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2,652,607

JOLT AND DRAW FOUNDRY MACHINE

Filed April 24, 1952

2 Sheets-Sheet 1

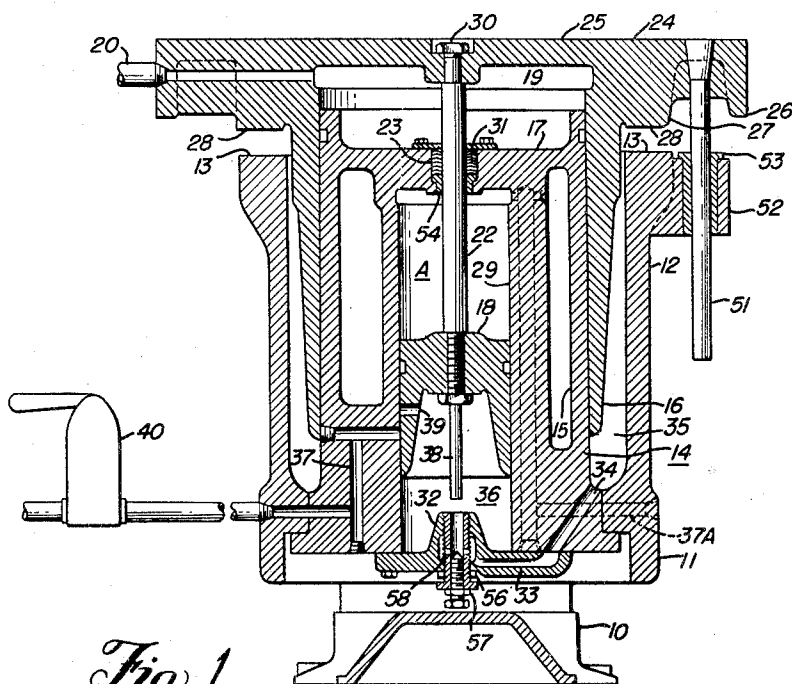


Fig. 1

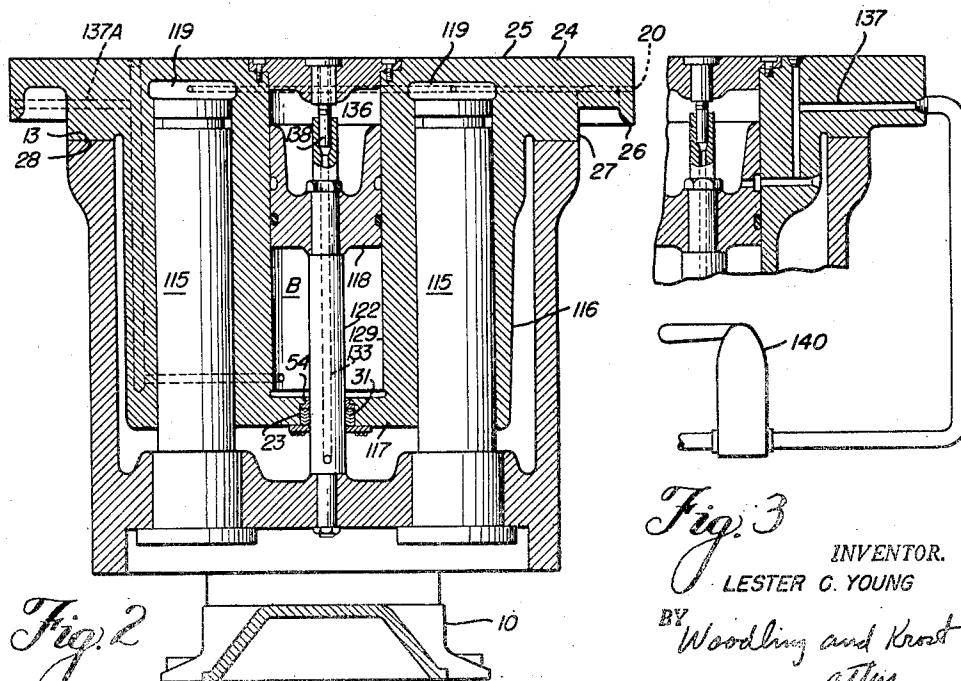


Fig. 2

Fig. 3

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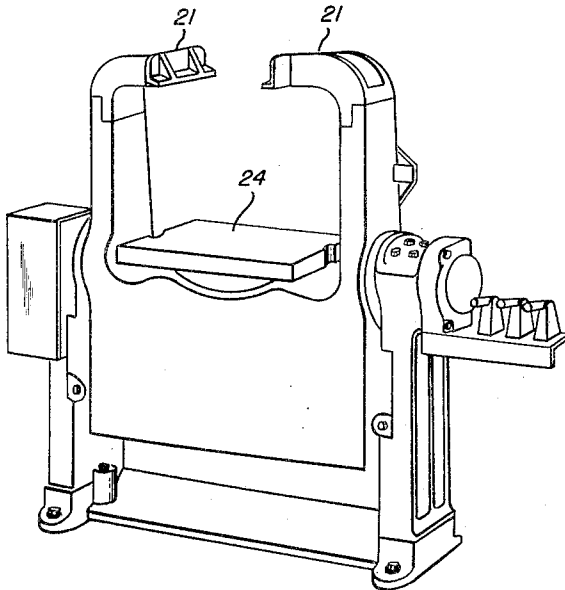


Fig. 4

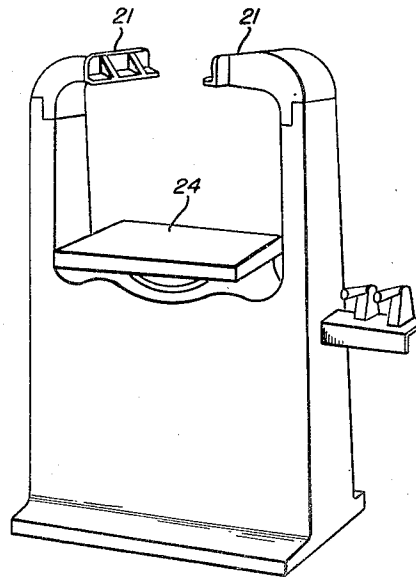


Fig. 5

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JOLT AND DRAW FOUNDRY MACHINE

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3 Claims. (Cl. 22—26)

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This invention relates to molding machines, and more particularly to jolt molding machines adapted to aid in compacting the molding sand or other material.

This application is a continuation-in-part of my prior application, Serial No. 105,554, now Patent No. 2,601,656.

In jolt molding machines, the jolt table is raised by a fluid pressure lifting means which comprises a piston element and a cylinder element adapted to be extended relative to each other and defining an extensible fluid pressure chamber. For the raising movement of the jolt table, fluid under pressure is introduced into the extensible fluid pressure chamber to raise the jolt table relative to an anvil upon which the jolt table rests in its lowermost position. In operation, the jolt table is raised a predetermined distance above the anvil, and then the fluid is exhausted from the fluid lifting chamber, which permits the jolt table to fall by gravity and strike the anvil for producing a jolting operation to aid in compacting the molding sand or other material in the molding flask or other container. In prior constructions, as the piston and cylinder move extensively relative to each other for raising the jolt table, there is an exposure of the relative movable portion of the piston. This exposed portion of the piston is normally subjected to a considerable amount of molding sand or other foreign abrasive materials which come in contact therewith during the jolting operations of the molding sand and which, if not prevented, cause a great deal of excessive wear. My Patent No. 2,456,663 teaches a construction which will protect such exposed portion. This invention provides a combination of piston and cylinder combinations to produce a jolting action and a continuous movement for squeezing. This invention incorporates all of the advantages shown by my prior patent, and in addition thereto provides for one piston and cylinder combination which is totally enclosed, and therefore shielded from all abrasive action of room dirt.

An object of this invention is to provide a jolt machine construction which encloses the relatively movable wall surfaces of the lifting means during the jolting operations.

Another object of this invention is to effectively combine a jolt and squeeze action together in one foundry machine.

Another object of this invention is to provide a two-directional piston and cylinder construction for jolting a table when the table is up-

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right, and for pulling the table to the base and holding it against the base when inverted.

Another object of this invention is to provide spaced guide surfaces acting between the relatively movable members of a jolt machine, to provide smooth jolt movement and prevent "galloping" action.

Still another object of this invention is to provide a jolt machine construction which can tolerate a large amount of wear between the relatively movable parts, and yet have a smooth, non-galloping jolt action.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a transverse cross-sectional view of a jolt molding machine base unit employing the features of this invention;

Figure 2 is a sectional view similar to Figure 1 of a modification of the base unit employing the features of this invention;

Figure 3 is a broken away sectional view taken at a 90° angle with respect to Figure 2 illustrating the air intake lines into the extensible chamber of the embodiment illustrated in Figure 2;

Figure 4 is a type of foundry equipment machine into which the base units of Figures 1 and 2 may be incorporated, the machine being of the roll-over type; and

Figure 5 is a stationary floor type of foundry machine into which either of the base units of Figures 1 or 2 may be built.

With reference to the Figure 1 of the drawing, my jolt machine comprises generally a base 10, a jolt table 24, a fluid pressure lifting mechanism comprising a piston 18 and a cylinder 29 interposed between the base 10 and the jolt table 24, and an outer tubular shell 11 projecting upwardly from the base and terminating in an anvil 12 against which the jolt table strikes to aid in compacting the molding sand or other materials.

The base 10 may be of any suitable shape and has a relatively flat bottom adapted to rest upon a suitable foundation. The outer tubular shell 11 projects upwardly with respect to the base 10 and serves not only as an anvil against which the jolt table 24 may strike, but also has the protecting shield to prevent molding sand or other foreign abrasive substances from coming into the interior of the machine. The upper end of the anvil 12 is provided with a flat annular face 13 against which the jolt table strikes.

In the basic unit illustrated in Figure 1 of the drawings, the cylinder 29 is the inner portion of a central core member 14. The core 14 has an annular wall 15 defining a stationary piston mounted upon the base 10.

The jolt table 24 is preferably constructed of a semi-steel casting and is disposed to rest upon the anvil 12 of the upper end of the tubular shell 11 in substantially a horizontal position. The jolt table 24 has preferably a flat upper surface 25 and has upon its underneath side three annular depending flanges or ribs to reinforce the construction; namely, an outer flange 26, an intermediate flange 27 and a central flange which constitutes a cylinder 16. This construction, and the action between the piston wall 15 and the cylinder 16, is similar to that set forth in Patent No. 2,456,663. The outer flange 26 extends downwardly from the marginal edge of the jolt table. The flange 27 projects downwardly at an intermediate radial annular location and constitutes a hammer for striking the anvil. The flanges are preferably integrally formed with the jolt table and aid in reinforcing the jolt table whereby it may withstand the heavy shocks to which it is subjected during the jolting operation. The annular flange or extension 27, is substantially in alignment with the anvil 12 and is provided with a flat annular face 28 adapted to strike the anvil 12 to effect compacting of the molding sand or other material. The cylinder wall 16 is preferably integrally connected to the underneath side of the jolt table 24 and constitutes a reinforcing annular rib or extension for the jolt table. It is to be noted that the three flanges, separate from their function of reinforcing the strength of the jolt table, have additional functions in that the outer flange 26 operates as an apron to guard the operator from the anvil, the inner flange 27 has the function of a hammer for striking the anvil 12, and the inner flange has the function of the cylinder 16. The cylinder 16 is not used as a hammer and thus this construction avoids the peening of the cylinder which would otherwise occur if the cylinder end were used as a hammer.

The core 14 is closed across the top by wall 17, and the wall 17, coacting with the area of the table 24 within the cylinder wall 16, defines an extensible chamber 19 adapted to receive fluid under pressure. Thus, fluid may be supplied to and exhausted from the chamber 19 through a convenient line 20 and the table 24 may be raised with respect to the core 14. Chamber 19 is employed in the illustrated embodiment of the invention as a "squeeze" chamber to push the table 24 steadily upward with a constant force. This action is employed in many types of foundry machinery, such, for example, as the machines illustrated in Figures 4 and 5, wherein a foundry mold is squeezed between jolt table 24 and hook arms 21. The described squeeze action is separate from the jolt action heretofore referred to, but when the chamber 19 is not in service for squeezing, the piston walls 15 and the cylinder walls 16 serve as guide means to aid in assuring proper vertical reciprocating motion of the table 24 during jolting operation.

In the embodiment of the invention as illustrated in Figure 1, the cylinder 29 is a part of the core 14, and is stationary with respect to the base 10. The piston 18 is adapted to reciprocate vertically within the cylinder 29. A piston rod 32 extends through an opening 23 in the top wall

17, and is secured by any suitable means, such, for example, as by the nut 30, to the table 24. In the preferred embodiment, it is preferable to provide a large opening 23 and place a packing 31 and a guide bushing 54 therein in order that fluid pressure may be introduced between piston 18 and wall 17 for return of the table 24 when the unit is used in a roll-over-draw machine.

In order to introduce a compressed fluid into the chamber A in Figure 1, a connecting series of conduits 37A are drilled into the casting and lead to the chamber A. A conventional flexible hose and valve is attached to the conduits 37A in the usual well-known manner.

The cylinder 29 is closed at the bottom by exhaust plate 32 which is more fully set forth and explained in the application for Control for jarring mechanism in foundry machine, Serial No. 105,553, now Patent 2,619,695. The exhaust plate 32 has a variable exhaust line 33 adapted to conduct exhaust fluid under pressure to exhaust port 34 leading into a chamber 35 formed within the shell 11. Thus, exhaust fluid will exit from the machine between the flat face 13 and the flat face 28 on the members 11 and 24, respectively, and blow room dust outwardly away from the machine.

The exhaust plate 32, and the piston 18 define an extensible jolt chamber 36. Fluid under pressure is introduced into the extensible chamber 36 through means of a connecting series of conduits 37 suitably provided in the well-known manner.

When the jolt table 24 is resting upon the anvil 12, a valve rod 38 closes the exhaust line 33, and an intake port 39 through the side wall of the piston 18 connects the conduits 37 into the chamber 36. Thus, the chamber 36 is closed against exhaust, and is supplied from a suitable source of fluid pressure through a regulating system of valves all illustrated diagrammatically by the control assembly 40.

In operation, the fluid under pressure enters into the chamber 36 until sufficient pressure is built up to push the piston 18 and the rod 22 upwardly and move the table 24 off of the anvil 12. When the piston 18 moves upwardly, however, the valve rod 38 is pulled out of the exhaust line 33 and the pressure within the chamber 36 is reduced by exhausting the fluid out through the port 34, and thus the jolt table is permitted to drop by gravity and strike the anvil for effecting the jolting operation to aid in compacting the molding sand or other material.

The internal walls of the cylinder 29 and the walls of the piston 18 may be conveniently lubricated by supplying oil into the compressed fluid entering through the conduit 37 in any well-known manner, such, for example, as the manner taught in the Patent 2,456,663. Further, a guide pin or guide pins 51 may be provided for preventing rotation of the table 24 during jolting operation. The pin 51 has its upper end securely connected to the jolt table 24 and has its remaining portion adapted to reciprocate within a bushing 53 provided in a lateral extension 52 formed integrally with the anvil 12.

In practice prior to Patent No. 2,456,663, jolt machines normally employed a stationary cylinder with a piston secured to the bottom of the jolt table. The piston walls were thus exposed to the atmosphere when the jolt table was raised, and therefore abrasive dust about the foundry could quickly wear the cylinder and piston. Very soon, therefore, the jolt table 24 could rock a

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slight amount with respect to the lower portion of the machine, and then one portion of the jolt table would strike the anvil prior to another portion, resulting in a "galloping" action. The galloping action will cause a violent side surge of force and hasten further wearing of the piston and cylinder.

Patent 2,456,663 overcame the wear by inverting the cylinder and piston, and making the piston stationary. Thus, the piston is never exposed to the room, and the lower portion of the piston is carried in an oil bath.

This invention is an improvement over Patent No. 2,456,663 in that the jolt piston and cylinder are entirely enclosed within the core 14, with no possibility of room dust causing wear. The principles of Patent 2,456,663 are employed in the construction and operation of piston 15 and cylinder 16, employed for the "squeeze" operations. This invention is an improvement thereon and provides the combination of the inverted and enclosed pistons and cylinders. Also, the illustrated embodiment provides an improved combination in one machine to produce both a jolt action and a squeeze action. These actions are not separable functions, but are sequential steps in the production of some types of foundry molds. The device of this invention provides both actions, and provides improved mechanism for producing the actions, in that all moving members are protected against dirt abrasion. Furthermore, the piston 18 is relatively short with respect to the cylinder 29, and the guide bushing 54 is spaced longitudinally from the piston 18. Thus, two spaced points are employed to accurately guide the vertical movement of the rod 22. As will readily be understood, a considerable amount of wear can take place between the piston 18 and the cylinder 29, and also between the guide bushing 54 and the rod 22, before any appreciable amount of galloping action will be possible in the jolt table 24. This improved guiding is provided by the spaced guiding nature of the piston 18 and the guide bushing 54. In addition, the cylinder 16 and the piston wall 15 provide an outrigger bearing action which further tends to stabilize the movement of the jolt table 24. In the preferred embodiment illustrated in Figure 1, the piston 15 and cylinder 16 are employed as the principal guiding means. However, it is understood that the cylinder 16 may be removed in a straight jolt machine, and the improved enclosed piston 18 with the spaced guide bushing 54 will provide accurate jolt movement.

The Figures 2 and 3 of the drawings set forth a modification of the invention with respect to the Figure 1. In the Figure 2, a piston 118 is secured to a piston rod 122, and rod 122 is secured to the stationary base of the machine. The table 24 carries a cylinder 129 which is provided with an opening 23 and a packing 31 and guide 54 described in connection with Figure 1 of the drawings.

In Figure 2, exhaust line 133 extends through the longitudinal axis of the piston rod holding the piston 118 and exhausts into the area inside the outer shell 11. Valve rod 138 is carried by the table 24 and operates to alternately open and close the exhaust line 133 as the table 24 reciprocates in a vertical direction. Fluid under pressure is fed to the chamber defined by the piston 118 and the table 24 through the system of conduits 137 and control assembly 140 in sub-

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stantially the same manner as described in connection with Figure 1.

In the embodiment of Figure 2, two spaced pistons 115 are designed to operate in corresponding cylinders 116 and serve to guide the vertical reciprocation of the table 24. Compression chambers 119 at the top of each of the pistons 115 are supplied with fluid under pressure through line 20 for the purpose of raising the table 24 with a constant pressure for squeezing operations. During jolting movement of the table 24 the chambers 119 are not employed. Further, the plurality of cylinders, each with a separate longitudinal axis, as illustrated in Figure 2, prevents rotational movement of table 24. Thus, a separate anti-rotation device is unnecessary.

In substantially all other respects the modification of Figure 2 is the same as the modification of Figure 1, and provides the spaced guiding action of the piston walls on the piston 118 and the bushing 54. Furthermore, the jolt piston and cylinder 118 and 129 are combined and are entirely enclosed in this embodiment also in order to prevent the wear of the relatively movable parts by abrasive dust in the room. As set forth with respect to the unit of Figure 1, the unit of Figure 2 is provided with a chamber B on the side of the piston opposite the jolt chamber in order to make the unit serviceable in a roll-over type of machine. A series of connecting conduits 137A is provided to conduct the compressed fluid into the chamber B.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A molding machine comprising relatively movable portions including a base and a jolt table, a jolt piston and jolt cylinder for raising the table relative to the base, said jolt piston and jolt cylinder defining a first extensible fluid pressure chamber on one side of the jolt piston, an inlet into said first extensible chamber for introducing fluid under pressure into said first chamber to raise the jolt table relative to the base, an outlet from said first extensible chamber through which fluid may be exhausted from said chamber, the flow of fluid into and out of said first extensible chamber being controllable by the relative movements of the jolt piston and cylinder, said jolt cylinder having internal walls and end closing means, said jolt piston having side wall surfaces fitting complementarily to said internal cylinder walls, piston rod means of smaller diameter than said jolt piston, said end closing wall means having a guide opening there-through, said piston rod being dimensioned to fit said opening in fluid sealing relationship, said piston rod being secured on one end thereof to the jolt piston and passing through said guide opening and being secured at the opposite end thereof to one of said relatively movable members, said jolt cylinder being secured to the other of said relatively movable members, said jolt piston and cylinder defining a second extensible chamber between the piston and the end closing means on the opposite side of the piston from said first extensible chamber, first conduit means connecting the second extensible chamber with

a source of controllable-pressure fluid, flow of fluid through said conduit means to the second extensible chamber thereby being operable independently of the relative position of the jolt piston and cylinder means, and outrigger piston and cylinder means having cooperating wall surfaces laterally spaced from said jolt piston and jolt cylinder, said out-rigger piston and cylinder means defining a third extensible chamber, second conduit means connecting the third extensible chamber with a source of controllable-pressure fluid, flow of fluid through said conduit means to the third extensible chamber thereby being operable independently of the relative position of the table and base, whereby the entire complementary sliding surfaces of the jolt piston and cylinder are enclosed and shielded against abrasive room dust, and the jolt table is guided for smooth jolt movement by the laterally spaced guiding action of the outrigger piston and cylinder means, and is guided by the vertically spaced guiding action of the jolt piston and guide opening.

2. A molding machine unit comprising a base, a jolt table, first piston means supported and carried by the base and extending upwardly therefrom toward the jolt table, first cylinder means extending downwardly from the table and surrounding the first piston means, said first piston means and first cylinder means defining extensible first fluid pressure chamber means, an inlet for introducing fluid under pressure into said first chamber to raise the table with a steady movement relative to the base, said first piston having an internal bore defining a second cylinder, end closing means closing said cylinder, a second piston operable in said second cylinder, said second piston having a piston rod extending through the said end closing means and being secured to said table, packing means to prevent the flow of fluid through the said end closing means past the piston rod, said second piston and second cylinder defining a second extensible fluid pressure chamber on the side of said second piston opposite said table, said second piston and second cylinder defining a third extensible fluid pressure chamber on the side of said piston opposite said second extensible fluid pressure chamber, an inlet into said second extensible chamber for introducing fluid under pressure into said second chamber to raise the table relative to the base, an outlet from said second extensible chamber through which fluid may be exhausted from said second chamber for permitting the table to return by gravity, said inlet

and outlet being opened and closed by the relative movements of the second piston and cylinder, second conduit means connecting the third extensible chamber with a source of controllable-pressure fluid, flow of fluid through said conduit means to the third extensible chamber thereby being operable independently of the relative position of the table and base to thereby provide a steady movement of the second piston and the table.

3. A molding machine unit comprising a base, a jolt table, two spaced pistons supported and carried by the base and extending upwardly therefrom toward the jolt table, a body structure depending from the bottom of said table and having bores therein defining two spaced cylinders extending downwardly from the table and surrounding the two spaced piston means, said two spaced pistons and two spaced cylinders defining first and second extensible fluid pressure chambers, inlet means for introducing fluid under pressure into said first and second extensible chambers to raise the table with a steady movement relative to the base, said body structure depending from the table having an internal bore between said two cylinders defining a third cylinder, a piston operable in said third cylinder, said piston in the third cylinder having a piston rod extending through the end of said third cylinder and being secured to said base, packing means preventing the flow of fluid through the end of the third cylinder past the piston rod, said third cylinder and the piston therein defining a third extensible fluid pressure chamber on the side of said third piston adjacent said table, said third piston and cylinder defining a fourth extensible fluid pressure chamber on the side of said third piston opposite said table, an inlet into said third extensible chamber for introducing fluid under pressure into said chamber to raise the table relative to the base, an outlet from said third extensible chamber through which fluid may be exhausted from said third chamber for permitting the table to return by gravity, said inlet and outlet being opened and closed by the relative movements of the piston and cylinder, conduit means connecting the fourth extensible chamber with a source of controllable-pressure fluid, flow of fluid through said conduit means to the fourth extensible chamber thereby being operable independently of the relative position of the table and base.

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No references cited.