Day One

Homework Problems I-II

Electromechanical

Advanced Patent Prosecution Workshop 2020: Claim Drafting & Amendment Writing

New York
The attached disclosure discloses a workbench with two principal features: (1) a work surface formed by a pair of top members that also form a giant vice for gripping both tapered and regularly-shaped workpieces and (2) a collapsible base structure that permits the workbench to be collapsed when not in use to facilitate handling and storage.

Three relevant prior art patents are also enclosed- the Thomas, Fleming and Larson patents.

Assume that the disclosed workbench has been a commercial success and that it is expected that competing workbenches will soon be introduced to take advantage of the market created by the disclosed workbench. Prepare an appropriate set or sets of independent and dependent claims that are patentable over the enclosed prior art and fully protect the disclosed workbench. While providing coverage of the aforementioned principal features, try to anticipate how a competitor might vary the workbench design to avoid your claims.
ABSTRACT OF THE DISCLOSURE

A workbench of saw-horse height has its top formed by a pair of longitudinally extending top members which form a working surface and which are carried by transverse supports. One of the top members is fixed with respect to the supports but the other is horizontally moveable towards and away from the fixed top member to form a vise between the opposed vertical faces of the top members. Adjacent each end the top members are interconnected by screw threaded rods which are restrained against axial movement at their ends adjacent the fixed top members but which are received in nuts connected to the movable top member. The connection of the nut to the movable top member allows independent operation of the screw threaded rods to permit the gap between the vertical faces to be greater at one end than at the other.

This invention relates to workbenches and is concerned with the provision of an arrangement wherein the bench has a vice incorporated as part of its basic structure. With many applications it is desirable to be able to clamp up an elongated timber or other workpiece but prior proposals have not enabled this to be done in a satisfactory manner. Specifically it has not been possible readily to clamp up a tapered workpiece.

According to one aspect of the present invention a workbench includes a supporting structure bearing a pair of top members having upper surfaces lying in substantially the same plane, e.g. to form a working surface, at least one of the top members being moveable with respect to the other to cause opposed substantially vertical faces thereof to be moved relatively towards and away from one another, said movement being caused by actuation of one or both of a pair of spaced clamping devices which are capable of independent operation to permit the gap between the vertical faces to be greater at one end than at the other.

According to one convenient arrangement the pair of top members between them afford the complete working surface of the bench. Thus the arrangement may be such that one top member is securely fixed to the supporting structure whilst the other top member is mounted for horizontal movement towards and away from the fixed top member. In an alternative construction a third top member may be included which is disposed on the side of the movable top member remote from the first, the third top member being rigidly secured to the supporting structure.

The supporting structure conveniently incorporates a pair of horizontal transverse supports to which one top member is securely fixed, the transverse supports affording horizontal slideways upon which the movable top member can bear during its movement. The transverse supports may take various forms but conveniently each may comprise an inverted channel member within which screw threaded devices are mounted, the movable top member being secured to slider members located by the channel members for substantially longitudinal movement with respect thereto. For example in this case the screw threaded devices may comprise screw threaded rods extending substantially at right angles to the vertical faces of the stationary top member, and cooperating with screw threaded holes of associated slider members.

In order to allow the gap between the vertical faces to be greater at one end than the other the top member is preferably secured to the slider members by securing means which permit relative rotation about a vertical axis. However, where the top supports are channel members, the slider members may be located for longitudinal movement with respect to the channel members, e.g. by operating projections and slots provided respectively therein, but preferably the slider members are located such that they can move laterally slightly with respect to the channels. Thus the slider member may have a projection which is laterally of a width which is less than the width of a locating slot provided by the channel member. This will permit the accurate movement of an end (or both ends) of the movable top member. It will be appreciated that the same effect can be obtained in other ways, e.g. by relative movement between the associated slider member and means by which it is secured to the top member. Alternatively the relative movement could occur between the said securing means and the top member itself. A further possibility of allowing for the accurate movement would be to permit the screw thread devices to move translationally at their ends opposite to the ends which cooperate with the slider members.

The supporting structure may include a base structure interconnected with the top members by supporting members which are capable of movement between a collapsed position in which the top members are in close juxtaposition to the base structure and a working position in which the top members are spaced apart and supported by the base structure.

The screw threaded rods are conveniently actuated by crank handles which may be formed in two angled sections to allow the crank to be folded for storage.

The invention may be carried into practice in a number of ways but two specific embodiments will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of one form of collapsible workbench constructed in accordance with the present invention;
FIG. 2 is an end elevation, partly in section, of the upper end of the workbench showing the manner in which the top members act as a vice;
FIG. 3 is a front part-sectional elevation of the workbench of FIGS. 1 and 2;
FIG. 4 is a plan view of a slideway incorporated in the workbench;
FIG. 5 is a cross-section of the slideway on the line T-T of FIG. 4;
FIG. 6 shows certain parts of the workbench in plan with the pair of top members of the bench in parallel spaced relationship, and
FIG. 7 is a scrap plan view showing one end of the workbench with one of the top members drawn into contact with the other top member at one end only.

FIG. 1 shows the general construction of a workbench having a base structure incorporating a base board 7 mounted on adjustable feet 1 and provided at each end with a supporting bracket 2 by which a pair of generally H-shaped frames 3 and 4 are pivotally mounted at 5 and 6 respectively for movement between the working position of FIG. 1 and a collapsed storage position in which the top members are in close juxtaposition to the base board.

The upper ends of the frames 3 and 4 each afford a pair of spaced limbs which are pivoted at 10 to a vertical
web 13 of a generally U-shaped inverted channel 14 the detailed form of which is shown in FIGS. 2 and 3. Thus, referring to FIG. 3 the channel 14 also includes a vertical web 15 situated externally of the web 13, the two webs 13 and 15 being interconnected by a further horizontal web 17. The diagonal bars 9 are secured to the webs 15 at pivot points 18 at their upper ends and at their lower ends co-operate with bolts 20 to allow for collapsing of the workbench.

The work surface of the workbench is afforded by a pair of spaced rectangular-section timber beams 21 and 22 having their horizontal surfaces aligned in the same plane. The beams also have opposed vertical surfaces 23 and 24 respectively, which as will be described, can be drawn towards one another from their spaced apart positions of FIGS. 1, 2 and 6. At each end the front beam 21 is rigidly connected to the horizontal web 17 of the respective channel by means of a pair of screws 25 as shown in FIG. 2, the front screw having a spacer washer 26 surrounding it between the beam and the web 17, and the rear screw 25 passing through a hole 27 in a slabeway 28 formed for example of nylon or metal strip provided with a PETR upper surface. The form of slabeway 28 is shown in detail being held in position in FIGS. 4 and 5. Apart from the hole 27 for the rear screw 25, it has a longitudinal slot 30 for a purpose to be described, and at its rear end is provided with a poppet and 32 which, as shown in FIG. 2, is received in an aperture 33 in the horizontal web 17 of the channel 14.

The horizontal web 17 is provided with a longitudinal slot 35 of a shape corresponding to the slot 30 in the slabeway and the two slots 30 and 35 have extending upwardly through it a projecting portion 40 formed on a slider member 41 shown in FIGS. 2 and 3.

The upper surface of the projection 40 abuts the underside of an end of the rear beam 22 and the slider member 41 is secured to the beam 22 at each end by a single screw 45, for which purpose the underside of the slider member 41 is provided with an open recess 46, as shown in FIG. 3.

As shown in FIG. 3 the slider member 41, below the web 17, is substantially wider than the width of the slots 30 and 35 so that the rear beam 22 whilst it can ride freely in a horizontal manner along the slabeway, is prevented from moving bodily upward or of tilting upwards, e.g. adjacent its front edge. It is to be noted from FIG. 3 that the width of the projection 40 35 of the slider member 41 is less than the width of the slots 30 and 35 to allow for lateral movement of the slider member in a manner to be described. For this purpose also the width of the lower, wider part of the slider member 41 is less than the width of the space between the webs of the channel 14.

As shown in FIG. 2, on each side of the recess 46 the slider member 41 has a screw threaded bore 50 which cooperates with an externally screw threaded rod 51, the outer end of which, to the left in FIG. 2, carries a crank handle 52 provided with a hinged end section 53 which can be maintained either in the position shown in FIG. 2 for operating purposes or hinged downwards to the dotted line position 54 against the action of a spring biased plunger 55 when not in use. In order to support the end of the rod 51 adjacent its handle 52 the webs 13 and 15 of the channel 14 are interconnected at the front by a traverse wall 58 through which the rod 51 passes, washers being provided on each side of wall 58 and the rod being held in position by means of a circlip.

Accordingly, rotation of the rod 51 by means of its cranked handle 52 will cause horizontal movement of the slider member 41 towards or away from the front beam 21. The extent of movement of the slider member 41 is determined in this condition by abutment of the beams 21 and 22 against one another or in the case of rearward movement of the beam 22 by abutment of the projection 40 of the slider member 41 against the rear end of the slots 30 and 35. As shown in FIG. 1 the beams 21 and 22 can be drawn together or moved apart by simultaneous or independent operation of identical screw threaded rods at each end by means of a pair of crank handles 52. In this way, therefore, the beams 21 and 22, apart from providing substantially horizontal surfaces, which together provide a working top surface upon which many operations can be carried out, also act in the manner of a vise between which lengths of timber or other material can be clamped. It will accordingly be apparent that each threaded rod and its cooperating slider member 41 constitutes an extensible and contractible clamping device, and the two relatively spaced clamping devices are operable independently of each other to permit angular adjustment of the movable top member 22 about either of the vertical axes defined by the respective screws 45.

Assuming that the beams 21 and 22 are initially in spaced parallel relationship as shown for example in FIGS. 1 and 2 equal rotation of the crank handles at each end will cause the beams to be maintained in parallel relationship, which as will be apparent from the drawings is a particular feature of this workbench that one or other of the handles 52 can be operated quite independently of the other to the maximum limits allowed by movement of the respective slider members 41. In other words one end of the rear beam 22 may be fully separated from the front beam 21 and remain so whilst the other end of the rear beam 22 is drawn fully into contact with the front beam 21. This extreme position is shown in FIG. 7. It will be appreciated that during such independent movement of one end of the beam 22, the beam will pivot at each end about the screws 45 by which it is secured to the two slider members 41. Assuming the extreme example mentioned above where one of the ends of the beam remains stationary, full clamping up for example of the right-hand end of the beam 22, with no movement of the left-hand end, in the manner shown in FIG. 7, will of necessity require the slider member 41 on the right to move to the left due to the accurate movement of the right-hand end of the rear beam 22. Such sideways movement of the slider member 41 is accommodated by the excess width of the slots 30 and 35 in relation to the width of the projection 40 of the slider member 41 as shown and described with respect to FIG. 3. FIGS. 6 and 7 demonstrate this lateral movement of the slider member 41 between its extreme positions. Thus in FIG. 6 the outline of the projection 40 of the slider member 41 is shown as engaging the right-hand face of the elongated slot 30 in the slabeway 28. After full clamping up to the position shown in FIG. 7 the projection 40 of the slider member 41 moves laterally to engage the left-hand side of the slot 30. Of necessity in this arrangement the slider member 41 has to tilt slightly with respect to the longitudinal axis of the slot 30 in the clamped up position of FIG. 7. This will cause slight lateral movement of the rear end of the screw threaded rod 51 as shown in FIG. 7 but this can be readily accommodated by means of the tolerances in the manner of mounting of the rod 51 at its front end.

It will be appreciated that the relative dispositions of the parts in FIGS. 6 and 7 show an example in which a full 3° closure of the beams has occurred at one end. In most instances such an extreme condition will not be required and there will usually be some clamping up at both ends either to the same amount or a different amount. The manner in which the slider members 41 are mounted to permit this independent movement avoids any difficulty of seizure of one or other of the screw threaded rods during clamping up or release as would normally be expected to occur with spaced screw threaded members of this type. Normally with spaced screw threaded members it is necessary to maintain substantially equal rotation of each in order to prevent seizure. The use of a pair of spaced screw threads of which one can be in tension thus applying a compressional load on a part clamped between the vertical faces, and the other can if desired, take a reaction load in compression, is par-
particularly useful for the clamping up of short parts. This is especially so where the point of grip of the part is outboard of one of the screw threads.

Accordingly, the workbench according to the invention enables a part to be clamped up within the space between the two beams irrespective of whether its sides are parallel or inclined to one another.

Whilst with the embodiment of FIGS. 1 to 7 the screw threaded rods 51 are used in tension for clamping up, this is not essential and compression screws could be used.

Whilst the twin screws have been described as being entirely independently operable it is envisaged that it may be possible to provide an optional link between them when it is desired that they should maintain the pair of top members in constant alignment. Equally it is envisaged that each screw may be provided with a quick release in order that the members can be drawn together or moved apart separately for coarse adjustment prior to clamping up.
To all whom it may concern:

Be it known that I, John R. Thomas, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Clamping Apparatus, of which the following is a specification.

My invention relates to clamping apparatus such as employed for instance in clamping doors and sash and similar objects to closely unite the joints thereof.

The object of my invention is to provide clamping apparatus in which the clamping strain is removed from the frame of the machine and is received by a rod or rods which act as a tension member or members for enabling a maximum amount of clamping force to be applied with a minimum amount of metal upon which the clamping strain is exerted.

In clamping mechanism of the character mentioned great strains are applied in the clamping action. In the forms of clamping apparatus now in general use, great strains are received by the frame of the machine, necessitating that the frame receiving the strains be made exceedingly heavy and resulting in breakage of the frame in the operation of the machine.

My improved construction removes this objection and provides a device in which the frame may be comparatively light, as the direct strain of the clamping action is removed from the frame.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a plan view of my improved device, partly broken away. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical cross-section of the same taken on the line 

40 s—s of Fig. 1. Fig. 4 is a detail in axial section of the mounting for the rockable sleeve; and, Fig. 5 is a detail in vertical section on the line 

45 y—y of Fig. 1 showing the mounting between the adjustable clamping-bar, the rod and the frame.

I represents the frame on which clamping-members 2 3 have movement. The clamping-members are shown as clamping-bars. The clamping-bar 2 is preferably the movable bar for effecting the clamping action, and the clamping-bar 3 is preferably an adjustable bar for regulating the effective distance between the bars.

4 are guide-ways on the frame on which the guides 5 of the clamping-bar 2 and the guides 6 of the clamping-bar 3 have movement. These respective guides have retaining-pieces 5' 6' for holding the clamping-bars to the guides 4.

7 are tension-members and are shown as adjusting rods having threaded connection with nuts 9, shown as swivel-nuts having swiveling movement in bearings 10 of the clamping-bar 3.

The screw-rods are journaled in bearings 11 12 in the frame and have handles 13 at their forward ends. They are preferably connected for combined movement, as by providing the same with sprocket-wheels 14 connected by a sprocket-chain 15, so that upon turning of one of the handwheels the screw-rods will be turned in unison. If it is desired to turn one of the screw-rods independently of the other, one of the sprocket-wheels may be disconnected from the screw-rod, as by loosening one of the setscrews 16 securing the respective sprocket-wheels to the screw-rods.

The swiveling connection of the nuts 9 in the clamping-bar 3 permits the clamping-bar 3 to be set at an angle with relation to the clamping-bar 2, so that work which has edges out of parallel with each other may be clamped by my improved device. For permitting angular positioning of the clamping-bar 3, the apertures 17 in said clamping-bar through which the screw-rods pass are formed of larger diameter than the screw-rod and lateral space 18 is provided between the guide-ways 4 on the frame and the guides 6 of the clamping-bars 3.

Relative movement longitudinal of the tension-member is caused to take place between the movable clamping-member and the tension-member for effecting the clamping operation, the strain of this movement being directed upon the tension-member and upon the movable clamping-member. The clamping-bar 2 preferably has bearings 21 for the screw-rods 7, the screw-rods being journaled in these bearings and the bearings 20 having movement longitudinal of the screw-
rods. This construction prevents tilting or lateral displacement between the tension-member and movable clamping-member, providing mutual support for said members at the point of greatest lateral strain between them.

The clamping force exerted for clamping the piece of work is exerted lengthwise of the tension-member as a pulling strain upon said tension-member. For effecting this movement I have provided each of the screw-rods with a collar 22 positioned lengthwise thereof between the positioning nuts 28 and jam-nuts 24.

25 25 26 are toggle-links at the respective sides of each of the screw-rods connecting the collars 22 with the clamping-bar 2. The toggle-links 25 are pivotally connected with the collars 22 by bolts 27, and the toggle-links 26 are pivotally connected with the clamping-bar 2 by bolts 28 received in lugs 29 on the clamping-bar; the toggle-links 25, 26 being connected together by bolts 30.

30 Having a bearing 36 at each end thereof about a connecting bar 37 between the side members of the frame. The sleeve has arms 38 thereon to which links 39 are articulated on bolts 40, the links 39 connecting with the toggle-links, as by having the bolts 30 pass therethrough. The sleeve is also provided with an arm 41 and forms a lever pivoted about the connecting-bar 37 for operating the toggle-links and forming powerful means for causing relative approach between the clamping bars 2 and 3.

40 is an operating treadle having a pivot 43 shown as a pin received in lugs 45 of a cross-girt 47. The operating lever is connected with the arm 41 by a link 48 which is articulated to the operating treadle by a bolt 49 and to the arm 41 by a bolt 50. The construction is such that pressure exerted by the foot of the operator upon the operating treadle is imparted through the operating treadle to the rockable member and the toggle-links for exerting great pressure upon the stock being clamped by the clamping members.

50 For relatively opening the clamping-members, I prefer to provide a reversing treadle 51 pivoted to the frame on a stud 52 and connected with an arm 53 of the sleeve 36 by a link 54, a bolt 55 connecting the reversing treadle with the link and a bolt 56 connecting the link with the arm 53. The pivot of the operating treadle is preferably in the rear of its connection with the sleeve, forming a lever of the second class, whereas the reversing treadle is pivoted forwardly of its connection with the sleeve, forming a lever of the first class, the connections of the operating treadles with the sleeve being to one side of the vertical plane of the axis thereof, so that the treadles may be operated for performing their operative functions by downward pressures of the foot therton and be out of the way of the operator.

In operation, the piece desired to be clamped is placed upon the clamping members between the upright flanges 37 thereof. The foot is placed upon the operating treadle, the force applied thereby causing the toggle-links to straighten for assuming an approximately parallel relation. This causes the working strain of the toggle-links 25 to be exerted upon the tension-members and through the latter upon the clamping-member 3, and the working strain of the links 26 to be exerted upon the clamping-member 2 for causing relative approach between the clamping-members, and causing the entire load of the clamping strain to be received in the tension-members and relieving the frame from this clamping strain.

In the construction shown the screw-rods are held against longitudinal movement by the hand-wheels and sprocket-wheels respectively contacting the front and rear bearings of the frame.

It is within the spirit of my invention that the adjustments for sizes and the movement for clamping may take place in either or both of the clamping members, and other changes may be made in the specific constructions shown without departing from the spirit of my invention. The adjustment for sizes of pieces is preferably obtained by adjustment of the rear clamping-bar 3 which may be caused to assume selective positions lengthwise of the screw-rods and be moved closely adjacent to the clamping-bar 2.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a clamping apparatus, the combination of a supporting frame, a tension-member, a clamping-member having connection with said tension-member, a mating clamping-member, link-mechanism between said mating clamping-member and tension-member, supporting means independent of said tension-member between said clamping-members and supporting frame, and means for operating said link-mechanism, substantially as described.

2. In a clamping apparatus, the combination of a frame, a screw-rod journaled therein, a clamping-member having connection with said screw-rod, a mating clamping-member, link-mechanism between said mating clamping-member and screw-rod for causing relative movement between said mating clamping-member and screw-rod, and means for operating said link-mechanism, and constructed and arranged for causing the clamping strain between said clamping-members to be exerted through said screw-rod, substantially as described.
3. In a clamping apparatus, the combination of a frame, a pair of clamping-members, a screw-rod journaled in said frame, a nut having threaded connection with said screw-rod and swiveling connection with one of said clamping-members for adjusting said screw-rod turns, means between said screw-rod and collar for limiting endwise movement between them, toggle-links between said collar and the other of said clamping-members, and means for operating said toggle-links, substantially as described.

4. In a clamping apparatus, the combination of a frame, a pair of clamping-members, a screw-rod journaled in said frame, a nut having threaded connection with said screw-rod and swiveling connection with one of said clamping-members for adjusting said clamping-member, a collar in which said screw-rod turns, means between said screw-rod and collar for limiting endwise movement between them, toggle-links between said collar and the other of said clamping-members, a rockable member having an arm at one side thereof having operative connection with said toggle-links and a pair of arms at the other side thereof, and operating levers of different classes having operative connection with said pair of arms for rocking said rockable member in opposite directions, substantially as described.

5. In a clamping apparatus, the combination of a frame, a plurality of tension-members therein, a plurality of clamping-members having slideable connection with said frame, one of said clamping-members having adjustable and swiveling connection with said tension-members and another of said clamping-members having slideable connection with said tension-members, and toggle-links having operative connection with said tension-members and last named clamping member, for the purpose described.

6. In a clamping apparatus, the combination of a frame, a plurality of screw-rods journaled therein, a plurality of clamping-members having slideable connection with said frame, nuts for said screw-rods having swiveling connection with one of said clamping-members, the other of said clamping-members having sliding bearings about said screw-rods in which said screw-rods are journaled, collars received about said screw-rods, means for limiting endwise movement between said collars and screw-rods, toggle-links between said collars and said last named clamping-member, and means for operating said toggle-links, substantially as described.

7. In a clamping apparatus, the combination of a main frame, a screw-rod journaled in said frame, a clamping-member having connection with said screw-rod, a mating clamping-member, link-mechanism having connection with said mating clamping-member, and said screw-rod for causing relative movement between said mating clamping-member and screw-rod and for causing the clamping strain between said clamping-members to be exerted through said screw-rod as a tension-member lengthwise of said screw-rod, and means for operating said link-mechanism, substantially for the purpose described.

In testimony whereof, I have signed my name hereto in the presence of two subscribing witnesses.

JOHN R. THOMAS.

Witnesses:
HARPER S. ROSS,
RICHARD D. COAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
CLAMPING SAWHORSE AND WORKBENCH

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Application September 8, 1948, Serial No. 48,367

1. Claim. (Cl. 144—256)

This invention relates to sawhorse workbenches.

It is an object of the invention to provide a sawhorse workbench which is particularly suitable for use by those who only occasionally do woodworking, or repair work in their home or workshop, and which provides a substantially horizontal working surface or tabletop and a vise or clamping means for clamping work in position for sawing, planing, etc.

It is a particular object of the invention to provide a sawhorse workbench with an extensive horizontal planar work surface having incorporated therein clamping means arranged to hold work-pieces in position for planing, sawing and the like, said clamping means forming a part of the sawhorse and workbench.

A further object of the invention is to provide a sawhorse workbench, of the character described, which is simple in structure and which may be sold and shipped "knocked down," and which may be readily and easily assembled by the user to provide a rigid substantial workbench and vise.

Another object of the invention is to provide in a sawhorse workbench means for storing or separating screws, nails and the like in a position accessible to the user.

Additional objects and advantages of the invention will readily be apparent from the reading of the following description of a device constructed in accordance with the invention, and reference to the accompanying drawings thereon, wherein:

Figure 1 is an isometric view of a sawhorse workbench constructed in accordance with the invention.

Figure 2 is a transverse vertical sectional view taken through one of the clamping members of the sawhorse.

Figure 3 is a plan view of the work surface of the sawhorse, and

Figure 4 is a transverse vertical sectional view, similar to Figure 2, of a modified form of the clamping means for the sawhorse workbench.

In the drawings, the numeral 10 designates generally a sawhorse workbench. Its entirety. The sawhorse includes the usual angularly disposed pairs of legs 11 converging at their upper ends and joined to longitudinally extending spaced vertical brace members 12 and 13 having a pair of similarly spaced horizontally disposed tabletop members 14 and 15 secured to the upper edges thereof. The tabletop member 14 is secured to the vertical brace member 12 so as to extend horizontally outward from the upper end of said vertical brace member in substantially an inverted L-shape in cross section, while the horizontal tabletop member 15 is secured at its inner end to the upper edge of the vertical brace member 13 so as to extend horizontally outward therefrom in an oppositely directed inverted L-shape. Supporting spacer members 16 are secured between each pair of legs 11 so as to abut against the lower edges of the vertical brace members 12 and 13 to support the same against downward movement.

The upper end portions of the legs 11 are preferably fitted within upwardly and inwardly sloping grooves 17 formed in the outer surfaces of the vertical brace members 12 and 13, as clearly shown in Figures 1 and 2. Each pair of legs is secured to said brace members by screws 18 extending through the leg members into the brace members and are urged together at their upper ends by means of a tie bolt 19 which extends through each pair of legs above the spacer members 16 and immediately below and preferably abutting the lower edges of the vertical brace members.

The legs are connected to the brace members at points spaced inwardly from the ends of such brace members, and it is preferable that a substantially U-shaped reinforcing strap 20 of steel or the like be secured by screws or otherwise to the projecting end portions of the vertical brace members 12 and 13, in the manner illustrated in Figures 1 and 2, for securely holding said vertical brace members in proper spaced vertical positions. The reinforcing members are provided with lateral extensions 21 which project horizontally beneath the tabletop members 14 and 16 for supporting said horizontal tabletop members against downward deflection. If desired, spacer blocks 22 having their outer ends relieved to provide spacing shoulders 23 thereon may be secured to the lower edges of the vertical brace members 12 and 13 at spaced points in the manner illustrated in Figure 3 for assuring that the lower edge portions of the brace members are held in spaced relationship. The spacing shoulders 23 engage the lower inner surfaces of the vertical brace members to prevent the brace members from being forced together, and the relieved or reduced outer portion of the brace members are secured by bolts or screws or the like to the lower edge of the vertical brace members.

The space 25 between the vertical brace members 12 and 13 constitutes the mouth of a vise, and a vertically disposed movable clamping plate or block 26 is adjustable laterally in said vise mouth or space. The clamping block is adjusted
by means of an elongate adjusting or clamping bolt 27 having an eye 28 or the like at its outer end, which bolt is threaded through the reinforcing clamp 28 and through a threaded boss 29 secured to the inner surface of said reinforcing clamp 28 by welding or otherwise, whereby the bolt may be longitudinally adjusted. The adjusting bolt extends inwardly through an opening in the vertical brace member 12 and is provided with a head 30 at its inner end which is rotatably mounted in a socket member 31 secured in a recess in the adjustable clamp member 26 by means of screws 32, as clearly shown in Figure 2. It will be seen, therefore, that the adjusting bolt 27 may be rotated to move the clamping block 25 laterally within the vise mouth 25 between the upright brace members 12 and 13 for clamping planks, doors, or other work in the mouth between the clamping block and the upright brace member 12.

The horizontal tabletop member 14 extends inwardly into the space or opening 25 a distance equal to the thickness of the clamping block and is cut away at its inner edge adjacent to the clamping block 25 to permit the block to move into the recess 35 so cut away so that the clamping block forms a continuation of the upper horizontal surface of the tabletop member 14 when in a fully opened position, as clearly shown in Figures 1 and 2. The clamping bolts 27 are provided at each end of the sawhorse workbench, as best shown in Figure 1, and a clamping block 25 is likewise provided at each end of the sawhorse and is arranged to be retracted into a recess 35 formed in each end of the tabletop member 14. However, if desired, instead of separate clamping blocks 25, a single elongate clamping member may be mounted upon the adjusting bolts 27, whereby the clamping member may extend throughout the length of the gap or space 25 forming the mouth of the vise in the sawhorse workbench. Furthermore, if desired, the clamping member may be disposed so as to be withdrawn below the inwardly projecting inner edge portion of the upper tabletop member 14', as clearly shown in Figure 4, whereby the tabletop member is not cutaway or interrupted and presents a smooth upper surface at all times. The elongate single clamping block will, however, be movable toward the upright brace member 13 below the lower surface of the horizontal tabletop members 14' and 15 to clamp material in the opening 25 between the upright members 12 and 13. When the clamping member is retracted, it will be withdrawn completely beneath the inwardly projecting lip portion of a tabletop member 14', as clearly shown in Figure 4.

Manisfestly, if desired, the U-shaped brace members 28 may be omitted, and the threaded boss or nut 29 may be mounted on the inner surface of the upright brace member 12 for providing means for longitudinal adjustment of the bolt 27 to adjust the clamping block 25 in the vise mouth. It is preferable that a horizontal tray 40 be secured between the legs 11 of the sawhorse workbench at a point spaced below the lower edge of the vertical brace members 12 and 13. The tray is provided with peripheral flange members 41, and with dividers 42 on its upper surface for dividing the tray into sections for receiving and storing screws, nails, bolts and the like. The tray serves to maintain the lower portion of the legs in proper spaced relationship.

The sawhorse workbench may be partially assembled by connecting the vertical brace members and horizontal tabletop member between the U-shaped clamp or brace strap 28, and the legs 11 and horizontal supporting spacer members 15 may be separately assembled and the entire device packaged in a small space for shipment. The complete assembly of the legs upon the vertical brace members and the tray before the legs, in the manner illustrated in the drawings, may be completed by inserting the screws 18 and the bolts 19 to secure the legs in place in the recesses 11 in the brace members and by bolting the tray between the legs. The sawhorse workbench is then ready to use.

It will be seen from the foregoing that a sawhorse workbench is provided which has an extensive horizontal tabletop providing a large planar work surface, and succeeds the space between the vertical brace members provides a vise mouth in which work may be clamped by means of the clamp members and clamping bolts 27, for planing, sawing and the like. It will also be seen that the device may be used in any manner in which a sawhorse or small workbench may be used, the projecting portions of the tabletop members providing means for securing various tools to the workbench in the usual manner.

It will be seen also that the device may be made of hard or soft wood or metal or the like, if desired, or any desired combination of such materials. It will also be seen that the sawhorse workbench is readily assembled for shipment in "knocked down" condition and may be easily and quickly assembled by the user. Also, the workbench is provided with a space for storing or holding screws, nails, bolts and the like, so as to be accessible and handy for the user of the workbench. The workbench will also be seen to be small and easily transported and stored, and yet it provides a large satisfactory working surface and a suitable clamping vise.

While certain uses have been hereinbefore mentioned for the sawhorse workbench, it is to be understood that it may be used wherever suitable as a sawhorse, or as a support, or as a support, or as a workbench, or as a standing platform or the like, and that no limitation as to use is to be implied or inferred.

The foregoing description of the invention is explanatory only, and changes in the details of the construction illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

A sawhorse workbench including, a pair of elongate longitudinally extending vertical brace members spaced apart laterally, legs secured to said brace members at points spaced inwardly from the ends thereof for supporting the brace members, a pair of elongate horizontally disposed tabletop members each carried by one of the vertical brace members spaced laterally therefrom, and each whereby an elongate longitudinal extending slot is formed between the pairs of tabletop members and brace members, a clamping block disposed in the slot between the vertical brace members with its upper edge horizontally aligned with the upper surface of the tabletop members and adjustable laterally in said slot for clamping work therein, and an adjusting screw carried by one of said vertical brace members.
and engaging the clamping block for positively adjusting and holding and securing the clamping block in adjusted position.

ROBERT B. FLEMING.

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This invention relates to a folding workbench. Among the objects of the present invention is to provide such a workbench made of a number of standardized shapes, preferably of wood, interconnected by standardized hardware and constructed and arranged so that the relatively shiftable parts thereof may be moved to open position to form a workbench, or shifted to a second position where the front legs of the workbench swing upwardly to folded position, and wherein the flat horizontal surface of the workbench may swing downwardly to an inclined position and be held therein so as to provide a drawing board or table, and also wherein the various members of the workbench are adapted to fold into a compact closed casing for shipping or for storage purposes.

Yet another object of the invention resides in providing a folding workbench having a pair of front legs adapted to hinge upwardly to the underside of the horizontal table portion of the workbench and wherein the table portion itself is hinged to swing downwardly in a vertical position adjacent the rear vertical legs of the workbench, and wherein also the workbench is provided with a rear hinged shelf adapted to swing forwardly and downwardly over the top of said downwardly swivelled platform portion to form with the downwardly swivelled platform portion a complete casing whereby the workbench is folded into a compact form for storage or shipping.

Yet another object of the invention resides in providing a folding workbench having the various characteristics disclosed in the appended specification and shown in the accompanying drawings.

These and other objects of the invention will be apparent from a perusal of the following specification when taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of the workbench when unfolded to open position;

Figure 2 is a side view of the same with the front board removed to show the underlying construction;

Figure 3 is a view showing the horizontal working surface swung downwardly to vertical position;

Figure 4 is a view showing the rear upper shelf of the workbench swung downwardly to closed position;

Figure 5 is a similar view with the end boards placed in position and secured together, as, for instance, by screws;

Figure 6 is a sectional view taken on the line C—C of Figure 4;

Figure 7 is an exploded view of the various parts of the workbench;

Figure 8 is a somewhat skeleton view of the understructure of the workbench;

Figure 9 is a section taken on the line 9—9 of Figure 8;

Figure 10 is a section taken on the line 10—10 of Figure 4;

Figure 11 is a view showing the manner in which the workbench is modified to make a drawing board; and

Figure 12 is a sectional view taken on the line 12—12 of Figure 11.

Referring now to the drawings in detail, the workbench comprises a pair of upright wood stumps 2 and 4 which may be of any desired cross section, but are generally of the general shape and configuration of short lengths of two by fours. These legs are arranged in spaced relation at the rear corners of the workbench. Referring to Figure 8, it will be seen that the top portions of the legs 2 and 4 are rigidly interconnected to the outer ends of a back board 8 by corner brackets 10 and 12. This back board 8 may be rigidly fastened to a building wall 14 by means of screws or other fastenings 16. It is to be noted that the back board 8 rises above the upper ends of the rear legs 2 and 4. Sidely attached to the inner upper walls of the rear legs 2 and 4 are two pivot blocks 18 and 20 which have forwardly curved walls of the rear legs 2 and 4 and are rigidly connected to the front face of the back board 8 by means of the screws 19. Additional corner brackets 28 and 32 rigidly interconnect the outer ends of the two by four 6 with the blocks 18 and 20. By means of this construction the entire rear assembly is rigidly interconnected. Pivotedly attached to the blocks 18 and 20 are two pivotally mounted side frames 34 and 36. The rear ends of these side braces are suitably curved and are apertured as at 38 and 40 to receive pivot pins 42 and 44 which pass through the apertures 38 and 42, and 38 and 40, of the side frame members whereby the side frame members 34 and 36 can swing about the pivot pins 42 and 44. The forward ends of these frame members 34 and 36 are rigidly interconnected to a front frame member 46 at the corners by means of the metal brackets and screws 48 and 50. Additional manor blocks 52 and 54 are provided to space the two forward legs depending from these blocks from the front face of the front cross member 46 and the forward ends of the side...
frames 34 and 36 and also to support the pivot pins 56 and 58 which pivotally support the front legs 60 and 62 therefrom. These front legs, as shown, are preferably L-shaped in cross section, being formed by two right angularly disposed boards suitably interconnected by screws and the corner brackets 63, as shown in Figure 10. The top wall portions 64 of these front legs are curved as shown in Figure 8. Each of the side boards 61 of the front legs is shorter than the 500 complementary front board of each leg, so that when the legs are swung downwardly into open position, the boards 61 being cut away will rest under the side boards 34 and 36.

A hinged shelf member is provided for the rear of the workbench. This comprises a rear back board 70 and a right angularly disposed shelf board 70. These boards are suitably interconnected by screws and disposed in normally L-shaped arrangement. The bottom portion of the side edges of the back board 68 have affixed thereon the flat metal hinge members 72 and 74 having rounded head portions 18 which are pivotally attached as at 76 to the ends of the back portion 8 whereby this shelf-like bracket may either be disposed in vertical upright position as shown in 8 or may be swung to a horizontal position as shown in Figures 4, 5 and 6. In addition, fixed to the rear building wall 14, see Figure 11, is a horizontally disposed strip 86 which is adapted to overlie the open portion of the horizontal shelf board 70 in such a manner that when the workbench is moved rearwardly into position, the shelf wall with the shelf-like portion 86—10 in vertical position, the horizontal shelf portion 70 will directly underlie the horizontal strip 86 which will hold the shelf-like portion 70 in vertical position.

The upper surfaces of the blocks 18 and 20 are provided with upstanding dowel pins 84 which serve to register with holes 92 in a loose board 101 which loosely overlies and rests upon the upper surface of the blocks 18 and 20, as shown clearly in Figure 1. The rear edge 104 of this loose board contacts the front face of the vertically disposed rear board 8.

A top panel 106 for the bench provides a working surface and is fixed to the upper surfaces of the side frames members 34 and 36 by screws and lies in a horizontal plane flush with the top surface of the loose board 102. The front edge 108 of the top panel 106 extends forwardly to a position shown in Figure 1 whereby the front edge 108 is in alignment with the front vertical surface of the legs 62 and 60. In addition, the front edge 108 of top panel 106 is provided with a set of hinges 110 which hingedly connect with a drop panel 112 which forms a front surface for the bench. This front surface is provided with a notched handle 114. Both the back panel 102, top panel 106, and the front panel 112 are provided with spaced holes such as 115 to receive pins acting either as means to fix gauges or clamps for holding work pieces in place.

In order to convert the workbench into a drawing table, as in Figure 11, the legs 60 and 62 are folded upwardly into horizontal position as shown in Figures 2 and 11 and a pair of side bars or strips 118 are provided which are adjustable secured in a series of holes 122 on the side members 34 and 36 by means of wing nuts 124 and 125 and either one will receive an elongated leg 128, there being one on each side, the lower end of which is adapted to rest in the junction of the floor 130 and wall 14 just to the rear of the leg members 2 and 4 whereby the table top 130 may be held at any adjustable angle by shifting the support members 118. It will be noted that in this position the forward end of the support member 118 forms an additional support for the now raised position of the hinged front board 112 which is thus swung up to a position flush with the plane of the top panel 106, thus forming a continuation of the top panel 106 and making it a larger working surface for the inclined drawing table.

The first step in folding up the workbench is to fold up the two front legs from the position shown in Figure 1, the legs being pivotally about their pivots and moving in the direction of the arrows accurately and upwardly to a position as shown in Figure 2, wherein the legs are folded directly underneath the top surface 106 and behind the front leg 60. The next step is to swing the front board 106 and the legs folded thereunder from a horizontal position to the position shown in Figure 3, whereby the side supports 24 and 26 will swing into contact with the rear legs 2 and 4, as shown in Figure 3, the front legs being in folded position as shown in dotted lines in Figure 3. In this folded position blocks 132 and 134 form stops for the inwardly shifted position of the members 24 and 36. Next, as shown in Figure 4, the rear shelf is moved from the dotted line position of Figure 6 down to the full line position to close the top. It will be noted that the front edge of this shelf contacts the rear edge of the panel 106 in this position. The front panel 112 in this position forms a continuation of the plane of the panel 106. Next, the two side closure members 130 and 132 are placed in position as shown in Figure 5 and attached thereto by screws 140. It is to be noted that these side boards 130 are suitably notched as at 144 in order to permit the projecting ends of the back board 8 to lie flush with the flush outer walls of these side boards 130 and 132. The whole combination when it is folded together forms a box-like structure adapted to be held together by suitable wood screws. It will thus be seen that the folding workbench, when folded into position as shown in Figure 5, may be put away in a compact form, or may be compactly shipped in this condition.

When the workbench is suitably mounted and in position as shown in Figure 1 it is adapted to accommodate different types of work fittings such as a metal vise, and also to provide dowel supports for positioning milling boxes and the like. It also may be adapted for fittings to support tools such as grinding or cutting implements, and in addition the back portion may form a shelf to support materials used in connection with the aforementioned operation.

Obviously the invention is not limited to the specific details of construction disclosed herein but is capable of other modifications and changes without departing from the spirit and scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A folding workbench comprising a pair of corner rear legs, a rigid frame rigidly interconnect the same, a pair of top side members pivotally connected to said rear frame, means inter-
connecting and rigidifying said side frame members, a pair of front legs pivotally connected to the front ends of said side frame members whereby said legs swing about horizontal pivots from a vertical position to a horizontal position, a bench top rigidly carried by said side frame members, a hinged extension for said bench top hingedly connected thereto for swinging into a plane at right angles to the plane of the bench top, and a shelf member of substantially L-shaped formation hingedly connected to the rear of said back frame member whereby said shelf member may be swung to vertical upright position to have the angled portion thereof directly overlie and lie parallel to the rear portion of the work surface of the bench, or whereby when the legs have been folded upwardly the bench working surface has been swung downwardly parallel to and adjacent the rear legs, said shelf member may be swung downwardly into position to close top of said bench whereby said shelf member may be folded into substantially a compact rectangular formation for shipping or storage.

2. A folding bench comprising a pair of rear legs, a rear leg cross support interconnecting said rear legs, a pair of side frame members pivotally connected to said rear leg structure to swing about horizontal pivots, a front frame member rigidifying and interconnecting the side frame members, a pair of front legs each pivotally connected to the front leg structure to swing about horizontal pivots, a bench top connected to said side frame members whereby said bench may fold from an open position to a closed position whereby front legs swing upwardly into parallelism beneath the bench top, and whereby the bench top may be swung downwardly into parallelism with the rear leg members, and means pivotally disposed on the rear leg structure for closing the space between the folded bench top and said rear leg structure whereby to provide a substantially rectangular folded structure for the bench for shipment or for storage.

3. A carpenter or working bench having four legs, a top, and an upright shelf at the rear, the front legs being pivotally connected to fold substantially parallel to the top surface of the bench and parallel to the rear of the bench, and the top surface of the bench being pivotally interconnected to swing into a position parallel with the rear legs, said rear leg structure having a pivotally connected rear shelf adapted to fold downwardly toward the upper surface of the rear legs and with respect to the folded bench top to form a compact, substantially rectangular figure, and a pair of side boards adapted to enclose the sides of the folded structure and adapted to be connected to the structure by suitable fastening means.

4. A working bench having rear legs and a rigidifying rear leg structure, a pair of side frames pivotally connected to said rear leg structure, means for rigidifying said side frames a plane working surface for the top of said bench, a hinged extension pivotally connected to the front edge of said working surface, a pair of extension blocks adjustably connected to said side frame members, and a pair of front legs pivotally connected to said side frames, said extension blocks supporting the top extension in a position flush with the plane of the main working surface, said front legs being adapted to hold said entire top and its extension in inclined position.

5. A foldable working bench comprising a pair of rear legs and a rigidifying, interconnecting, rear leg cross support, a board member detachably overlying the upper ends of said rear leg structure, a pair of side frame members pivotally interconnected to said rear leg structure, said side frame members being rigidly connected at the front to provide a front leg support, a pair of legs connected to said front leg support to swing to open position thereunder, a bench top mounted upon said side frame members with its rear edge lying in the plane of the board, and a shelf member pivotally connected to said rear leg structure and having an angularly disposed portion adapted to overlie the board in parallel relation.

6. A foldable working bench comprising a pair of rear legs and a rigidifying, interconnecting, rear leg cross support, a board member detachably overlying the upper ends of said rear leg structure, a pair of side frame members pivotally connected to said rear leg structure, said side frame members being rigidly connected at the front to provide a front leg support, a pair of legs connected to said front leg support to swing to open position thereunder, a bench top mounted upon said side frame members with its rear edge lying in the plane of the board, and a shelf member pivotally connected to said rear leg structure and having an angularly disposed portion adapted to overlie the board in parallel relation.

7. A folding workbench comprising a pair of corner rear legs, a rear frame rigidly interconnecting the same, a pair of top side members pivotally connected to said rear frame, means interconnecting and rigidifying said side frame members, a pair of front legs pivotally connected to the front ends of said side frame members whereby said legs swing about horizontal pivots from a vertical position to a horizontal position, a bench top rigidly carried by said side frame members, and a shelf member of substantially L-shaped formation hingedly connected to the rear of said back frame member whereby said shelf member may be swung to vertical upright position to have the angled portion thereof directly overlap and lie parallel to the rear portion of the work surface of the bench, or whereby when the legs have been folded upwardly and the bench working surface has been swung downwardly parallel to and adjacent the rear legs, said self member may be swung downwardly into position to close top of said bench whereby said bench may be folded into substantially a compact rectangular formation for shipping or storage.

8. A folding workbench comprising a rear frame, a front frame pivotally connected to said rear frame, a pair of front legs pivotally connected to the front end of said front frame, said front legs being pivotable to a supporting position and to a position parallel to the top surface of said front frame, and a shelf member of substantially L-shaped formation hingedly connected to the rear of said rear frame whereby said shelf member may be swung to vertical upright position to have the angled portion thereof directly overlap and lie parallel to the rear portion of the surface of the bench, or whereby when the legs have been folded upwardly and the front frame has been swung downwardly parallel to and adjacent the rear frame, said shelf member may be swung downwardly into position to close the top of said
bench whereby said bench may be folded into substantially a compact rectangular formation for shipping or storage.

9. A foldable work bench comprising a vertically disposed rear frame, a front frame pivotally connected to said rear frame and providing a plane work surface, a pair of legs pivotally mounted on the forward side of said front frame for holding said front frame in a position in which the work surface is substantially horizontal, and a shelf member pivotally connected to said rear frame and having an angularly disposed portion adapted to overlie the horizontal top surface of said rear frame, said legs when swung upwardly permitting the bench top to be swung downwardly in a position substantially parallel to said rear frame, said shelf member being swingable downwardly to overlie the top of said rear frame with the angularly disposed portion of the shelf member lying parallel to the work surface of the front frame.

10. A folding work bench comprising a rear leg structure, a pair of foldable side arms pivotally mounted on said rear leg structure, a pair of front legs pivotally mounted adjacent the front ends of said side arms, a bench top carried by said side arms and of a width to its front edge less than the height of said rear leg structure, and a bench top extension hinged to the forward edge of said bench top and disposed at right angles there-

to when the bench is open with the bench top in substantially horizontal position, and said extension lying in the plane of said bench top when the bench is closed with the bench top substantially parallel to said rear leg structure to form with said bench top a front closure for the folded structure down to the bottom of said rear leg structure.

11. A folding work bench as claimed in claim 10, wherein means are provided for engaging said extension and adjacent portions of said bench top to maintain the said bench top and said extension in substantially coplanar relative positions.

CHARLES O. LARSON.

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The attached specification and drawings disclose a push button electric switch.

The Finegan and Tsen et al. prior art references are also supplied so that you can write a broad claim that is distinguishable from the prior art.

Prepare a set of claims, including at least one broad independent claim covering the novel features of the invention.

Before beginning claim preparation, review all the patent disclosures, in order that you might direct the claims to the distinguishing features.
BACKGROUND OF THE INVENTION

The present invention is directed towards an improved push button switch, and more specifically to an improved push button switch with a highly desirable tactile feel.

Prior art push button switches normally include a mechanical switch having a stationary and a moveable contact and a push button connected to the moveable contact. The movable contact is ordinarily biased into a normally open position and is closed when the operator of the push button switch depresses the push button and thereby moves the movable contact into the closed position.

It is highly desirable that push button switches of this type have a positive tactile feel wherein the operator of the switch unequivocally knows whether or not he has depressed the switch sufficiently to close the mechanical switch; that is, the switch should give the operator of the switch sufficient feedback to know whether or not he has closed the switch. This is especially important if the push button switch is located in a room which is remote from loads (e.g., lamps) being controlled.

To assure the operator of the switch that he has closed the electro-mechanical switch, it is also important the electro-mechanical switch closes properly irrespective of the specific location on the push button switch which is depressed by the operator of the push button switch.

BRIEF DESCRIPTION OF THE INVENTION

In order to achieve the foregoing and other desired results, the present invention is directed towards a push button switch, comprising:

- a face plate having a front surface, a rear surface and an opening extending from said front to said rear surface, said opening having a geometric center as viewed from a position in front of said face plate;
- a push button located in said opening;
- means for resiliently coupling said push button to said face plate with at least a portion of said push button being biased against a stationary surface which is located rearward of said front surface of said face plate and such that said push button can be moved rearwardly by an operator of said switch;
- a normally open electro-mechanical switch having a stationary contact and a moveable contact which is moveable between an open and a closed position, and biased against a portion of said rear surface of said push button by second means, separate from said first means, said portion being located at approximately said geometric center of said opening;
- said push button, said face plate, said coupling means and said electro-mechanical switch cooperating to ensure that whenever the operator of said push button switch depresses said push button at a first location which is removed from said geometric center of said opening, said push button will contact said stationary surface at a second location on the opposite side of said center of said opening relative to said first location.

The stationary surface is preferably the rear surface of the face plate and surrounds the entire periphery of the opening. The push button preferably has a recessed flange section which is biased into contact with the stationary surface by the coupling means. The coupling means comprises first and second resilient members which respectively contact said push button on opposite sides of said center of said opening.

The invention is also directed towards a push button switch, comprising:

- a face plate having a front surface, a rear surface and an opening extending from said front to said rear surface, said opening having a geometric center as viewed from a position in front of said face plate;
- a push button located in said opening;
- means for resiliently coupling said push button to said face plate with at least a portion of said push button being biased against a stationary surface which is located rearward of said front surface of said face plate and such that said push button can be moved rearwardly by an operator of said switch;
- a micro switch having a stationary contact and a moveable contact, said moveable contact being moveable between an open and a closed position and biased against a portion of a rear surface of said push button, said portion being located at approximately said geometric center of said opening, said micro switch producing a mechanical shock upon closing of said stationary and moveable contacts thereby providing tactile feedback to the operator of said push button switch;
- said push button, said face plate, said coupling means and said mechanical switch cooperating to ensure that whenever the operator of said push button switch depresses said push button at a first location which is removed from said geometric center of said opening, said push button will contact said stationary surface at a second location which is on the opposite side of said center of said opening relative to said first location.

In order to ensure that the push button is not depressed a distance which might injure the mechanical switch, at least a portion of a heat sink to which the face plate is coupled is located below the push button and limits the rearward movement of the push button.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the front, top and side surfaces of a push button switch constructed in accordance with the present invention;

FIG. 2 is an elevational view of the front surface of the switch of FIG. 1.

FIG. 3 is a top view of FIG. 2.

FIG. 4 is a side view of FIG. 2.

FIG. 5 is a cross-sectional view of FIG. 2 taken across the section line 5—5 in FIG. 2.

FIG. 6 is a cross-sectional view of FIG. 5 taken across the section line 6—6 in FIG. 5.
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DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings wherein like numerals indicate like elements, there is shown in FIGS. 1-6 a push button switch constructed in accordance with the principles of the present invention. The switch preferably takes the form of a wall-mounted switch which can be mounted to a standard switch wall box. The overall appearance of the switch is very similar to the appearance of a slide dimmer switch shown in U.S. Pat. No. 3,746,923 dated July 17, 1973 with the exception that the dimmer slider has been replaced with a push button 190. Slide dimmers of the foregoing type utilize a triac or similar controllable conductive device and thereby require the use of a heat sink to dissipate the heat created by the triac. While a heat sink of this type is not required for the simple push button switch of the present invention, the presently preferred embodiment incorporates such a heat sink 180 in order to ensure a similar appearance to the slide dimmer and to make it possible to utilize as much common inventory as possible.

A face plate 184 is releasably coupled to the front surface of the heat sink 180 whose rear surface supports an insulation housing 181 which preferably houses the stationary and movable contacts 216, 215 of the mechanical switch forming part of the push button switch. An opening 183 is formed in the face plate and receives the push button 190 which effectively closes the opening. As best shown in FIGS. 5 and 6, the push button 190 is provided with an enlarged annular flange 191 which abuts against the interior of opening 183 to hold the outer surface of push button 190 flush with the outer surface of plate 184.

Two insulation support members 200 and 201 are appropriately secured to the inside surface of plate 184 as by cementing. Members 200 and 201 have leaf-spring members 202 and 203, respectively, secured therein which leaf springs press against the right-hand surface of push button 190 as viewed in FIG. 5 to force flange 191 toward contact with the opposing interior surface 185 of plate 184. Thus, the push button 190 is secured in position and fits closely within the opening 183 but can be depressed against the biasing force of springs 202 and 203.

Also note that annular flange 191 is relatively thick and dimensioned such that its rear surface will come into contact with the raised top section of fins 212 if sufficient force is applied to button 190. By properly dimensioning the thickness of button 190 and flange 191 as well as the height of fins 212 of the heat sink 180, the switching device 210 (described below) will be protected from damage due to overtravel beyond its mechanical limit, since the button travel is forcibly stopped when the rear surface of button 190 comes into contact with fins 212. Even extremely high force on button 190 can easily be absorbed at this relatively large interface, and switching device 210 is thereby protected from abuse.

As best shown in FIGS. 5 and 6, the switching device 210 is contained within the insulation housing 181, and can be a conventional microswitch which has a projecting plunger 211, the plunger projecting from the housing through an opening 182 in the heat sink 180. The plunger 211 is conventionally biased toward the button 190 (in the direction shown as D in FIG. 5) by resilient means within the device 210, these resilient means being shown schematically at 219 in FIG. 5. The depression of the plunger 211 causes the internal contacts, schematically shown in FIG. 5 as contacts 215 and 216, to engage one another. This engagement takes place with relatively little axial motion of the plunger 211 (less than about 1 millimeter) and is accomplished with relatively small actuating force (of the order of several ounces). The contacts 215 and 216 are then connected to the leads 217 and 218 (FIG. 5) which are taken through the insulation housing 181. These leads are preferably coupled to a control circuit such as that described in parent application Ser. No. 541,368, now U.S. Pat. No. 4,563,592, to control one or more load devices. Note that in FIG. 5 there is also schematically illustrated a positive temperature coefficient resistor 161 which is contained within the housing 181 and which protects the mechanical switch comprising contacts 215, 216 from high currents which might result from wiring errors.

As a result of the novel structure shown in FIGS. 1 to 6, the remote switch can be operated by the depression of the relatively large area push-button switch operator 190. The push button in the preferred embodiment is about 1 inch in width by 1 inch in height. It engages the plunger 211 at its center. Because of the short actuating motion needed for the plunger 211 in order to close contacts 215 and 216, an operator can press the push button 190 at any point on its exposed surface area to obtain the necessarily axial movement of plunger 211 to cause operation of the remote switch device. That is, even though the push button 190 may attempt to rotate or tilt during operation, its center will still move sufficiently to operate the plunger 211 to contact-closed position.

As a result of the foregoing, whenever the operator of the switch depresses a portion of push button 190 which is located off center from plunger 211, a portion of the front surface 213 of the flange 191 (FIG. 5) which surrounds the periphery of push button 190 contacts the rear surface 185 of the face plate 184 at a location located on the opposite side of the plunger 211 from the point where the operator contacted the push button 190.

Also note that the button and face plate are parts of a single subassembly, so that the face plate may be removed, as for assembly or installation purposes, and the button remains attached to the face plate, so that reassembly is very simple. Also, this reduces tolerance problems between the button and face plate location. Further, this design allows the use of a button which does not protrude above the surface of the face plate, enhancing the aesthetic appeal of the design.

It will be seen particularly in FIG. 6 that the heat sink 180 can be reduced in width by breaking it off at notches 220 and 221, for example, for gang-mounting purposes. Either one or both sides can be broken off. With both sides intact, the switch width will be about 2 inches and its height will be about 4 inches. When one side is broken off, the switch width is reduced to 2 inches and when both sides are broken off the switch width is reduced to 1 inch. The plastic face plate 184 is also provided with similar break-off notches 223 and 224, respectively, which enables a reduction in the width of the face plate 184 by the same amount as the underlying heat sink.

Although the present invention has been described in connection with preferred embodiments thereof, many variations and modifications will now become apparent
ABSTRACT

A power control device utilizing a circular control potentiometer having a rotatable control shaft may be adapted to a slide switch configuration by attaching a pinion gear to the shaft. A slide bar having a rack member for engagement with the pinion gear may then be utilized in place of the knob typically utilized with the shaft. The fins of the heat sink associated with the power control device advantageously act as guide channels for the slide bar. A cover member having a slot adapted to accept the slide bar handle fits over the slide bar and heat sink, acting as a retainer for the slide bar and providing a chimney effect for the heat sink.
POWER CONTROL SLIDE SWITCH

BACKGROUND OF THE INVENTION

This invention relates to power control devices, and, more particularly, to an improved handle assembly therefor.

In conventional power control devices, such as for example, light dimming devices for incandescent lighting systems, power control may be achieved by controlling the conductive time of a switching device, commonly referred to as a phase control of power. Power supplied to a load is controlled through the use of a potentiometer which is a part of a power control circuit connected between the power source and the lighting system. Typical prior art systems have utilized a circular potentiometer having a shaft extending outwardly therefrom to which is attached a knob. By rotating the knob, the resistance of the potentiometer is varied to control the amount of power applied to the lighting system. Typically, the amount of power applied to the lighting system, and correspondingly the amount of light given off thereby, increases as the control knob is turned in a clockwise direction and decreases as the control knob is turned in a counterclockwise direction, a commonly used type of potentiometer having an OFF detented position in which a switch is open when the knob is turned fully in the counterclockwise direction.

While the aforesaid arrangement where the power control is effected by turning a knob may be suitable for most applications, certain applications and personal subjective preferences may call for an arrangement where the control is achieved in a linear manner, that is by sliding a control handle back and forth. One way of achieving this is to provide a linear potentiometer in place of the aforesaid circular potentiometer. However, this approach has several disadvantages. For example, a linear potentiometer with a full OFF detented position in which a switch is open is not readily available commercially at a reasonable price. Further, the use of a linear potentiometer in place of a circular potentiometer would require completely different tooling and packaging. This latter factor also would cause a cost increase if both types of controls are to be offered for sale.

It is therefore an object of the present invention to provide a power control device which may be operated in a linear manner.

It is a further object of this invention to provide such a device wherein a readily available conventional circularly operated device may be easily converted to linear operation.

SUMMARY OF THE INVENTION

The foregoing and additional objects are attained by providing a power control device utilizing a circular potentiometer. The power control device is mounted on a finned or channelled heat sink member. The control shaft of the circular potentiometer is fitted with a pinion gear. A slide bar having a rack for engagement with the pinion gear is adapted to move in the channels of the heat sink. A cover member adapted to retain the slide bar in the channels has a slot for accepting the slide bar handle and fits over the slide bar.

DESCRIPTION OF THE DRAWING

The foregoing will be more readily understood upon reading the following description in conjunction with the drawing in which:

FIG. 1 is a perspective view, partially broken away, of a power control device embodying improvements according to this invention; FIG. 2 is a front elevation view of the apparatus shown in FIG. 1 with the cover and slide bar removed therefrom; FIG. 3 is an elevation view of the slide bar as viewed from the heat sink of the power control device; and FIG. 4 is a top plan view of the apparatus shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, a complete power control device assembly includes a housing 12 mounted on a heat sink member 14. Inside housing 12 is a control circuit including a circular potentiometer having an integral switch. The power control device is adapted to be connected between a source of power and the load to be controlled by means of a pair of wires 16 and 18 extending through openings in housing 12. Heat sink 14 comprises a plate 20 and a plurality of longitudinal fins or rings 22 extending perpendicularly outward from plate 20. The fins 22 form channels therebetween. Heat sink 14 may be machined or extruded from aluminum or other metal having good heat conductivity characteristics. Also included in the power control device assembly is a slide bar 24 used for controlling the angular position of the circular potentiometer within housing 12, in a manner to be described hereinafter.

Extending out from housing 12 through plate 20 is potentiometer shaft 26. In the prior art mode of operation, a knob, not shown, is adapted to be fitted over shaft 26. However, in the improvement contemplated by this invention, the knob may be removed and a gear 28 may be fitted over shaft 26. Gear 28 should be fitted on shaft 26 so that there is no relative motion therebetween. This may be accomplished in any of several different simple ways such as for example by cementing gear 28 to shaft 26, or by means of a set screw through gear 28, or by press fitting gear 28 on shaft 26. Slide bar 24 comprises a bar 30, a handle 32, a rail 34 extending longitudinally and perpendicularly from bar 30 on the opposite side of bar 30 from handle 32, and a rack 36 parallel to rail 34. The teeth of rack 36 are adapted to engage the teeth of gear 28. Rail 34 and rack 36 are spaced so that they ride within fins 22 of heat sink 14, the fins serving the additional function of acting as guides for slide bar 24. In operation, the slide bar 24 is moved parallel to the fins 22. This linear motion of slide bar 24 is converted by means of the rack and pinion operation of rack 36 and gear 28 into a circular motion of shaft 26, resulting in full operation of the control potentiometer within housing 28, including the use of the full off detent position of the potentiometer switch.

To retain rack 36 in engagement with gear 28, an and for other purposes to be described hereinafter, a cover member 38 is provided. Cover 38 is essentially a plate and has a slot 40 through which handle 32 extends. Slot 40 is sufficiently wide to accept handle 32 therethrough and is sufficiently long to accommodate the full length of travel of handle 32 when slide bar 24 is operated to its extreme positions. Cover 38 is also formed with a chan-
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cnel 42 dimensioned so that bar 30 of slide bar 24 fits therein. Cover 38 may be held in place by any of several different methods, not shown. For example, cover 38 may be snapped onto fins 22 either by means of spring clips or extensions of the cover itself. Alternatively, cover 38 may be attached to plate 20 of heat sink 14 by means of screws or bolts. This attachment of cover 38 to heat sink 14 provides for the retention of slide bar 24. In addition, cover 38 allows for greater cooling effects of heat sink 14 by providing a chimney effect in the channels between the fins 22. Additionally, the exterior face of cover 38 may be provided with decorative features, such as different colors or designs, to provide an esthetically pleasing appearance.

It is apparent from the foregoing description that the synergistic combination of elements provides certain unexpected advantages. With a single basic package, comprising the power control device within housing 12 and the finned heat sink member 14, two types of control motion may be selected, i.e. circular or linear. If the circular mode of control motion is chosen, a conventional knob may be fitted over the control potentiometer shaft. When the linear motion control is selected, a gear is fitted over the control potentiometer shaft and a slide bar having a rack is meshed with the gear teeth. In this latter arrangement, the fins of the heat sink serve a dual function. Firstly they afford a radiation surface for heat dissipation and secondly they serve as guides for the slide bar. Accordingly, there has been described an improved control arrangement. It is understood that the above-described arrangement is merely illustrative of the application of the principles of this invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of this invention as defined by the appended claims.

What is claimed is:

1. In combination with a power control device including parallel finned heat sink means and a control shaft extending through said heat sink means, said power control device including means responsive to the angular position of said control shaft for effecting a power transfer function:
   gear means mounted on said control shaft;
   a slidable control handle member having teeth adapted to engage said gear means and produce rotation of said control shaft responsive to linear movement of said control handle member; and
   means supporting said handle member on said control device for linear movement with said teeth in engagement with said gear.

2. The combination of claim 1 wherein said handle member comprises:
   a bar having a handle extending outwardly from one side thereof; and
   a plurality of parallel rails extending outwardly from said bar on the side opposite said handle, one of said rails having teeth for engaging said gear means and said rails being dimensioned to fit between respective pairs of the heat sink fins.

3. The combination of claim 2 further comprising a cover adapted to fit over said heat sink means and said handle member, said cover having a slot therein dimensioned to receive handle extends therethrough and moves therein over its entire length of travel.

4. A slide switch assembly for a power control device which includes parallel finned heat sink means and a control shaft extending through said heat sink means for effecting a power control function dependent upon the angular position of said control shaft, said assembly comprising:
   gear means mounted on said control shaft;
   a bar having a handle extending outwardly from one side thereof;
   a pair of parallel rails extending outwardly from said bar on the side opposite said handle and dimensioned to fit between respective pairs of said heat sink fins, one of said rails having teeth along one side for engaging said gear means, the separation between opposed surfaces of said rails being dimensioned to maintain the teeth on said rail in engagement with said gear with the opposed surface of the other rail in sliding engagement with one side of one of said fins;
   a cover member adapted to fit over said heat sink means and said bar, said cover having a slot therein dimensioned so that said handle extends therethrough and moves therein over its entire length of travel, said cover member further having a channel adjacent said fins running parallel thereto and having a width substantially equal to the width of said bar and adapted to retain said bar therein when said teeth engage said gear means;
   the number of teeth on said one rail and the number of teeth on said gear being such that the control shaft is rotated between opposite desired positions as the handle traverses a distance not greater than the length of the slot.
A push button switch is supported in a mounting plate. A control panel is positioned in front of the mounting plate and spaced therefrom. A secondary push button of decorative appearance is positioned in an opening in the control panel to be offset from the centerline of the first push button. The secondary push button has a flange extension on one side thereof behind the control panel to serve as a fulcrum means for an improved motion of the secondary button. A spacer spring is attached to the mounting plate to bear against the inner end of the secondary button.

2 Claims, 3 Drawing Figures
PUSH BUTTON SWITCH WITH SECONDARY PUSH BUTTON

BACKGROUND OF THE INVENTION

(1) Field Of The Invention
This invention relates to a push button switch assembly, and particularly to an assembly with a secondary push button to be positioned in a control panel that overlies the switch.

(2) Description Of The Prior Art
The present invention is used in the control panel of an electric range, and particularly a high-low range having a lower oven provided with a cooktop mounted over the top of the oven. In addition, there is a microwave oven positioned at eye-level over the cooktop. At the side of the microwave oven is a single large control panel which supports control components for all three appliances; the two ovens and the cooktop. Hence, it will be appreciated that such a control panel is short of available space as it may include a selector switch, an oven thermostat and a clock-timer for the lower oven, also an infinite heat switch for each of the four surface heating units of the cooktop, as well as a timer and temperature control, power level control, mode selector switch, indicator lights and start switch for the upper microwave oven.

To maintain a pleasing appearance of such a control panel and to avoid confusing the user, it is necessary to locate certain components near the related components. Symmetry is also of importance in order to obtain proper balance. Oftentimes the available space behind the control panel does not match the spacing that is dictated by the aesthetics of the control panel. This is what motivated the discovery of the present invention.

The mounting position of a push button switch behind a control panel is dictated by the available space in relation to the other components. Frequently, the control panel is provided with secondary push buttons of decorative size, shape and appearance for operating the hidden push button switch.

A prior art patent showing a push button switch with an enlarged secondary push button is the Abernathy et al. U.S. Pat. No. 3,916,150. This patent teaches a push button switch having an enlarged secondary push button in combination with a guide post mounted parallel to the first push button so the secondary push button will not cause the first push button to jam.

The principal object of the present invention is to provide a control assembly with a push button switch having a secondary push button supported in a control panel in a manner offset from the first push button, so the secondary push button may be operated at any side without causing the push button switch to jam.

A further object of the present invention is to provide a push button switch assembly of the class described with a fulcrum means for the secondary push button to provide smooth operation.

SUMMARY OF THE INVENTION
The present invention, in accordance with one form thereof, relates to a control assembly having a push button switch supported from a mounting means and a control panel positioned over the switch and spaced therefrom. A secondary push button is supported in an opening in the control panel in a position that is out of alignment with the first push button. The secondary push button includes flange means to prevent this button from passing out through the opening. The flange means has a side extension on the side nearest the first push button to provide a fulcrum means with respect to the cover plate and insure enough distance of travel as well as smooth operation.

BRIEF DESCRIPTION OF THE DRAWINGS
This invention will be better understood from the following description taken in conjunction with the accompanying drawings, and its scope will be pointed out in the appended claims.

FIG. 1 is an exploded fragmentary perspective view of a control assembly comprising the present invention showing a push button switch in front of its mounting plate, a secondary push button in front of the switch, a cantilever spring adapted to fit between the switch and the secondary push button, and a control panel for receiving the secondary push button.

FIG. 2 is a cross-sectional plan view of the control assembly of FIG. 1 showing the normal at-rest position of the secondary push button with its flange extension, as well as the nature of the folded-over cantilever spring bearing against the inner end of the secondary push button.

FIG. 3 is a cross-sectional plan view similar to that of FIG. 2 showing the operation of the flange extension and the cantilever spring when the secondary push button is acted upon by the user exerting a pushing force at the side that is remote from the centerline of the first push button.

DESCRIPTION OF THE PREFERRED EMBODIMENTS
Turning now to a consideration of the drawings, and in particular to FIG. 1, there is shown an electric push button switch 10 of standard design having an insulating housing 12 with a front mounting strap 14, a spring-biased push button 16, electrical terminals 18 on the back side of the switch housing and a pair of resilient mounting fingers 22 on the opposite sides of the housing, as is conventional in this art. The push button switch 10 is supported in an opening 26 in a mounting plate 28. The switch 10 is assembled in the opening 26 by pushing the switch, as shown in FIG. 1, through the opening so the fingers 22 will be compressed until the mounting strap 14 engages the mounting plate 28 which frees the fingers 22 to return to their normal position where they will engage and interlock with the inner surface of the mounting plate 28, as is shown in FIG. 2.

A control panel 32 is positioned in front of the push button switch 10 and spaced outwardly therefrom. This panel 32 has a rectangular opening 36 for receiving a secondary push button 38. As is clear from FIG. 2, the centerline of the secondary push button 38 is offset to the left from the centerline of the first push button 16. This misalignment is not due to a buildup of manufacturing tolerances but is designed into the control assembly.

The secondary push button 38 has an elongated rectangular face 40 and a transverse planar flange 42 about its midportion to serve as a stop means to engage the back side of the control panel 32 and prevent the secondary push button 38 from passing out through the opening 36. The secondary push button 38 would work
well if it were depressed by the user at the right side of
the button in FIG. 2 for this force would be in a line
near the centerline of the push button switch 16.
If the switch-actuating force were applied at the left
side of the button 38 in FIG. 2, the button might become
jammed except for the presence of a flange extension 44
at the short side of the rectangular face 40 that is nearest
the centerline of the push button 16. As best seen in
FIG. 3, this flange extension 44 serves as a fulcrum
means with relation to the control panel 32 to provide a
long radius of movement for the secondary push button
38 when this button is pushed at its left side, as shown
by the arrow 48 in FIG. 1. This also gives the button 38
a longer travel or throw than if the flange 42 were
narrow and symmetrical about the button. This travel
or throw is important to insure the actuation of the push
button switch 10.
Another improvement is the use of a cantilever spring
52, sometimes called spacer spring, that is supported
from the mounting plate 28 to bear against the inner end
of the secondary push button 38 and urge it to seat the
flange 42 against the control panel 32, as seen in FIG. 2.
This spring 52 takes care of any dimensional tolerance
buildup and prevents the secondary push button 38
from rattling when outside environmental vibrations are
set up, such as by motor or fan operations.
Moreover, the secondary push button 38 is preferably
a hollow molded plastic part with thin walls. The canti-
lever spring 52 is of wide width to cover the opening in
the back end of the hollow button 38 to give a good
bearing surface between the first push button 16 and the
secondary push button 38.
The cantilever spring 52 is of folded-over configura-
tion having a flat bifurcated end 56 which is adapted to
slip onto the side of the switch housing 12 and behind
the mounting strap 14, as is seen in FIG. 2. Extending
from the bifurcated end 56 is a cantilever blade 58 of
slightly curved configuration which is sandwiched be-
tween the two push buttons 16 and 38. The tip 60 of the
blade 58 is elongated to extend beyond the secondary
push button. The reason for this elongation is to provide
a stop or limit means to engage the mounting strap 14 of
the switch 10, as is best seen in FIG. 3. This protects the
switch mechanism and also limits the travel of the sec-
ondary push button 38 to prevent it from slipping
through the opening 36 of the control panel. The end of
the blade opposite the tip is located adjacent the
side of the secondary push button 38, remote from the
centerline of the push button 16, so that the stiffest
portion of the spring is adjacent the side of the sec-
ondary push button 38, that is remote from the flange exten-
sion 44.
Modifications of this invention will occur to those
skilled in this art; therefore, it is to be understood that
this invention is not limited to the particular embodi-
ments disclosed, but that it is intended to cover all modi-
fications which are within the true spirit and scope of
this invention as claimed.
What is claimed is:

1. In a control assembly comprising an electrical push
button switch supported from a mounting means, said
switch including a primary push button and a secondary
push button, a control panel positioned over the switch
and spaced therefrom, an opening formed in the control
panel offset from the centerline of the primary push
button of the switch, said secondary push button being
positioned in the opening of the control panel so that it
is out of alignment with the primary push button of the
switch, a flange formed on the secondary push button to
overlie the said opening on the inner side of the control
panel and prevent the push button from passing out
through the opening, the said flange having an exten-
sion on the side of the secondary push button which is
nearest the primary push button, said flange extension
serving as a fulcrum means with respect to the control
panel, said flange extension being of sufficient length to
provide supplementary lever action to set the switch,
thereby preventing jamming when the secondary push
button is depressed adjacent the side which is remote
from the flange extension and further including a canti-
lever spring sandwiched between the two push buttons
with one end of the spring fixedly mounted to the push
button switch on a side remote from the flange exten-
sion so that the stiffest portion of the spring is adjacent
the side of the secondary push button that is remote
from the flange extension, the other end being a resilient
spring blade of sufficient width to provide a bearing
surface between the primary and secondary push but-
tons, said spring blade having an elongated distal end,
and wherein said assembly further includes stop means
engageable by said distal end to limit the amount of
depression of the secondary push button thereby pro-
tecting the switch and retaining the secondary push
button in the control panel opening.

2. In a control assembly comprising an electric push
button switch supported from a mounting means, said
switch including a primary push button and a secondary
push button, a control panel positioned over the switch
and spaced therefrom, an opening formed in the control
panel offset from the centerline of the primary push
button of the switch, the secondary push button being
positioned in the opening, limit means on the secondary
push button to prevent this button from passing out
through the opening, a cantilever spring sandwiched
between the primary and secondary push buttons such
that the stiffest portion of the spring is located adjacent
the edge of the secondary push button remote from the
centerline of the primary push button, with one end of
said spring being fixed to the mounting means, and the
other end being a resilient spring blade biased out-
wardly against the inner side of the secondary push
button, said blade being of sufficient width to provide a
bearing surface between the primary and secondary
push button, said blade having an elongated distal end,
and said assembly further including stop means engage-
able by said distal end to limit the amount of depression
of the secondary push button, thereby protecting the
switch and retaining the secondary push button in the
control panel opening.

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