July 8, 1952 J. G. MOOHL ET AL 2,602,215

STOCK CLAMP

Filed Jan. 18, 1947 2 SHEETS—SHEET 1

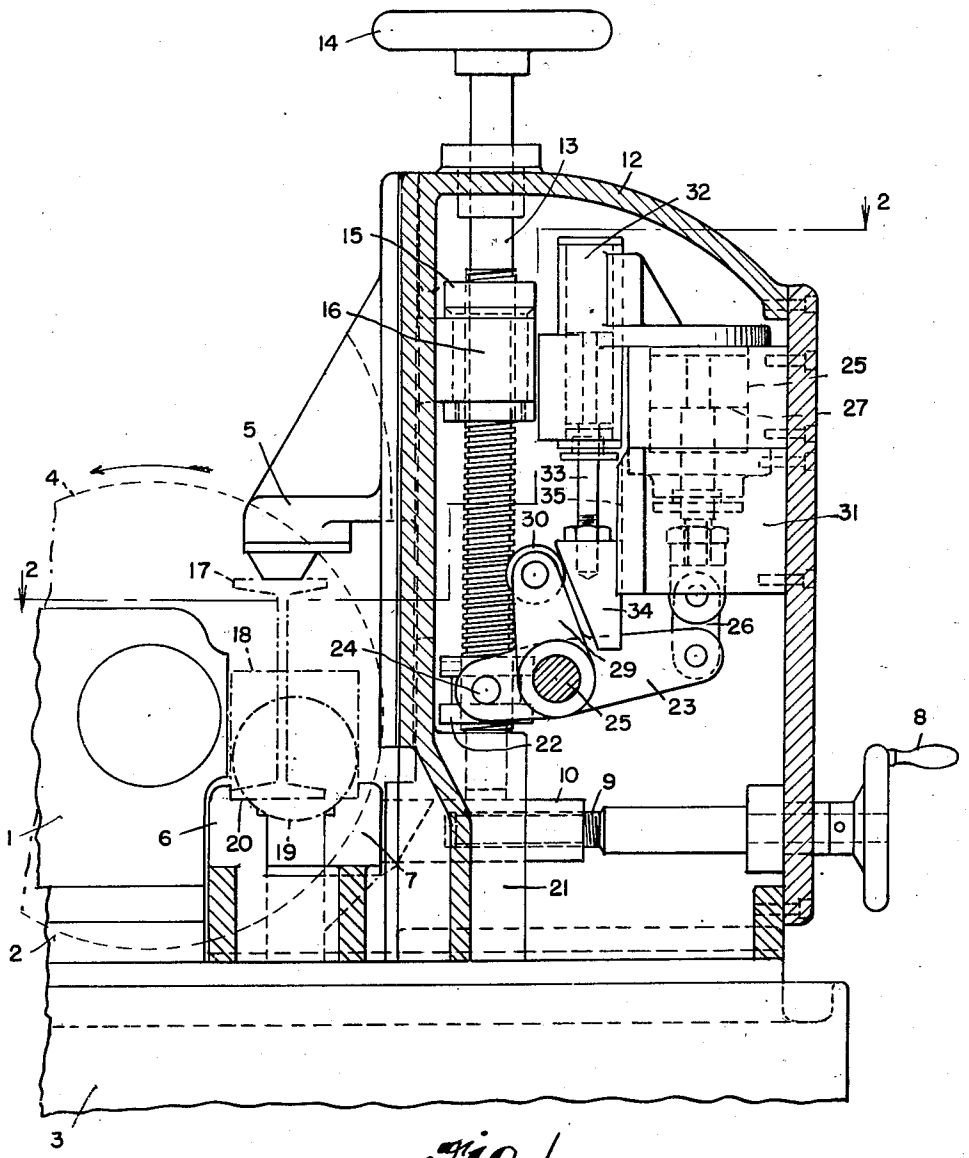


Fig. 1

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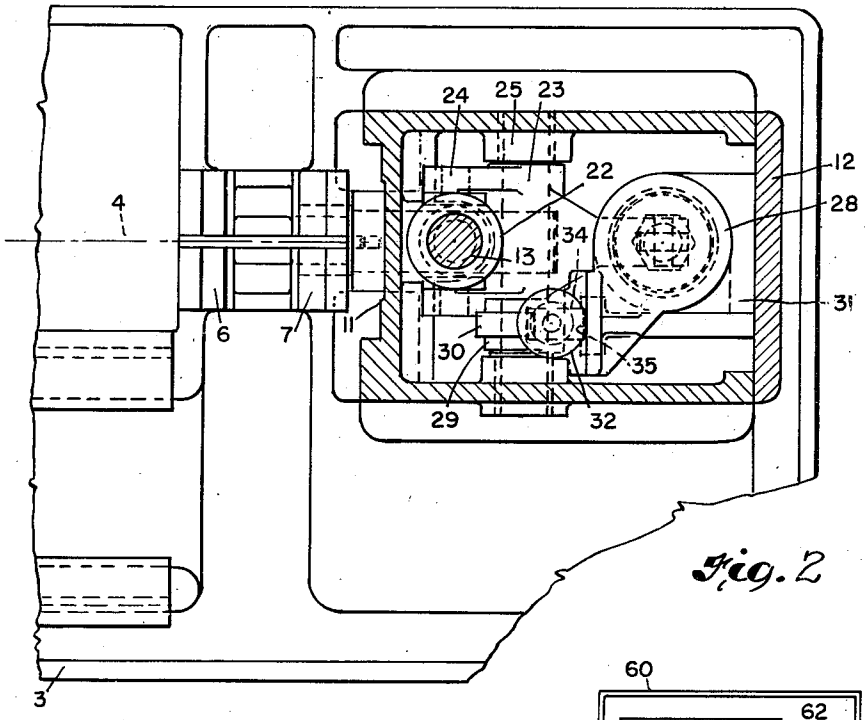


Fig. 2

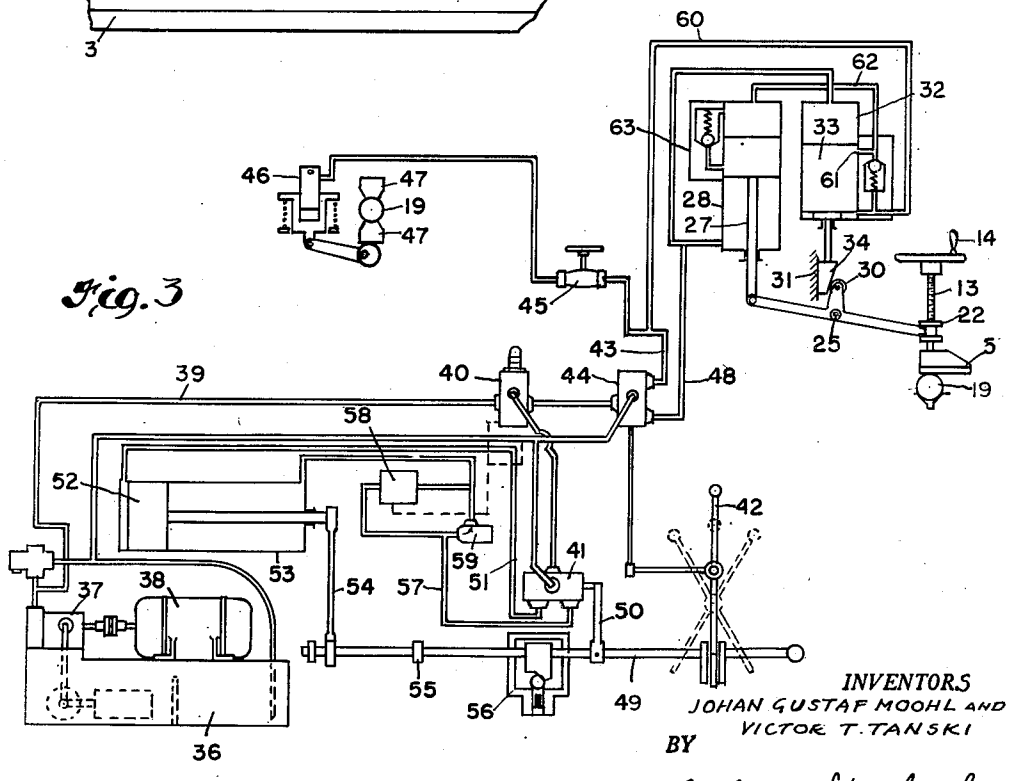


Fig. 3

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UNITED STATES PATENT OFFICE

2,602,215

STOCK CLAMP

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6 Claims. (Cl. 29—69)

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This invention relates as indicated to an improved stock clamp for sawing machines and the like and more particularly to clamping mechanism adapted to be quickly and automatically moved into clamping position and then firmly locked against displacement during the performance of an operation upon the workpiece.

Column clamps of the nature described and illustrated in Moohl Patent No. 2,327,920 are adapted to be quickly adjusted to different sizes of stock and may then be rapidly clamped and unclamped through action of a fluid pressure cylinder. Such fluid pressure actuating means is additionally advantageous in that it lends itself to adaptation in the system of controls whereby the sawing machine may be automatically operated. It has been found advantageous to rotate the rotary saw blade of the machine in such direction that it will cut upwardly into the work. While this helps to maintain the saw carriage firmly seated in the ways, it obviously causes considerable pressure to be exerted against the reciprocable upper jaw of the clamp. Since such jaw is held in clamping engagement with the work through the exercise of fluid pressure, there will be a tendency toward chattering as the saw cuts therethrough.

It is, therefore, a primary object of this invention to provide clamping means adapted to be reciprocated rapidly into clamping engagement by action of fluid pressure means, but which will then be mechanically locked to prevent such chatter.

It is a further object of this invention to provide such locking means which will automatically lock the reciprocable clamping member the moment it enters into clamping engagement with the stock.

Still another object of this invention is to provide means for automatically unlocking such clamping member prior to reciprocation thereof out of clamping position.

Other objects of this invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings;

Fig. 1 is a vertical sectional view of a column clamp for a metal sawing machine constructed in accordance with our invention;

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Fig. 2 is a horizontal sectional view taken along the line 2—2 on Fig. 1; and

Fig. 3 is a diagrammatic layout of a fluid pressure system whereby such mechanism is adapted to be automatically operated.

Referring now more particularly to said drawing, a saw carriage 1 is mounted on ways 2 carried by base frame 3 of an automatic sawing machine. The saw 4 indicated in dash lines on Fig. 1 is adapted to be driven in a counter-clockwise direction as viewed in such figure. Such saw carriage is reciprocable toward and away from a column clamp comprising vertically reciprocable upper jaw member 5 and a lower jaw comprising two relatively laterally adjustable members 6 and 7. Both the upper and lower jaws are vertically divided into two clamping portions adapted to receive the saw therebetween when the saw carriage is advanced to make a cut. Lower jaw member 6 is fixed to the base 3 of the machine and member 7 is adapted to be reciprocated into desired adjusted position relative thereto by means of hand wheel 8 through which threaded shaft 9 may be rotated in boss 10 on said member.

Upper jaw 5 is adapted to be vertically reciprocated along a slide-way 11 in the front of housing 12. Member 5 is supported by and is adapted to be vertically positioned by a screw shaft 13 provided with a hand wheel 14, such screw shaft threadably engaging in a quill 15 which is rotatably mounted but longitudinally fixed in a sleeve 16 integral with jaw 5. It will thus be seen that by rotation of hand wheels 8 and 14, lower jaw member 7 may be laterally positioned and upper jaw 5 vertically positioned to accommodate a variety of stock shapes such as I-beam 17, square bar 18 and round bar 19. Lower jaw members 6 and 7 are provided with corresponding steps such as 20 in their opposed faces to receive various sizes of stock and the edges of one pair of steps are beveled to accommodate the round bar stock 19. The use of removable inserts to accommodate various types of stock is thereby avoided.

The lower end of shaft 13 is journaled in a boss 21 within housing 12 and a collar 22 is secured to such shaft as by means of a set screw adjacent such lower end. A shifter crank 23 carrying a yoke 24 engaged in the peripheral groove of collar 22 is mounted for oscillation about horizontal shaft 25. The other end of such crank is connected through link 26 with an extension of piston 27 of fluid pressure cylin-

der 26. An upstanding arm 29 is formed integrally with crank 23 and carries a roller 30 at the end thereof. Above such arm and supported by the same bracket 31 which supports cylinder 28 is a second smaller cylinder 32. The downwardly projecting extension 33 of the piston of such latter cylinder carries a wedge 34 adapted to engage roller 30 with its inclined face and to bear against a guide-way 35 in a bracket 31 with its opposite face. It will thus be seen that when such wedge is in engagement with roller 30, as shown in Fig. 1, crank 23 is mechanically locked against clockwise rotation about shaft 25. As a result, when stock is fed through the clamp of this invention between lower jaw members 6 and 7 and upper jaw 5, such upper jaw may be brought down into clamping engagement with the workpiece through action of fluid pressure in cylinder 28, rocking crank 23 in a counterclockwise direction. As such crank thus rocks, wedge 34 descends in continual engagement with bracket 31 and roller 30 under the influence of fluid pressure in cylinder 32. Thus fluid pressure means is employed to reciprocate the upper jaw 5 into and out of clamping engagement with the work and also to supply the necessary gripping pressure to such jaw, but such jaw will be mechanically locked in tight clamping engagement with the work so as to be fixed against any yielding or chattering which might otherwise occur as the saw cuts upwardly through the work.

Referring now more particularly to Fig. 3 of the drawing, the fluid pressure system for operating our new clamp is there diagrammatically illustrated in association with the sawing machine operating means. Hydraulic fluid, such as oil, is pumped from sump 36 by pump 37 driven by motor 38 into pressure line 39 and thence through pressure sequence valve 40 to 4-way valve 41. To start operation after setting up the machine, the operator shifts control handle 42 to connect line 43 with such pressure line through valve 44, hand valve 45 having already been opened. Fluid pressure in line 43 thereupon operates piston-cylinder assembly 46 to clamp the stock 19 between the jaws 47 of the stock feeding mechanism. The stock will then be fed the desired distance past the saw blade either manually or, in the case of completely automatic operation, by additional fluid pressure means (not shown).

The operator next shifts control 42 to connect line 48 to pressure through valve 44, thereby admitting fluid pressure simultaneously into cylinders 28 and 32 and causing clamp jaw 5 to be reciprocated into clamping engagement with the stock 19 and locked in such position. This same shifting of control 42 reciprocates rod 49 and attached arm 50 to shift valve 41, admitting fluid pressure to line 51. Valve 40, however, will not be over-balanced to admit fluid pressure to valve 41 until the pistons in cylinders 28 and 32 have ceased to travel and pressure is built up in line 48. As will be seen it is thus impossible for the saw carriage to start forward to make a cut until the work has been firmly clamped. Fluid pressure in line 51 operates to reciprocate piston 52 in saw carriage feed cylinder 53 to advance such carriage. When the cut has been completed arm 54 will engage adjustable stop 55 on rod 49 and return said rod, thereby reversing valve 41 with a snap action afforded by trip box 56 and connecting line 57 to pressure.

During the advance of the saw carriage the rate of such advance was regulated by escape of fluid from the other side of piston 52 through flow control valve 58. Now when pressure is applied to line 57 and line 51 is connected to relief the saw carriage will be rapidly returned by passage of fluid through check valve 59.

The return of rod 49 also shifts control 42 to reverse valve 44, connecting line 43 to pressure. This again causes feed gripper 47, which in the meantime has been returned by the operator, to seize the stock. Fluid pressure in line 60 first returns piston 33, withdrawing wedge 34, and when such piston has retreated sufficiently to uncover port 61 fluid pressure is admitted to line 62 to reciprocate piston 27 in cylinder 28, thereby elevating clamp jaw 5. It will thus be seen that during the clamping operation both pistons are reciprocated simultaneously, advancing the wedge as the jaw is lowered, but when the clamp is to be released the pistons are automatically reciprocated in sequence, the wedge being first withdrawn.

The by-pass and check valve 63 is a safety feature which prevents advancing of the saw carriage should the column clamp fail to seize the work. Thus, should jaw 5 not be positioned properly by handwheel 14 the movement of piston 27 might be insufficient to bring such jaw into tight engagement with the stock. Reciprocation of such piston beyond such by-pass will permit the fluid to escape to relief and sufficient pressure will not be built up in line 48 to overbalance valve 40 to admit fluid pressure to valve 41. As soon as the operator properly adjusts wheel 14 so that jaw 5 can be moved into firm clamping engagement with the work the operation will resume.

While hydraulic fluid such as oil will ordinarily be employed it will be seen that since jaw 5 is mechanically locked in clamping position air pressure may be utilized to operate the same, if desired. The divided jaws of the clamp hold the end portion of the stock being cut off and prevent rotation and burring of such section as the cut nears completion.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

We therefore particularly point out and distinctly claim as our invention:

1. In combination with a metal sawing machine operative to cut upwardly into a workpiece, a work holding clamp including a vertically reciprocable upper clamp member, pivotally mounted lever means connected with and operative to reciprocate said clamp member in response to rocking movement of said lever, fluid pressure means connected with and operative to rock said lever, wedge means operative to engage said lever and prevent rocking movement thereof in a direction to retract said upper clamp member, thereby mechanically to lock said upper clamp member in clamping position, and separate fluid pressure means connected with and operative to advance said wedge means as said upper clamp member is advanced into clamping position and to withdraw said wedge means prior to actuation of said first-named fluid pressure means to retract said clamp member from clamping position.

2. In a work-holding clamp, a first jaw member, a reciprocable jaw member opposed thereto, jaw-operating means including fluid-pressure means and a mechanical element adapted to be reciprocated thereby, operative to shift said second jaw member into and out of clamping posi-

tion relative to said first jaw member, wedge means adapted to engage said element to prevent movement thereof in a direction to unclamp said second jaw member, and separate fluid-pressure means operative to advance said wedge means closely to follow said element as the latter is reciprocated to shift said second jaw member toward clamping position and to withdraw said wedge means independently of actuation of said element whereby the latter may at once thereafter operate to unclamp the work.

3. In a work-holding clamp, a lower jaw member, a vertically reciprocable upper jaw member opposed thereto, a vertically disposed axially reciprocable and rotatable shaft threadedly engaging said upper jaw member for adjustably positioning the latter therealong, a pivotally mounted lever connected with and adapted thus axially to reciprocate said shaft, fluid-pressure means connected with and operative to rock said lever to reciprocate said shaft and said upper jaw member into and out of work holding position, an arm on said lever, a fixed straight guideway, wedge means interposed between said lever and guideway adapted to engage said lever to prevent movement thereof in a direction to unclamp said upper jaw member, and separate fluid-pressure means operative to withdraw said wedge means to permit said first-named fluid-pressure means at once to rock said lever to unclamp the work.

4. In a work-holding clamp, a lower jaw member, a vertically reciprocable upper jaw member opposed thereto, a pivotally mounted lever adapted thus to reciprocate said upper jaw member, fluid-pressure means connected with an operative to rock said lever to reciprocate said upper jaw member into and out of work-holding position, a fixed straight guideway, reciprocable wedge means interposed between said lever and guideway adapted to engage said lever to prevent movement thereof in a direction to unclamp said upper jaw member, and separate fluid-pressure means operative to advance said wedge means closely to follow said lever as the latter is rocked to shift said upper jaw member toward clamping position and to withdraw said wedge means independently of actuation of said lever whereby the latter may at once thereafter operate to unclamp the work.

5. In a work-holding clamp, a lower jaw member, a vertically reciprocable upper jaw member opposed thereto, a pivotally mounted lever adapted thus to reciprocate said upper jaw member, fluid-pressure means connected with and operative to rock said lever to reciprocate said upper jaw member into and out of work holding position, a fixed straight guideway, reciprocable wedge means interposed between said lever and guideway adapted to engage said lever to prevent movement thereof in a direction to unclamp said upper jaw member, separate fluid-pressure means operative thus to reciprocate said wedge means, and control means for said two fluid-pressure means operative simultaneously to actuate the same to rock said lever to move said upper jaw member toward clamping position and to advance said wedge means closely to follow said lever as the latter is thus rocked, said control means being operative sequentially to actuate said two fluid-pressure means first to withdraw said wedge means and thereafter to rock said lever to shift said upper jaw member away from said lower jaw member to unclamp the work.

6. In a work-holding clamp, a lower jaw member, a vertically reciprocable upper jaw member opposed thereto, a vertically disposed axially reciprocable and rotatable shaft threadedly engaging said upper jaw member for adjustably positioning the latter therealong, a pivotally mounted lever connected with the adapted thus axially to reciprocate said shaft, a fluid pressure operated piston-cylinder assembly connected with and operative to rock said lever thereby to reciprocate said shaft and said jaw member into and out of work clamping position, an arm on said lever having a roller mounted on the free end thereof on an axis generally parallel to the pivotal mounting of said lever, a fixed straight guideway, reciprocable wedge means interposed between said roller and guideway adapted to engage said roller to prevent rocking movement of said lever in one direction to unclamp said upper jaw member, a second fluid-pressure operated piston-cylinder assembly operative thus to reciprocate said wedge means, and control means for said two piston-cylinder assemblies operative simultaneously to actuate the same to rock said lever to move said upper jaw member toward clamping position, and to advance said wedge means closely to follow said roller on said lever arm as said lever is thus rocked, said control means being operative sequentially to actuate said fluid pressure assemblies first to withdraw said wedge means and thereafter to rock said lever to shift said upper jaw member away from said lower jaw member to unclamp the work.

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