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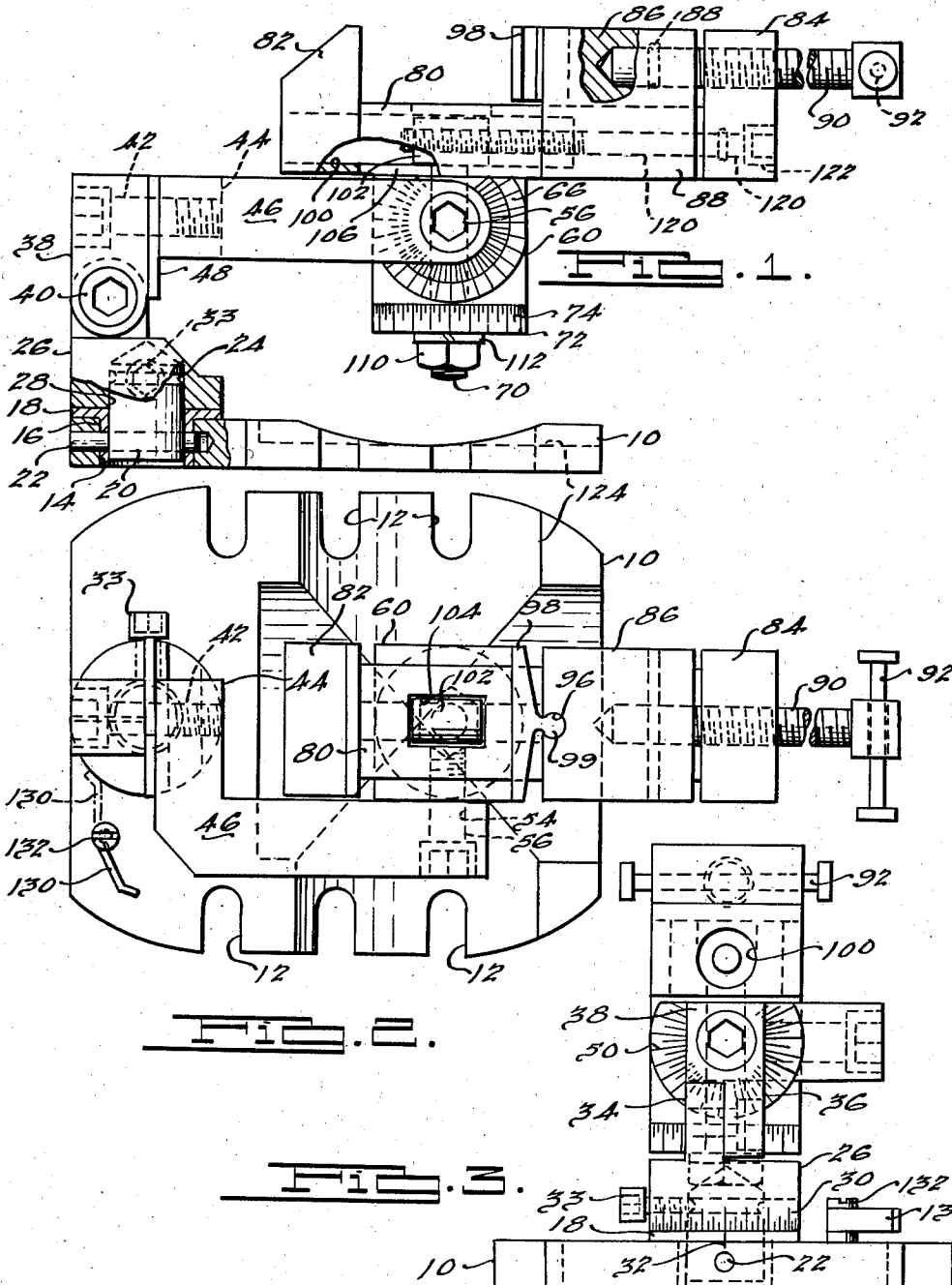
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UNIVERSAL VISE

Filed Oct. 12, 1942

2 Sheets-Sheet 1



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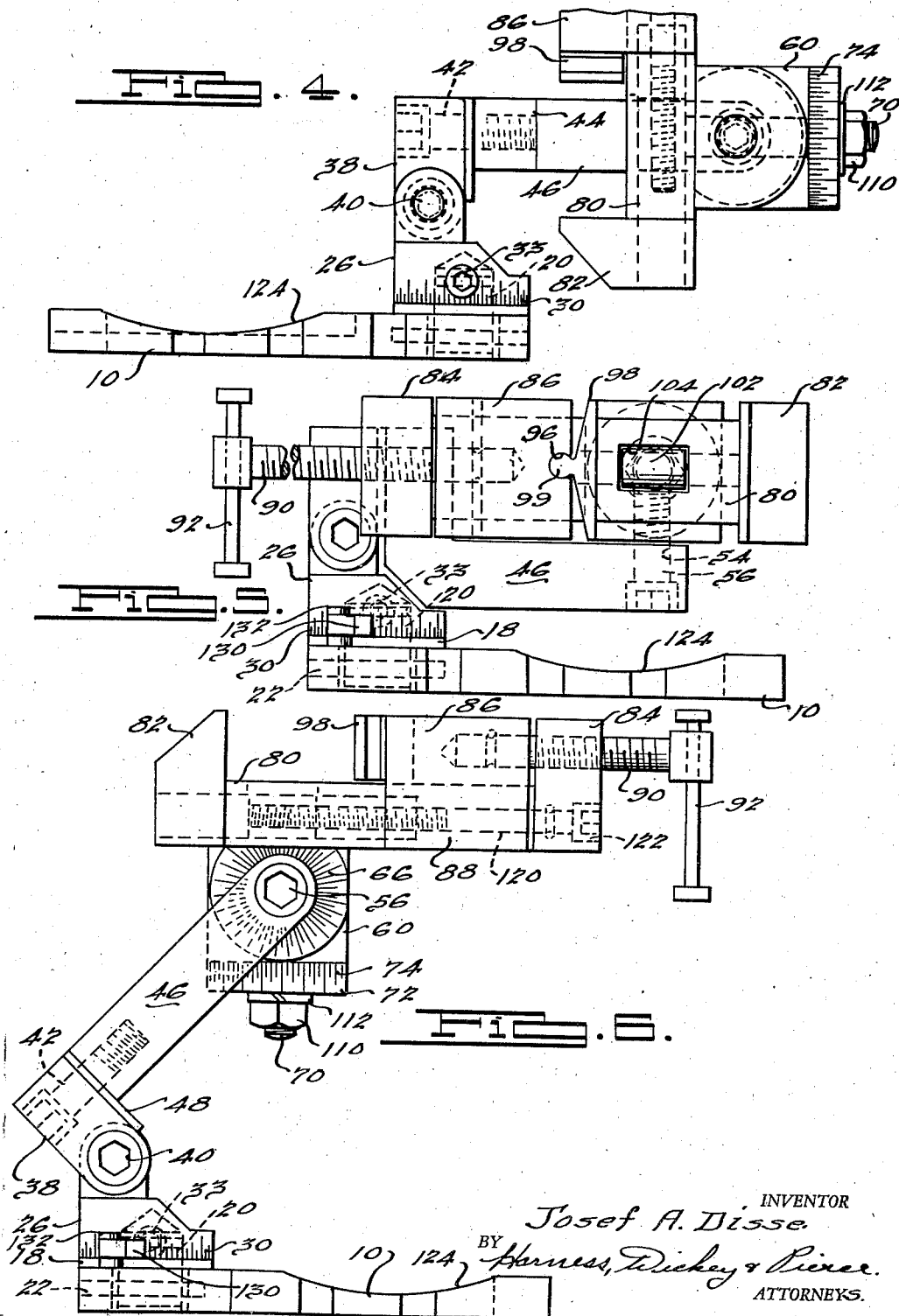
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UNITED STATES PATENT OFFICE

2,390,428

UNIVERSAL VISE

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1 Claim. (Cl. 81—41)

This invention relates to universal vises and has for its principal object the provision of such a vise capable of presenting a piece of work secured therein in any position to a cutting element intended to operate upon the work in a simple and efficient manner.

Objects of the invention include the provision of a universal vise supported for movement about a plurality of pivotal axes through any one or all of which the vise may be positioned to present a piece of work supported thereby to a cutting element; the provision of a universal vise providing rotatable adjustment of the vise itself about a plurality of pairs of spaced and parallel axes, which pairs of axes may be vertically or horizontally arranged and when in the same plane arranged at angles to one another; the provision of a universal vise structure including a base and a vise and a plurality of pivotally interconnected elements connecting the two, and in which the vise is shiftable relative to the base independently of the pivotal connections; the provision of a universal vise structure in which the elevation of the vise itself and the parts supported thereby may be accomplished without necessitating the shifting of the base with respect to its supporting surface in order to maintain the work in alignment with respect to a cutting tool adapted to operate upon the work; the provision of a universal vise capable of being mounted on a magnetic chuck or table without danger of magnetizing the major portion of the vise itself; and the provision of a universal vise of the type described that is relatively simple in construction, economical to build, rugged in construction, and efficient in operation.

The above being among the objects of the present invention the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which illustrate a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a partially broken, partially sectioned side elevational view of my improved universal vise structure;

Fig. 2 is a plan view of the universal vise shown in Fig. 1;

Fig. 3 is an end view of the vise shown in the preceding views and taken looking from the left-hand end thereof; and,

Figs. 4, 5, and 6 are side elevational views of the

universal vise shown in the preceding views and illustrating the same adjusted to various positions of operation.

As is commonly understood by those skilled in the art, universal vises are commonly employed by tool makers or the like for the purpose of presenting a piece of work at a desired angle or relation to a cutting tool such as a grinding wheel, drill or other boring element, or the like, for the purpose of performing a cutting operation upon the work. The universal vise of the present invention has been designed to enable such piece of work supported by the vise to be presented in substantially any position to a cutting element without requiring shifting of the vise with respect to its support in most instances and has been accomplished in such a manner as to provide a universal vise of minimum size for the required capacity of the vise and in such a manner that shifting of the vise to present the work supported thereby in varied relation to a cutting element may be accomplished in a simple, quick, and efficient manner.

Universal vises as heretofore suggested when formed from steel or other magnetic material have been of such character that when supported on a magnetic table or chuck the vise itself becomes magnetized with the result that the chips or the like produced in the cutting operation on the work supported thereby adhere to the vise structure and cause a great deal of inconvenience. While the vise of the present invention is preferably constructed substantially entirely of steel or other magnetic material precautions have been taken whereby the base of the device is the only part thereof that will become magnetized under such conditions, and, therefore, the principal objections to the prior art devices occurring when employed on magnetic tables or the like is eliminated. This is accomplished by insulating the base from the remainder of the structure by a non-magnetic material and preferably a non-magnetic metal so that the required rigidity of the device is not affected because of the inclusion of this feature.

Referring now to the accompanying drawings it will be noted that the universal vise structure there shown comprises a relatively wide base 10 of generally uniform thickness throughout provided with a plurality of conventional bolt slots 12 along opposite sides thereof by means of which the base may be clamped to a table or other supporting surface by bolts and nuts in a conventional manner. At one end of the base 10 and centrally thereof a cylindrical opening 14 is pro-

vided in which is closely received a bushing 16 having a radially outwardly directed annular flange 18 at its upper end which overlies the upper surface of the base 10 about the margins of the opening 14 in contact with such upper surface. A short post 20 is relatively tightly received within the bushing 16 with its lower face upwardly spaced from the lower face of the base 10 and its upper end projecting upwardly above the upper face of the flange 18 and preferably having its upper end of conical or of truncated conical conformation as shown. A pin 22, preferably of tapered conformation, is projected through the end of the base 10 and through the bushing 16 and post 20 to positively lock both the bushing 16 and the post 20 against movement axially of the opening 14 and to prevent relative rotation of these parts relative to the base 10. Additionally, the post 20 immediately below the truncated upper conical end portion thereof is provided with a circumferential groove 24 therein as best brought out in Fig. 1.

A part or member 26 is relatively closely received upon the upwardly projecting end of the post 20 for rotation about the axis of the latter, the opening 28 therein for reception of the post 20 preferably being formed for complementary reception of the upper frusto-conical end of the post 20 as shown. The lower portion of the member 26 is preferably cylindrical and is provided with a circular scale 30 thereon as best indicated in Fig. 3 and a cooperating pointer mark such as 32 and indicated in Fig. 3 may be provided on the base 10 and bushing flange 18 so as to indicate the relative rotatable position of the member 26 relative to the base 10. A set screw 33 is threaded radially through the side of the member 26 and its inner end projects into the groove 24 of the post 20 in order to enable the member 26 to be locked in rotatably adjusted position and to prevent its axial removal from the post 20 when the screw 33 is loosened.

As best indicated in Fig. 3 the part 26 is provided with an upwardly projecting flat sided tongue or projection 34 one face of which is preferably located substantially diametrically of the axis of rotation of the part 26 about the post 20. A complementary tongue or projection 36 formed on a block-like member 38 extends downwardly from the member 38 into face-to-face engagement with the tongue or projection 34 and is releasably secured thereto for rotation about a horizontal axis by means of a screw 40. The upper end of the tongue or projection 34 and the lower end of the tongue or projection 36 are preferably formed to semi-cylindrical conformation concentric with the axis of the screw 40 and a suitable circular scale and pointer marking may be provided on these cooperating surfaces to indicate the relative rotatable position of one with respect to the other if desired.

The block-like member 38 has a flat vertically directed righthand face as viewed in Figs. 1 and 2 and it is provided with a cylindrical bore therethrough arranged perpendicularly with respect to such face. A screw 42 projects through such opening and is threadably received in the laterally offset arm 44 of an arm or member 46 which normally extends toward the opposite end of the base 10, or to the right as viewed in Figs. 1 and 2. The arm 44 at its point of engagement with the block member 38 is circularly enlarged as at 48 and may be provided on the lefthand face thereof, as viewed in Fig. 1, with a circular scale 50, shown in Fig. 3, for cooperation with a suitable pointer

mark on the block member 38 whereby to enable the relative rotational position of these parts to be determined.

As indicated in Fig. 1 the length of the arm 46 is preferably such that it projects beyond the mid-point of the base 10 when the device is in the position illustrated in Fig. 1. At its free end and as best brought out in Fig. 2 the arm 46 is provided with a transverse bore 54 therein in which is received a screw 56 which projects therethrough and is threaded into the side of a block-like member 60 thus mounting the latter for rotation about the axis of the bolt 56. The member 60 is square in section at its upper end as viewed in Fig. 1 and as brought out in Fig. 2 but its lower end is turned into circular conformation of a diameter equal to the width thereof, the turned surface being located in a conical surface whose axis passes through the center of the block 60. A circular scale 66 concentric with the axis of the bolt 56 is formed on the side face of the block member 60 which abuts the end of the arm 46 and a suitable pointer mark (not shown) is provided on the end of the arm 46 for cooperation therewith whereby the rotatable position of the block 60 with respect to the arm 46 may be readily determined.

The block 60 is provided with a central bore therethrough, directed vertically when the block 60 is in the position shown in Fig. 1, in which a bolt 70 is closely but rotatably received. The bolt 70 has non-rotatably secured thereto a disc 72 lying against the bottom face of the block member 60, as viewed in Fig. 1, and which is peripherally provided with a circular scale 74 cooperable with a suitable pointer marking on the circular lower edge of the block member 60 for indicating the rotatable position of the bolt 70 with respect to the block member 60.

Resting upon the top of the block member 60 in the position of the parts illustrated in Fig. 1, is a vise which comprises a base 80 having upstanding rigid parts 82 and 84 on opposite ends thereof the first of which serves as one of the jaws of the vise. The remaining jaw of the vise comprises a block-like member 86 slidably received upon the base 80 and having depending side flanges 88 which relatively closely embrace the sides of the base 80. A screw 90 is threaded through the upstanding part 84 and its end is projected into the vise jaw part 86 where it is preferably retained against relative axial movement with respect thereto by means of a conventional snap ring such as 88. Thus it will be appreciated that by rotation of the screw 90 the vise jaw 86 may be caused to approach toward or recede from the jaw member 82. It might be noted and as indicated in exaggerated form in Fig. 1 that preferably the end of the screw 90 which is received by the jaw 86 is coned and the opening in the jaw member 86 for reception of the same is complementarily coned at its end but the point of the cone of such opening is disposed slightly above the point of the cone of the screw 90 so that when the force of the screw is applied to clamp a piece of work between the jaws 82 and 86 the axial pressure between the coned end of the screw and the coned end of the opening in the jaw 86 will tend to force the jaw 86 downwardly with respect to the base 80. There will ordinarily be a sufficient running clearance between the end of the screw 90 and the opening for reception of it in the jaw member 86 to permit a limited amount of action in the above described

respect. The screw 90 is, of course, provided with a conventional operating handle such as 92.

The operative or clamping face of the jaw member 86 is preferably provided with a partially cylindrical recess 96 arranged with its axis parallel thereto and vertically directed in the position of the vise illustrated in Fig. 1 and opening at a less width than its diameter onto the operative or clamping face of the jaw member 86. Where a part that does not have parallel side faces is to be clamped into the device, then an auxiliary clamping member 98 of the same width as the jaws of the vise and having a rearward extension 99 of cylindrical character complementary in size to the opening 96 may be applied to the jaw member 86 with the extension 99 thereof received in the opening 96. The member 98 is thus mounted for a limited amount of swivetable movement about the axis of the opening 96 and may adjust itself to conform to the angularity of the sides of the piece of work and thus enable the work to be rigidly and securely clamped in the vise.

One of the important features of the present invention is that the vise itself is mounted for bodily longitudinal adjustment on the block member 60 and this is accomplished in the following manner. The base member 80 is provided with a cylindrical opening 100 therein which extends centrally thereof from a point which may be approximately midway the length of the base 80 out through the end of the jaw 82. The bolt 70 is provided with a cylindrical head 102 which is relatively closely and slidably received in the bore 100. It will be understood that the head 102 is of substantially the same diameter as the bore 100 and is arranged in axially aligned relation with respect thereto and that, therefore, the axis of the cylindrical head 102 is perpendicular to the axis of the bolt 70. To enable the bolt 70 to be inserted into position with the head 102 thereof in the bore 100, an opening or slot 104, best shown in Fig. 2, is provided in the upper face of the body 80 leading into the bore 100 and is of sufficient size to pass the head 102 of the bolt 70 therethrough. A slot 106 is provided in the lower face of the body 80 centrally of the bore 100 and is of such width as to pass the body of the bolt 70 therethrough. Thus in assembly the bolt 70 may be projected downwardly first through the slot 102, then through the bore 100, then through the slot 106 and into the block member 60 and the head 102 thereof will follow through the slot 104 and into the bore 100 without being capable of passing through the slot 106 in view of the fact that the diameter of the head 102 is greater than the diameter of the body of the bolt 70. A nut 110 which is received on the screw 70 below the scale ring 72, preferably in conjunction with a cooperating lock washer 112, provides a means by which the head 102 of the bolt 70 may be drawn downwardly to rigidly clamp the body 80 of the vise against the upper surface of the block 60.

The slot 106 in the bottom of the body 80 preferably extends from a point adjacent the jaw 82 to a point approaching the blind or opposite end of the opening 100. This is for the purpose of permitting the vise as a unit to be shifted bodily in the direction of its length on the upper face of the block 60. It will be appreciated that by loosening the nut 110 sufficiently and by reason of the fact that the head 102 of the screw 70 is slidable in the bore 100 of the body 80 and the shank of the screw is slidable in the slot 106, such

shifting movement may be readily effected. Preferably screw means are provided for facilitating such shifting movement of the vise on the block 60 and this comprises a screw 120 concentric with the bore 100 and fixed against axial movement in the body 80. It is provided with a head 122 exposed on the righthand face of the portion 84 and formed for reception of a suitable wrench. The screw 120 extends freely through the bore and into the body 100 where it is threadably received by the head 102 of the bolt 70 centrally thereof. Accordingly, it will be appreciated that by rotating the screw 120 the vise as a whole may be caused to shift axially of the cylindrical head 102 of the bolt 70 and, therefore, transversely with respect to the block 60. It will also be appreciated, of course, that after longitudinal adjustment of the vise on the block 60 the nut 110 will be tightened up to rigidly lock the vise in its thus shifted position.

The vise as a whole is, of course, rotatable relative to the block 60 about the axis of the nut 70 and the relative rotation of the vise on the block 60 is, of course, indicated through the scale 74. The nut 110 must, of course, be loosened on the bolt 70 to permit adjustment of the vise as a whole about the axis of the bolt 70 and re-tightened after the adjustment is made. A similar procedure must, of course, be followed in adjusting any other part or member about its axis of rotation in adjusting the vise to present the work clamped therein in the proper position and at the proper angle to a cutting tool to be applied thereto.

From the above it will be appreciated that because of the many axes of rotation about which the vise as a whole may be swung, a piece of work supported in the vise may be presented in substantially any position and at substantially any angle with respect to a cutting tool intended to perform an operation on the work. The part 26 being rotatable through 360 degrees about the axis of the post 20 permits the vise as a whole to be turned therewith about such axis through 360 degrees. In Fig. 4 it is shown swung about the axis of the post 20 through 180 degrees. Likewise the vise as a whole is capable of being swung about the axis of the screw 40 through an arc of in excess of 180 degrees, in fact through an arc closely approximating 230 degrees in the particular construction shown. In Fig. 4 it is shown swung about such axis 180 degrees from the position illustrated in Fig. 1. Additionally, the arm 46 and the parts carried thereby is capable of swinging through 360 degrees of movement about the axis of the bolt 42. It will be appreciated that in order to accomplish this full rotational movement of the arm 46 about the axis of the bolt 42 it is necessary for the free end of the arm 46 to be raised sufficiently above the base to provide clearance above base 10 for the vise itself, if the base 10 is not recessed in its upper face. Preferably, however, a recess 124 is provided in the upper face of the base 10 and preferably such recess as shown is formed to present a pair of partially cylindrical recesses intersecting one another at right angles approximately centrally below the axis of the bolt 70 as viewed in Figs. 1 and 2. This provides additional clearance for the vise structure itself during certain of the above described movements. In Fig. 5 the arm 46 and the parts carried thereby are illustrated as having been swung through an arc of 90 degrees about the axis of the bolt 42 from the position illustrated in Fig. 1. The block 60 and the

vise carried thereby are rotatable about the axis of the bolt 56 and this movement may be through an angle of 360 degrees if the free end of the arm 46 is raised from the horizontal position illustrated in Figs. 1 and 4 and the vise as a whole is shifted toward the offset arm portion 44 of the arm 46 so as to centralize the vise as a whole with respect to the block 60. Additionally, the vise as a whole is swingable through 360 degrees about the axis of the bolt 70 and is bodily shiftable laterally of such axis as previously described.

It will thus be appreciated from the foregoing that provisions are made for rotating the vise as a whole about pairs of parallel but spaced axes both vertically and horizontally arranged. For instance, in the relation of the parts illustrated in Fig. 1 the vise as a whole is swingable about both the vertical axis of the post 20 and about the vertical axis of the bolt 70. It is likewise rotatable about the axes of both the bolt 40 and the bolt 56 thus providing movement about a pair of parallel, spaced and horizontally directed axes when the axis of the bolt 56 is so disposed. If the vise as a whole is swung about the axis of the bolt 56 through 90 degrees from the position illustrated in Fig. 1, then it is swingable as a whole about the axis of the bolt 42 and also the axis of the bolt 70 which is now arranged in parallel relation with respect to the bolt 42, thus providing a different pair of parallel axes about which the vise may be swung and in a plane which may vary between vertical and horizontal positions depending upon the relative rotatable positions of the members 26 and 38 about the axis of the bolt 40. Because of this feature it will be appreciated that the vise is capable of presenting work clamped therein in substantially any position and at substantially any angle to a cutting element arranged to operate upon the work.

It will be appreciated that the ability to shift the vise as a whole upon the block 60 transversely of the axis of the bolt 70 involves numerous advantages apparent to those skilled in the art. One advantage is, for instance, that a piece of work may be clamped in the vise while it is in the position illustrated in Fig. 1, for instance, and at which time the work may be vertically aligned with a vertically directed drill or the like, and it may thereafter be desirable to raise the work without requiring shifting of the base 10 relative to the part upon which it is supported and still keep the alignment of the work and the drill or the like. Were it not for the ability to shift the vise transversely with respect to the axis of the bolt 70 then, as the vise is raised and as illustrated in Fig. 6, it would necessarily be shifted laterally with respect to its original position as the arm 46 swings about the axis of the bolt 40. In the present case this lateral shifting movement may be offset by operating the screw 120 to return it to its originally vertically aligned relation with respect to the drill or the like.

It is to be particularly noted that the axes of the bolts 42 and 56 lie in a common plane, and that the axes of the bolt 42 and 70 lie in a common plane. Because of the fact that the vise is shiftable as a whole transversely of the axis of the bolt 70, any object clamped in the vise may be centralized with the axis of the bolt 70, and because of the co-planar relationship of the bolt 42 with the bolt 56 and with the bolt 70, the vise may be swung about the axis of the bolt 70 to present the work in the vise to a tool, without affecting the position of the work with respect to the tool except rotatably. Likewise, if the vise is swung 90°

about the axis of the bolt 42, to the position shown in Fig. 5, for instance, the work may be presented to the tool differently but in this case may be swung about the axis of the bolt 56 without changing the position of the work with respect to the tool, except rotatably.

Universal vises are often employed for supporting a cutting tool or cutting tool bit at the proper angle and position for operation thereon by a grinding wheel in order to sharpen it, and in many cases such grinders are provided with a magnetic table or chuck to which the universal vise is magnetically secured during the grinding operation. In the past such universal vises have been such that when applied to a magnetic table of the type described they are in themselves permanently or otherwise magnetized with the result that any chips, abrasions, or the like removed from the work adhere to the vise and from which it is relatively difficult to remove them, and this generally causes great inconvenience, trouble and loss of time. This disadvantage is overcome in connection with the vise shown by making the bushing 16 and the pin 22 of brass or other non-magnetic material which, combined with a spacing between the bottom of the post 20 and the bottom of the base 10, prevents any direct contact of any part of the structure except the base 10 with the magnetic table or chuck. Thus while the base 10 may become magnetized under such conditions the remaining portion of the vise structure will remain unmagnetized and, therefore, will be free of the disadvantages in this respect to which conventional universal vises are subjected under similar conditions. If, however, it is ever desired to have the vise magnetized for any reason whatever, it is only necessary to bridge the insulation bushing 16—18 with a piece of steel to short circuit the bushing, whereby the desired result will be obtained. Such piece of steel may be of any suitable character, but in the drawings by way of illustration is shown as a piece of strip steel 130 which is secured to the base 10 by a screw 132 and about which the strip 130 may be swung into, or out of, contact with the lower part of the block 26.

While reference heretofore has been made in all cases of the use of the vise for holding a piece of work for operation thereon by a cutter or the like, an important function of a vise constructed in accordance with the present invention is in connection with the vise structure itself serving as part of a cutting tool. This is particularly true in the use of the vise structure shown as a grinding wheel trimming device. In this connection it will be appreciated that if a diamond point is clamped in the vise proper and the nut 110 on the bolt 70 is loosened, then the vise with the diamond point may be swung about the axis of the bolt 70 and will carry the diamond point in an arc at which it may be desired to dress the face of a grinding wheel. Such arc may be varied to any radius desired either by shifting the position of the diamond point in the vise or by shifting the vise as a whole on the head 102 of the bolt 70. The vise may also be swung about any of its other pivotal axes if desired or necessary for this purpose. The vise structure as a whole may be suitably supported in relation to the grinding wheel whereby such movement may be obtained. On the other hand, the vise with the diamond point so supported may be employed to dress a flat surface on a grinding wheel and in any desired relation with

respect to the work. For instance, if it is desired to form a truly cylindrical surface on a grinding wheel the vise structure may be arranged so that rotation of the screw 120 will carry the point across the face of the grinding wheel in parallel relation with respect to its axis. On the other hand, the angularity of the face to be dressed may be varied with respect to the axis by simply rotating the vise proper about the axis of the bolt 42 to the desired angle and then the vise moved by the screw 120 to carry the diamond point over the wheel. On the other hand, movement of the vise with the diamond point about any of the other axes provided will provide additional movements of the diamond point at various radii or along a straight line at different angles as desired. This feature makes the vise of the present invention of increased utility as compared to universal vises of the conventional construction.

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Having thus described my invention what I claim by Letters Patent is:

In combination, a support, a bolt rotatably received by said support, a head on said bolt disposed with its axis perpendicular to the axis of said bolt, a vise having a base provided with an opening extending longitudinally thereof and a slot leading from said opening to the bottom face of said vise base, said head of said bolt being slidably received in said opening in said vise base and the body of said bolt being slidable longitudinally of said slot, a jaw member slidably received on said vise base, screw means cooperating between said vise base and said jaw member for moving said jaw member on said vise base, and screw means cooperating between said vise base and said head of said bolt for moving said vise bodily in the direction of the axis of said head of said bolt.

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