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MEANS FOR CONTROLLING THE SPEED OF A CHARGING PLUNGER IN A DIE CASTING MACHINE

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Fig. 1.

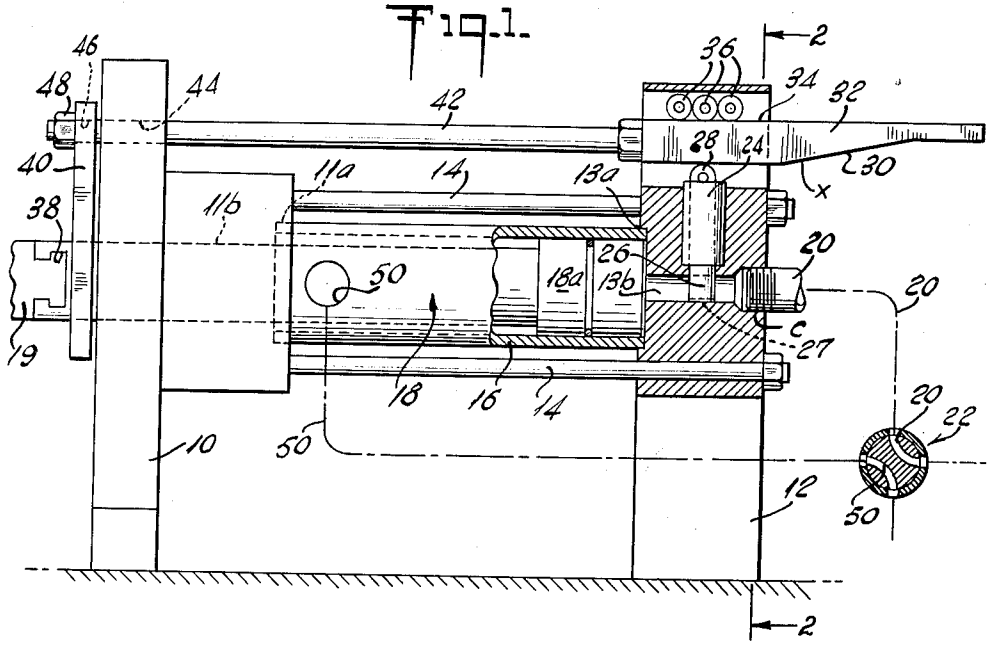
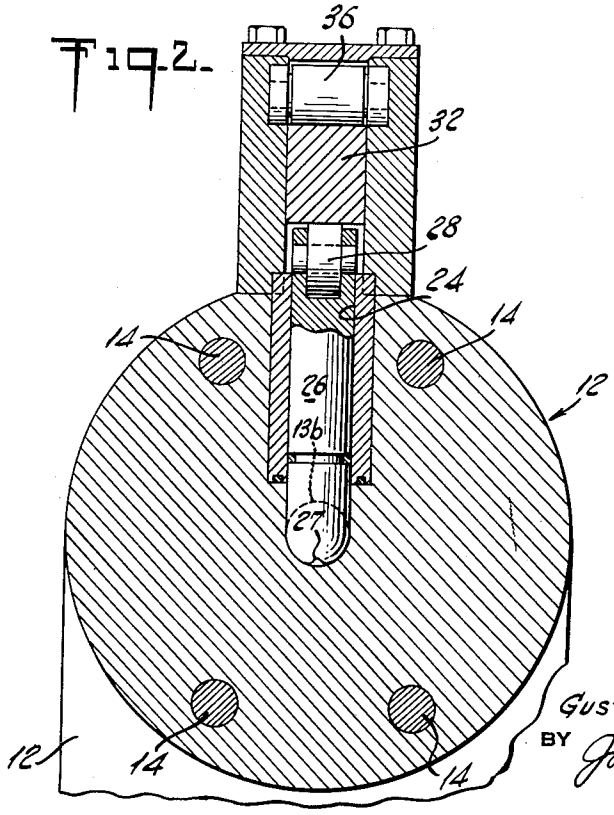


Fig. 2.



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MEANS FOR CONTROLLING THE SPEED OF A CHARGING PLUNGER IN A DIE CASTING MACHINE

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This invention relates to die casting machines of the kind employing a reciprocating plunger to move a charge into a die cavity, and more particularly to means for varying the speed of travel of the plunger.

Heretofore in apparatus of the kind described the die charging plunger has either been moved at a single uniform speed, or first at one speed and then at a second faster speed, each phase of the charging stroke being at a substantially uniform speed.

It is an object of this invention to provide improved means for varying the speed of travel of the charging plunger.

Another object of the invention is to provide a device in which the speed of the plunger may be continuously varied through all or a portion of its charging stroke.

Another object of the invention is to provide an apparatus which is simple, practical and dependable.

The invention will best be understood if the following description is read in connection with the drawings in which FIGURE 1 is a side elevation partly in cross section and FIGURE 2 is a vertical sectional view taken on the line 2—2 of FIGURE 1.

The apparatus comprises the vertical frame members **10** and **12** interconnected by the tie rods **14**. Mounted in and extending between from members **10** and **12** is a cylinder **16**. Member **10** has the bore **11** the wider portion **11***a* of which receives the forward end of cylinder **16** and the narrower portion **11***b* of which provides a passage for the plunger **18** the piston portion **18***a* of which is reciprocable within cylinder **16**. Member **12** has a bore **13** the wider portion **13***a* of which receives the rear end of cylinder **16** and the narrower portion **13***b* of which is a port through which fluid under pressure is introduced into the rear end of cylinder **16** and into contact with the rear end of plunger **18**. The end of fluid port **13***b* which is remote from plunger **18** is enlarged and forms a coupling *c* for a fluid conduit **20** extending from a reservoir (not shown) of fluid under pressure through a 4-way valve **22** the position of which determines whether fluid under pressure is supplied into, or exhausted from the rear end of cylinder **16** through port **13***b*.

Within frame member **12** is a vertical slideway **24** for a slide or gate valve member **26** the lower end of which extends into port **13***b* and controls it, and the upper end of which supports the roller **28** which is a cam follower adapted to travel on the cam surface **30** of the sliding cam member **32**. It will be noted that a small passage **27** is provided extending through valve member **26** adjacent its lower end and is open at all times.

Member **32** extends through a horizontal slideway **34** provided in the upper end of frame member **12** and defined on top by the rollers **36**. When 4-way valve **22** is turned to supply fluid under pressure into the rear end of cylinder **16** through port **13***b* the force of said fluid, acting first only within passage **27** in member **26**, starts raising member **26** in its slideway **24**, and as the lower end of member **26** is uncovered by moving away from the lower surface of port **13***b* the force of the fluid acting now on the entire lower end of slide valve **26** continues to raise member **26** until its cam follower roller **28** contacts and is held against the cam surface **30** of sliding cam **32**.

It will be noted that at least a portion of the cam

surface **30** is inclined providing a surface of varying elevation relative to port **13***b*. This surface of varying elevation controls the height to which member **26** can rise and in so doing vary the size of the opening through which fluid under pressure is introduced into the rear end of cylinder **16** into contact with the rear end of the piston portion **18***a* of plunger **18**.

In the drawing only the rear end portion of a die charging plunger is fully shown but the front end of the portion which is illustrated is provided with a bayonet slot **38** for ready attachment to a suitable front section **19**.

Attached to and moving with the plunger **18** is the vertical bracket **40**. A slide cam extension **42** is adjustably attached to the front end of cam member **32** and the forward end of said extension is supported in a bearing **44** provided in the upper portion of frame member **10** and extends through the bore **46** in the upper end of bracket **40** to which it is detachably secured as by the nut **48**.

It will be seen that when 4-way valve **22** is turned to supply fluid under pressure to the rear end of plunger **18** a small amount of said fluid will flow through passage **27** in slide valve **26** and will cause the plunger **18** to start forward slowly and will urge slide valve **26** to rise to the extent permitted by the cam surface **30**. Since bracket **40** and cam member **32** will move forward with the plunger the cam surface **30** will move over the cam follower roller **28** on the top of valve member **26** and the latter will start to rise as soon as it starts riding on the upwardly inclined portion *x* of the cam surface. As valve member **26** moves upward progressively the port **13***b* is correspondingly opened admitting more high pressure fluid into the rear end of cylinder **16** and progressively increasing the speed of the plunger in moving through its charging stroke. The speed of the plunger is varied in direct relation to the slope of cam surface **30**.

The plunger **18** is returned in a known manner by turning 4-way valve **22** to exhaust the pressure fluid from the rear end of cylinder **16** and to introduce it into the front end of cylinder **16** through conduit **50** leading from the 4-way valve **22**. As plunger **18** is returned to its starting position slide valve member **26** will fall as the fluid pressure in the rear end of cylinder **16** and port **13***b* is reduced and the slope of cam surface **30** forces it to return to its starting position.

There has thus been provided thoroughly practical means for varying the speed of travel of the charging plunger of a die casting machine.

What I claim is:

1. In apparatus of the kind described including a reciprocable plunger having a piston portion enclosed in a cylinder and means for introducing fluid under pressure alternately into opposite ends of said cylinder to reciprocate the plunger, a port through which said fluid is supplied to, and exhausted from, the rear end of said cylinder, a gate valve extending into said port reciprocable in a plane normal to the axis of said port, and cam means moveable in response to movement of the plunger and having a cam surface disposed to limit opening movement of said gate valve.

2. In a die casting machine of the kind employing a reciprocable plunger to move a charge into a die cavity, the plunger including a piston portion enclosed in a cylinder, means including an entrance port for supplying fluid under pressure into said cylinder while exhausting fluid from the other end of the cylinder to move the plunger through its charging stroke, a cam moveable with the plunger, a gate valve disposed in said port, and extending into contact with the surface of said cam member, said gate valve having a surface portion exposed at all times to fluid pressure in said port and acting to direct a com-

ponent of said pressure in a direction tending to lift the gate valve against said cam.

3. An apparatus of the kind described including a reciprocable plunger having a piston portion enclosed in a cylinder and means for introducing fluid under pressure alternately into opposite ends of said cylinder to reciprocate the plunger, a port through which said fluid is supplied to an exhaust from the rear end of said cylinder, a cam with an inclined surface moving with the plunger, and a gate valve between the port and the cam and having a fluid channel extending transversely to the axis of the valve, whereby said valve is responsive to pressure in the port to move in an opening direction to the extent permitted by the cam surface.

4. In a die casting machine of the kind employing a reciprocal plunger to move a charge into a die cavity, a frame and a plunger reciprocable in said frame, said plunger having an enlarged rear-end portion, a cylinder enclosing said enlarged rear-end portion, and means for reciprocating the plunger by means of fluid under pressure including, a 4-way valve, and supply and return conduits leading from said 4-way valve to the opposite ends of said cylinder, respectively, to exert pressure alternately on the rear and front ends of the enlarged portion of said plunger, a gate valve extending in to the conduit leading to the rear end of said cylinder, a cam moveable with said plunger and having a cam surface comprising a portion parallel with the axis of said plunger followed by an inclined surface portion sloping away from the axis of the plunger, said gate valve being moveable in the direction of the cam and having a small passage extending axially of the port and of sufficient size to initiate movement of the valve member in response to fluid pressure in the conduit means leading to said port when such movement is permitted by the slope of said cam.

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