Aug. 2, 1932. A. W. SWANSON 1,869,631

WORKHOLDING VISE

Filed Feb. 5, 1931 2 Sheets-Sheet 1

Fig. 1.

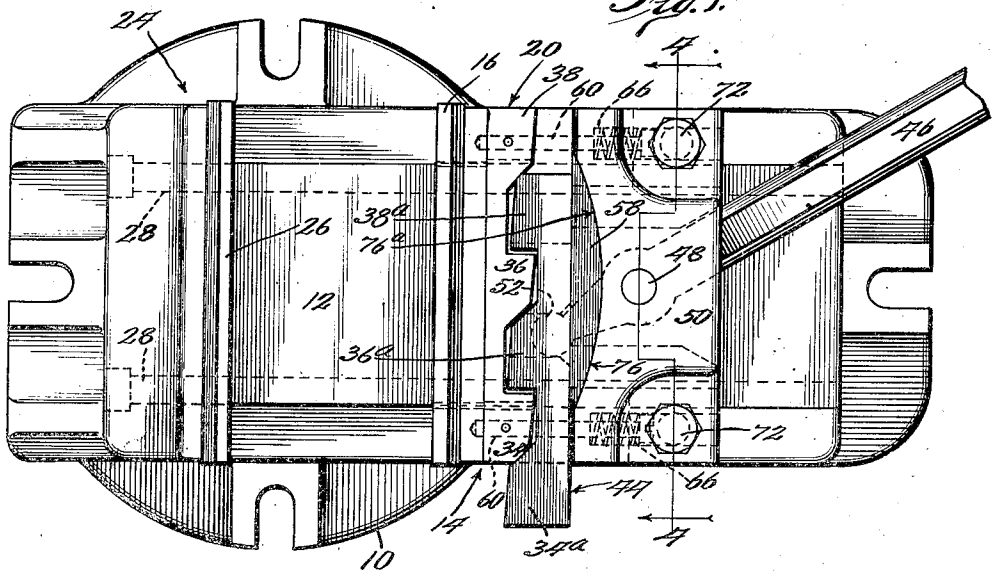
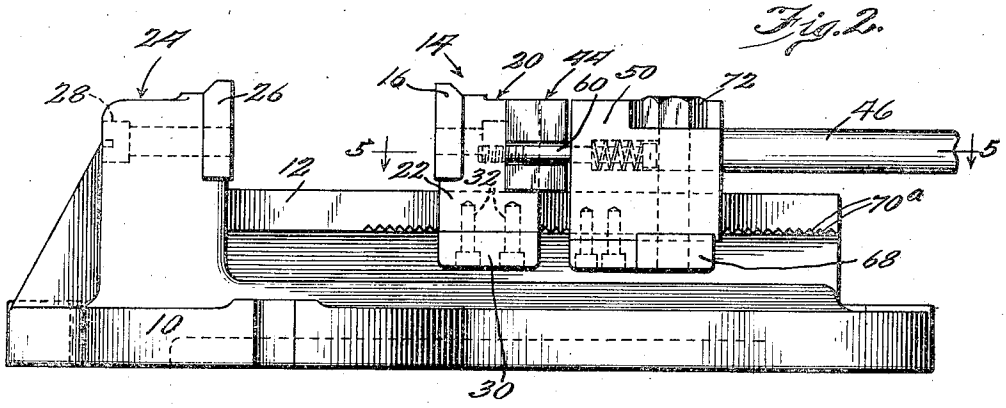


Fig. 2.



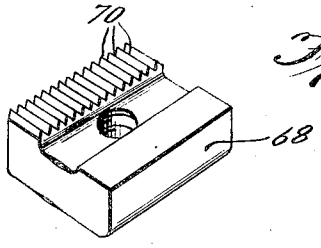


Fig. 3.

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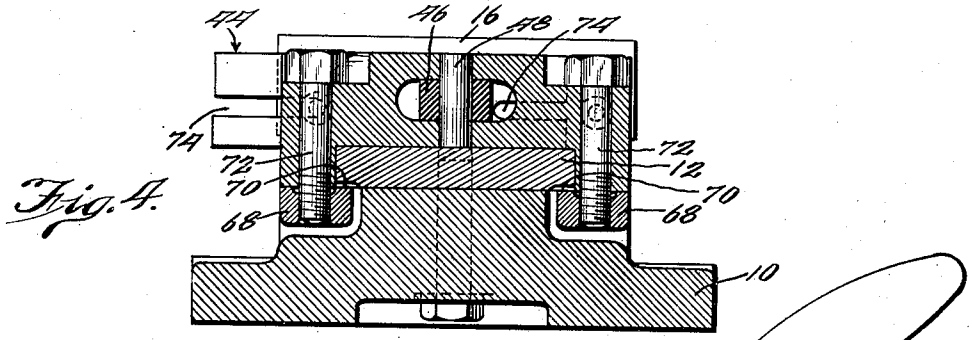

Fig. 4.

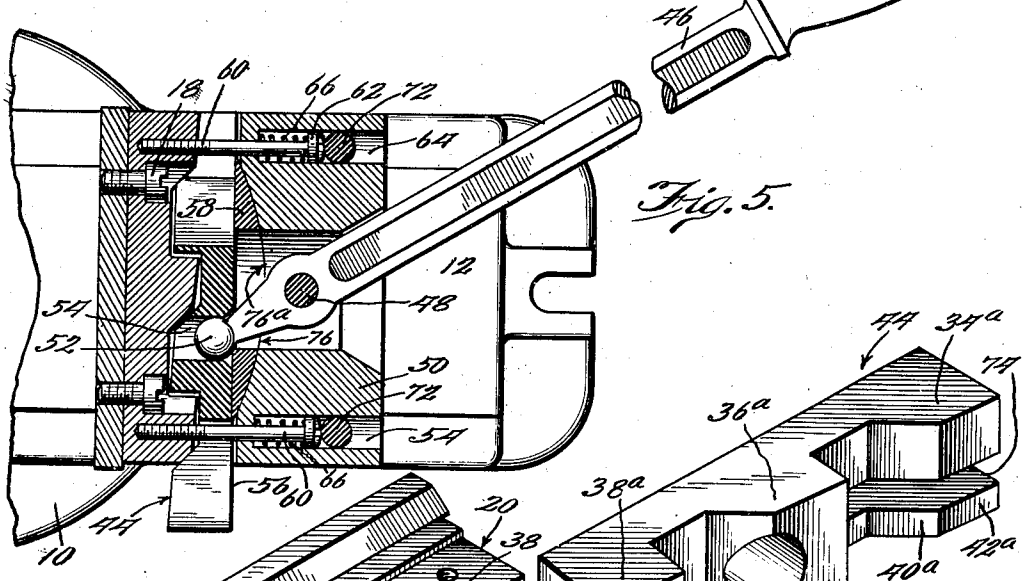

Fig. 5.

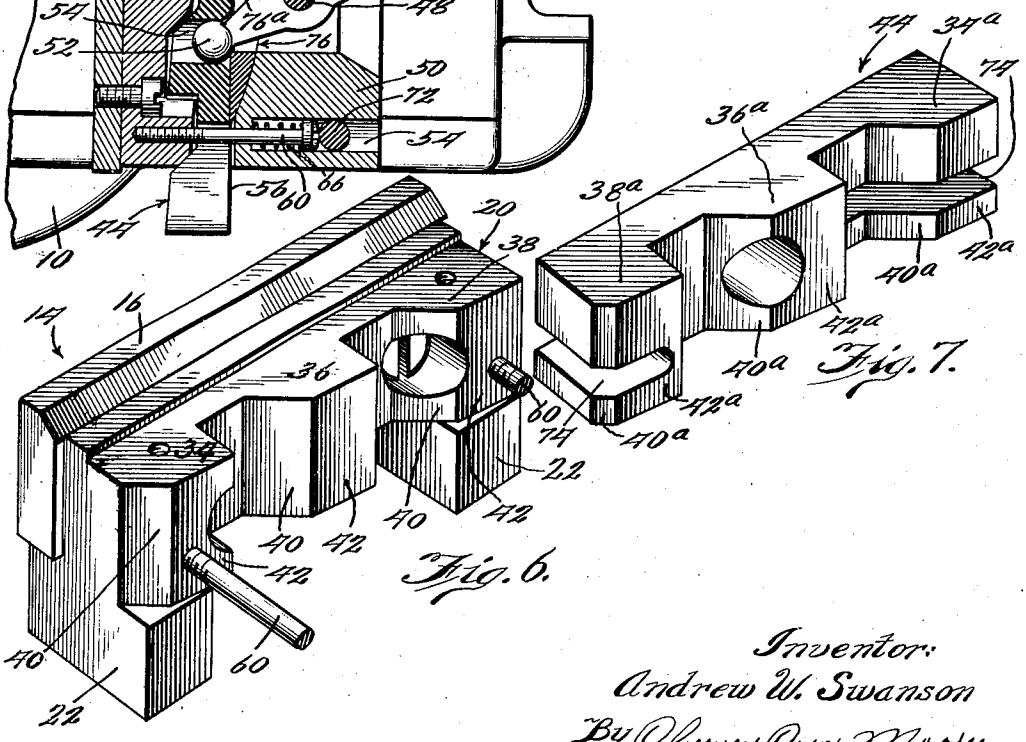

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE

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WORKHOLDING VISE

Application filed February 5, 1931. Serial No. 513,634.

My invention relates to work holding devices and more particularly to work holding vises and the like.

My present invention relates to the subject matter set forth in my co-pending application, Serial No. 447,481, filed April 26, 1930, now Patent Number 1,801,648 issued April 21, 1931, but presents certain improved structural characteristics not shown in said co-pending application.

It is one of the primary objects of my invention to provide an economically constructed and efficiently operable work holding means, in which work pieces may be quickly and rigidly secured in position.

More specifically, my invention contemplates the provision, in combination with a work gripping device adapted to experience a quick and then a retarded clamping movement, of improved means for effecting the automatic adjustment of the gripping means to conform with the contour of the work piece.

In order to accomplish this self-adjustment set forth above, I propose to provide, in combination with the gripping or clamping means, an arcuately formed member which may be shifted in order to vary the disposition of the surface of the clamping means in conformity with the surface of the work piece to be engaged.

Another object of my invention is to provide an improved work holding mechanism or vise as above set forth, in which improved means is provided for variously adjusting the distance between the jaws of said vise.

In addition to the above mentioned advantageous structural features, my invention contemplates the provision of a new and efficiently operable self-adjusting vise jaw, which may be quickly moved into engagement with a work piece and then firmly clamped thereagainst by the manipulation of a single control means or handle.

The foregoing and numerous other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawings, wherein—

Figure 1 is a plan view of a work holding mechanism or vise which is representative of one embodiment of my invention;

Figure 2 is a side elevational view of the device shown in Figure 1;

Figure 3 is a perspective view of one of the clamping elements employed to secure one of the vise jaws in various predetermined positions with respect to the other vise jaw;

Figure 4 is a transverse sectional view taken substantially along the line 4—4 of Figure 1;

Figure 5 is a fragmentary transverse sectional view of the clamping device taken substantially along the line 5—5 of Figure 2, the operating handle being shown in elevation;

Figure 6 is an enlarged perspective view of the shiftable vise jaw and its associated cam mechanism; and

Figure 7 is a perspective view disclosing the cam mechanism which cooperates with the cam mechanism of Figure 6.

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that one embodiment of my invention includes a suitable base 10. The upper surface of the base supports a guide plate 12, which slidably supports a vise jaw designated generally by the numeral 14. This vise jaw includes an upright jaw member 16, which is secured by means of screws 18, Figure 5, to a hardened jaw or cam mechanism 20. This cam mechanism 20 includes a pair of depending guide sections 22 which extend over the sides of the guide plate 12, as clearly shown in Figure 4. Thus, it will be apparent that the jaw or cam mechanism 20 may be shifted along the guide plate 12 toward and away from a companion vise jaw 24, which is formed integral with the base 10. This vise jaw 24 includes a hardened jaw plate 26 similar to the plate 16, and screws 28 serve to secure the plate 26 in position. Guide blocks 30 are secured to the underside of the guide sections 22 by means of bolts 32, Figure 2. These guide blocks cooperate with the sections 22 in guiding the jaw 14 as it is shifted along the guide plate 12.

The jaw or cam mechanism 20 is provided with a plurality of cam sections 34, 36, and

38. Each of these cam sections is provided with a cam surface 40, which is inclined at a considerable angle with respect to the clamping surface of the jaw plate 16, as clearly seen in Figures 5 and 6. Each of said sections is also provided with a cam surface 42, and these surfaces 42 are inclined at a considerably less angle with respect to the clamping surface of the jaw plate 16.

Cooperatively arranged with respect to the cam sections 34, 36, and 38 is a similar group of cam sections 34*a*, 36*a*, and 38*a*. These cam sections form a part of a shiftable cam or actuating mechanism or member designated generally by the numeral 44. The cam sections of this mechanism 44 are each provided with a surface 40*a* which corresponds in inclination with the surfaces 40 on the cam mechanism 20. Surfaces 42*a* are also provided which correspond in inclination and co-act with companion surfaces 42 on the mechanism 20. When the cam mechanisms or members 20 and 44 occupy the position shown in Figures 1 and 5, the cam section of one mechanism will extend within or occupy a nested relation with respect to the other mechanism. In other words, the cam sections of one mechanism present projections which are adapted to nest themselves within companion recesses in the other mechanism.

The cam mechanism 44 is shifted by means of an actuating handle or lever 46. This lever 46 pivots about a pin 48 mounted within a block 50, and the inner end of the lever 46 is provided with a spherical head 52, which is received by a cylindrical socket or aperture 54 provided in the mechanism 44 (see Figure 5). In order to continuously urge the cam surfaces of the mechanism 20 into engagement with the companion cam surfaces of the mechanism 44 and also to maintain contact between a surface 56 of the mechanism 44 and the adjacent surface of an arcuate bearing plates 58, I provide a pair of threaded pins 60. The threaded ends of these pins 60 are mounted within the cam mechanism 20, and the opposite ends thereof provided with a head 62 are positioned within cylindrical recesses 64 provided in a block 50. Suitable coiled springs 66 urge the heads 62 to the right. Figure 5, and thereby continuously maintain contact between the above mentioned cam surfaces. In this connection it should be understood that the bearing plate 58 is capable of only slight adjustment or movement. The very fact that the pins 60 are interposed between the block 50 and the cam member or mechanism 20 precludes the shifting of the parts to any great extent. In fact, in practice I have only provided approximately a sixty-fourth of an inch between the surface 56 of the mechanism or member 44 and the adjacent surface of the block 50. Sufficient clearance, however, is presented between the pins 60 and the companion apertures in the block 50, through which they extend. Also the inherent resiliency of the metal of the connecting elements is sufficient to permit of slight adjustment of the clamping plate 16 to accommodate slight variations in the surface contour of the work piece. In fact, it is an object of my invention to provide a very limited rocker action for the purpose of accommodating the above mentioned slight surface variations in the work piece. The block 50 may be adjustably secured along the guide plate 12 by means of suitable clamping blocks 68. Each of these blocks 68, Figure 3, is provided with serrations or teeth 70 which are adapted to interlock with companion serrations 70*a* provided along the underside of the plate 12. Bolts 72 which extend through the block 50 are employed to clamp the blocks 68 against the guide plate 12.

Assume that the cam mechanisms 20 and 44 are positioned as shown in Figures 1 and 5 and that a work piece is inserted between the jaw plates 16 and 26. By imparting a clockwise rotation to the handle 46, the cam mechanism 44 is shifted, and the co-action between the cam surfaces 40 and 40*a* causes the jaw mechanism 14 to be quickly moved toward the work piece. As the jaw plate 16 approximates the work piece, the companion cam surfaces 42 and 42*a* co-act to impart a slow clamping movement to said jaw plate, thereby effecting the firm gripping of the work piece between the vise jaws. In other words, the pitch of the cam surfaces 40 and 40*a* being greater than the pitch of the surfaces 42 and 42*a* causes a rapid approach of the movable vise jaw, and the lesser pitch of the cam surfaces 42 and 42*a* causes said movable jaw to experience a relatively slow clamping action. The cam mechanism 44 is provided with slots or recesses 74 in order to clear the pins 60 during the shifting thereof.

In order to render the movable vise jaw, and particularly the plate 16 thereof, self-conformable to the inclination of the surface of the work piece, I provide the plate or segment 58. This plate is provided with a flat bearing surface for the adjacent surface 56 of the cam mechanism 44, Figure 5, and is also provided with an arcuate surface 76, which slidably bears against a companion arcuate surface 76*a* on the block 50. This presents a very simple and convenient device for automatically or manually adjusting the position of the vise jaw mechanism 14 and particularly the work clamping plate 16 thereof. The arc presented by the surfaces 76 and 76*a* is sufficiently gradual in curvature to provide a rather extensive bearing surface within the block 50. In other words, if an arc of considerably smaller radius were employed, the size of the surface would necessarily be descreased and a slight shifting

of the surface 76 would impart a considerable movement to the clamping surface of the vise jaw. By employing my extensive and hence gradual arcuate surface, the vise jaw 14 may be very sensitively adjusted to accommodate small variations in surface contours of the work piece. Furthermore, sufficient frictional contact is presented by reason of the engaging surfaces 76 and 76*a* to prevent inadvertent shifting of the member 58 with respect to the block 50. Also, by having the surfaces 76 and 76*a* forming a part of a gradual arc, these surfaces are adapted to extend over substantially the entire width of the block 50, and thus present a very firm bearing for the vise jaw 14. It should be noted also that by having the radius of the arc of the segment 58 of considerable length, as for example of a length which extends beyond the clamping surface of the plate 16, as clearly shown in the drawings, I am not only able to provide a gradual and extensive arcuate bearing surface, but also a substantially flat bearing surface to permit the cam mechanism or member 44 to be reciprocated thereon.

From the foregoing it will be apparent that my invention contemplates the provision of a new and improved work clamping means, in which a work piece may be quickly clamped and unclamped with a minimum amount of effort on the part of an operator. If a series of work pieces of similar shape are to be successively clamped and unclamped in a device of the type described above, the block 50 may first be set by loosening the clamping screws 72 so as to set the jaw plate 16 at the proper distance from the plate 26. Thus, as the handle 46 is actuated to suddenly move the jaw plate 16 toward the work piece, said plate will approximate the adjacent surface of the work piece just as the slow pitch or slightly tapered surfaces 42 and 42*a* are moved into association with each other. In this way it is only necessary during each clamping and unclamping operation to move the vise jaw a distance corresponding to the throw of the cam surfaces 40 and 40*a* and a portion of the slight throw of the cam surfaces 42 and 42*a*. The springs 66 serve to automatically urge the vise jaw 14 away from the work piece when the control handle 46 is shifted so as to move the cam mechanism 44 into nested relation with the mechanism 20, as clearly shown in Figures 1 and 5. As stated above, the member 58 provides a very convenient means for effecting the self-adjustment of the shiftable vise jaw to accommodate slight variations in the contour of the work piece. The entire structure may be very economically produced by the practice of conventional machine shop methods, and all of the parts cooperate to present a very sturdy and durable work clamping device. The member 58 may be referred to as a compensating member as said member compensates for a slight variation in surface disposition or inclination of the work piece. The block 50 provides an effective abutment for the compensating member 58, and the combination of the member 58 and the block 50 presents what may be referred to as an abutment against which the actuating device or cam mechanism 44 operates to impart movement to the vise jaw.

Obviously changes in form from the specific design shown in the drawings may be made without departing from the spirit and scope of the appended claims.

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

1. A clamping mechanism of the class described including a support, clamping means on said support adapted to be shifted toward and away from a work piece, a bearing member having an arcuate surface, and a member slidable upon said bearing member for effecting the actuation of said clamping means, the arcuate surface of said bearing member rendering said clamping means self-adjustable to conform with slight differences in the contour of the work to be clamped.

2. In a clamping mechanism of the class described, a support, a clamping member arranged for movement relative to said support, an actuating member shiftable in a direction transverse to the direction of movement of the clamping member, and a bearing device upon which said actuating member is slidable, said bearing device being shiftable to enable the adjustment of said clamping member to conform with slight variations in the surface disposition of the work piece to be clamped.

3. In a clamping mechanism of the class described, a support, a clamping member arranged for movement relative to said support, an actuating member shiftable in a direction transverse to the direction of movement of the clamping member, and a bearing device upon which said actuating member is slidable, said bearing device having an arcuate bearing surface and being shiftable to enable the adjustment of said clamping member to conform with slight variations in the surface disposition of the work piece to be clamped.

4. In a device of the class described a pair of clamping jaws, at least one of which is relatively movable with respect to the other for clamping and releasing the work, and a pair of cooperating members one of which is shiftable with the movable jaw, the other of said members constituting a jaw actuating member, one of said cooperating members having cams of similar pitch at different points transversely with respect to the line of travel of the movable jaw, other cams having

a pitch differing from the first mentioned pitch for effecting a variation in the relative movement of said clamping jaws, and a bearing member having an arcuate surface cooperatively arranged with respect to one of said members to enable one of the clamp jaws to conform with slight variations in the surface contour of work pieces acted upon by said jaws.

In witness whereof, I have hereunto subscribed my name.

ANDREW W. SWANSON.