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HYDRAULIC MACHINE VISE HAVING CYLINDER-ADVANCED SPRING-RETRACTED JAW-OPERATING SCREW

Original Filed July 20, 1953

FIG. 1

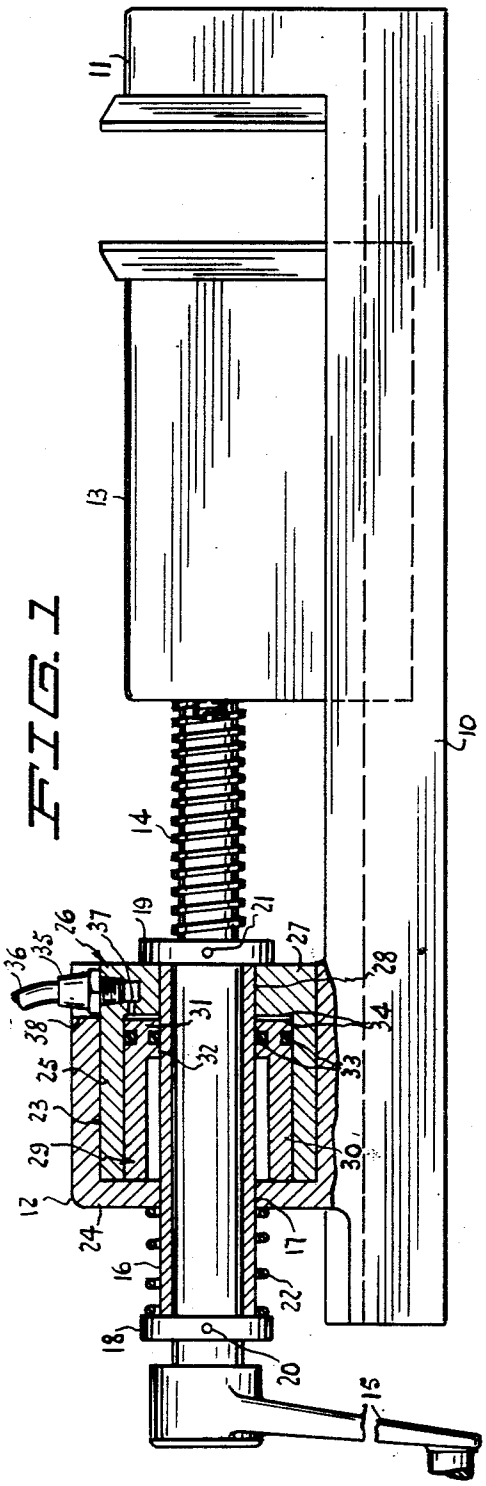
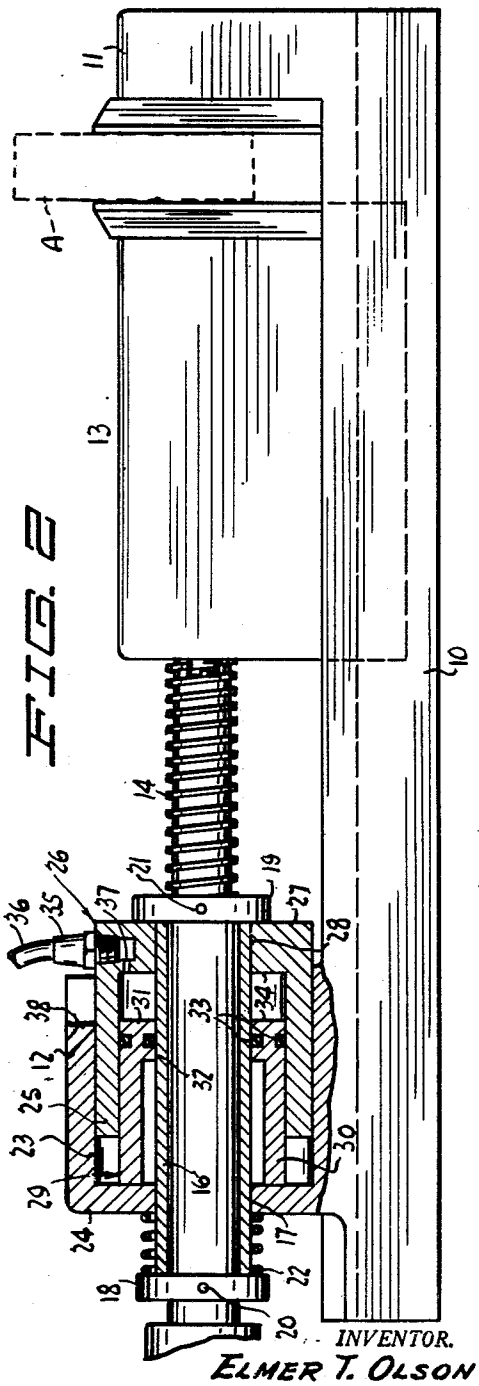


FIG. 2



INVENTOR.
ELMER T. OLSON
BY
Carlson & Hogle
ATTORNEYS

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HYDRAULIC MACHINE VISE HAVING CYLINDER-ADVANCED SPRING-RETRACTED JAW-OPERATING SCREW

Elmer T. Olson, Minneapolis, Minn., assignor of one-half to William J. Rawitzer, Minneapolis, Minn.

Original application July 20, 1953, Serial No. 368,928, now Patent No. 2,693,727, dated November 9, 1954. Divided and this application June 29, 1954, Serial No. 440,149

3 Claims. (Cl. 81—17.2)

This invention relates to improvements in combination manual and fluid-actuated work-holding vises and is a division from my prior application Serial No. 368,928, filed July 20, 1953, for Hydraulic Vise, and now Patent No. 2,693,727, issued November 9, 1954.

In my prior application, in addition to a disclosure of the type of vise herein described and claimed, there is a claimed disclosure of a bench type of work-holding vise which is commonly secured to a work bench and used for holding various types of work while it is filed or otherwise worked upon. It is very desirable, in order to speed up and make much easier the operation of such vises, to provide for a rough manual adjustment of the spacing between the jaws and then to utilize a quick-acting fluid-operated means for finally closing the jaws upon the work, this being particularly the case where a large number of workpieces of the same dimensions are to be handled in succession. My present invention has as its primary object to provide a combination manual and fluid-operated vise of the type commonly known as a machine vise, for the reason that it is used upon a drill press, milling machine or the like, for holding the work while it is drilled, milled, etc. In this type of vise dimensions are important since there is often but little clearance to be spared between the bed of the machine and the tool, and it is a further object of my invention to provide means for fluid actuating the vise which does not increase its size while still providing for jaw pressures sufficient to hold the work under all circumstances. Still another object of my invention is to provide fluid-actuating means for a vise of this character which is readily adapted to machine vises as they are presently constructed, making the invention not only applicable to the initial fabrication of new vises with a minimum of added expense but also rendering the invention capable of being added to existing vises with a minimum of alteration thereof.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a side elevation, partially in section, showing a machine vise fitted with fluid-actuating means according to my invention, the movable jaw in this case being shown as roughly adjusted by means of a hand screw to a position which will receive the workpiece between the jaws.

Fig. 2 is a similar view but showing the movable jaw urged into engagement with the workpiece by the fluid-actuating means.

Referring now more particularly and by reference characters to the drawing, the machine vise chosen for illustration conventionally comprises a base **10** upon one end portion of which is a stationary jaw **11** and adjacent the opposite end of which is a stationary, upstanding lug **12**. In a completely conventional manner a movable jaw **13** is reciprocably mounted upon the base **10** between the stationary jaw **11** and the lug **12** for movement toward and away from the former for receiving and clamping

the work. In the ordinary vise this movement of the jaw **13** is accomplished by means of a hand screw **14** extending through the lug **12** and provided with a handle **15** at what may be regarded as the forward end of the vise. The hand screw **14** is threaded into the jaw **13** and in some manner is held against axial displacement through the lug **12** so that turning the handle **15** will slide the jaw **13** toward or away from the stationary jaw **11**. This type of vise per se is, of course, well known and functions satisfactorily except that for production work where large numbers of similar workpieces must be handled, it is desirable that means be provided for more rapid closing of the jaws, which labor saving function I obtain by provision of the fluid-actuating mechanism next to be described. It is to be noted, however, that the application of the fluid-actuating mechanism does not in any way interfere with the normal screw actuation of the vise and the same may still be used for manual operation and, of course, may be pre-set to any rough adjustment by operation of the hand screw.

As stated above, the hand screw **14** extends through the lug **12** and in accordance with my invention the screw is preferably enclosed within a smooth sleeve **16** sized to fit an opening **17** through the lug. The length of the sleeve **16**, as measured axially of the screw, is considerably longer than the corresponding dimension of the lug **12** and collars **18** and **19** are pinned, as designated at **20** and **21** respectively, to the screw at opposite ends of the sleeve to prevent endwise movement thereof relative to the screw. An expansion coil spring **22** is braced between the forward end of the lug **12** and the collar **18** in order to bias the screw **14** and the attached jaw **13** in a direction away from the stationary jaw **11**, thus to normally open the vise to the maximum distance permitted by the adjustment of the hand screw at any given time. Such movement of the jaw **13** under the influence of the spring **22** is limited by the collar **19**, as will presently appear, and it will be readily observed that while the hand screw is permitted spring-biased sliding movement through the lug **12**, nevertheless the movable jaw **13** may be adjusted by operation of the handle **15** in exactly the same fashion as in the ordinary machine vise.

In addition to the opening **17** the lug **12** is bored out coaxially with the screw **14** to form a cylindrical recess **23** which opens through the end of the lug **12** facing the jaw but is closed at the forward end **24** of the lug. Said recess **23** slidably accommodates the cylindrical skirt **25** of a cylinder **26** which is open at one end but is closed at the other end **27** except for an opening **28** which slidably fits the sleeve **16**. As clearly shown in the drawing, this end **27** of the cylinder **26** forms the surface contacted by the collar **19** to limit opening movement of the vise jaws as heretofore described, the cylinder being in effect braced against the collar **19**. The internal diameter of the skirt **25** of the cylinder is substantially larger than the diameter of the sleeve **16** and telescopically fitted within the skirt is a piston **29** shaped very similarly to the cylinder **26** but, of course, smaller as to diameter and length. Thus the piston **29** has a cylindrical skirt **30** and is open at the end remote from the vise jaws and closed at the opposite end **31** except for an opening **32** which is slidably engaged by the sleeve **16**. Slidably engageable fluid seals, such as O-rings **33**, are provided between the piston **29** and the sleeve **16** and between the piston and the interior of the skirt **25** of the cylinder **26**.

In the normal position of the parts shown in Fig. 1 the cylinder **26** is telescoped over the piston **29** and the parts fit into the lug **12**, but the shape of the elements **26** and **29** is such that opposed annular end surfaces **34** are provided, these surfaces being spaced to provide a chamber into which fluid under pressure may be intro-

duced through a conventional fitting 35 and flexible hose 36. Said fitting is screwed into the end of the cylinder 26 and communicates through a port 37 with said chamber, said fitting being here shown for convenience as extending from the top of the cylinder although in actual practice it may be disposed at the side. A notch 38 is formed in the lug 12 to clear the fitting 35 whenever the cylinder 26 moves into or out of its retracted position.

In the operation of the vise the same may be adjusted by the hand screw 14 to any rough adjustment at which the distance between the jaws 11—13 will readily accommodate the work piece. From that point on in production work upon similar workpieces it is only necessary for the operator of the machine to operate a valve (not shown) which will admit fluid under pressure to the fitting 35, the port 37 and the chamber between the surfaces 34 each time a workpiece is placed between the jaws. The cylinder 26 will be advanced by the thrust of this fluid upon said surfaces 34 in such fashion that the movable jaw 13 will be closed upon the workpiece, designated at A in dotted lines in Fig. 2. It will, of course, be understood that the advancing cylinder 26 engages the collar 19 to correspondingly move the hand screw 14 and the attached jaw 13. When work is completed the fluid is permitted to return to a reservoir (also not shown) and the spring 22 will immediately re-open the vise ready for the next operation. Thus it will be seen that I have provided an extremely simple and compact fluid motor along with means for assembling the same into the ordinary type of machine vise in order to obtain all of the advantages of a combination mechanical and hydraulic vise with a minimum of added expense and with no real change in the normal dimensions of the vise itself.

While I have not herein shown any particular type of fluid supply system for the vise, it will in many instances be desirable to utilize the combination air-hydraulic cylinder such as disclosed in my parent application previously identified. I do not, however, limit myself to such operation of the vise and where adequate fluid pressures are readily available, they may, of course, be utilized.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the function and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. A vise of the character described having a base, a stationary jaw and a lug spaced apart upon the base, a movable jaw reciprocably mounted on the base between the lug and stationary jaw for movement toward and away from the latter, a hand screw extending through the lug and threadedly connected to the movable jaw, means for limiting axial movement of the screw with respect to the lug in one direction whereby rotation of the screw will move the movable jaw toward the stationary jaw, said lug having a cylindrical recess coaxial with the screw and open at one end toward the movable jaw, a piston slidably receiving the screw and braced against the opposite end of the said recess, a cylinder telescoped over the piston and fitted into the recess and connected to the screw, the piston and cylinder having annular end surfaces in facing relation, and means for supplying fluid under pressure between said end surfaces to thrust the cylinder axially with respect to the piston and thereby force the movable jaw toward the stationary jaw.

2. In a vise of the character described having a base, a stationary jaw and a lug spaced apart upon the base, a movable jaw reciprocably mounted on the base between the lug and stationary jaw for movement toward and away from the latter, a hand screw extending through the lug and threadedly connected to the movable jaw, a collar secured on the screw for limiting axial movement of the same with respect to the lug in one direction whereby rotation of the screw will move the movable jaw toward the stationary jaw, said lug having a cylindrical recess coaxial with the screw and open at one end toward the movable jaw, a piston slidably receiving the screw and braced against the opposite end of the said recess, a cylinder telescoped over the piston and fitted into the recess and braced against the collar on the screw, the piston and cylinder having annular end surfaces in facing relation, and means for supplying fluid under pressure between said end surfaces to thrust the cylinder axially with respect to the piston and thereby force the movable jaw toward the stationary jaw.

3. In a vise of the character described having a base, a stationary jaw and a lug spaced apart upon the base, a movable jaw reciprocably mounted on the base between the lug and stationary jaw for movement toward and away from the latter, a hand screw extending through the lug and threadedly connected to the movable jaw, a sleeve positioned on the screw and extending through the lug, collars secured to the screw at opposite ends of the sleeve, one collar limiting axial movement of the screw with respect to the lug in one direction whereby rotation of the screw will move the movable jaw toward the stationary jaw, a spring braced between the other collar and the lug to normally open the vise, said lug having a cylindrical recess coaxial with the screw and open at one end toward the movable jaw, a piston slidably receiving the sleeve and braced against the opposite end of the said recess, a cylinder telescoped over the piston and fitted into the recess and braced upon the collar which limits movement of the screw, the piston and cylinder having annular end surfaces in facing relation, and means for supplying fluid under pressure between said end surfaces to thrust the cylinder axially with respect to the piston and thereby force the movable jaw toward the stationary jaw.

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