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TANDEM CYLINDER GLASS PLUNGER ACTUATOR

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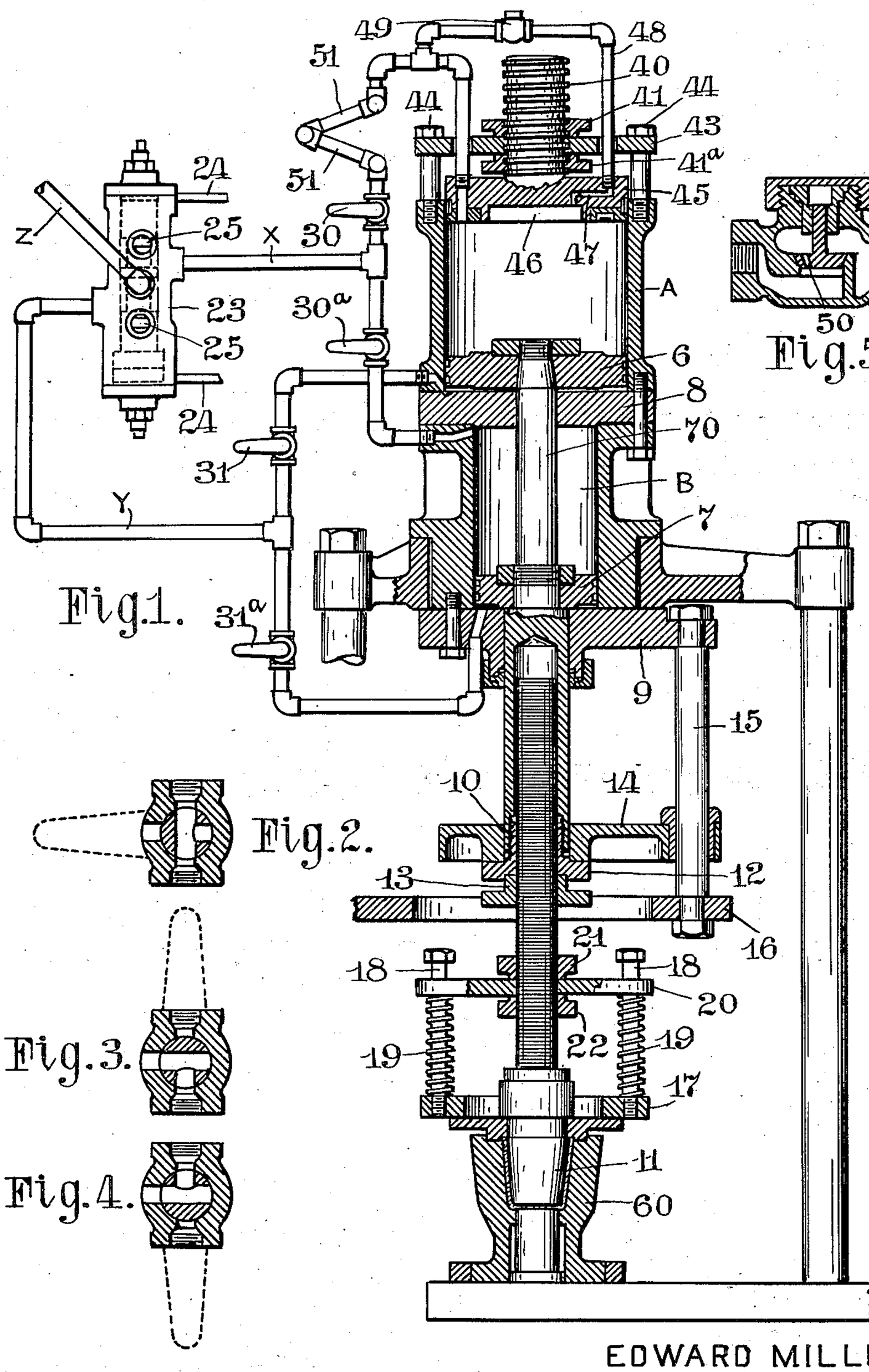

Fig.1.

Fig.2.

Fig.3.

Fig.4.

Fig.5.

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TANDEM CYLINDER GLASS PLUNGER ACTUATOR

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This invention relates to glass pressing or molding machines and more particularly to pneumatically operated glass plungers and means for predetermining and varying the pressure to be exerted by the plunger and finally shaping the part thereof in the mold. It is desirable in pressing molten glass with a plunger that the degree of pressure be predetermined and controlled according to the form, size and nature of the ware to be produced.

An object, generally, of the invention, therefore is to provide improved means whereby the aforesaid variations in pressure may be easily, quickly, conveniently and economically controlled by pre-adjustment to vary the degree of pressure to be exerted. This object I accomplish by the employment of one or more cylinders with pistons of different or varying capacity actuating the same plunger together with means whereby either or both of the cylinders and pistons may be operated. A further object is to provide a cylinder with an adjustable head whereby the capacity of the cylinder and the length of stroke of the piston therein can be varied. Another object is to provide improved means whereby the length of the plunger can be adjusted and varied. Other objects will appear from the disclosure herein.

The invention is embodied in the example herein shown and described, the features of novelty being finally claimed.

In the accompanying drawing—

Figure 1 is a view mainly in vertical section, with parts in elevation.

Figs. 2, 3 and 4 are sectional views, on a larger scale than appears in Fig. 1, of the valve employed in the pressure line showing in broken lines the plug operating handles in different positions for delivering to and exhausting pneumatic pressure from the cylinders and either of them.

Fig. 5 is a vertical sectional view, on a larger scale, of the cushion or check valve for the up stroke of the upper piston.

In the views A designates the upper cylinder and B the lower cylinder, these being arranged in tandem. The cylinder A is of larger diameter than cylinder B and contains a piston 6. The cylinder B contains piston 7 and the two pistons are connected to move in unison on a stem 10 common to the two pistons, said stem extending through head 8 common to the two cylinders and the lower head 9 of the cylinder B.

The lower end of the piston stem is internally threaded to receive a threaded portion 10 of the plunger 11 to permit vertical adjustment of the plunger. When adjusted the plunger is secured in adjusted position by a nut 12 supplemented with a jam nut 13. A guide for the plunger is provided by means of bracket 14 engaging the stem and a parallel bar 15 fixed between an extension of the lower head of cylinder B and a suitable stationary frame member 16.

Suitable cushioning means for graduating the pressure of the plunger head is provided consisting of a bottom ring 17 having vertical bolts 18 with encircling springs 19, a top bar 20 having perforations through which the bolts 18 are passed and top and bottom nuts 21 and 22 on the threaded plunger stem to permit setting of the bar 20 to predetermine the resistance to be afforded by the springs to the descent of the plunger head on its downward stroke into the glass of the mold 60 as shown.

Pneumatic pressure is fed from steady pressure or compressor line Z to the cylinders through an ordinary spool or slide valve 23, said valve adapted to be shifted pneumatically by suitably timed means through pipes 24, 24. The case of the spool valve is provided with exhaust ports 25.

Pipe line X has branches leading from the upper end of valve 23 into the upper ends of cylinders A and B; and pipe line Y has branches leading into the lower ends of said cylinders A and B. The branches of the pipe lines X and Y are each provided with a hand operated three-way valve like that illustrated in Figs. 2, 3 and 4. These three-way valves are designated 30, 30ª, in the branch lines of X and 31 and 31ª in the branch lines of Y.

The operation is this: If both pistons are to be operated the three-way valves are set as indicated in full lines Figs. 1 and 2 and the spool valve reciprocated by the timer. The feed pressure is alternately through lines X and Y to the cylinders thereby reciprocating the plunger. It will be noted that in this operation the exhaust is alternately through the lines X and Y and the exhaust ports 25 of the spool valve.

When the piston in the cylinder A alone is to have operating pressure applied thereto the valves 30 and 31 are left as set as in Fig. 1, but valves 30ª and 31ª are moved to set them as depicted in Fig. 3 thus leaving the cylinder A subject to pressure through the lines X and Y and the cylinder B open to the atmosphere and thus with intake from and exhaust directly through the valves to the atmosphere upon the power reciprocations of the piston in cylinder A.

When the piston in cylinder B alone is to have operating pressure applied thereto the valves 30ª and 31ª are restored as in Fig. 1, and the valves

30 and 31 turned to the position indicated in Fig. 4 thereby admitting pressure to operate the piston in cylinder B and open the cylinder A to the atmosphere through the exhaust port in said valves 30 and 31.

In all three of these operations the cylinders or the cylinder receiving pressure exhausts through the exhausts 25 of the spool valve. In the last two described operations the idling cylinder exhausts through the said three-way valves in the branch pipe lines.

In the present construction the upper head 45 of the cylinder A is shown as adjustable by means of a screw 40 engaging adjustable nuts 41 and 41a on opposite sides of a cross bar 43 that is held on bolts 44, 44. This adjustability of the cylinder head permits varying the capacity of the cylinder A and limits the upward stroke of the plunger.

The said head 45 is shown as provided with a cavity 46 in its lower side from which extends a port 47 to a sub-branch pipe 48 connected with the branch X and in said sub-branch 48 is a Lunkenheimer bleeder check valve 49 provided with a small bleeder port 50 to permit cushioning of the up-stroke of the piston.

In order that said cylinder head 45 with its connected pipes may be adjusted up or down without removing the pipes and by merely adjusting the nuts 41 and 41a there is interposed on the upper branch line of the pipe X a pair of short pipes 51 and 51 hinged to each other and to the respective portions of said branch so that when said head is moved up or down the angular relation of said pipes 51 and 51 to each other is merely increased or diminished as the case may be without materially affecting the flow of air through said branch line.

From the foregoing it will be observed that the pressure to be exerted on the plunger in pressing glass can be varied by operating either piston or both and also by changing the capacity of cylinder A by adjusting its head to operate the piston therein either alone or in conjunction with that of cylinder B.

The forms of the parts can be changed without departing from the gist of the invention as claimed.

What I claim is:

1. In a glass forming machine, a plurality of pneumatic cylinders with a piston in each of them, a glass treating plunger actuatable by either or both of said pistons and means for conducting air under pressure to either or both of said pistons at will.

2. In a glass forming machine, a plurality of pneumatic cylinders with a piston in each of them, a glass treating plunger actuatable by either or both of said pistons and means for conducting air under pressure to either or both of said pistons at will, said means including adjustable three-way valves in said fluid pressure conducting means.

3. In a glass forming machine, a plurality of pneumatic cylinders with a piston in each of them, a glass treating plunger actuatable by either or both of said pistons, a steady air pressure line, branch lines to the respective cylinders, a valve between said steady pressure line and said branch lines for shifting the pressure of the steady pressure line and means for controlling the flow of air under pressure through said branch lines to either or both of said pistons at will, said last named means including adjustable three-way valves in said branch lines.

4. In a glass forming machine, a duality of pneumatic cylinders in tandem with a piston in each of them, said pistons having a stem common to them, a glass forming plunger head actuatable by said stem and means for conducting air under pressure to either of said pistons at will.

5. In a glass forming machine, a duality of pneumatic cylinders with a piston in each of them, said pistons having a stem common to them, means whereby air under pressure can be conducted to either of said pistons at will and means for varying the stroke of the pistons in said cylinders independently of the speed of movement thereof.

6. In a glass forming machine, a duality of cylinders with a piston in each of them, said pistons having a stem common to them, an air pressure conducting line whereby air under pressure can be conducted to either of said pistons at will, one of said cylinders having an adjustable head to vary the stroke of the piston, and a flexible means in the air pressure conducting line permitting adjustment of said cylinder head without disturbing the conductivity of said line.

7. In a glass ware making machine, a glass forming plunger, a cylinder, a piston therein for actuating said plunger, a fluid pressure line for reciprocating said piston at will, said cylinder having a head, a pressure conducting sub-line connected to said head, said sub-line provided with a check valve and a bleeder port to cushion the stroke of said piston in one direction.

8. In a glassworking machine, a glass pressing mechanism comprising a pressing plunger, pneumatically operated means for actuating said plunger including a plurality of cylinders connected in tandem, a piston in each cylinder connected to said plunger, and means for varying the stroke of the plunger without varying the speed of initial movement thereof.

9. In a glassworking machine, a glass pressing mechanism comprising a pressing plunger, pneumatically operated piston and cylinder mechanism for reciprocating said plunger into and out of pressing position including a plurality of cylinders connected in tandem, a piston in each cylinder connected to said plunger, and means for varying the stroke of said pressing plunger throughout a wide range without varying the speed of initial movement of the plunger.

10. In a glassworking machine, a glass pressing mechanism comprising a pressing plunger, pneumatically operated piston and cylinder mechanism for reciprocating said plunger into and out of pressing position, said piston and cylinder mechanism including at least two separate cylinders, each having a piston connected to said plunger, and means for varying the capacity of the cylinder to vary the stroke of the plunger without substantial alteration of the speed of initial movement of the plunger.

11. In a glassworking machine, a glass pressing mechanism comprising a pressing plunger, pneumatically operated piston and cylinder mechanism for reciprocating said plunger into and out of pressing position, said piston and cylinder mechanism including at least two separate cylinders, each having a piston connected to said plunger, said cylinder comprising a cylindrical head slidably mounted within and in contact with the inner walls of said cylinder, and means for adjusting the position of the head with reference to the body of the cylinder whereby the stroke of the cylinder may be adjusted throughout a wide range.

12. In a glassworking machine, in combination with a mold, glass pressing mechanism for shap-

ing the glass charges in a mold and including a plunger carrier and a plunger, said glass pressing mechanism being adjustable to press ware throughout a wide range of sizes comprising an adjustable pneumatic cylinder for adjusting the actuating stroke of the plunger, in approximate accordance with the size and shape of ware to be produced, and means for adjusting the position of the plunger with reference to the plunger carrier in exact accordance with the size and shape of ware to be produced.

13. In a glassworking machine, in combination with a mold, glass pressing mechanism comprising a plunger carrier and a plunger, pneumatic cylinder and piston means for actuating the plunger carrier and plunger, means for adjusting the length and capacity of the cylinder to vary the stroke of the plunger in approximate accordance with the size and shape of ware to be produced without varying the speed of movement of the plunger, said plunger being screw-threadedly carried by said plunger carrier whereby the lower limits of plunger position may be varied in exact accordance with the size and shape of the ware.

14. In a glassworking machine, a glass pressing mechanism comprising a pressing plunger, pneumatically operated piston and cylinder mechanism for reciprocating said plunger into and out of pressing position, said cylinder comprising a cylindrical head slidably mounted within and in contact with the inner walls of said cylinder, and means for adjusting the position of the head with reference to the body of the cylinder whereby the stroke of the cylinder may be adjusted throughout a wide range, and means for selectively varying the pressure on said plunger in accordance with the size, shape and weight of ware being produced.

15. In a glassworking machine, in combination with a mold, glass pressing mechanism comprising a plunger carrier and a plunger, pneumatic cylinder and piston means for actuating the plunger carrier and plunger, means for adjusting the length and capacity of the cylinder to vary the stroke of the plunger in approximate accordance with the size and shape of ware to be produced without varying the speed of movement of the plunger, said plunger being screw-threadedly carried by said plunger carrier whereby the lower limits of plunger position may be varied in exact accordance with the size and shape of the ware, and means for optionally increasing or decreasing the pressure for actuating the plunger in accordance with the weight of the ware being produced.

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