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2,544,356

AIR LOCK WORK CLAMP

Filed March 26, 1947

3 Sheets-Sheet 1

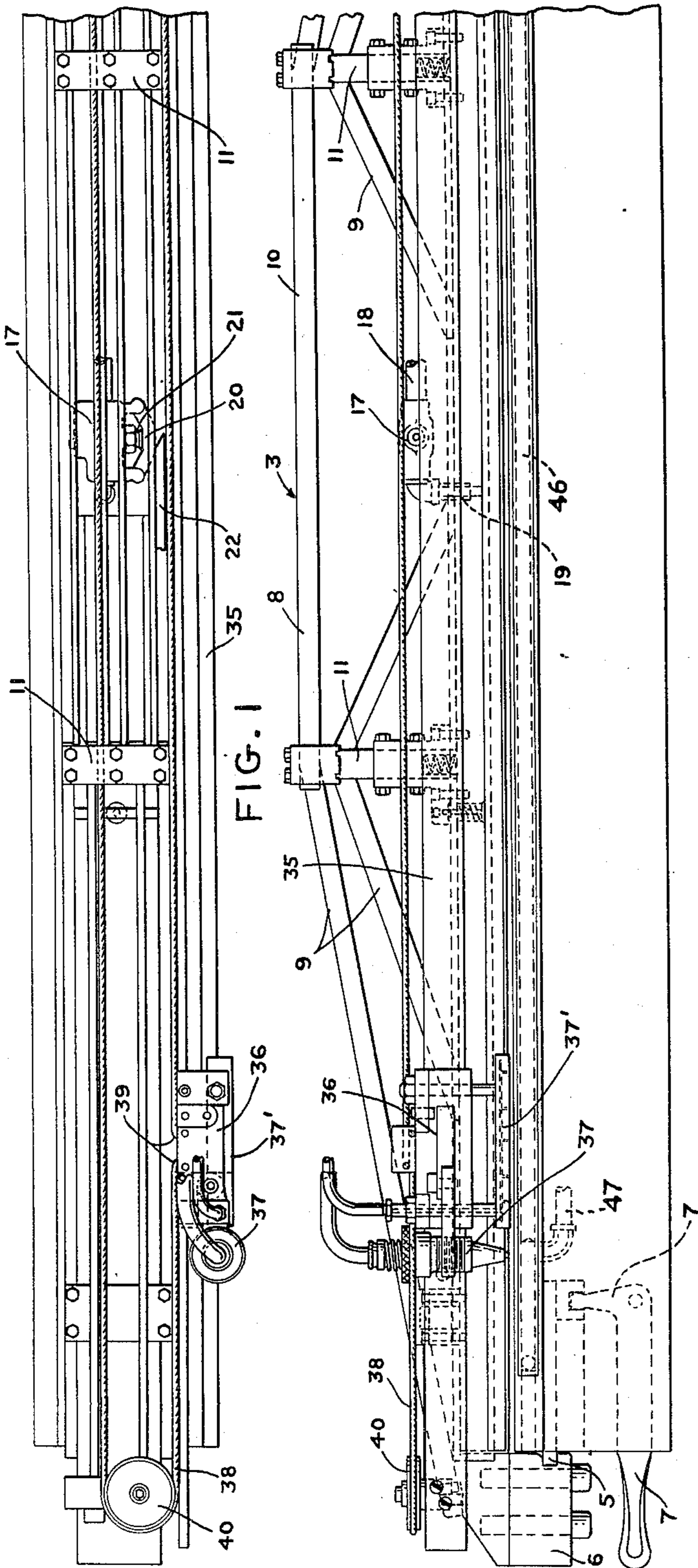


FIG. 2

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3 Sheets-Sheet 2

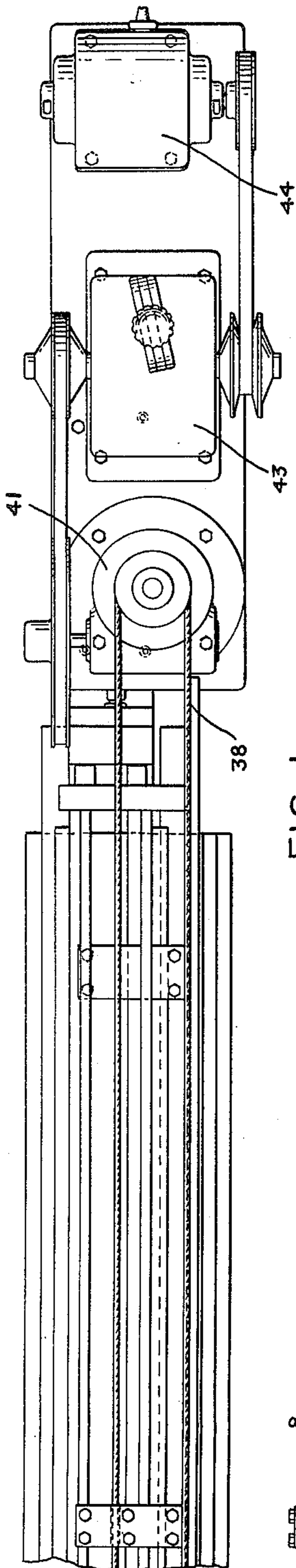


FIG. 1a

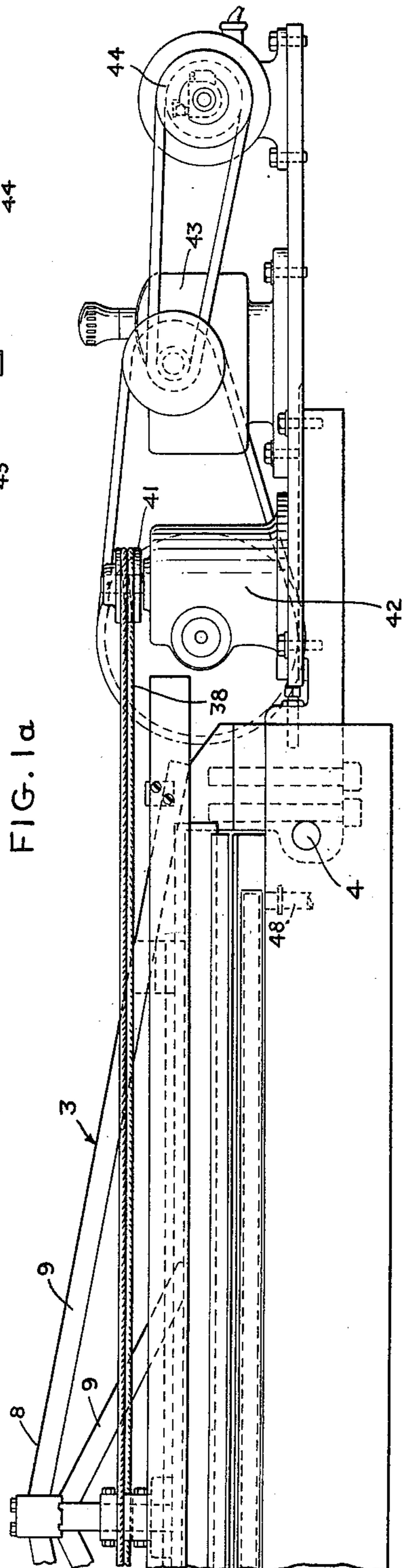


FIG. 2a

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3 Sheets-Sheet 3

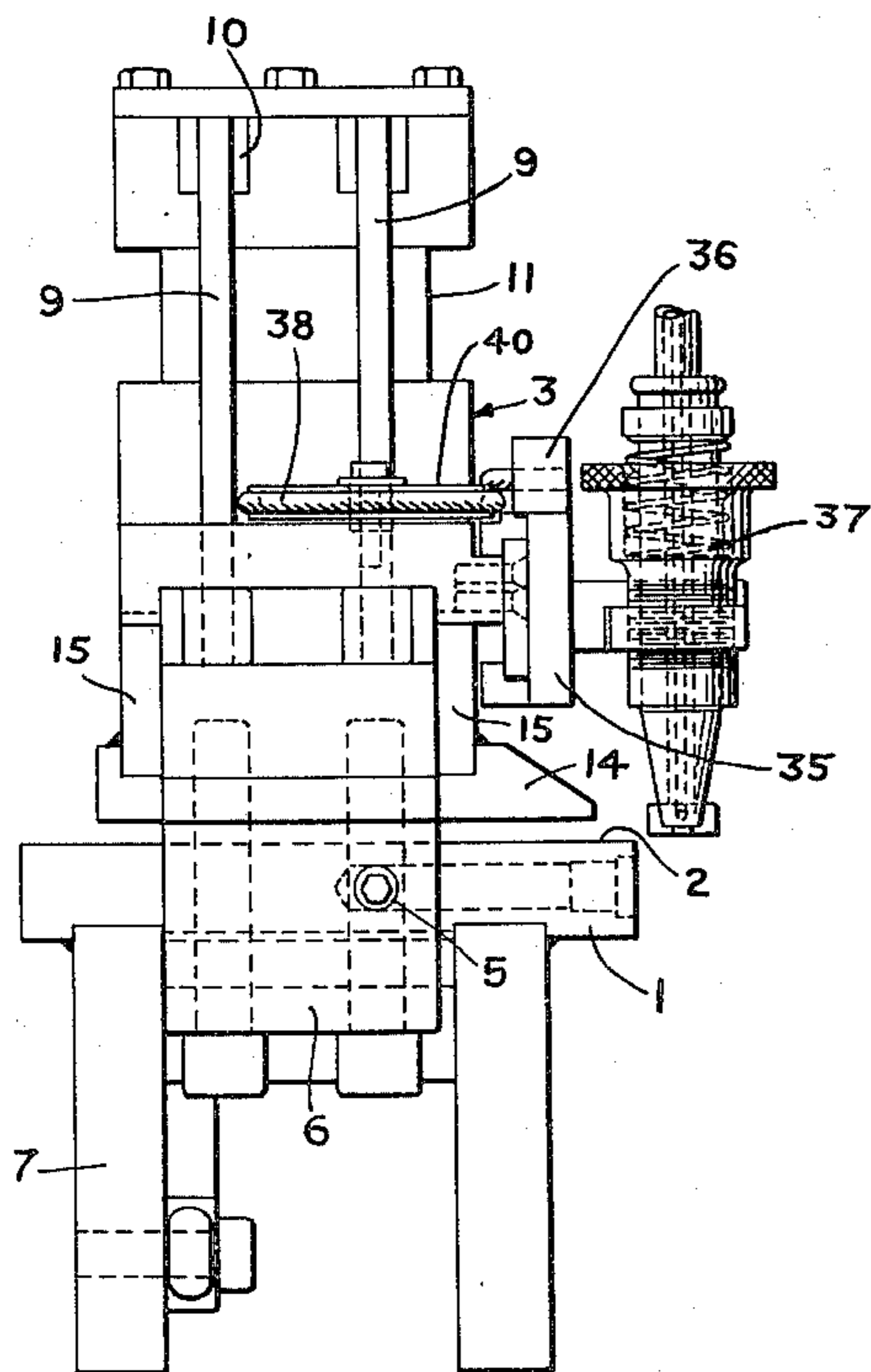


FIG. 3

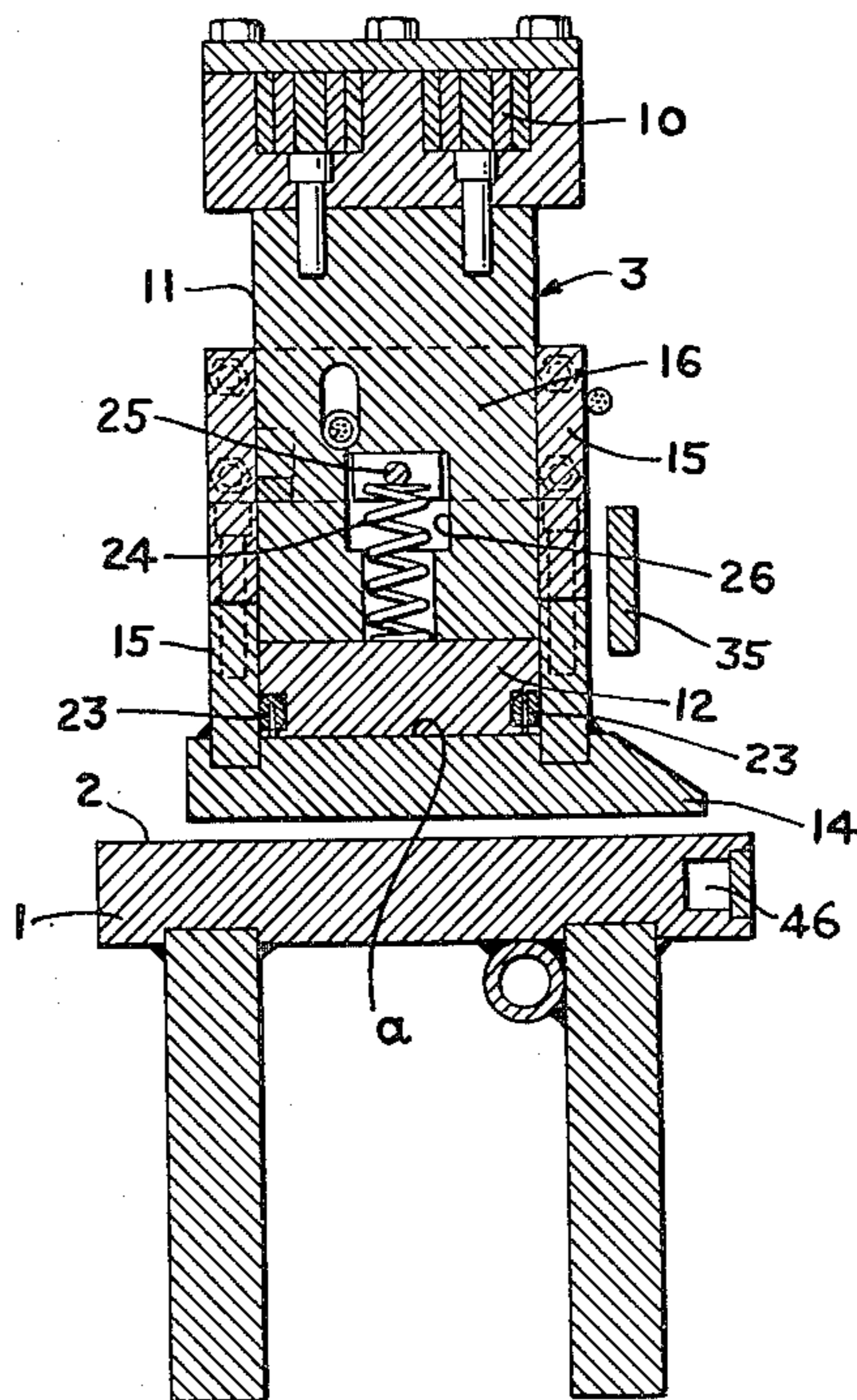


FIG. 5

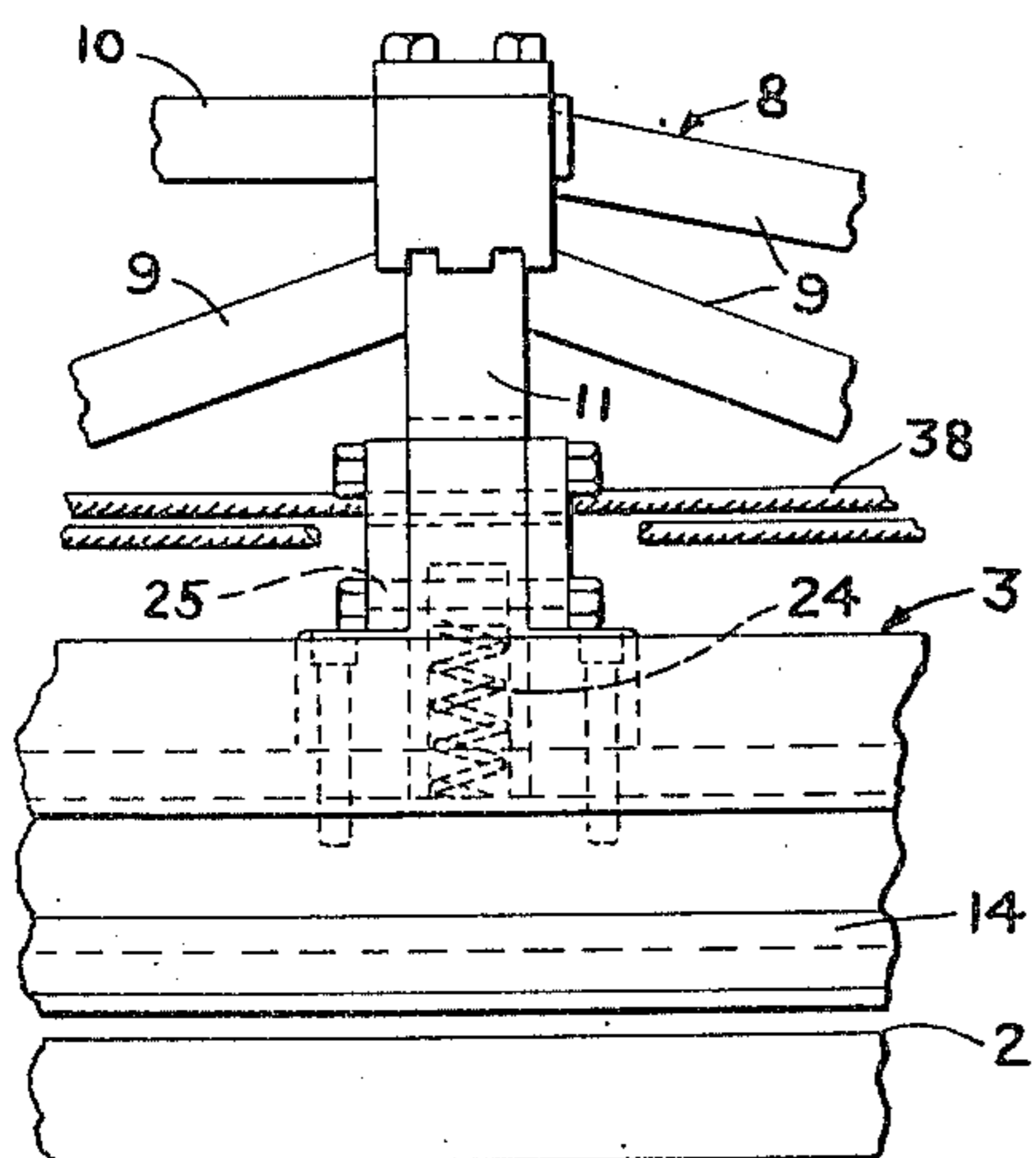


FIG. 4

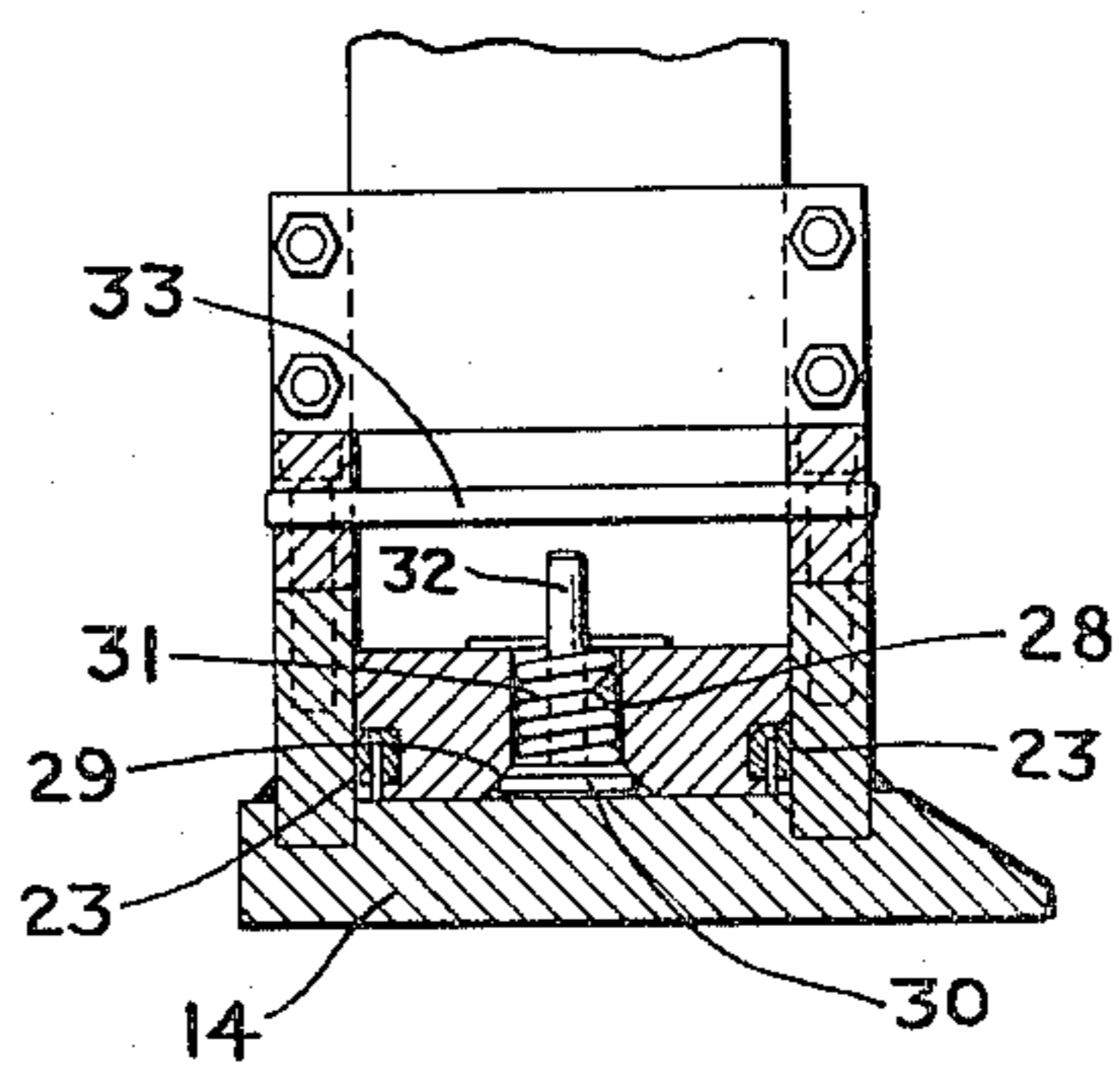


FIG. 6

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## UNITED STATES PATENT OFFICE

2,544,356

## AIR LOCK WORK CLAMP

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Application March 26, 1947, Serial No. 737,237

4 Claims. (Cl. 29—288)

1

This invention relates to clamping devices for holding material being worked upon such as metal plates during welding, metal plates or sheets during bending, shaping or like work where it is necessary and desirable to hold the material or sheets firmly in proper position during the period of time it is being worked upon.

An object of the present invention is to provide a work clamp by means of which relatively large sheets of metal may be firmly held in place during welding, bending, shaping or like operations in which clamp embodies pneumatic pressure for forcing a clamping head firmly against the metal plate or plates to hold them in position on a work table, together with means which will automatically relieve the clamp structure of the pressure of the pressure air when it is desired to release the metal plate or plates.

Another object of the present invention is to provide a clamping device as specified in which the clamping head is mounted to swing on a pivot so that it may be quickly and easily moved to permit work to be positioned for acting upon it or quick removal of the work after the operation is completed.

Another object of the present invention is to provide a work clamp as specified which has a carrier thereon for carrying a working tool along work held in place by the work clamp.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing an air lock work clamp of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figures 1 and 1A are a top plan of the improved air lock work clamp.

Figures 2 and 2A are a side elevation of the improved work clamp.

Figure 3 is an end view of the improved work clamp.

Figure 4 is a slightly enlarged fragmentary side elevation of the work clamp.

Figure 5 is a vertical section through the work clamp taken on the line 5—5 of Figure 1 of the drawings.

Figure 6 is a vertical section through the work clamp taken on line 6—6 of Figure 1 of the drawings and showing the pressure air relief valve.

Referring more particularly to the drawings, the improved work clamp cooperates with a work

2

holding table 1 on the upper surface 2 of which the metal sheets, plates or the like to be worked upon, are placed.

The clamping structure for holding the articles or the material to be worked upon tightly in place upon the surface 2 of the table 1 includes a clamping head structure 3 which is pivotally connected as shown at 4 on the table 1 so that it may be swung upwardly on the pivot 4 to move the clamping head away from the work or swung downwardly on the pivot 4 to move the clamping head into work engaging position, in which position it is locked by means of a sliding bolt 5 which is moved into and out of locking position with the locking head 6 carried by the working clamp structure 3 by means of a pivoted lock bolt operating lever 7.

The clamping head structure 3 includes a bracing framework 8 composed of a plurality of angular braces 9 and straight braces 10. The braces 9 and 10 are connected to the spaced columns 11 and the longitudinally extending stationary piston 12 which forms a part of the clamping head and swings on the pivot 4 with the clamping head. A work clamp or clamping plate 14 extends parallel to the surface 2 of the table 1 and to the elongated stationary piston 12 being supported for movement towards or away from the stationary piston 12 in a reciprocating manner by means of suitable guide structures 15 which are attached to the work clamp 14 and surround the columnar extension 16. The columnar extension 16 forms part of the columns 11 and are welded or otherwise suitably attached to elongated stationary piston 12.

Air under pressure or analogous pressure fluid is delivered to the space between the stationary elongated piston 12 and the movable work clamp 14 at the space indicated at a in Figure 5 of the drawings through a valve structure 17 of any approved type which may be purchased upon the open market and a suitable conduit 18 and passage 19 for forcing the work clamp 14 towards the surface 2 of the table 1 for firm clamping engagement with the sheets, plates or the like resting upon the table 2 for securely holding said sheets, plates or the like in position during the period of time that they are being worked upon. The valve structure 17 has a spring actuated, operating arm or lever 20 thereon which is normally urged into valve closing position by means of a spring 21. An operating bar 22 is carried by the table 1 in any suitable manner (not shown) and is positioned so that when the clamping head 3 is moved downwardly upon its pivot

3

towards the surface to the table 1 the operating bar 22 will engage the arm or lever 20 and open the valve structure 17 to admit air under pressure into the space *a*. The air under pressure may be supplied from any suitable source of air pressure (not shown). Expansible substantially U-shaped packings 23 are carried by the stationary piston 12 and engage the housing or frame 15 to prevent leakage of pressure air or fluid past the stationary piston 12. A series of coil springs 24 are carried by the stationary piston 12 at spaced points along the pivoted clamping head structure 3. These springs 24 are housed in suitable openings in the columnar extension 16 of the stationary piston 12 and they engage against cross bars 25 which are connected to the frame structure 15 and extend through the elongated openings 26 formed in the columnar extensions 16 so that when the pressure air or pressure fluid is admitted between the elongated stationary piston 12 and the work clamp 14 forcing the work clamp 14 downwardly or outwardly relative to the columnar extensions 16 and the elongated stationary piston 12 the springs 24 will be compressed and when the work clamp 14 is relieved of the pressure of the pressure fluid as will be hereinafter more specifically described, the springs 24 will expand returning or moving the work clamp 14 into its non-clamping position as is shown in Figure 5 of the drawings. It will be noted that the openings 26 are of sufficient depth to permit the movement of the bars 25 throughout the complete scope of movement of the work clamp 14.

The elongated stationary piston 12 is provided with a transversely extending opening 28 therein which has a valve seat 29 formed at its lower or inner end, that is, the end which opens against the inner surface of the work clamp 14. A valve 30 is held seated against the valve seat 29 by a spring 31. A valve stem 32 is connected to the valve 30 and extends upwardly into a space between the longitudinally extending side bars 32 which are attached to the work clamp 14 and to the frame structures 15. A cross bar 33 is carried by one of the frame structures 15 and is directly in the path of the valve stem 32. This valve 30 operates to relieve the work clamp 14 of the pressure of the pressure air or pressure fluid after the work has been completed and also the clamping head structure 3 is swung outwardly or upwardly on its pivot 4. The relief of the work clamp 14 from the pressure of the air pressure is accomplished as follows: When the work has been completed on the plates or material securely clamped against the table 2 of the work clamp 14, the lock bolt 5 is relieved and the clamping head structure 3 is moved on its pivot 4 away from the table 1. This causes further outward movement of the work clamp 14 by the pressure of the pressure fluid, bringing the cross bar 33 into engagement with the valve stem 32 and forcing the valve 30 off of its seat 29, against the tension of the spring 31 thus permitting escape of the pressure air from between the stationary piston 12 and the movable work clamp 14. When the pressure air has escaped from between the stationary piston 12 and movable work clamp 14 the springs 24 will act to move the work clamp 14 to its outermost non-clamping position ready to again be moved by pressure of admitted pressure air into work clamping position as the clamping head 3 is again moved towards the table 2.

The clamping head structure 3 has a tool hold-

4

ing bar 35 attached thereto and extending longitudinally therealong on which is slidably mounted a tool carrying head 36. In Figures 1, 1A, 2, and 2A, and Figure 3 a welding head of any approved type and a long metal shield 37' through which an inert gas tent may be formed to expel atmospheric oxygen from the weld preventing oxidization of the weld until it is reasonably cool, indicated at 37, is mounted on the tool carrying head 36. The tool carrying head 36 has the opposite ends of a flexible cable 38 connected thereto, as shown at 39 in Figure 1 of the drawings. This flexible cable 38 passes about a sheave 40 at the free end of the clamping head structure 3 and about a driving sheave 41 at the pivoted end of the clamping head structure 3. The sheave 41 is driven by a speed reducer 42 of any approved type, such as the Boston Reductor Type VAD, which is, in turn, driven through a variable speed transmission 43 from a motor 44. The variable speed transmission 43 may be of any approved type which may be purchased upon the open market and is also shown in United States Letters Patent: 2,342,604, February 22, 1944 and 2,207,073, July 9, 1940.

The table 2 is provided with a longitudinally extending channel 46 extending longitudinally therein along the edge of the table where the portion of the plate, sheets or the like to be worked upon engage, and cooling water is circulated, from any suitable source of supply through the channel 46 through an intake pipe 47 and discharged through an outlet pipe 48 at the opposite end of the table. The cooling water is circulated through the channel 46 to prevent over-heating of the table.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a work clamp structure, a work supporting table, a clamping head pivotally connected at one end to said table, said clamping head including a bracing super structure and a plurality of spaced columns, a work clamp, guide structures on said work clamp surrounding each of said spaced columns, pistons on said columns, said guide structures forming cylinders for receiving said pistons, yieldable means connecting said work clamp for movement with said clamping head upon pivotal movement of the head and for reciprocatory movement into or out of work clamping position relative to the clamping head, means for delivering pressure fluid into the spaces between said pistons and said work clamp to move the work clamp into work clamping position, a normally closed valve carried by said clamping head for controlling the delivery of pressure fluid to said spaces, and a valve actuating member carried by said table for opening said valve upon pivotal movement of said clamping head into work engaging position.

2. In a work clamp structure, a work supporting table, a clamping head pivotally connected at one end to said table, said clamping head including a bracing super structure and a plurality of spaced columns, a work clamp, guide structures on said work clamp surrounding each of said spaced columns, pistons on said columns, said guide structures forming cylinders for receiving said pistons, yieldable means connecting said work clamp for movement with said clamping head upon pivotal movement of the head

5

and for reciprocatory movement into or out of work clamping position relative to the clamping head, means for delivering pressure fluid into the spaces between said pistons and said work clamp to move the work clamp into work clamping position, a normally closed valve carried by said clamping head for controlling the delivery of pressure fluid to said spaces, and a valve actuating member carried by said table for opening said valve upon pivotal movement of said clamping head into work engaging position, said pistons provided with pressure fluid relief ports therein, valves normally closing said ports and provided with valve stems, and abutments carried by said guide structure for engagement with said valve stems to open said pressure relief valves upon pivotal movement of the clamping head out of work engaging position.

3. In a work clamp structure, a work supporting table, a clamping head pivotally connected at one end to said table, said clamping head including a bracing super structure and a plurality of spaced columns, a work clamp, guide structures on said work clamp surrounding each of said spaced columns, pistons on said columns, said guide structures forming cylinders for receiving said pistons, yieldable means connecting said work clamp for movement with said clamping head upon pivotal movement of the head and for reciprocatory movement into or out of work clamping position relative to the clamping head, means for delivering pressure fluid into the spaces between said pistons and said work clamp

6

to move the work clamp into work clamping position, said pistons provided with pressure fluid relief ports therein, valves normally closing said ports and provided with valve stems, and abutments carried by said guide structure for engagement with said valve stems to open said pressure relief valves upon pivotal movement of the clamping head out of work engaging position.

4. A work clamp structure as claimed in claim 1 wherein said yieldable means connecting the work clamp and clamping head consists of transverse openings through said columns, axial openings in said columns communicating with said transverse openings, abutment members carried by said guide structure and extending through said transverse openings, and springs in said axial openings and engaging said pistons and said abutments.

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