July 14, 1953 O. G. LARSON 2,645,143

SCREW-OPERATED VISE HAVING SHIFTABLE NUT FOR QUICK ADJUSTMENTS

Filed Oct. 2, 1948 3 Sheets-Sheet 1

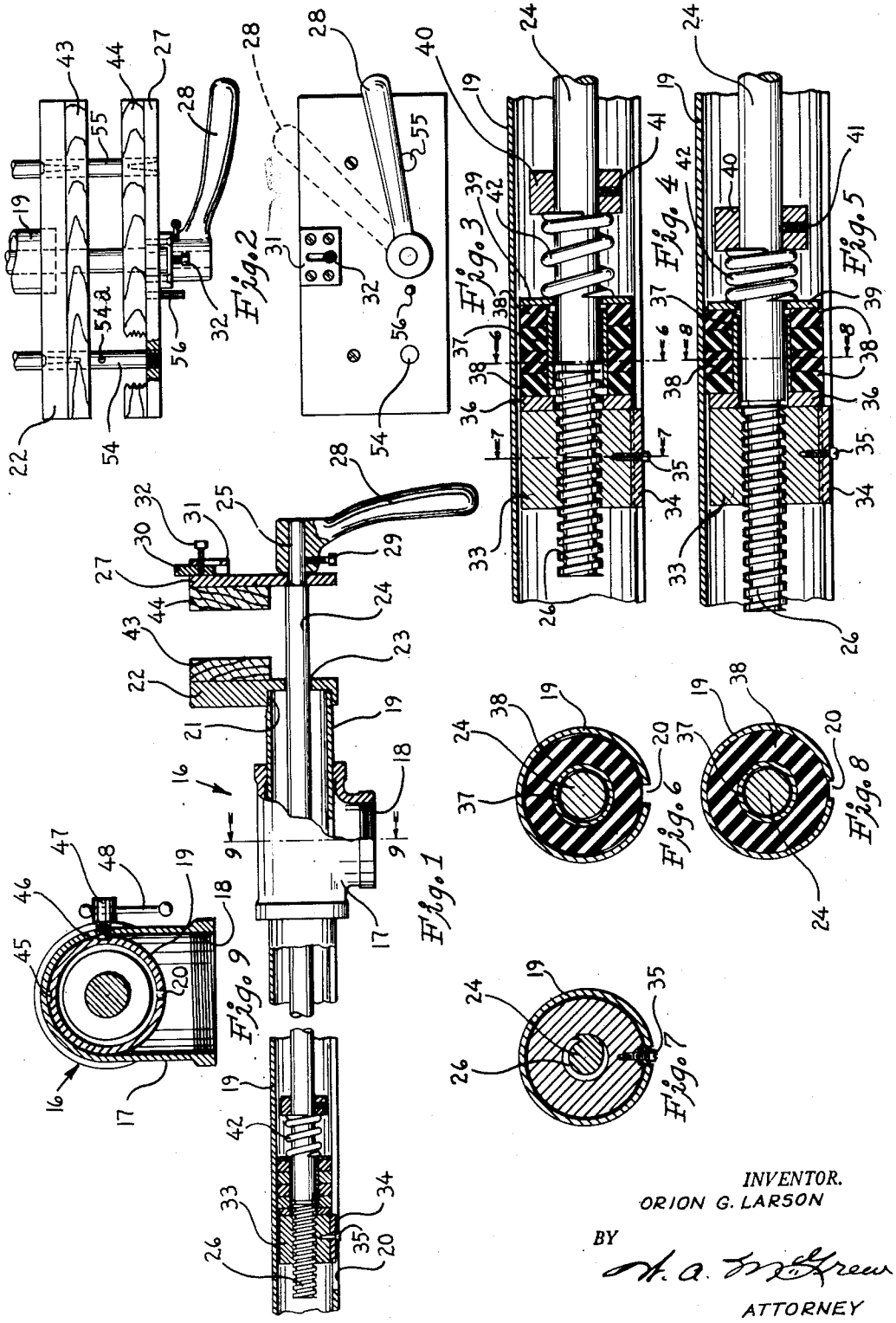


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

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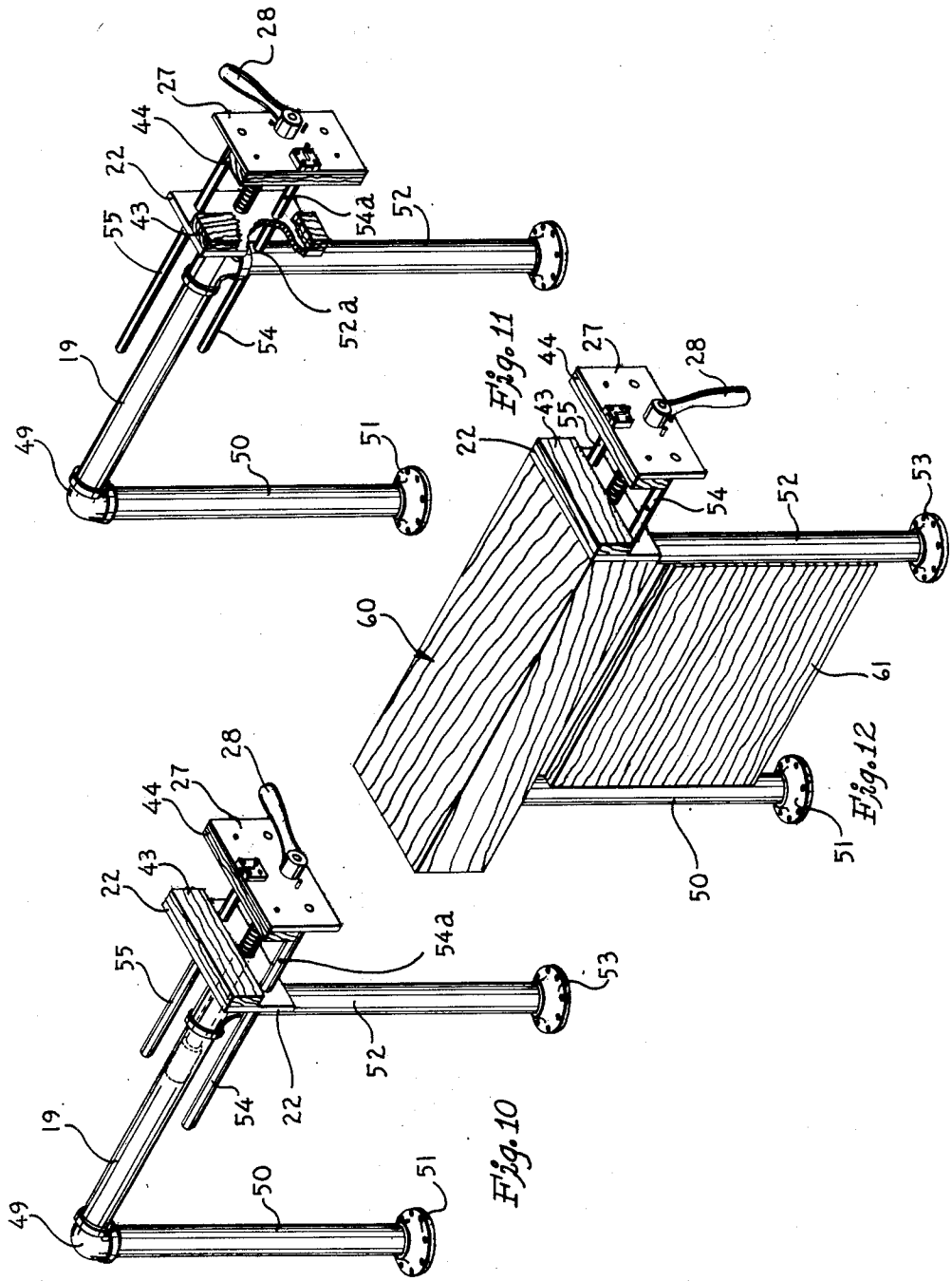


Fig. 11

Fig. 12

Fig. 10

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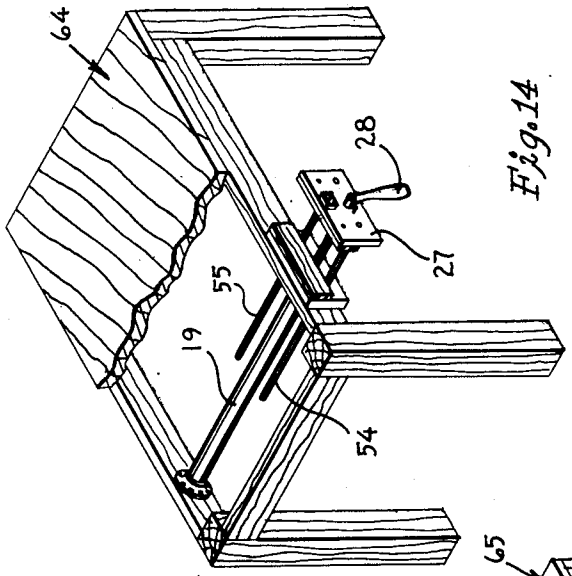


Fig. 14

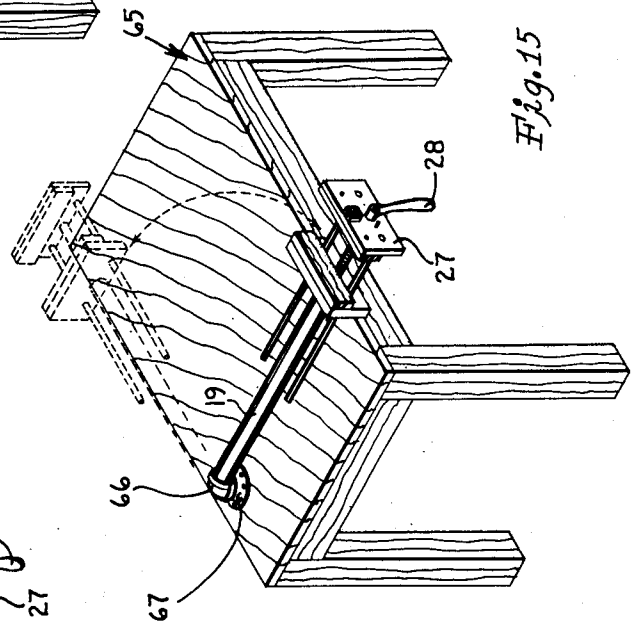


Fig. 15

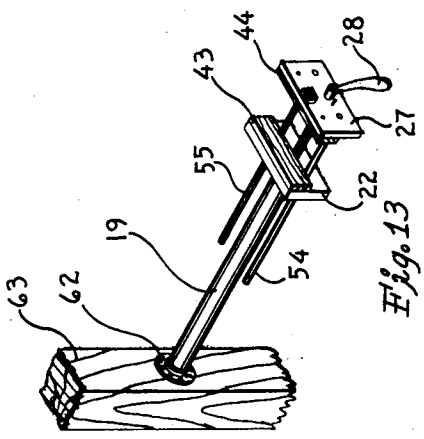


Fig. 13

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SCREW-OPERATED VISE HAVING SHIFTABLE NUT FOR QUICK ADJUSTMENT

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Application October 2, 1948, Serial No. 52,451

6 Claims. (Cl. 81—17)

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The present invention relates to a screw-operated vise having shiftable nut for quick adjustment. It has to do particularly, although not exclusively, with a vise for supporting wood pieces and having its own supporting means for supporting it in various ways, as well as one which is capable of being mounted upon or applied to a work bench or table and supported thereby.

Various kinds and types of vises have been available in the market for many years. Some of them have been efficient while others have not. Generally speaking, the present invention comprises a relatively simple, sturdy and inexpensive quick-acting vise which is efficient in operation and which is so constructed and arranged that one of the working parts or members of the vise structure itself serves, in conjunction with a conventional supporting surface which may be either horizontal or vertical, to support or mount the vise for use. An important feature of the vise of this invention is the provision of a sleeve or housing formed from a length of conventional pipe having an adjustable rod extending thereinto, the pipe and rod providing supports for the vise jaws, and a cooperable jaw position-holding unit or binding unit in the nature of a metallic cage having associated therewith, flowable friction-creating means which may be in the form of one or more rubber or synthetic rubber ring-like members which are disposed between the pipe and the rod. Other important features, objects and advantages of the present invention will appear below.

One of the objects of the present invention is to provide a vise of simple and efficient construction in which a free sliding movement or adjustment of the movable clamping jaw may be obtained without the necessity of employing a conventional screw adjustment which is common to vises of previously known types, said free sliding movement or adjustment preferably being preliminary to the final clamping action of the vise, which latter action is obtained by means of a screw adjustment, there being provided means for automatically maintaining the movable clamping jaw in its adjusted position.

Another object of the present invention is to provide an improved vise of the foregoing character which includes means capable of being expanded or caused to flow at predetermined times to hold the movable jaw of the vise in fixed position with relation to the stationary jaw of the vise.

A further object of the present invention is to provide in a quick-acting vise structure, rubber means which is capable of being caused to flow from its normal position of rest to a different position to maintain the movable jaw in a given adjusted position with relation to the stationary jaw of the vise.

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Another object of the present invention is to provide an improved vise of the foregoing character wherein the jaws of the vise and their related parts may be swung from a horizontal position of use to a right-angularly disposed or upright position of use without in any way affecting the operation of the vise-adjusting and work-clamping mechanism.

A further object of the present invention is to provide an improved vise as aforesaid, having incorporated therein its own improved means for supporting or mounting it in various positions and in various ways.

The foregoing and other objects and advantages of the present invention will appear from the following description and appended claims when considered in connection with the accompanying drawings forming a part of this specification, wherein like reference characters designate corresponding parts in the several views.

In said drawings:

Fig. 1 is a longitudinal sectional view, partly in elevation and partly broken away illustrating one form of vise structure embodying the present invention.

Fig. 2 is a fragmentary top plan view, partly broken away, of the clamping mechanism of the vise of Fig. 1.

Fig. 3 is a front end elevational view of the structure shown in Fig. 2.

Fig. 4 is a fragmentary longitudinal sectional view through the locking mechanism for the holding jaws of the vise with the movable jaw released.

Fig. 5 is a view similar to Fig. 4 with the locking mechanism in operative position to maintain the movable jaw against movement relative to the stationary jaw.

Fig. 6 is a vertical sectional view taken substantially along the line 6—6 of Fig. 4, looking in the direction of the arrows.

Fig. 7 is a vertical sectional view taken substantially along the line 7—7 of Fig. 4, looking in the direction of the arrows.

Fig. 8 is a vertical sectional view taken substantially along the line 8—8 of Fig. 5, looking in the direction of the arrows.

Fig. 9 is a vertical sectional view, on a somewhat enlarged scale, taken substantially along the line 9—9 of Fig. 1, looking in the direction of the arrows.

Fig. 10 is a perspective view of the vise of the present invention employing one form of supporting means or standard.

Fig. 11 is a perspective view of the vise of Fig. 10, partly broken away, and showing the clamping jaws disposed substantially at a right angle to their position of Fig. 10.

Fig. 12 is a perspective view of the vise unit of a slightly modified form embodying the present invention.

Fig. 13 is a perspective view of a simplified form of vise and supporting means therefor.

Fig. 14 is a perspective view, partly broken away, of the vise of the present invention applied to a work bench or table of conventional construction; and

Fig. 15 is a perspective view of the vise of the present invention having modified supporting means and being shown as mounted upon a table top or work surface of a bench.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. It is to be understood also that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention herein claimed beyond the requirements of the prior art.

Referring now particularly to Figs. 1 through 9 of the accompanying drawings, there is shown in these figures one embodiment of the quick-acting vise embodying the present invention. The particular vise structure therein shown is capable of application or use in various ways, some of which are illustrated in Figs. 10 through 15 of the drawings, these applications or uses being fully described hereinafter.

As seen in Figs. 1 and 9 particularly, the vise mechanism of the present invention is indicated as a whole at 16 and comprises, as shown, a body portion in the form of a T-coupling 17 which is internally threaded at 18. The member 17 carries, as shown, a tubular metal guide or housing member 19 having in its lower wall a longitudinal slot 20. This slot extends throughout a portion of the length of the tubular member 19 and terminates, as shown, within the coupling 16. The forward end of member 19 is externally threaded at 21 and is engaged in a threaded socket formed in an immovable metal face plate or member 22.

Extending through an opening 23 of the face plate 22 and projecting into the member 19 is a rotatable shaft or stem 24 having its outer or forward end portion reduced at 25 and its inner end portion externally threaded at 26. The shaft 24 is shouldered at the juncture of the reduced forward end portion 25 and abuts against a movable metallic face plate or member 27. As will be explained later, the normally immovable face plate 22 carries the fixed jaw of the vise, whereas the movable face plate or member 27 carries the movable or adjustable jaw of the vise.

To provide means for turning rod 24, its reduced end 25 carries an operating handle 28 which, as shown, is fixed to the shaft by a set screw 29.

As is usual with bench type vises for handling pieces of wood or lumber, the movable face plate 27 carries an upward extension or metal block 30 which is mounted in a frame 31 and is movable or shiftable by means of a finger piece which may be a screw or bolt 32 which is adapted to travel in a slot formed in the frame 31, see Figs. 1 and 3.

As best seen in Figs. 1, 4 and 5, the rotatable shaft or stem 24 has its threaded portion 26 engaging a movable nut-piece 33 which is internally threaded and which carries a small block or plate 34 removably attached to it by a screw 35 having a head that extends beyond the outer surface of the tubular member 19. The block or

stop member 34 fits within the longitudinal slot 20 and thus prevents rotation of nut 33 relative to the stem 24 and also the housing 19. The block thus can only be made to progress in opposite directions lengthwise of the tube 19.

As best seen in the enlarged views of Figs. 4 and 5, the holding mechanism or the releasable binding unit of the vise includes an apertured metal plate or washer 36 which rests or seats against one face of the nut-piece or member 33. The aperture or central opening in this washer or plate member 36 is of sufficient diameter to permit the free movement therethrough of shaft 24 and its threaded portion 26. In association with the member 36 is a metal sleeve 37 having an inside diameter which is somewhat greater than the outside diameter of shaft 24. The sleeve 37 carries a plurality of preferably rubber or synthetic rubber rings, or washer-like non-metallic members 38 whose elasticity causes them to firmly grip the sleeve member 37. The innermost ring of the group of rings 38 engages the adjacent face of the metallic washer 36, the outermost of said ring members 38 being in engagement with a similar but somewhat lighter weight metal washer or ring member 39. In other words, the sleeve 37, the rubber or other non-metallic rings 38 and the metallic end members or washers 36 and 39, together form a binding unit or assembly which is maintained at all times in relatively intimate contact or engagement with the nut-piece 33. The holding or binding unit is thus held in engagement with the nut-piece by virtue of the provision of a longitudinally adjustable stop block or member 40 which is held in adjusted position upon the shaft or stem 24 by a lock screw 41 and by means of a relatively stiff coil or spring 42. The normal tendency of the spring 42 is to expand, as seen in Fig. 4, but it is capable of being compressed from its normal or expanded position of Fig. 4 to its compressed or contracted position, as seen in Fig. 5. During the movement of the spring from its Fig. 4 position to its Fig. 5 position, the washer members 39 and 36, together with their interposed non-metallic flow members or rings 38, are moved together and toward the nut-piece 33. This compressing action of the spring and the movement of the metallic parts serve to squeeze together the several ring members 38 (four being shown) so that the material thereof, which may be preferably rubber, synthetic rubber, plastic or the like, will flow from the position of Fig. 4 wherein the peripheries of the rings 38 are out of contact with the sleeve member 19, to a position in which their peripheries intimately engage and are forced against the adjacent wall of the surrounding sleeve member 19, this latter position being clearly illustrated in Fig. 5 of the drawings. It will be understood, of course, that when the parts are in their positions of Fig. 4, the rod 24 and its attached parts may be slid longitudinally of the sleeve 19 in either direction, whereas when the parts are in the position of Fig. 5, there can be no relative sliding movement of members 24 and 19. It will be understood that the strength of the coil spring 42 may be varied in accordance with the amount of pressure which it is desired to exert upon the flow members 38 and also in accordance with the diameter, and thus size or resistance to stress, of the members 24 and 19.

As indicated previously, the fixed and movable metallic face plate members 22 and 27 carry the actual work-contacting members or facings of the vise jaws. For example, plate 22 carries a

wood facing piece 43 and the movable face plate member 27 carries a similar wood or other preferably non-metallic facing piece 44. These wood blocks or members 43 and 44 are held to their respective metallic supporting plates in any suitable manner, as by means of screws, bolts or the like whose heads are preferably countersunk.

From the foregoing, it will be appreciated that when the parts of the holding device are in the position of Fig. 4 of the drawings, and also of Fig. 1 thereof, the movable vise jaw constituting members 27, 44, can be slid toward or away from the fixed or immovable jaw members 22, 43 of the vise. When the contact members 43 and 44 of the jaws have preliminarily gripped or engaged the work piece (not shown) a turning of handle 28 from its broken line position as seen in Fig. 3 to its full line position of that figure, will cause spring 42 to be compressed from its normal position of Fig. 4 to its position of Fig. 5, to thus squeeze and shift the non-metallic ring members 38 into their tube-engaging position of Fig. 5 to hold the vise jaws tightly clamped against the work piece. Therefore, it will be understood that the quick, or rough, and preliminary adjustment of the jaws is effected rapidly by moving or shifting rod or bar 24 relative to the tube 19 and then by rotating the handle 28 until the spring 42 has been properly compressed to cause the holding or binding unit or assembly to exert outward binding pressure against the enclosing sleeve 19 to hold the vise jaws in their final gripping position.

As seen in Fig. 9, tubular member 19, in addition to having slot 20, is provided at spaced points with sockets or depressions 45 and 46 (two being shown) and the T-coupling 17 carries at one side a rotatable member 47 having a slidable handle 48, said member having at its inner end a projecting portion which is adapted to engage in either of the sockets or the slot 20. As shown in this figure, the inner end of screw member 47 is in engagement with socket 46, thus maintaining the vise with its jaws in horizontal position, as seen in a majority of views of the drawings. When, however, it is desirable to dispose the jaws in a substantially vertical or upright position, as indicated in Fig. 11 of the drawings, the screw member 47 is released from contact with socket 46 whereupon sleeve 19 is rotated a quarter turn in a counter-clockwise direction to bring the slot 20 in registry with the inner end of screw member or pin 47. If desired, sleeve 19 may be rotated in a clockwise direction to bring socket 45 into registry with pin 47. Now by manipulating handle 48, the inner end of member 47 is made to enter slot 20 and the sleeve member is thereby held in its new position.

As stated previously, the particular vise mechanism of the present invention may be installed in various ways, for example, upon a work bench, or it may be carried by its own supporting means or standard as indicated in many of the views of the drawings. To thus permit it to be a self-supported and sufficient apparatus, the tubular housing member 19 of Fig. 1 may have its inner end threaded into an elbow, such as the elbow 49 of Fig. 10, said elbow in turn being mounted upon an upright pipe or tube 50 whose lower end is threadedly attached to a base flange member of conventional construction, shown at 51 in Fig. 10. Moreover, the lower threaded portion 18 of the T-coupling 19, see Figs. 1 and 9, receive another stand pipe or tube 52 having its lower end in engagement with a conventional base

flange 53. The flanges 51 and 53 may, if desired, be bolted or screwed to a supporting surface, preferably the floor of a work shop, or the like.

It is, of course, desirable to provide guiding means for the movable jaw of the vise and, as shown, such means comprises a pair of rods 54 and 55 whose forward ends are threadedly engaged with sockets formed in metal face plate 27 and which extend through suitable holes or openings in immovable face plate 22. Since face plate 22 is normally maintained immovable, the rods 54 and 55 will serve to guide the movable jaw 27, 44 in a straight-line path relative to the fixed or immovable jaw 22, 43.

When it becomes desirable to shift the jaws from their horizontal position to their upright or substantially vertical position of Fig. 11, a spanner wrench (not shown) is applied to diametrically opposite holes or sockets 54*a* in rod 54 so that the rod 54 may be unscrewed from engagement with movable face plate 27 and slid rearwardly away from said face plate to permit the vise structure, when locking screw 47 (Fig. 9) is released from socket 46, to be shifted a quarter turn in a counter-clockwise direction to dispose the parts in their positions of Fig. 11. So that rod 54 may be replaced to serve with rod 55 as guiding means for the movable jaw when the vise has been tilted to the Fig. 11 position, the tubular upright or standard 52 is provided with a hole or opening 52*a*, see Fig. 11, to permit the rod 54 to be passed therethrough and to be again secured in the socket in face plate 27, this latter operation being performed by the spanner wrench previously referred to and which is applied to the sockets 54*a*, one of which may be seen in each of Figs. 2, 10 and 11.

So that the handle 28 may not be moved too far in a counter-clockwise direction, face plate 27 carries a stop pin or member 56.

If desired, the vise structure of Fig. 10 may be provided with its own table or top section, as shown in Fig. 12. Said top section is indicated as a whole at 60 and is mounted in suitable manner upon the horizontal tube 19 and attached to the immovable face plate 22. As seen in Fig. 12, the upright standards or legs 50 and 52 may be used to support a tool board or panel 61 in addition to the bench top 60. This bench top 60 may be made to slide on vise tube 19 and, as stated above, is secured to the vise member 22. The tool board 61 provides sufficient room for tools allotted to the bench and permits them to be openly exposed so that the can be readily checked for shortages. This is important where the speed vise of the present invention with its bench top 60 and associated parts is employed, for example, in manual training work shops. With the form of invention shown in Fig. 12, the necessity of the usual bench tool drawer is eliminated. By such elimination, there can be no possibility of the accumulation of sawdust and shavings and for this reason the vise unit can be cleaned up promptly after class, where the vise is being used for instruction purposes. Moreover, by providing the standard or conventional threaded up right pipes or standards, such as shown at 50 and 52, it is a simple matter to arrange for the proper height of the vise with relation to the floor. Thus, different age groups in the same or different classes are enabled to have the vise at the proper elevation for the particular group and/or individual, it being merely necessary to substitute longer or shorter supporting legs or pipes to accomplish this.

Fig. 13 illustrates the use of a very simple or so-called "stripped" speed vise embodying the present invention. In the present instance, the tubular member 19 has its rear end threaded into a conventional flange 62 which, as shown, is screwed or bolted to a wood upright or standard 63. This particular type or vise may be applied to a vertical or upright supporting surface at any desired location and may thus be installed in a very limited space, heretofore impossible with bench-type vise structures.

In Fig. 14, there is shown the installation of the speed vise of the present invention upon a standard type of table or work bench, indicated as a whole at 64, whereas in Fig. 15 a somewhat different installation of the present speed vise is illustrated. In Fig. 15, the speed vise of the present invention is mounted upon the top surface of a standard table or work bench, indicated as a whole at 65. In this instance, the free threaded end of tubular member 19 carries an elbow 66 which in turn is engaged with a close nipple (not shown) the latter engaging a conventional or standard type flange 67 mounted by means of screws or bolts upon the top and near the left rear corner of table 65. The installation herein illustrated permits the vise unit to be moved from its full line position of use to an out-of-the-way position, or position of non-use, as shown in broken lines in this figure.

From the foregoing it will be seen that there is provided a relatively simple and inexpensive to manufacture, vise construction, which is of extremely durable nature and which may be quickly and easily, as well as accurately, adjusted to accommodate work of various sizes and lengths. Moreover, various applications for the vise have been illustrated, merely as being representative of many ways in which it may be installed and used.

The holding or binding unit or assembly which includes the non-metallic ring-like members 38 may vary as to the size of the rings and also as to the number of rings employed, it being the intention to provide one, or a plurality of members, such as indicated at 38 in the drawings, which may be formed from some suitable material which, under pressure or a compressive force, will shift or flow from a non-binding and out-of-contact to a binding and in-contact position to prevent the relative movement of a movable member and a non-movable member. The material employed for either a single ring-like block 38 or a plurality of similar ring-like members, may be rubber, synthetic rubber, a composition of rubber and fabric, or in fact, any known material or any later-developed material which will serve the purpose by being capable of being moved from one position to another position when subjected to a compressive force to perform the binding action required.

Having thus described the invention, what is claimed is:

1. A quick-acting adjustable vise comprising a stationary clamping jaw and a movable clamping jaw slidably related thereto, said movable clamping jaw having a rotatable shaft connected therewith, said shaft being provided with an externally screw-threaded inner end portion, a cylindrical guide member into which said shaft extends, a non-rotatable nut slidably disposed in the cylindrical guide member and receiving the threaded portion of the shaft, means within the cylindrical guide member and engaging said non-rotatable nut for maintaining the movable clamping jaw in adjusted position relative to the stationary clamping jaw at predetermined times, said means including an inner metal sleeve surrounding the shaft, metal end washers also surrounding the shaft, and ring-like flowable members mounted on said sleeve and disposed between the metal end washers, and means for causing said flowable members to flow into position to engage the inner wall of the cylindrical guide member to maintain the movable clamping jaw immovable with relation to the stationary clamping jaw.

2. Structure according to claim 1, wherein said flowable members comprise a plurality of rubber ring members.

3. A quick-acting vise structure comprising a non-movable clamping jaw and a movable clamping jaw slidably related thereto, said movable clamping jaw having a slidable and rotatable shaft connected therewith, the shaft having an externally screw-threaded inner end portion, a tubular guide member into which the shaft extends, said tubular member having a longitudinal slot extending throughout a portion of its length, a non-rotatable nut slidably disposed in the tubular member and having an internal threaded socket to receive the threaded end of the shaft and having an associated part extending outwardly through said slot beyond the outer surface of the tubular member, a binding unit carried by the shaft and engaging the nut for maintaining the shaft and tubular member against relative movement at predetermined times, said unit including means adapted to be compressed and thus shifted from a position out of contact with the tubular member into a position contacting said member in binding relationship and manually-operable means for effecting the binding and releasing action of said first-named means.

4. Structure according to claim 3, wherein the binding unit comprises a central metal sleeve and one or more non-metallic flowable members grippingly engaging the sleeve, and metallic washer-like members disposed at opposite ends of said flowable member or members and maintained in contact therewith.

5. Structure according to claim 3, wherein the binding unit includes a plurality of rubber ring-like members normally under tension and movable by a compressive force into binding relationship with the tubular guide member of the vise.

6. Structure according to claim 3, wherein the binding unit includes a plurality of rubber or synthetic rubber ring-like members shiftable from an inactive position to an active binding position by pressure exerted by a spring member carried by said shaft.

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