

- [54] **WORKBENCHES**
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- [58] Field of Search 144/285, 286 R, 286 A, 144/287, 288 R, 288 C; 269/219, 220, 221, 240, 244, 258, 164; 108/121, 99, 83, 88, 114, 123, 132

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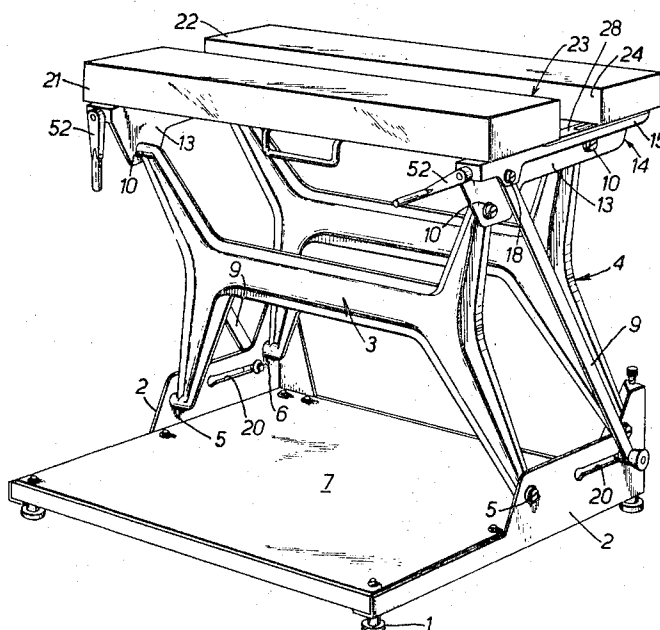
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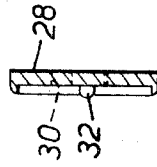
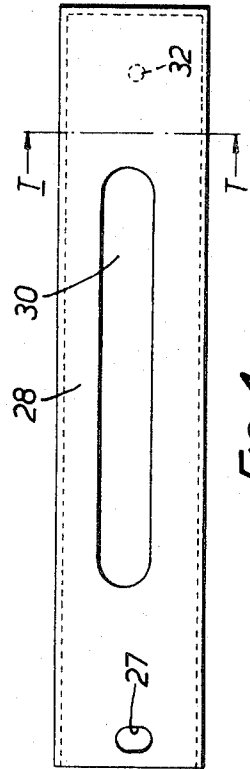
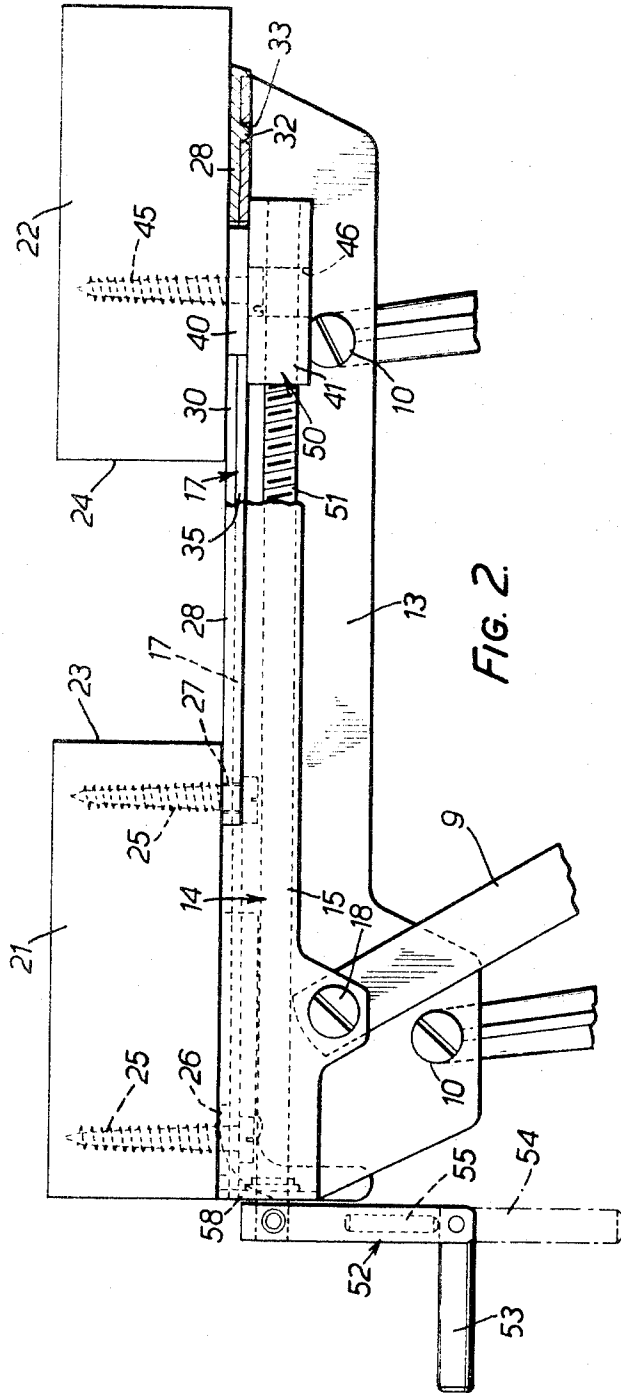
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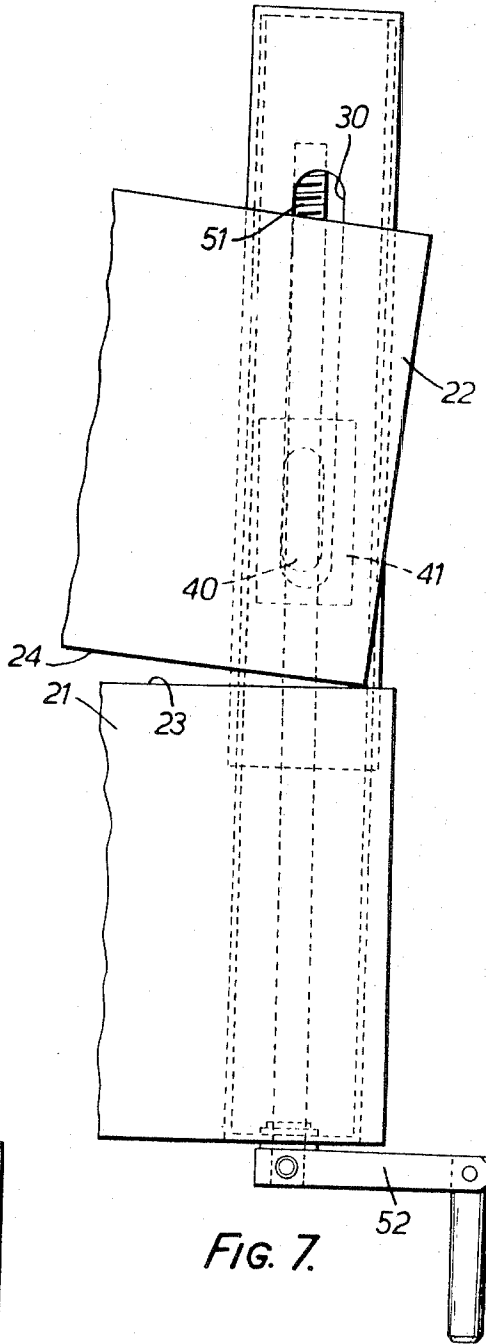
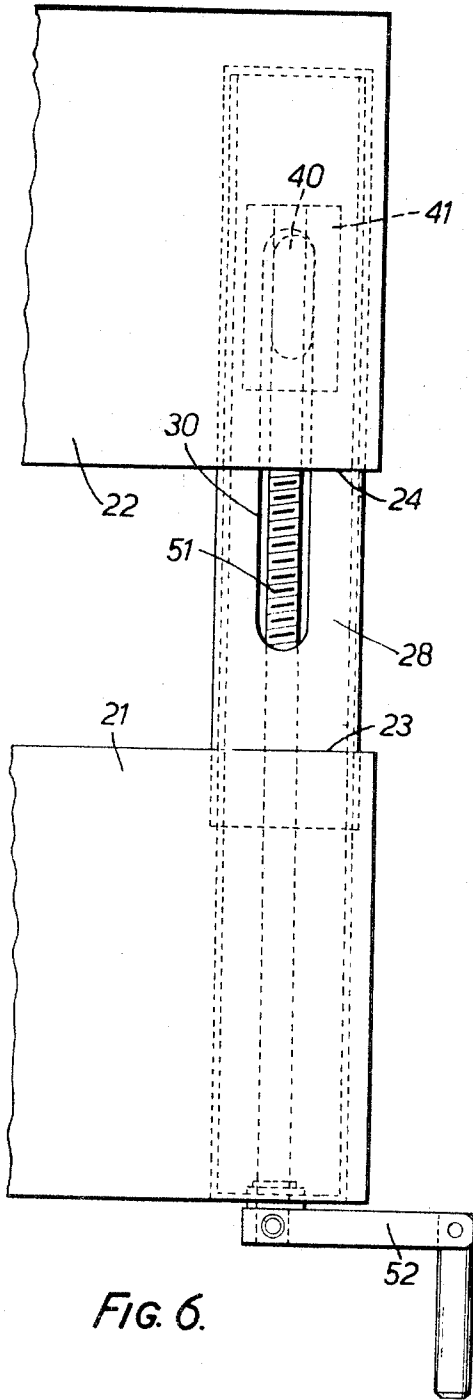
[57] **ABSTRACT**

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 movable towards and away from the fixed top member to form a vice 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.

54 Claims, 7 Drawing Figures







WORKBENCHES

This is a division, of application Ser. No. 803,600, filed Mar. 3, 1969 now U.S. Pat. No. 3,615,087.

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 movable 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 face of the stationary top member, and co-operating with screw threaded bores 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 co-operating projections and slots provided respectively thereon, 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 arcuate movement of an end (or both ends) of the mov-

able 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 arcuate movement would be to permit the screw thread devices to move translationally at their ends opposite to the ends which co-operate 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 closed juxtaposition to the base structure and a working position in which the top members are spaced from and supported by the base structure.

The screw threaded rods are conveniently actuated by crank handles which each may be formed in two hinged 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 shows a cross-section of the slideway on the line T-T of FIG. 1;

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 'H'-shaped inverted channel 14 the detailed forms 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 slots 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 slideway 28 formed for example of nylon or metal strip provided with a PTEE upper surface. The form of slideway is shown in detail 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 stud 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 slideway and the two slots 30 and 35 have extending upwardly through them 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 slideway, is prevented from moving bodily upward or tilting upwards, e.g., adjacent its front edge. It is to be noted from FIG. 3 that the width of the projection 40 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 transverse wall 58 through which the rod 51 passes, washers being provided on each side of the 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 one direction 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 vice between which lengths of timber or other material can be clamped.

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 but it 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 up 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 only 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 beams 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 arcuate 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 slideway 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 lefthand 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 extreme condition in which a full 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 or a different extent. 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 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 side faces 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.

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

1. A collapsible workbench movable between collapsed and erected conditions, and including a horizontally extending top structure affording an upwardly facing work surface, a horizontally extending base structure adapted to rest on a supporting surface and including a load-bearing platform upon which a person can stand in front of the top structure in the erected condition, front and rear intermediate structures each interconnecting the top and base structures with the front intermediate structure adjacent the platform, the front and rear intermediate structures having hinge connections to the top and base structures along four parallel hinge axes in such a manner that the top structure folds forwardly over the platform in the collapsed condition, and bracing means at each end to maintain the said top and intermediate structures with respect to the base structure in the erected condition,

the top and base structures being capable of bearing tension and compression loads in all directions within substantially horizontal planes extending through those structures, and the front and rear structures each being capable of bearing tension and compression loads in all directions within a plane extending through that structure through the respective upper and lower hinge axes of that front or rear structure when in the erected condition.

2. A collapsible workbench movable between collapsed and erected conditions and including a horizontally extending top structure affording an upwardly facing work surface in the erected condition, a base structure having underside contacting regions defining a supporting plane, the base structure including a load-bearing platform upon which a person can stand in front of the top structure in the erected condition to then stabilize the whole workbench, and an intermediate structure comprising a framework having hinge connections with the base and top structures, which hinge connections define four substantially horizontal parallel pivotal axes namely front and rear upper axes on the top structure and front and rear lower axes on the base structure, the upper and lower front pivotal axes being lower than the respective upper and lower rear axes; and the top structure, in the collapsed condi-

tion, at least partially overlying the load-bearing platform in close juxtaposition therewith.

3. A collapsible workbench movable between collapsed and erected conditions, comprising:

a horizontally extending top structure affording an upwardly facing work surface;

a horizontally extending base structure adapted to rest on a supporting surface and including a load bearing platform which, in the erected condition, extends rigidly beyond the top structure in a forward direction and upon which a person can stand in front of the top structure in the erected condition to stabilize the whole workbench;

front and rear intermediate structures, each interconnecting the top and base structures, with the front intermediate structure adjacent the platform, the front and rear intermediate structures having hinge connections to the top and base structures along four parallel hinge axes in such a manner that the top structure folds forwardly over the platform in the collapsed condition; and

bracing means at each end to maintain the said top and intermediate structures with respect to the base structure in the erected condition, the bracing means, in the erected condition, being disposed entirely to the rear of the most forward part of the top structure.

4. A collapsible workbench movable between collapsed and erected conditions, comprising:

a generally horizontally extending top structure;

a base structure adapted to rest on a supporting surface and including a load bearing platform, which, in the erected condition, extends rigidly beyond the top structure in a forward direction and upon which a person can stand in front of the top structure in the erected condition to stabilize the whole workbench;

an intermediate structure connected between the base structure and the top structure and including structure defining a front, a back and two sides;

said front, back and two sides, in combination with said base and top structures, defining the faces of a hexahedron and including structure for bearing tension and compression loads on each of at least 11 edges in the hexahedron, and for bearing diagonal tension and compression loads on each base of the hexahedron, whereby torsional stress in said intermediate structure is minimal;

said front and back being hingably connected to said top and base structures along four parallel hinge axes in such a manner that the top structure is foldably forwardly over the platform in the collapsed condition; and

said two sides including bracing means at each end to maintain the said top and intermediate structures with respect to the base structure in the erected condition, the bracing means in the erected condition being disposed entirely to the rear of the most forward part of the top structure.

5. A workbench including a top structure, comprising:

two vise members having upper surfaces lying in substantially the same plane and each having an elongated face generally facing the elongated face of the other vise member;

a support defining a horizontal support plane underlying at least one of said vise members and operatively supporting both of said vise members;
 means constraining both vise members against any rotation which would change the angle of the elongated faces thereof relative to the horizontal support plane;
 vise operating means for positively moving one of said vise members toward and away from the other said vise member, said vise operating means including a pair of vise operating devices spaced apart lengthwise of the elongated faces of the vise members;
 means operatively coupling each vise operating device to at least one of said vise members at horizontally spaced positions on opposite sides of the vertically extending longitudinal centerline of the elongated face thereof for enabling said vise operating means to move said one of said vise members to a position in which the elongate face thereof is shifted through a horizontal angle to a nonparallel position with respect to the elongate face of the other of said vise members, whereby a tapered workpiece may be gripped by said vise members along the full length of the tapering faces thereof;

a base structure adapted to rest on a floor;
 an intermediate collapsible structure interconnecting the base structure and the support;
 said intermediate collapsible structure including a pair of forwardly facing parallel frame members pivotally connected at the top and bottom thereof to said support and said base structure respectively;

whereby said workbench may be folded from an erect configuration with said top structure substantially parallel to and spaced above said base structure, and a collapsed configuration wherein said top structure is juxtaposed with said base structure.

6. A workbench comprising:

a base structure adapted to rest on a floor;
 a top structure,
 an intermediate structure connected between the base structure and the top structure and collapsible between an erected position and a storage position, in the latter of which it lies in juxtaposed relation to the base structure and the top structure,
 said top structure being carried by the intermediate structure and including a pair of elongate vise members which, in the erected position of the intermediate structure, provide a substantially flat work surface, said top structure also including a pair of supports extending beneath the vise members defining a generally horizontal support plane, one of the vise members being secured in a stationary manner to the supports and the other vise member bearing on the supports in a movable manner,

means for holding both of said vise members flush against said support members to maintain constant the angle between said work surface and said support plane;

a pair of vise operating devices operatively connected to at least one of said vise members, each comprising a screw threaded rod extending sub-

stantially at right angles to the length of the stationary vise member, and

means mounting said members for relative movement towards and away from one another in a direction substantially perpendicular to the direction of elongation of the vise members thereby to form a vise.

7. A workbench, comprising:

a base structure adapted to rest on a floor;
 a top structure having a work surface including a pair of vise members, each having an elongate clamping face generally facing the elongate clamping face of the other vise member;

an intermediate structure collapsible between erected and storage conditions, and interconnecting said base structure and said top structure, and including means defining a front, a back and two sides intersecting at four generally upright edges, and having means for directly bearing compression and tension on each of said upright edges and on at least one diagonal of each of said sides;

said base structure having a plan area larger than the plan area encompassing said work surface, and including, in both collapsed and storage conditions, an integral rigidly extending load-bearing platform upon which, in the erected condition of said intermediate structure, a person can stand beside said top structure;

means for mounting one of said vise members for relative movement towards and away from the other of said vise members in a direction substantially perpendicular to the direction of elongation of the clamping face of said one of said vise members, which movement is also substantially towards and away from a person standing upon said load-bearing platform.

8. A workbench, comprising:

a base structure adapted to rest on a floor;
 a top structure having a work surface including a pair of elongate vise members;

an intermediate collapsible structure interconnecting said base structure and said top structure;
 said base structure having a plan area larger than the plan area encompassing said work surface, and constituting a load-bearing platform upon which a person can stand beside said top structure;

means for mounting said vise members for relative movement towards and away from one another in a direction substantially perpendicular to the direction of elongation of said vise members, which movement is also towards and away from a person standing upon said load-bearing platform;

said mounting means including two independently operable vise operating devices connected between said vise members at locations spaced lengthwise therealong and operative to positively move one of said vise members towards and away from the other of said vise members whereby the gap between said vise members may be greater at either end.

9. A workbench comprising:

a base structure adapted to rest on a floor;
 a top structure,

an intermediate structure including diagonal brace means and also including vertical support structure hingably connected between the base structure and the top structure along four parallel axes and in-

cluding structure defining a front, a back, and two sides,
 said intermediate structure being collapsible by folding about said axes between an erected position and a storage position, in the latter of which it lies in juxtaposed relation to the base structure and the top structure,
 said front, back and two sides, in combination with said base and top structures, in the erected position of said intermediate structure, defining the faces of a rigid hollow hexahedron and including structure for directly bearing diagonal tension and compression loads and shear loads on each face of the hexahedron, and for directly bearing tension and compression loads on the edges of the hexahedron interconnecting the top structure and the base structure, whereby torsional stress and bending moments in the workbench structures are minimal,
 said top structure being carried by the intermediate structure and including a pair of vise members each having an elongate clamping face and a top surface which, in the erected position of the intermediate structure, provide a work surface, said top structure also including a pair of support members extending beneath said vise members, one of said vise members being secured to said support members in a stationary manner and constituting an integral portion of the top face of said hexahedron, and the other of said vise members bearing on said supports in a movable manner, and
 means mounting said other of said members in said movable manner for relative movement towards and away from said one of said vise members in a direction substantially perpendicular to the direction of elongation of the clamping face of said movable vise member thereby to form a vise.
10. A workbench, comprising:
 a base structure adapted to rest on a floor;
 a top structure;
 an intermediate structure connected to the base structure and connected to and supporting the top structure, and which is collapsible between an erected position and a storage position, in the latter of which it lies between and in juxtaposed relation to the base structure and the top structure;
 said intermediate structure having structure defining a front face, a back face and two lateral sides, and a brace on each of said two lateral sides extending diagonally between a first position adjacent and to the rear of said front face and a second position adjacent and forward of said back face and pivotally secured at one end of said brace to a pivotal connection at one of said first and said second positions, and having means at the other end of said brace for releasably locking to the other of said first and second positions thereby to hold said workbench in its erected position;
 said top structure being carried by the intermediate structure and comprising a pair of elongate vise members, which, in the erected position of the intermediate structure, provide a work surface;
 said top structure, base structure, front face, back face, and two lateral sides defining the faces of a generally hexahedral form having structural members for directly bearing compression and tension along each of at least eleven edges thereof, and for

directly bearing diagonal tension and compression loads on the six faces thereof; and
 means mounting and vise members for relative movement towards and away from one another in a direction normal to the direction of elongation of the vise members thereby to form a vise;
 said base structure having a plan area larger than the plan area encompassing said work surface, and constituting a load-bearing platform upon which a person can stand beside said top structure in line with the direction of said relative movement of said vise members.
11. A workbench including a top structure, comprising:
 two vise members, each having an elongated face generally facing the elongated face of the other vise member;
 a supporting structure underlying at least one of said vise members and operatively supporting both of said vise members;
 means constraining each vise member against rotation about an axis parallel to the direction of elongation of the elongated face thereof;
 vise operating means for positively moving said one of the vise members towards and away from the other said vise member, said vise operating means including a pair of vise operating devices spaced apart lengthwise of the vise members;
 means operatively coupling the vise operating devices to at least one of said vise members, one on each side of the center of the clamping face in its direction of elongation for enabling said vise operating means to move said one of said vise members to a position in which the elongate face thereof has shifted through an angle about an axis parallel to the elongated face of said one of said vise members and perpendicular to the direction of elongation thereof, to a nonparallel position with respect to the elongate face of the other of said vise members, whereby a tapered workpiece may be gripped by said vise members along the full length of the tapering faces thereof;
 a base structure adapted to rest on a floor; and
 an intermediate collapsible structure interconnecting the base structure and the supporting structure;
 said intermediate collapsible structure including a pair of forwardly facing parallel frame members pivotally connected at the top and bottom thereof to said supporting structure and said base member respectively;
 whereby said workbench may be folded from an erect configuration with said top structure parallel to and spaced above said base structure, and a collapsed configuration wherein said top structure is adjacent to and parallel with said base structure.
12. A workbench including a pair of elongate vise members disposed in side by side relationship and supported from below by a supporting structure having supporting surfaces defining a plane of support; means for constraining each vise member against any rotational movement out of said plane of support, at least one of the vise members being mounted on said supporting structure for movement towards and away from the other vise member and for rotation in a plane parallel to said plane of support; means for moving said one of the vise members in a positive manner towards and away from said other vise member, including two

spaced, independently operable vise operating devices, both of which are operatively coupled to at least one of said vise members by means which enables the gap between the vise members to be greater at either end;

a base structure adapted to rest on a floor;

an intermediate structure connected between the base structure and said supporting structure and which is collapsible between an erected position and a storage position, in the latter of which it lies between and in juxtaposed relation to the base structure and the supporting structure;

said intermediate structure arranged to maintain a substantially parallel relationship of said supporting structure to said base structure at said erected position and said storage position.

13. A workbench comprising:

a base structure adapted to rest on a floor;

a top structure, including a pair of vise members each having an elongate clamping face generally facing the elongate clamping face of the other vise member, and also including means defining a supporting plane for supporting said vise members,

an intermediate structure connected between the base structure and the top structure and collapsible between an erected position and a storage position, in the latter of which it lies in juxtaposed relation to the base structure and the top structure,

said top structure being carried by the intermediate structure,

means mounting one of said members for relative movement towards and away from the other of said members in a direction substantially perpendicular to the direction of elongation of the clamping face of said one of said vise members thereby to form a vise,

means linking said supporting means and said vise members for resisting a moment tending to rotate said vise members about any axis parallel to said supporting plane, thereby to maintain the angle of the clamping face of said vise members with respect to said support plane, and

vise operating means operatively coupled to two horizontally spaced positions on at least one of said elongate vise members for positively moving each end of said one of said vise members independently with respect to the other end toward and away from the other said vise member whereby the gap between the two elongate vise members may be greater at either end.

14. A workbench, comprising:

a base structure adapted to rest on a floor;

a top structure,

an intermediate structure connected between the base structure and the top structure and collapsible between an erected position and a storage position in the latter of which it lies in juxtaposed relation to the base structure and the top structure,

said top structure being carried by the intermediate structure and including a pair of elongate vise members which in erected position of the intermediate structure, provide a substantially flat work surface,

said top structure also including a pair of horizontally spaced support members defining a supporting plane and extending generally at right angles to the direction of elongation of the vise members and supporting the vise member from below, and

means constraining the vise members against rotation about any axis parallel to said supporting plane;

means mounting said members for relative movement towards and away from one another in a direction substantially perpendicular to the direction of elongation of the vise members thereby to form a vise, and

said mounting means includes vise operating means for positively moving one of said vise members towards and away from the other said vise member, said vise operating means including a pair of spaced vise operating devices, and means operatively coupling each vise operating device to at least one of the members at positions spaced apart lengthwise therealong for enabling one of the vise members to rotate relative to the other of the vise members about an axis perpendicular to said support plane whereby the opposed ends of the vise members may be spaced at different distances from each other.

15. A workbench as claimed in claim 1, wherein the top structure in plan has a substantially rectangular form which has a longer edge dimension extending parallel to the hinge axes than the base structure.

16. A workbench as claimed in claim 15 wherein the top structure includes an elongate stationary vise member extending horizontally and parallel to the hinge axes, a pair of supporting members being rigid with the underside of the stationary vise member and extending away therefrom substantially at right angles to its direction of elongation, the supporting members bearing between them a horizontally elongate movable vise member capable of movement towards and away from the stationary vise member, the movable vise member being constrained, with respect to the supporting members, against translational movement about a horizontal axis extending parallel to the hinge axes.

17. A workbench as claimed in claim 1 in which the four hinge connections in end elevation are disposed on the corners of a parallelogram.

18. A workbench as claimed in claim 1 in which the bracing means includes diagonal bracing members at end which are adapted to be latched in the erected condition to maintain the workbench in the erected condition.

19. A workbench as claimed in claim 18 in which the bracing members at each end comprise a longitudinal bracing member which is pivotally connected to at one end and slottedly connected at its other end.

20. A workbench as claimed in claim 19 in which the bracing members in the erected position extend forwardly and upwardly from a rear part of the base structure.

21. A workbench as claimed in claim 20 in which each end of each bracing member remains connected to one of the parts of the workbench in both erected and collapsed conditions and during movement between such positions.

22. A workbench as claimed in claim 1 in which each intermediate structure, at each of its hinge connections with the top and base structures has a hinge part thereof disposed inboard of an inwardly facing surface of the respective top and base structure such that the intermediate members are physically located between said inwardly directed facing surfaces against lateral movement therebetween, thereby preventing relative

axial movement of the intermediate structures along the hinge connections.

23. A workbench as claimed in claim 1 in which the load-bearing platform comprises a rigid integral part of the base structure.

24. A workbench as claimed in claim 1 in which the top structure has end parts thereof overhanging the intermediate and base structures.

25. A workbench as claimed in claim 2 wherein the said four axes, in end elevation, lie on the corners of a parallelogram.

26. A workbench as claimed in claim 2 wherein the front and rear upper pivotal axes, in the collapsed condition, are positioned at lower levels than the front and rear lower pivotal axes respectively.

27. A workbench as claimed in claim 2 in which the load-bearing platform comprises a rigidly integral part of the base structure.

28. A workbench as claimed in claim 2 which, in its collapsed condition, affords a secondary supporting surface extending at right angles to the supporting plane whereby the workbench as a whole may then be stored upright on the secondary supporting surface.

29. A workbench as claimed in claim 2 in which the secondary supporting surface is afforded by the base structure.

30. A workbench as claimed in claim 2 in which the top structure incorporates fixed and movable beams mounted in the manner of a vise.

31. A workbench as claimed in claim 2 including longitudinal bracing members one at each end which are adapted to be latched in the erected condition to maintain the workbench in the erected condition.

32. A workbench as claimed in claim 31 in which the bracing members, in the erected condition each extend diagonally forwardly and upwardly from a rear part of the base structure.

33. A workbench as claimed in claim 32 in which each end of each bracing member remains connected to one of the parts of the workbench in both the erected and collapsed conditions, and during movement between such positions.

34. A workbench defined in claim 5, further comprising a bar extending diagonally between the horizontal support and the base structure, and pivotally secured at one end thereof to one of said base and said horizontal support, and having means at the other end of said bar for releasable locking to the other of said horizontal support and base structure, thereby to hold said workbench in its erect and its collapsed configuration.

35. A workbench defined in claim 11, further comprising a bar extending diagonally between the supporting structure and the base structure, and pivotally secured at one end of said bar to one of said base and said supporting structure, and having means at the other end of said bar for releasably locking to the other of said supporting structure and said base structure, thereby to hold said workbench in its erect and its collapsed configuration.

36. A workbench defined in claim 9, wherein said intermediate structure comprises a pair of parallel forwardly facing frame members pivotally connected at their top and bottom to said top structure and said base structure respectively, and said diagonal brace means include a bar on each side of said hexahedron extending from a position adjacent and rearward of the front face of said hexahedron diagonally across the side face

to a position forward of and adjacent the back face of said hexahedron whereby the workbench may be erected to said erected position wherein said top structure is disposed above and parallel to said base structure and may be folded to said storage position wherein said top structure is disposed adjacent and substantially parallel to said base structure.

37. A workbench defined in claim 9, wherein:

said base structure has a plan area larger than the plan area of said top structure and includes, in both the erected and the storage positions of said intermediate structure, a fixed, rigidly extending, integral load bearing platform upon which, in the erected position of said intermediate structure, a person can stand beside the top structure.

38. A workbench as defined in claim 36, wherein said base structure has a plan area larger than the plan area of said top structure, and includes a rigidly extending, unobstructed load bearing platform upon which a person can stand beside the top structure when said workbench is in said erect configuration.

39. The workbench as defined in claim 11 wherein:

the connections of one of said frame members to said top and base structures are slightly higher than the corresponding connections of the other of said frame members to the top and base structures, whereby said higher connected frame may lie adjacent and parallel to said lower connected frame member without interfering therewith when said workbench is in said storage position.

40. A workbench as defined in claim 11, wherein said base structure has a plan area larger than the plan area encompassing said work surface, and constitutes a load-bearing platform upon which a person can stand beside said top structure in line with the direction of movement of said one of said vise members.

41. The workbench defined in claim 9, wherein:

said intermediate structure comprises a pair of parallel disposed frame members hingably connected at the top and bottom thereof to said top structure and said base structure, respectively;

the connections of one of said frame members to said top and base structures are slightly higher than the corresponding connections of the other of said frame members to the top and base structures; whereby, said lower connected frame member may lie adjacent and parallel to said higher connected frame member without interfering therewith when said workbench is in said storage position.

42. A workbench as claimed in claim 9, including a pair of vice operating devices, each comprising a screw threaded rod extending substantially at right angles to the length of the stationary vice member.

43. A workbench as claimed in claim 42 in which each screw threaded rod is axially fixed at its end adjacent the stationary vice member and extends through a nut secured to the movable vice member.

44. A workbench as defined in claim 9, wherein said mounting means comprises:

vise operating means operatively coupled to each end of at least one of said vise members for positively moving each end of said one of said vise members independently with respect to the other end toward and away from the other said vise member whereby the gap between the two elongate faces may be greater at one end than at the other end.

45. A workbench as defined in claim 9, wherein:
 said top structure includes a pair of horizontally
 spaced support members extending generally at
 right angles to the direction of elongation of one of
 the vise members, clamping face and supporting
 the vise members from below, and means con-
 straining the vise members against upward move-
 ment relative to the support members;

said mounting means includes vise operating means
 for positively moving one of said vise members to-
 ward and away from the other said vise member,
 said vise operating means including a pair of
 spaced vise operating devices, and means opera-
 tively coupling each vise operating device to at
 least one of the members for enabling the opposed
 ends of the vise members to be spaced at different
 distances from each other.

46. A workbench as defined in claim 45, wherein
 each said vise operating device includes an independ-
 ently operable vise operating screw threaded rod
 which is operatively coupled to a threaded receptacle
 connected to the movable vise member by a vertical
 pivotal connection which enables the gap between the
 vise members at one end to be greater than the gap at
 the other end.

47. A workbench as defined in claim 45, wherein said
 support members further comprises means formed
 therein defining longitudinally extending locating sur-
 faces; and

said coupling means further comprises a coupler piv-
 otally connected to the underside of said one of
 said vise members and having means formed on
 said coupler defining a corresponding locating sur-
 face for contacting one of said support member lo-
 cating surfaces to limit lateral movement of said
 one of said vise members relative to said support
 members.

48. A workbench as defined in claim 10, wherein said
 intermediate structure comprises a pair of parallel dis-
 posed frame members hingably connected at the top
 and bottom thereof to said top structure and said base
 structure, respectively.

49. A workbench as defined in claim 10, wherein said
 diagonal brace is connected between the rear of said
 base structure and the front of said top structure, one

end of said brace being received on a track to which it
 may be secured to hold said workbench in erected posi-
 tion and on which it may slide when said workbench is
 folded to said storage position.

50. A workbench as defined in claim 48, wherein the
 connections of one of said frame members to said top
 and base structures are higher than the corresponding
 connections of the other of said frame members to the
 top and base structures, whereby said lower connected
 frame member may lie parallel and adjacent to said
 higher connected frame member without interfering
 therewith when said workbench is in said storage posi-
 tion.

51. A workbench as defined in claim 7, wherein said
 mounting means comprises:

two independently operable vise operating devices
 connected between said vise members at locations
 spaced lengthwise there along and operative to
 positively move one of said vise members towards
 and away from the other of said vise members
 thereby the gap between said vise members may be
 greater at one end thereof than at the other.

52. A workbench as defined in claim 51, wherein said
 each of said vise operating devices includes a handle
 for manually manipulating said vise operating devices,
 said handles being connected to said workbench in a
 position overlying said load-bearing platform.

53. A workbench as defined in claim 12 wherein said
 intermediate structure comprises a pair of parallel dis-
 posed frame members hingably connected at the top
 and bottom thereof to said supporting structure and
 said base structure, respectively.

54. A workbench as defined in claim 53 wherein the
 connections of one of said frame members to said sup-
 porting structure and said base structure are slightly
 higher than the corresponding connections of the other
 of said frame members to the supporting structure and
 base structure, whereby said lower connected frame
 member may lie substantially parallel to said base when
 said workbench is in said storage position and said
 higher connected frame member may overlies said
 lower connected frame member in adjacent parallel re-
 lationship thereto without interfering therewith when
 said workbench is in said storage position.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,841,619

Dated October 15, 1974

Inventor(s) Ronald Price Hickman

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

First page, Item [62], "3,615,086" should be

--3,615,087--;

Col. 1, line 41, "it" should read --its--;

Col. 1, lines 60-61, "mmembers" should --members--;

Col. 2, line 36, "shows" should read --is--;

Col. 2, line 37, "Fig. 1" should read --Fig. 4--;

Col. 2, line 38, "ishows" should read --shows--;

Col. 2, line 56, "'H'-shaped" should read

'U' -shaped--;

Col. 2, line 57, "forms" should read --form--;

Col. 3, line 10, "PTEE" should be --PTFE--;

Col. 3, line 58, "handled" should read --handle--;

Col. 4, line 19, change the comma to a period;

Col. 4, line 53, "3" should be --3"--;

Col. 6, lines 54 & 55 "foldably" should be

--foldable--;

Col. 12, line 44, after "at" insert --each--;

Col. 12, line 49, "compriss" should read --comprises--

Col. 12, line 50, delete "to";

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,841,619 Dated October 15, 1974

Inventor(s) Ronald Price Hickman

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

Col. 13, line 41, "collasped" should read
--collapsed--;

Col. 15, line 27, "comprises" should read
--comprise--;

Col, 16, line 21, "thereby" should read --whereby--;
and

Col. 16, line 23, delete "said".

Signed and sealed this 11th day of March 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks