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DOUBLE PISTON ARRANGEMENT

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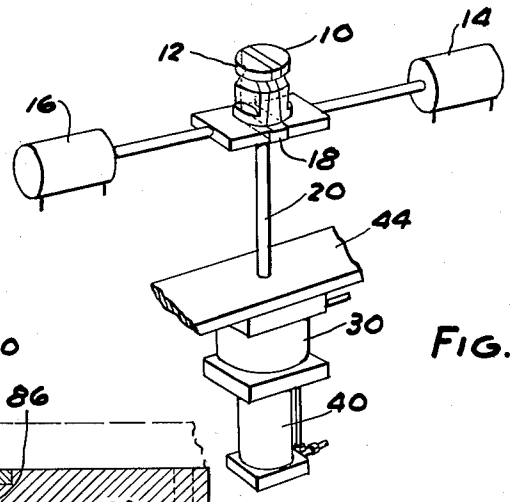


FIG. 1

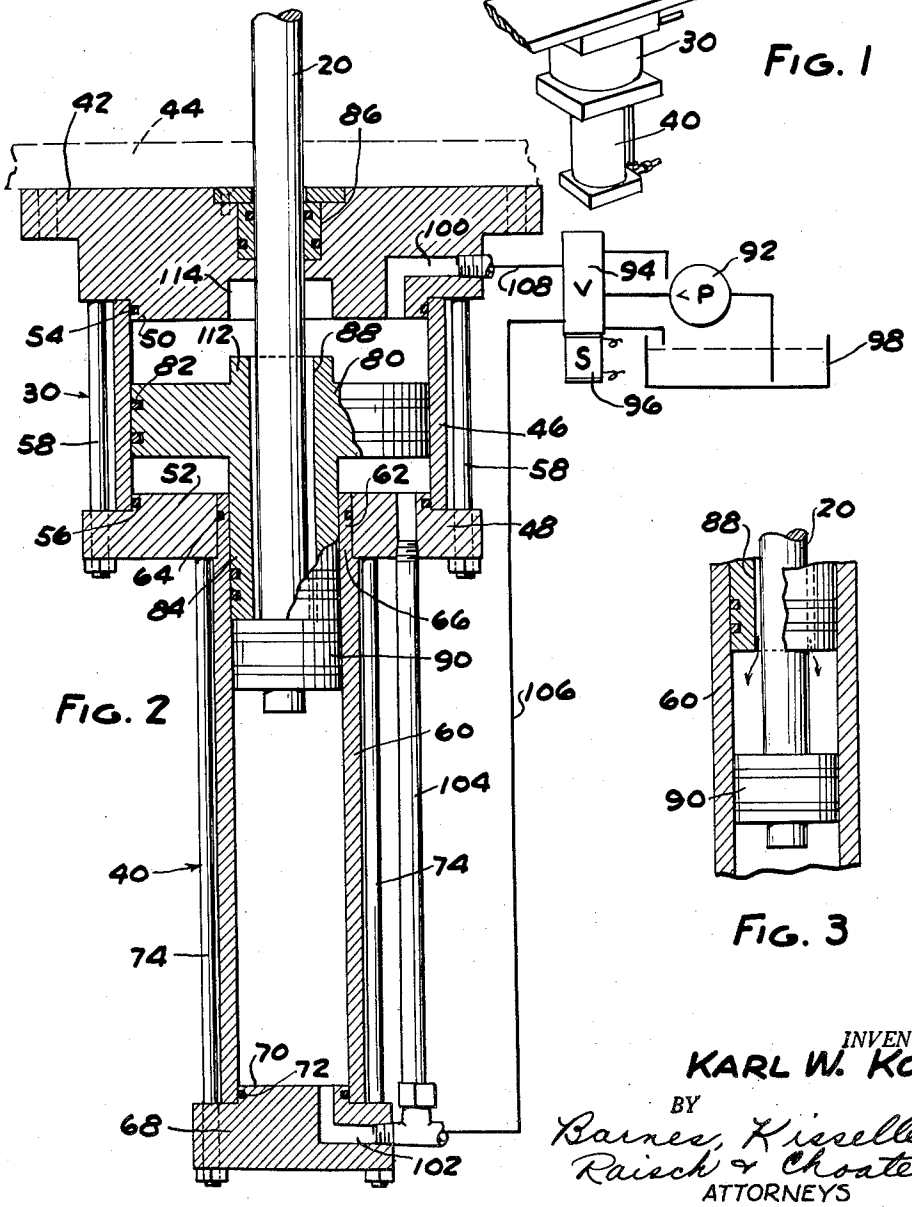


FIG. 2

FIG. 3

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DOUBLE PISTON ARRANGEMENT

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This invention relates to a control cylinder for machinery. For example, in the art of molding aluminum pistons, it is necessary to have a piston which closes the mold. Frequently, in opening this mold a great deal of initial power is required to break the mold and the motion thereafter is an easy motion. To utilize fluid pressure either in the form of hydraulics or air to accomplish this motion would require a large capacity of pressure supply if the piston required for the initial pressure were to continue the full stroke.

It is an object of the present invention, therefore, to provide a composite piston which is capable of giving a high break-away force and which thereafter can continue a motion with a low amount of pressure fluid required.

Other objects and features of the invention relating to details of construction and operation will be apparent in the following description and claims.

Drawings accompany the disclosure and the various views thereof may be briefly described as:

FIGURE 1, a perspective view of the assembled unit showing the adaptation to a piston molding machine.

FIGURE 2, a sectional view of the piston illustrating the fluid circuit diagrammatically.

FIGURE 3, a sectional view of the proportion of the piston illustrating the parts in a different relative position.

Referring to the drawings:

A piston mounting machine is shown in FIGURE 1 having two side parts **10** and **12** controlled by piston motors **14** and **16**, respectively, and a center portion **18** connected to a piston rod **20** leading into a major cylinder **30** and a minor cylinder **40**.

As shown in FIGURE 2, the major cylinder has a head **42** suitably mounted on a bracket **44** with a cylinder wall in the form of a sleeve **46** closed at the lower end by a cylinder base **48**. The sleeve **46** fits around cylindrical projections **50** and **52** each provided with O-rings **54** and **56**, the major cylinder **30** being tied together with tie rods **58**.

The minor cylinder is assembled into the base **48** of the major cylinder and consists of a cylindrical member **60** having an ensmalled portion **62** sealed by an O-ring **64** in a recess **66** in base **48**. The lower end of the cylinder **60** is closed by a final base **68** having a cylindrical extension **70** sealed by an O-ring **72**. This sub-assembly is held in place by tie rods **74**.

In the cylinder **30** is a piston **80** with suitable sealing rings **82** having a center projecting portion **84** which pilots into the cylinder **60**. The piston rod **20**, which is sealed at **86** in the head **42**, is smaller than an opening **88** in piston **80** and on the end of the piston rod is a secondary piston **90** having a sealed fit in the cylinder **60**.

The diagrammatic portion of FIGURE 2 illustrates a pump **92** leading to a valve **94** operated by a solenoid **96**, there being a tank **98** for fluid. The valve is adapted to direct fluid to an inlet passage **100** in head **42** while exhausting it from a passage **102** in the sub-head **68** which is also connected by a pipe **104** to the lower end of cylinder **30**.

It will be seen that pressure directed from valve **94** to conduit **106** will apply to the bottom of the piston **90** and to the bottom of piston **80** and that this will force both pistons upwardly to the extent of their stroke, it being possible for piston **80** to raise from piston **90** at the top of the stroke, depending upon the limit of the stroke of

rod **20**. With this motion, the mold in FIGURE 1 can be closed and ready for a molding operation. When it is desired to break the mold by withdrawing the center portion **18**, pressure is applied through valve **94** to conduit **108** leading to passage **100** so that pressure enters the top of the cylinder **30** and is exposed to the large area of piston **80**. Pressure can also pass back and forth through the passage **88** around piston rod **20** so that piston **80** traveling downwardly can obtain a certain degree of momentum while it displaces fluid between it and the piston **90**. At this point the piston **80** will strike the piston **90** and both pistons will travel simultaneously for the remainder of the stroke of the piston **80** in its chamber. This is sufficient for a breakaway action at the mold after which pressure may continue to flow through the passage **88** to the piston **90** to move it to the full retraction position desired for the mold part. On the return stroke the piston **90** will again move up as described and similarly the piston **80** will be repositioned for an opening motion. If the upstroke of rod **20** permits, then piston **80** can retract to the top of the cylinder **46** where projection **112** enters a recess **114**. Pilot projection **84** will still lodge in cylinder **60** and can be in direct contact with piston **90** at this part of the stroke.

I claim:

1. A double piston power unit for high breakaway force and low volume sustained motion which comprises a composite cylinder having a main head, a secondary head, and a base head, cylinders locked between said heads to form connected operating cylinder chambers, said primary and secondary heads having a diameter substantially greater than that of the base, and the primary cylinder chamber between said main head and said secondary head being substantially greater in diameter than the secondary cylinder formed between the secondary head and the base head, a piston in said primary cylinder intended to have a very short stroke and a piston in the secondary cylinder intended to have a prolonged stroke relative to the first piston, a piston rod on said second piston extending through said first and second heads and through said first piston, and an annular chamber surrounding said piston rod within said first piston providing communication between the primary cylinder chamber adjacent said main head and said second piston, and means for directing pressure to said first head for shifting both of said pistons within the cylinder chambers simultaneously as a unit until said first piston reaches the end of its stroke and thereafter shifting said second piston independently of said first piston in said secondary cylinder, and means for directing pressure selectively to the base head and the secondary head for shifting both of said pistons back to an original position.

2. A device comprising a composite piston and cylinder arrangement for developing a high breakaway pressure and a low volume sustained motion which comprises means forming two connected concentric cylinders, one having a short axial length and large diameter and the second having a long axial length and small diameter, a primary piston having a large portion movable in said first chamber and a small portion movable in said second chamber, and a secondary piston, movable only in said small cylinder, a piston rod fastened to said second piston passing through said first piston, said first piston having passages axially therethrough to permit the flow of liquid between the end of said first piston around said rod to said second piston, and means for directing pressure to said cylinders to cause shifting of said rod sequentially by said large piston and said small piston.

3. A device as defined in claim 2 in which the small portion of the primary piston is dimensioned always to be in part at least in the small cylinder, said secondary piston being of the same diameter as said small portion

of the primary piston and adapted to abut said portion during the movement thereof.

4. A device as defined in claim 2 in which the passages through said primary piston comprises a large bore centrally thereof of greater diameter than the piston rod.

5. A device as defined in claim 2 in which the means for directing pressure to said cylinders comprises a source of fluid pressure, a directional valve, a first connection to one side of said primary piston from said valve, and a second connection from said valve to the opposite side of said primary piston and to the free end of said secondary piston, wherein pressure reaches the rod end of said secondary piston from said primary piston.

6. The combination set forth in claim 1 in which said first piston has a portion dimensioned such that it always extends through said secondary head into said secondary cylinder, said second piston being of the same diameter as said portion of the first piston and adapted to be abutted by said portion during the simultaneous movement of said pistons.

References Cited in the file of this patent

UNITED STATES PATENTS

1,970,999	Ferris et al.	Aug. 21, 1934
2,490,625	Hall	Dec. 6, 1949