Jan. 14, 1947. W. WOERNER 2,414,348

JIG-VISE

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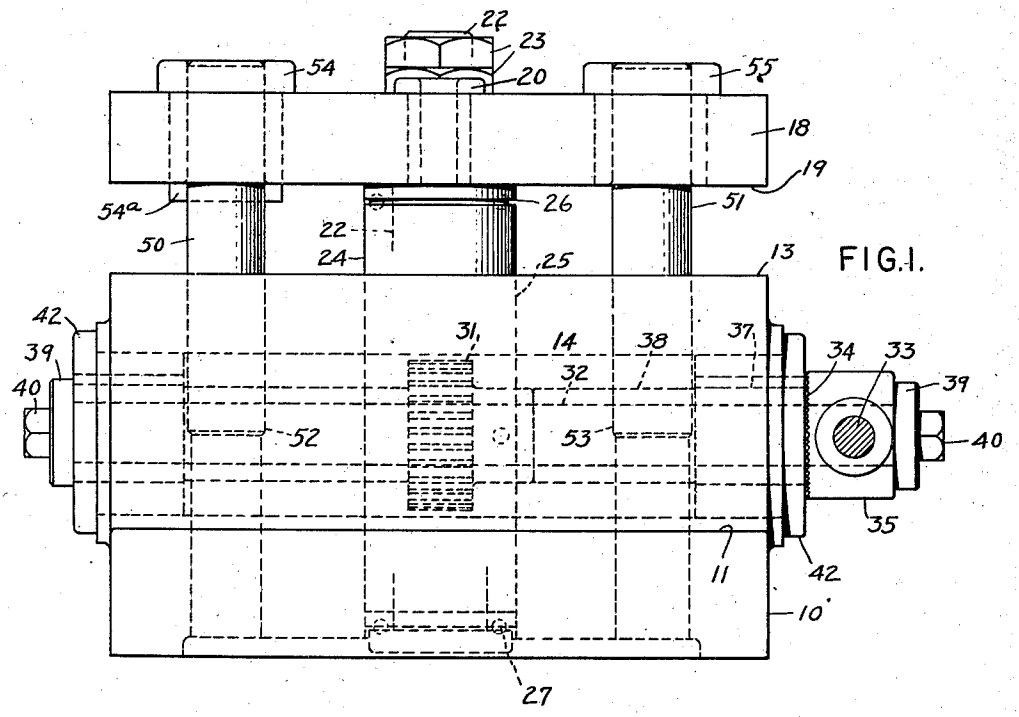


FIG.1.

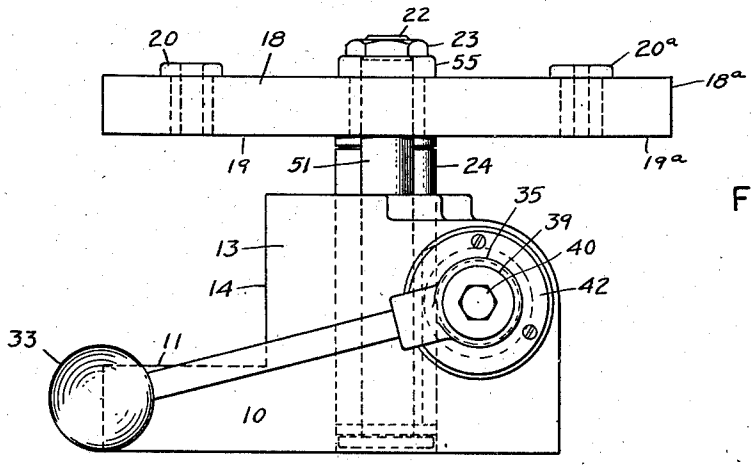


FIG.4.

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JIG-VISE

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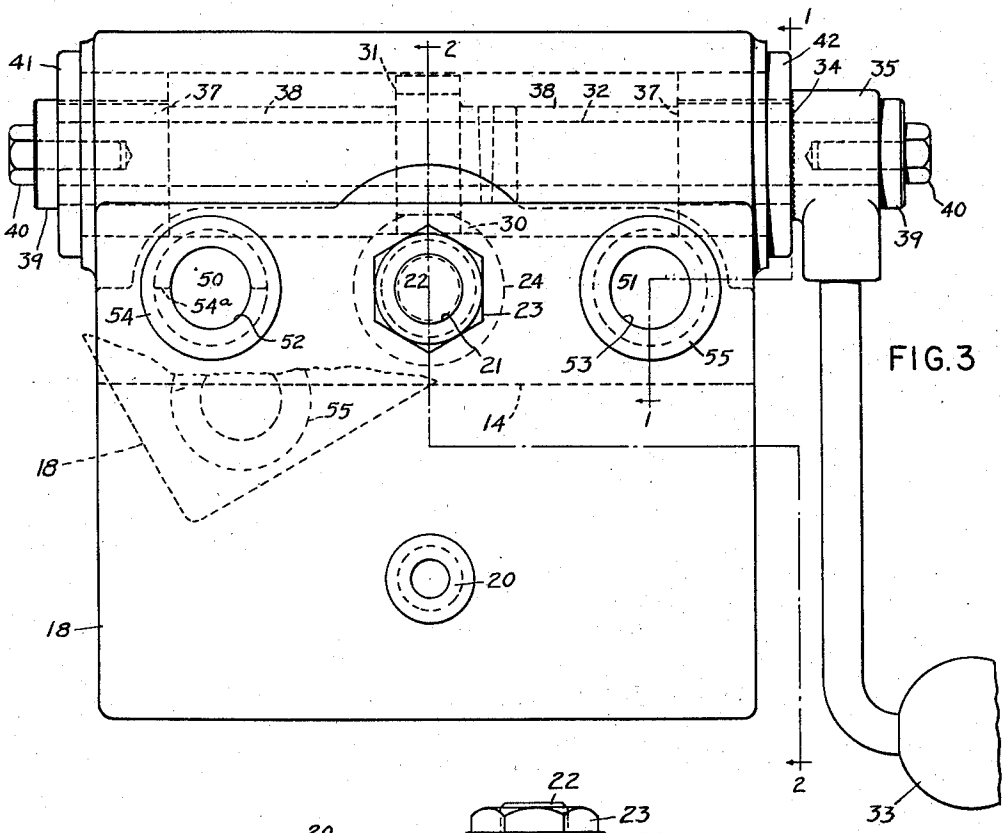


FIG. 3

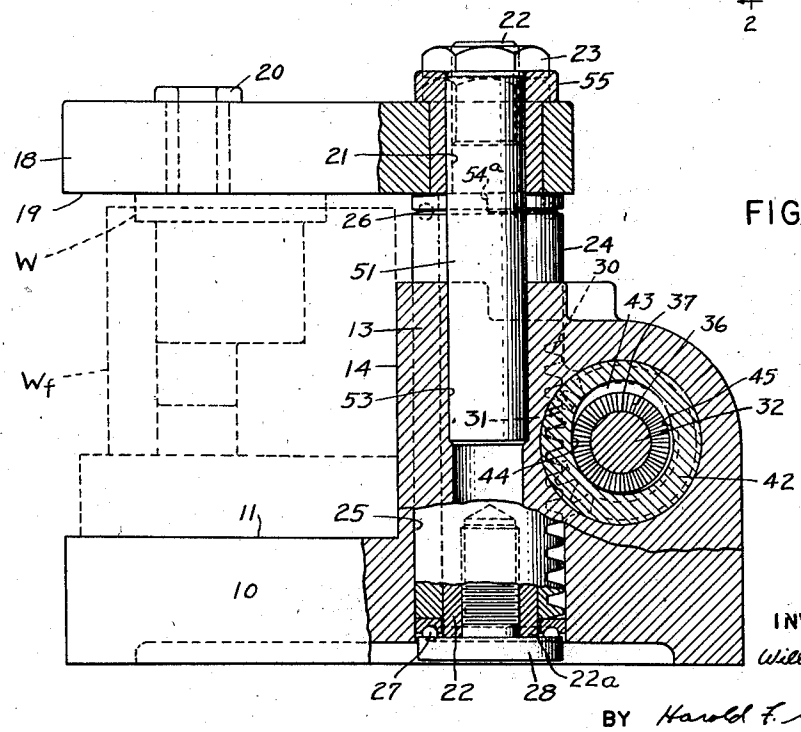


FIG. 2.

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UNITED STATES PATENT OFFICE

2,414,348

JIG VISE

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Application January 30, 1945, Serial No. 575,217

8 Claims. (Cl. 77—62)

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The present invention relates to combined work-holding and tool-locating fixtures and is concerned more particularly with improvements in devices of the character in which the same element that engages and clamps the work is also the element that accurately locates and guides the tool. The aim of the invention is to provide a fixture that will enable the worker to insert and remove workpieces with greater ease and dispatch than has been possible heretofore and without sacrifice to rigidity or accuracy in the work-clamping and tool-locating functions of the fixture.

The aim of the present invention is to render available a jig-vise which is arranged for top-loading and adapted for use in restricted areas wherein the hinge-like movement of the upper jaw element of the prior designs can not be employed because of interference with the work-pieces or with parts of the machine on which the jig-vise is used.

A further aim of the present invention is to provide a compact, easily manipuated, and sturdily constructed jig-vise suited for use in confined regions and a jig-vise constructed of relatively few parts easy to manufacture and assemble.

In carrying out the objectives of the invention it is proposed to construct the base plate member of a jig-vise with a substantially reinforced rear wall rising therefrom, and to support therein the operating mechanism, bushing-plate mounting plunger, and guide bearings for the cooperating jaw of the vise. The mounting plunger is constructed preferably in two parts, one being a reciprocable sleeve and the other beng a coaxial spindle rotatively journaled in the sleeve. To the upper end of the spindle is mounted the coacting combined bushing plate and upper jaw element of the jig-vise, which, by virtue of the spindle's rotative mounting in the sleeve, may be rotated about the sleeve axis to bring the overhanging portion of the jaw into or out of cooperating relation with the lower jaw member. In this embodiment of the invention, the mounting plunger on and about which the combined jaw and bushing plate swings is proportioned in size as to maintain the working plane of the jaw in parallelism with the plane of the base plate in all spaced and laterally swung positions of the movable jaw. The movement of the jaw selectively in a clamping and unclamping direction is effected, in this instance by a lever operated pinion that engages rack teeth cut into the reciprocable sleeve. Other forms of

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actuating means, for example, screw and nut, cam or eccentric, etc., may be employed if desired.

Easy relocating of the upper jaw in a definite angular position relative to the base element and work locating devices that may be mounted thereon, is attained in accordance with this invention, by means of one or more pilot bars and complemental bushing elements positioned on axes parallel to the axis of swing of the jaw element but offset therefrom. On movement of the jaw to a work-unclamped position, the pilot-bars and complemental bushings automatically disengage, thus freeing the jaw for lateral swinging movement about the axis of the mounting plunger. After the workpiece is removed and a new blank inserted, the jaw is again moved laterally into position over the work and precision centering thereof obtained by means of the pilot bar or bars.

A jig-vise so constructed has the avantages of strength and accuracy, by reason of its simplified construction and relation of its cooperating elements, which, together with the important feature of compactness in height, affords a workman with a serviceable and practical production vise capable of top-loading and of expeditious use in restricted areas.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as a part of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which—

Figure 1 is a front elevation of a jig-vise embodying the principles of this invention.

Fig. 2 of the drawings is a side view, shown partly in section substantially along lines 1—1 and 2—2 of Fig. 3.

Fig. 3 is a plan view of a jig-vise embodying this invention.

Fig. 4 is a side view of a jig-vise of this invention adapted for successive tooling operations.

Referring more particularly to Fig. 2 of the drawings, the jig-vise illustrated comprises a base member 10 having a finished upper surface 11 upon which a supplemental work locating fixture Wf, shown by the dotted lines is mounted. To

the rear of the work platform 11, is an upstanding reinforced wall 13 whose front face 14 limits the inward position of the workpiece W or work fixture Wf. The wall 13 also translatably journals the sleeve element 24 of the upper jaw mounting plunger, provides a support for parts 50 and 51 of the upper jaw guide and aligning means, and houses portions 31, 32 of the jaw elevating mechanisms later to be referred to.

The upper jaw element 18 functions as a combined vise-jaw and bushing plate and has its under surface 19 finished parallel with the platform 11 of the base so as accurately to engage and clamp on the workpieces. One or more tool locating apertures, such as bushing 20, are provided in the bushing plate, as the needs of the work may require.

The bushing plate extends to the rear of the surface 14 and is bored centrally as at 21 to receive the upper end of a spindle 22 that forms an element of the mounting plunger. Lock nuts 23 are provided to clamp the elements together. The spindle 22 extends downwardly and is rotatively journaled in a shiftable but non-rotatable sleeve member 24 that is slidingly fitted in a relatively long bearing 25 in the wall 13. Anti-friction thrust bearings 26 and 27 located at the ends of the sleeve 24 and between the bushing plate 18 and the opposite end 22a of the spindle 22 serve to center and guide the spindle and also to maintain the plane of the extending jaw element 18 perpendicular to the axis of the mounting plunger 22, 24. The lower race of the lower bearing 27 is herein illustrated as being in the head of a screw 28.

The sleeve 24 is provided with rack teeth 30 that are constantly meshed by the teeth of a rack pinion 31. Because of the normally meshed relation of the rack teeth 30 with the teeth of the pinion 31, the sleeve 24 is constrained against rotation in the bore 25 of the base member. The pinion 31 is pinned or otherwise non-rotatively secured to an operating shaft 32 which has an operating handle 33 adjustably fastened thereto. The manner of securing the handle 33 to the shaft 32 may be effected in various ways, and a preferred construction comprises the forming of radially extending serrations 34 on one face of the handle hub 35, adapted to interfit and lock with complemental radial serrations 36 formed on an end face of one of the bushing elements 37. The bushings 37 are non-rotatively secured to the shaft 32, as by sweating, shrinking, or cross pinning, and are further constrained against movement by means of spacer sleeves 38.

With this form of handle mounting, the position and swing of the handle may be adjusted for convenient operation with due regard to the height of the work to be clamped. End washers 39 and clamp screws 40 are provided to seal the interior against entrance of chip and foreign particles and to clamp the assembly together, sufficient clearance space being provided between the inner face 34 of the handle hub 35 and the outer face of the bushing 42 to allow for free turning of the handle and parts associated therewith.

A rocking of the handle 33 will, through the mechanism explained, effect a raising or lowering of the upper jaw element 18, and so that the latter will maintain its clamped position against a workpiece, when the handle is released, the entire rack pinion shaft assembly is arranged to have a slight floating movement in a vertical direction. As illustrated in Fig. 2, the bushings 37 are received within larger bushing members

41 and 42. Each bushing (41—42) has an elongated opening 43 formed therein whose front wall 44 parallels the pitch line of the rack teeth 30, and whose rear wall 45 slants forward in an upward direction. The Fig. 2 illustration exaggerates the conditions, for purposes of this explanation, and it will be understood that the relations are such that a counterclockwise turning of the pinion shaft, propels the upper jaw downwardly until resistance is encountered thereby. Further turning of the pinion shaft when resistance is encountered, causes the pinion to "climb" the rack, and this vertical movement of the shaft brings the bushings 37 into binding relation with the narrower portions of the slots 43 in the bushings 41 and 42. When the handle is released, the forces tending to lift the bushing plate tend to effect counter turning of the pinion shaft and increase the binding action, and actual unclamping is prevented.

The workpiece is readily unclamped, however, by operating the handle in a clockwise direction, for, when so actuated the fulcrum point shifts from the line of contact of the bushings 37 with the tapered wall 45 to the pitch line of the rack teeth, and the bushings and pinion shaft are rocked downwardly into wider portions of the tapered slots, thus permitting free rotation of the pinion shaft and upward movement of the upper jaw element. The foregoing is but representative of a preferred form of jaw operating and clamping mechanism. Other forms, such as screw and nut, worm and worm wheel, eccentric or cam arrangements may, of course, be employed, if desired.

At least at one side, and preferably at opposite sides of the central mounting plunger 22, 24, bushing plate centering and guiding studs 50 and 51 are provided. Each stud has a press fit or is otherwise secured in aligned bores 52 and 53 in the base member and projects upwardly therefrom sufficiently to be engaged, for a substantial distance, by bushing members 54 and 55 carried by the upper jaw member 18, as the latter is moved toward work-engaging and clamping position. When the upper jaw is raised to the position whereat the guide bushings 54 and 55 are lifted from the guide studs 50 and 51, the combined bushing plate and vise jaw member 18 may then be shifted laterally about the mounting plunger 22, 24 as an axis, thereby completely to expose the work and to permit removal thereof vertically. By so mounting and swinging the upper jaw element, the jig-vise need not be shifted relative to the operating tool between tooling operations, and the overhead room required within which to operate the device, is reduced to minimum proportions. The dotted lines illustrated in Fig. 3, represent the combined bushing-plate and vise-jaw element 18, in an out-of-the-way position.

After loading the fixture with another workpiece the bushing-plate is again revolved to working position, and so that the working position may be quickly determined at least one of the guide bushings (54) is formed with a depending portion 54a that extends around the rear one-half of its lower periphery and serves as an abutment for the stud 50. The upper ends of the guide studs are beveled slightly to facilitate their re-entry into the bushings as the jaw is moved toward work-clamping position.

Where the nature of the work requires, the upper jaw element 18 may be extended further to the rear and carry in the rear extension 18a, an-

other bushing 20a or set of bushings appropriately sized and located for a succeeding operation on the same or a different workpiece. Fig. 4 illustrates such a construction. The width of bushing plate, in the duplex or turret type of jig-vise just mentioned, is preferably such as to permit convenient top-loading, when swung about the post axis 90°. Drilling and reaming operations may, for example, be performed in rapid succession on a given workpiece by unclamping and indexing the duplex clamping bushing plate through 180° and reclamping, the pilot bars reentering opposite sockets. In other respects the device of Fig. 4 is similar in construction and operation to the structures herein above referred to.

It will be seen that in either constructional form the guide studs 50 and 51 in addition to their function of locating the bushing plate repeatedly in a precise location, also serve as supplementary means for maintaining the plane of the work engaging surface 19 of the movable jaw parallel with the platform surface 11 or to the work mounted thereupon. Thus the tool is precision located laterally, and its vertical alignment assured by reason of the substantial bearing provided at the mounting plunger and at the guide bushings 54 and 55, the former being relatively low, and the two latter relatively high.

That is, by the construction disclosed, the movable jaw carries an extension 22, 24 that is guided slidingly in the base, and the base is provided with extensions (50—51) that slidingly guides and supports the movable jaw, and this double and spaced apart guide means effectively maintain the movable jaw, and hence the tool locating bushing or bushings therein, in proper precision relation in all normal operating positions.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations and elements, or equivalents thereof, by Letters Patent of the United States:

1. A jig-vise comprising a base member having a work supporting platform, a non-rotatable sleeve slidably mounted in said base offset from said platform, a combined jaw and bushing-plate member rotatively mounted on said sleeve with its tool locating portion normally extending over said platform, means for actuating said sleeve to effect a work clamping operation, and means operative during movement of the sleeve for restraining said bushing plate member against rotation relative to said sleeve and base members.

2. A jig-vise combining a base member having a forward portion affording a work receiving platform and a thickened rear portion affording an abutment surface normal to said platform, a sleeve member projecting from said thickened portion and provided with rack teeth, a pinion journaled in said thickened portion and engaging said rack teeth for shifting the sleeve axially, a combined work clamping and drill bushing plate supported by said sleeve as to extend over said work receiving platform, means comprising antifriction bearing means at each end of said sleeve

and a spindle element connected with said plate and extending through the sleeve for journaling the sleeve and plate together, and plate centering and guide means provided in part by said plate and in part by said thickened portion of the base for guiding said plate in parallelism with said platform and for constraining said plate against rotative movement relative to said sleeve during a movement of said plate to a work clamped position.

3. A device of the character disclosed combining a base member having a flat surface adapted to function as a clamping jaw member; a second clamping jaw and tool guide member positioned normally opposite and movable relatively thereto; means mounting one of said members for movement electively toward and away from the other including a translatable but non-rotatable member slidably mounted in the said base member and a connection rotatably securing said second clamping jaw element to said non-rotatable member; means to actuate said non-rotatable member and parts carried thereby to effect a work clamping and tool locating operation simultaneously; and means engageable with said jaw and guide member for constraining said jaw and guide member against rotation as it approaches work clamping position.

4. The combination set forth in claim 3 in which said mounting means embodies antifriction bearing means in said connection between said non-rotatable member and the member.

5. A device of the character disclosed combining a base member having a work platform, an elongated clamping jaw and tool guide member positioned normally opposite and movable relatively thereto; means mounting one of said members for movement electively toward and away from the other comprising a translatable but non-rotatable member, and means rotatively securing the said elongated member at a medial region to said translatable member, means to actuate said translatable member to effect simultaneous work clamping and tool locating, and means effective during the clamping movement to precision center and maintain one end of said elongated jaw member in an extending over and cooperative relation with said work platform.

6. A jig-vise comprising a lower jaw member and a relatively rotatable two-ended cooperating upper jaw member, means offset from the work engaging areas of said jaw members for actuating and guiding one of said members toward and away from the other selectively to effect work clamping and work unclamping operations, means operative when one of the ends of the upper jaw member is in work clamping position to constrain said member against rotation relative to the lower jaw, said means being operative when the members are in work unclamped position to render the upper member movable about an axis normal to the plane of its work engaging area electively through a distance approximately 90 degrees from normal to permit vertical loading and unloading of the workpiece on the work area of said lower jaw member, or through approximately 180 degrees to bring an opposite end portion of the upper jaw member into working relation with the lower jaw member.

7. A jig-vise comprising a lower jaw member and a cooperating upper jaw member, a supporting plunger for said upper jaw member, means rotatably mounting said uper jaw member to said plunger, means offset from the work engaging areas of said members for actuating one of said

members toward and away from the other selectively to effect work clamping and work unclamping operations; guide means operative when the members are in work clamped position to constrain said upper jaw member against rotation, said guide means being operative when the members are in work unclamped position to render said upper jaw member rotatable relative to said lower jaw member about the longitudinal axis of said supporting plunger.

8. A jig-vise combining a base member having a forward portion affording a work receiving platform and a thickened rear portion, an axially movable sleeve member projecting from said thickened portion, a combined work clamping and drill bushing plate supported by said sleeve so as to extend over said work receiving platform, means comprising antifriction bearing means at each end of said sleeve and a spindle element connected with the bushing plate and extending through the sleeve for journaling the sleeve and plate rotatively together, plate centering and guide means carried by said base and engageable with complementary means carried by said plate for guiding said plate in parallelism with said platform and for constraining said plate against rotative movement relative to said base during a movement of said plate in a work clamping direction, and manually operable means operatively connected with said sleeve for moving the sleeve axially.

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