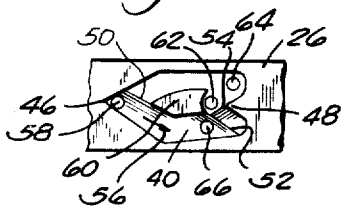


Fig. 6

Fig. 7



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MULTISTATION PUSHBUTTON SWITCH ASSEMBLY WITH MASTER CONTROL MEANS FOR ALTERNATIVE PUSH-PUSH OR ONLY ONE SWITCH OPERABLE AT A TIME MODES OF ACTUATION

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Original No. 3,646,283, dated Feb. 29, 1972, Ser. No. 29,858, Apr. 20, 1970. Application for reissue Dec. 4, 1972, Ser. No. 311,861

Int. Cl. H01h 9/26

U.S. Cl. 200—5 EB 14 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A multistation or ganged modular pushbutton switch assembly including a plurality of switch modules having a slider bar with a cam section and a push-push actuation mechanism thereon and separate latch bars cooperating with the cam sections so that some of the modules acting as operating modules can be controlled by master switch modules to have either a push-push action, momentary action or are interlocked so that one must be actuated to deactuate the other.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to electrical switches, and more particularly, to multistation or ganged, modular pushbutton switches for performing the switching of a plurality of circuits.

Multistation or ganged modular pushbutton switches have been developed for uses where a control of multiplicity of operations or control of a sequence of operations is desired. Switches of this type are particularly useful in automatic station selection mechanisms for radio and television, automatic coin-operated devices and household appliances, such as electric ranges, washing machines, etc. They are also frequently used in electrical equipment such as communication and instrument devices, computer and office equipment and other mechanical equipment employing multiple circuits for the control thereof.

Switches of this type commonly have either an interlocking mechanism whereby the actuation of one station releases a previously actuated station to the original deactuated position, a push-push mechanism whereby a slider bar is depressed to actuate and is also depressed to deactuate, or are of the momentary-type action. For some applications where the switch assembly is being used to control equipment with several modes of operation, such as in automotive test equipment, it is desirable to have a single pushbutton switch assembly wherein at least some of the switching modules are capable of operating with more than one of the above modes of actions at any chosen time. A pushbutton switch assembly including this capability is especially desirable where there is a restricted space available for the equipment control module. Of course, it is always desirable to provide apparatus of this type having a minimum of moving parts and simplified construction.

SUMMARY OF THE INVENTION

A primary object of this invention is to provide a simple and economical multistation or ganged modular pushbutton switch assembly having at least some of the switch modules capable of operating with more than one type of action.

Another object of the invention is to provide such a switch assembly wherein some of the switch modules can be controlled to operate either with a push-push action, with a momentary action, or are interlocked with at least one other module so that the slider bar of one must be depressed to disengage a previously depressed slider bar of another module.

Other objects and advantages of this invention will become apparent to those skilled in the art from the following description of the preferred embodiment, accompanying drawings and appended claims.

The multistation or ganged modular pushbutton switch assembly of this invention includes a plurality of switch modules, each having a slider bar with a cam section and a push-push actuation mechanism thereon, and at least one latch bar cooperating with said cam sections to provide the desired switching action. Master switches, also having cam sections, are actuated to control the operation of the latch bar. As the slider bar of the master switch switch is depressed, the cam section thereof coacts with the latch bar and positions it with respect to the cam sections of the operating switch modules so they engage the latch bars in a manner to obtain the desired switching action. In a preferred embodiment, two separate latch bars and two master switches are employed. When the two master switches are in the deactuated position, the operating modules operate with a push-push action. The cam sections and latch bars are arranged so that the actuation of one master switch interlocks operating modules requiring the depressing of one operating module slider bar to release one previously depressed and the actuation of the other master switch results in the operating modules operating with a momentary action.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view, partially broken away, of a ganged modular pushbutton switch exemplifying this invention.

FIG. 2 is a perspective view of one of the latch bars.

FIG. 3 is a perspective view of the other latch bar.

FIG. 4 is a partial plan view, partially broken away, of the switch assembly shown in FIG. 1 showing one of the master switches in the actuated position.

FIG. 5 is the same view as in FIG. 4 except the other master switch has been actuated.

FIG. 6 is a perspective view, partially broken away, showing the push-push mechanism located on each slider bar.

FIG. 7 is a plan view of the cam notch arrangement of the push-push mechanism shown in FIG. 6.

FIG. 8 is a sectional view of switch module C taken along the plane defined by line 8—8 in FIG. 1, showing the interrelationship of cam section 30C and the push-push mechanism 38 on slider bar 26.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is illustrated a pushbutton switch assembly having five switch modules. However, it should be understood that the number of modules can be increased or decreased. As shown in FIG. 1, the switch assembly includes a plurality of switch modules 10, generally designated A, B, C, D and E, mounted in spaced relationship on mounting bracket 12, latch bars 14 and 16, and bias springs 18 and 20 associated with latch bars 14 and 16, respectively. Switch modules A and B act as the master switches for controlling the type of action for the actuation of operating switch modules C, D and E. Each module 10 includes a stator block 22, made of electrically insulating material, which carries

fixed contact terminals **24**, slider bar **26** carrying movable contacts **28** which slide inside stator block **22** and a cam section **30** located on slider bar **26**. Mounted on each silder bar **26**, after the switch assembly has been assembled onto mounting bracket **12**, are return spring **32**, held in place by retaining clip **34**. The basic construction of stator block **22**, fixed contact terminals **24** and movable contacts **28**, the interrelationship of these parts, and the operation thereof are conventional, being exemplified by U.S. Pat. No. 3,259,728, now exclusively licensed to the assignee of the present applicant. For purposes of brevity and completeness of the disclosure, the entire disclosure of that patent is incorporated herein. With the exception of cam sections **30**, the differences between which will be described hereinafter, the various components of the master switch and operating switch modules are identical. Hence, in FIG. 1, the referenced numerals, therefore, are shown only for control module A for the sake of brevity.

Located on the underside of each slider bar **26** is a push-push mechanism **38**, shown in FIGS. 6 and 7. Push-push mechanism **38** is of conventional design. The construction operation of the exemplary push-push mechanism illustrated is fully described in U.S. Pat. No. [3,229,584] *3,229,548*, now exclusively licensed to the assignee of the present applicant. For the purposes of brevity and completeness of disclosure, the entire disclosure of that patent is also incorporated herein.

Only a summary of the construction and operation of the push-push mechanism will be described herein. Push-push mechanism **38** includes a hollow cam notch **40** and pivotable pin **42** which is held elastically against the bottom of cam notch **40** by leaf spring **44** attached to mounting bracket **12**. As shown in FIG. 7, cam notch **40** has a closed contour with two points or peaks **46** and **48** and a variable depth forming several bevels and stops **50**, **52** and **54**. The bottom end of pin **42** is normally guided along this contour in the direction of arrow **56** as slider bar **26** reciprocates during depression and release. Slider bar **26** is in the deactuated position, the end of pin **42** is in position **58** in cam notch **40**. For a normal push-push operation, slider bar **26** is depressed and the end of pin **42** is guided along the contour of cam notch **40** in the direction of arrow **56** over bevels **52** and **54**, assuming position **62** when slider bar **26** is fully depressed. Slider bar **26** is held in the depressed or actuated position against the force of spring **32** by pin **42** engaging the notch portion of the central cam section **60** which is located opposite the point or peak **48** of the heart cam. When slider bar **26** is again depressed for deactuation, the end *of* pin **42** is prevented from returning backwards by bevel **54**, and therefore, moves in the direction of arrow **56** or counterclockwise towards position **64**. Slider bar **26** moves back under the biasing force of *spring* **32** and pin **42** follows the upper branch of cam notch **40** and lodges at the home position **58** in the depression formed by peak **46**. Bevel **50** is sloped downwardly thereby preventing pin **42** from moving backwards or clockwise when slider bar **26** is again pressed. For alternate actions of the operating switch modules C, D and E described hereinafter, the movement of slider bar **26** is limited so that pin **42** does not proceed past position **66**.

FIGS. 2 and 3 show latch bars **16** and **14** respectively. As shown in FIG. 2, latch bar **16** has been rotated endwise 180° from its assembled position shown in FIG. 1. Latch bar **14** has a plurality of apertures **68a**, **68b**, **68c**, **68d** and **68e** and latch bar **16** has a plurality of apertures **70a**, **70b**, **70c**, **70d** and **70e**, through which slider bars **26** can pass. Apertures **68b**, **68c**, **68d** and **68e** include tongues **72b**, **72c**, **72d** and **72e**, respectively, and apertures **70a**, **70c**, **70d** and **70e** include tongues **74a**, **74c**, **74d** and **74e**, respectively. Aperture **68a** of latch bar **14** and aperture **70b** of latch bar **16**, which are associated with master switch modules A and B, do not have tongues. As shown in FIGS. 1, 4 and 5, the contour of cam sections **30a** and **30b** on master switch modules A and B are generally in the shape of an inverted Y whereas one side of the cam sections **30c**, **30d** and **30e** on operating switch modules C, D and E are configured with a diverging portion **76** and a notch **78**. Tongues **72b**, **72c**, **72d** and **72e** of latch bar **14** are adapted to engage the left side of cam sections **30b**, **30c**, **30d** and **30e** of modules B, C, D and E, respectively, and tongues **74a**, **74c**, **74d** and **74e** of latch bar **16** are adapted to engage the right side of cam sections **30a**, **30c**, **30d** and **30e** of modules A, C, D and E, respectively.

As shown in FIG. 1, spring **18** bars against extension **80** of latch bar **14** urging it in the direction of arrow **82** until tongue **72b** bears against the left side of cam section **30b** and spring **20** bears against extension **84** of latch bar **16** urging it in the direction of arrow **86** with tongue **74a** bearing against the right side of cam section **30a**. When neither of the master switch modules A and B are actuated, latch bars **14** and **16** are positioned so that the apertures permit the slider bars **26** of the operating switch modules C, D and E to pass therethrough without engaging with cam sections **30c**, **30d** and **30e** and these operating switch modules are operated to the actuated and deactuated position with the push-push action described above.

When the slider bar **26** of master switch module A is depressed as shown in FIG. 4 the converging contour of cam section **30a** allows spring **20** to urge latch bar **16** in the direction of arrow **86** until tongue **74a** is in contact with the vertical section **88** of cam section **30a**. With this transverse movement of latch bar **16**, aperture **70c**, **70d** and **70e** are positioned so that tongues **74c**, **74d** and **74e** will engage cam sections **30c**, **30d** and **30e** of operating switch modules C, D and E when the slider bars thereof are depressed. Slider bar **26** of master switch module A is held in the depressed position by a push-push mechanism in the manner described above until being depressed a second time. As a slider bar of one of the operating switch modules, e.g., module C, the tongue associated therewith, e.g., tongue **74c**, engages the corresponding cam section, e.g., **30c**, rides along the profile of diverging portion **76** thereof and is urged into notch **78** by spring **20** when the slider bar is actuated to the fully depressed position, thereby locking the slider bar into that position. Notch **78** is arranged so that the maximum distance to which slider bar **26** can be depressed is that where pin **42** of the push-push mechanism will not pass position **66** (FIG. 7) i.e., pin **42** is not allowed to move over bevel **52**. In this position, spring **32** will return slider bar **26** to the deactuated position, without further depressing of that particular slider bar, when latch bar **16** is moved to the right a sufficient distance to remove tongue **74c** from notch **78** and allow cam section **30c** to pass through aperture **70c**. This right-hand movement of latch bar **16** is effected either by depressing the slider bar of another operating switch module, e.g., module D, so that the diverging portion **76** of the cam section thereof, e.g., **30d** engages the associated tongue **74d** and forces latch bar **16** to the right against the biasing force of spring **20** or by deactuating master switch module A. Hence, with master switch module A actuated, the operating switch modules C, D and E are interlocked so that in order to release a previously depressed slider bar, the slider bar of another operating switch module must be depressed.

When the slider bar **26** of master switch module B is depressed and master switch module A is in the deactuated position, as shown in FIG. 5, the converging contour of cam section **30b** allows spring **18** to urge latch bar **14** in the direction of arrow **82** until tongue **72b** is in contact with vertical surface **90** of cam section **30b**. With this transverse movement of latch bar **14**, aperture **68c**, **68d** and **68e** are positioned so that tongues **72c**, **72d** and **72e** will engage flange **92** of cam sections **30c**, **30d** and **30e** of operating switch modules C, D and E when the slider bars **26** thereof are depressed. The slider bar of

master control module B is held in the depressed position by a push-push mechanism in the manner described above until being depressed a second time. Flange 92 is arranged so that the maximum distance to which slider bar 26 can be depressed is that where pin 42 of the push-push mechanism will not pass position 66 (FIG. 7), i.e., pin 42 is not allowed to move out [heel] *bevel* 52. Since pin 42 does not move over bevel 52, thereby preventing backward movement of the slider bar, the slider bar is returned to the deactuated position by spring 32 upon the release of the depressing force. Hence, when master switch module B is actuated, the operating switch modules C, D and E operate with a momentary action.

As illustrated in the drawings, master switch modules A and B are shown with movable contacts which also can perform some switching function if desired. It should be understood that the master switch modules do not have to act as switching meihanisms but can be of any arrangements which includes a cam section coacting with the latch bars to produce the desired movement. Although two separate latch bars and master switches are shown, only one of each is required if only two different actions of the operating modules are desired. For example, if only a push-push and momentary action is desired, only master switch B and latch bar 14 are required.

From the above detailed description of the preferred embodiment it can be seen that a simple inexpensive multistation or ganged modular pushbutton switch assembly having operating switch modules capable of several different types of action is provided. While a preferred embodiment of this invention has been described in detail, it will be obvious to those skilled in the art that the invention may be embodied otherwise without departing from the spirit and scope thereof.

I claim:

1. In a ganged modular pushbutton switch assembly comprising a plurality of changeover switch having at least one pair of fixed contacts mounted in spaced relationship, the improvement comprising:

(a) a reciprocative slider bar disposed in each module carrying at least one contact member for bridging said fixed contacts;

(b) at least two of said switch modules being operating modules having a push-push mechanism means cooperating with said slider bar to control the operation of said switching module;

(c) first cam means located on the slider bars of said operating modules;

(d) a first master control means having a reciprocative slider bar with second cam means thereon; and

(e) a first latch bar slidably supported by mounting bracket means, said first latch bar having first cam follower means arranged to cooperate with said first and second cam means so that, when said first master control means is in the deactuated position, said operating modules operate with a push-push action, and when said first master control means is moved to the actuated position, said first latch bar is moved to override said push-push means and to interlock said operating modules so that the slider bar of one operating module must be depressed to return a previously depressed slider bar of another operating module to the deactuated position.

2. The switch assembly according to claim 1 further comprising:

(a) a second master control means having a reciprocative slider bar with a third cam means thereon; and

(b) a second latch bar slidably supported by said mounting bracket means, said second latch bar having second cam follower means arranged to cooperate with said first and third cam means so that, when said first and second master control means are in the deactuated position, said operating modules operate with a push-push action, and when said first master control means is deactuated and said second master control means is moved to the actuated position, said second latch bar is moved to a position where said operating modules operate with a momentary action.

3. The switch assembly according to claim 1 wherein said first cam follower means and said first cam means are arranged so that when said first master control means is moved to the actuated position, said second cam means engages the first cam follower means associated therewith and moves said first latch bar laterally to a position where said first cam means cooperate with the first cam follower means associated with the operating modules to interlock said operating modules.

4. The switch assembly according to claim [1] *2* wherein said second cam follower means and said first cam means are arranged so that when said second master control means is moved to the actuated position, said third cam means engages the second cam follower means associated therewith and moves said second latch bar laterally to a position where said first cam means cooperate with the second cam follower means associated with the operating modules to limit the inward movement of the slider bars thereof so that said operating modules operate with a momentary action.

5. The switch assembly according to claim 3 wherein said first latch bar is provided with a plurality of first apertures through which said slider bars project, the first apertures associated with said first master control means and said operating modules being arranged to cooperate with said first and second cam means so as to act as said first cam follower means.

6. The switch assembly according to claim 3 wherein said first master control means comprises a switch module having at least one pair of fixed contacts with the slider bar thereof carrying at least one contact member for bridging these fixed contacts upon actuation.

7. The switch assembly according to claim 4 wherein said *second* latch bar is provided with a plurality of second apertures through which said slider bars project, the second apertures associated with said second master control means and said operating modules being arranged to cooperate with said first and third cam means so as to act as said second cam follower means.

8. The switch assembly according to claim 4 wherein said second master control means comprises a switch module having at least one pair of fixed contacts with the slider bar thereof carrying at least one contact member for bridging these fixed contacts upon actuation.

9. In a ganged modular pushbutton switch assembly including a plurality of changeover switch modules supported in spaced relationship on a mounting bracket means with each module having at least one pair of fixed contacts, the improvement comprising:

(a) a reciprocative slider bar disposed in said module carrying at least one contact member for bridging the fixed contacts upon actuation;

(b) at least two of said switch modules having a push-push mechanism associated therewith and acting as opertaing modules with a controllable slider bar action;

(c) first cam means located on the slider bars of said operating modules;

(d) a master control means having a reciprocative slider bar with a second cam means thereon; and

(e) a latch bar slidably supported by said mounting bracket means, said latch bar having cam follower means arranged to cooperate with said first and second cam means so that, when said master control means is in the deactuated position, said operating modules operate with a push-push operation, and when said master control means is moved to the actuated position, said latch bar is moved to a position where said operating modules operate with a momentary action.

10. The switch assembly according to claim 9 wherein said cam follower means and said first cam means are arranged so that, when said master control means is moved to the actuated position, said second cam means engages the cam follower means associated therewith and moves said latch bar laterally to a position where said first cam means cooperate with the cam follower means associated with the operating modules to limit the inward movement of the slider bars thereof so that said operating modules operate with a momentary action.

11. A multimode ganged modular pushbutton switch assembly comprising:

(a) support means;

(b) a plurality of modules affixed to said support means providing control and switch assemblies; said modules comprising:

(i) a housing,

(ii) at least a pair of fixed contacts supported in a spaced fixed relationship in said housing,

(iii) a pushbutton actuated slider bar [means] slidably supported in said housing for reciprocal movement between actuated and deactuated positions,

(iv) contactor means carried by said slider bar for bridging said fixed contacts, and

(v) first cam means formed in said slider bar;

(c) first cam follower means supported by said support means and engaging said first cam means whereby said control and switch assemblies operate in a push-push mode;

(d) second cam means formed in the slider bar [means] of said control modules;

(e) third cam means formed in the slider bar [means] of said switch modules; and

(f) latch bar means slidably supported by said support means engaging portions of said second and third cam means for alternatively providing a sequential and momentary modes of switch assembly operation.

12. The switch assembly according to claim 11 wherein said plurality of modules includes at least two control assemblies.

13. The switch assembly according to claim 12 wherein said latch bar means comprise:

(a) a first latch bar means biased in a first direction for engaging predetermined portions of said second and third cam means so that, when *a* said control assembly slider bar [means are] *is* in the deactuated position, said switch assemblies operate in the push-push mode and, when one [of] said control slider bar [means] is in the actuated position, said switch assemblies operate in the sequential mode; and

(b) a second latch bar means biased in a second direction for engaging predetermined portions of said second and third cam means so that, when *a* said control assembly slider [bars are] *bar is* in the deactuated position, said switch assemblies operate in the push-push mode and, when the other of said control assembly slider bar [means] is in the actuated position, said switch assemblies operate in the momentary mode.

14. The switch assembly *according* to claim 13 wherein said first and second latch bar means are spring biased and said first and second directions are diametrically opposite directions.

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JAMES R. SCOTT, Primary Examiner

U.S. Cl. X.R.

200—153 J; 74—483 RB

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. Re.27,836 Dated December 11, 1973

Inventor(s) Eric George Hansen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, lines 21 and 22,	The word "switch" is repeated, one of which should be deleted
Column 4, line 11,	"bars" should be ---bears---
Column 5, line 7,	"out" should be ---over---
Column 5, line 18,	"meihanisms" should be ---mechanisms---
Column 5, line 37, (Claim 1)	after "switch" insert ---modules---

Signed and sealed this 2nd day of July 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents