Jan. 27, 1970 R. E. POTTS 3,491,826

EXTENDED OPENING DIE CASTING MACHINE

Filed July 15, 1966

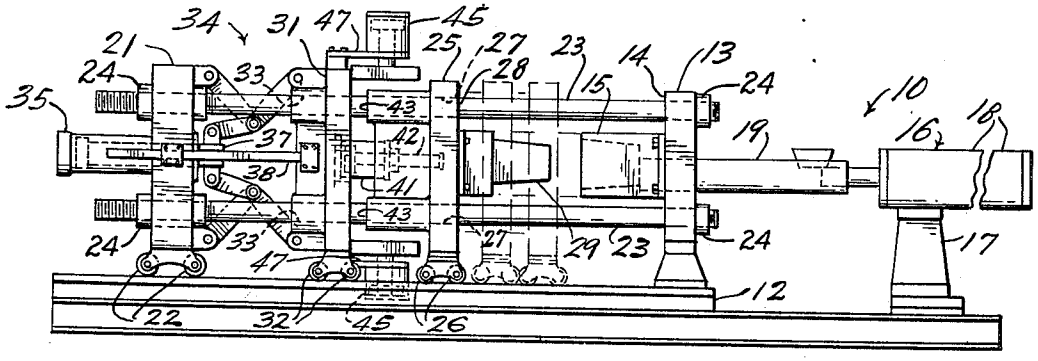


FIG-1-

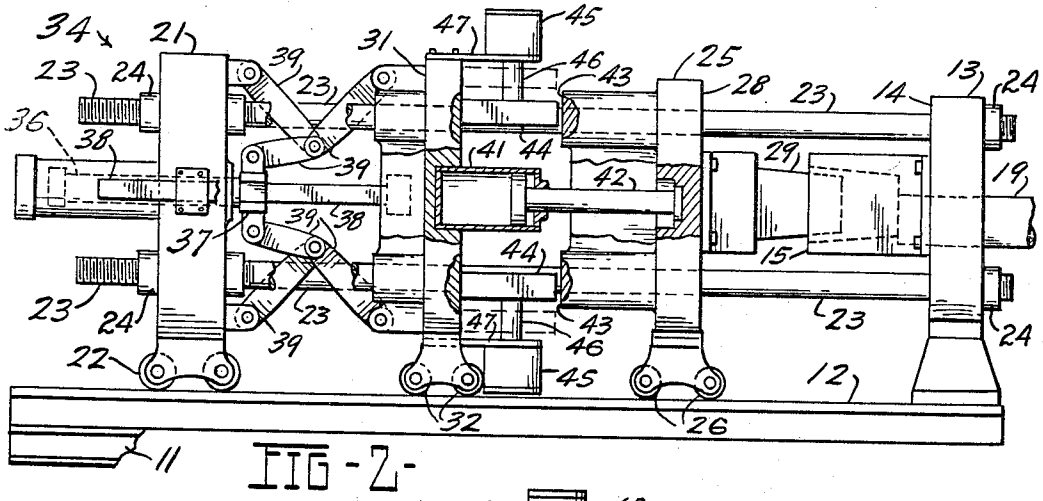


FIG-2-

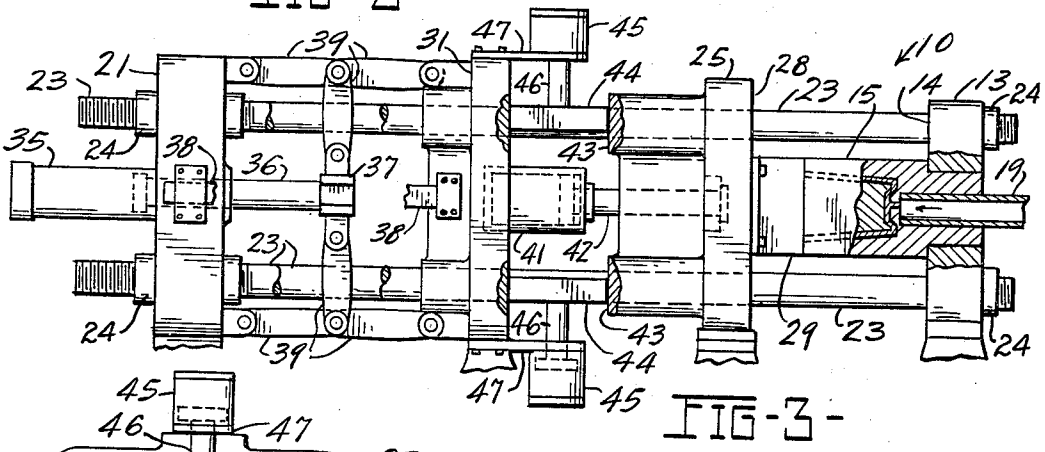


FIG-3-

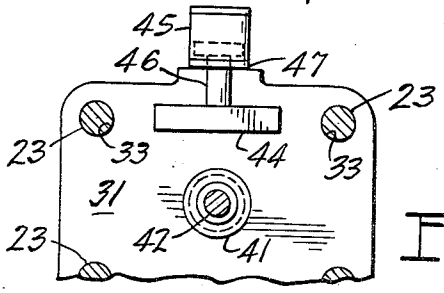


FIG-4-

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EXTENDED OPENING DIE CASTING MACHINE

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ABSTRACT OF THE DISCLOSURE

An extended opening die casting machine for use in producing elongated die castings. The machine has a longitudinal base which mounts opposed front and back plates. A sliding plate and an auxiliary plate are positioned between the front and back plates. A crab mechanism is mounted between the back plate and the auxiliary plate. Right parallelepiped compression blocks are removably mounted between the auxiliary plate and the sliding plate. The compression blocks are moved into and out of blocking position by displacement cylinders and are of an axial length sufficient to provide an extended die opening.

This invention relates to die-casting machines and more particularly, to a die-casting machine having an extended die receiving opening.

While the present invention may be used in connection with a die-casting machine of the submerged-plunger type, it is more commonly used on a high pressure cold-chamber injection type machine. Machines of the later type are used for the die casting of higher melting point alloys, such as aluminum, magnesium, and brass.

In cold-chamber die casting machines injection pressures of 10,000 p.s.i. and higher are not uncommon. When working with high pressures it is necessary that the opposed die halves be held in position under high locking pressures while the shot is being made.

Because of the overall increase in machining labor costs, many industries are specifying larger and more complex die castings. Prior art die casting machines are not capable of successfully producing extremely long die castings of high temperature alloys. A die casting that is long or deep in the axial direction of the machine, which is the axial direction of the shot sleeve, requires a die casting machine with an extended opening to properly eject the completed die casting. Because of the high pressures and resultant forces involved, it is not satisfactory to merely extend the length of the toggle mechanisms in prior art die casting machines. If the length to width ratio of the toggle links is substantially increased such links fail, when placed under the high compression forces resulting from the die locking operation. Furthermore, it is not possible merely to increase the size of prior art toggle linkages because not enough clearance space is available in such prior art apparatus to handle the larger linkages.

It is the primary object of the present invention to provide an improved die casting machine having an extended opening to receive elongated or deep dies.

It is another object of the present invention to provide an improved die casting machine having an improved locking mechanim which is suitable for holding the two halves of a die together under high locking pressures.

Further objects will become apparent from the following specification and drawings in which:

FIG. 1 is a side elevational view of an improved die casting machine, according to the present invention;

FIG. 2 is a side elevational view, similar to FIG. 1, drawn on an enlarged scale, and showing portions of the die casting machine in vertical cross section;

FIG. 3 is a side elevational view, similar to FIG. 2, showing the die casting machine, according to the present invention, in a locked position; and

FIG. 4 is a vertical sectional view, with parts broken away, taken along the line 4—4 of FIG. 2.

Briefly, the invention relates to an extended opening die casting machine having the conventional longitudinally extending base on which a front plate is fixedly mounted to carry the cover die. A back plate is spaced from the front plate on the base and a plurality of guide bars extend between and are connected to the front plate and the back plate. A sliding plate on which the ejector die is mounted is usually moved towards and away from the front plate by a crab mechanism. The present invention interposes an auxiliary plate between the back plate and the sliding plate, and the crab mechanism moves the auxiliary plate forward and back. A separate cylinder means is provided to impart relative movement between the auxiliary plate and the die carrying sliding plate to supplement the longitudinal stroke of the crab mechanism, and blocking means are moved into position between the relatively movable sliding plate and auxiliary plate so that the forces tending to open the machine during a die casting operation are taken through the blocking means, the auxiliary plate and the crab mechanism. These forces then appear as tension forces in the guide bars which join the front and back plates in the usual manner.

When the die halves are in open position the crab mechanism is retracted, the blocking means withdrawn, and the separate cylinder means has moved the sliding plate and auxiliary plate into close juxtaposition to give a maximum die opening. When the die halves are in closed position the crab mechanism is extended, the sliding plate and auxiliary plate are moved apart and the blocking means are interposed therebetween. In this closed position the machine is capable of withstanding the full die casting pressures.

Referring to FIG. 1, an extended opening die casting machine, according to the present invention, is indicated by the reference number **10**. The die casting machine **10** comprises a longitudinally extending base **11** having the usual upper guide tracks.

A front plate **13** is fixedly mounted to the base **11** and has means on an inner surface **14** for mounting a cover die **15**.

The die casting machine **10**, illustrated in the drawings, is a cold-chamber machine and includes shot mechanism generally indicated by the reference number **16** (see FIG. 1). The shot mechanism **16** comprises a pedestal **17**, which is mounted on the base **11**, a hydraulic shot cylinder **18**, and a shot sleeve **19** which is in communication with the interior of the die halves, through an opening in the cover die **15** (see FIG. 3), in a manner well known in the art.

A back plate **21** is spaced from the front plate **13** and is positioned on the guide tracks **12** of the base **11**. In the present embodiment the plate **21** is provided with rollers **22** which engage and ride upon the tracks **12**. A plurality of heavy duty guide bars **23** extend between and are connected to the front plate **13** and the back plate **21** and the distance setting between the front and back plates is adjustable by guide bar nuts **24** as is the usual practice.

A sliding plate **25**, having rollers **26**, in engagement with tracks **12** is positioned between the front plate **13** and the back plate **21**. The sliding plate **25** has a plurality of openings **27** through which the guide bars **23** extend.

Means are provided on a surface **28** of the sliding plate **25** for mounting an ejector die **29** in an opposed and complementary relationship to the cover die **15**, which is mounted on the front plate **13**.

An auxiliary plate **31**, having rollers **32**, is mounted for longitudinal movement along the tracks **12** of the base **11**.

The auxiliary plate **31** is positioned between the sliding plate **25** and the back plate **21** and has a plurality of openings **33** through which the guide bars **23** extend (see FIG. 4).

Closing means are provided for moving the auxiliary plate **31** between a retracted position, shown in FIG. 2, and an extended position, shown in FIG. 3. When in the extended position shown in FIG. 3, the closing means is locked and the auxiliary plate **31** and its supporting structure resists die casting forces which are transmitted through the die casting machine **10** to the auxiliary plate **31**. In the present embodiment, the closing means comprises a conventional crab mechanism generally indicated by the reference numeral **34**. The crab mechanism **34** includes a closing cylinder **35** carried by the back plate **21**. The cylinder **35** has a rod **36** connected to a cross head **37** (see FIG. 3). The cross head **37** is mounted for movement on a pair of cross head guide bars **38**. A plurality of toggle links **39** extend between and are pivotally connected to the cross head **37**, the back plate **21**, and the auxiliary plate **31**, respectively.

Referring to FIG. 2, when it is desired to move the auxiliary plate **31** from the retracted position to the extended position (shown in FIG. 3) the closing cylinder **35** is actuated. The rod **36** and the cross head **37** move to the right (see FIG. 2) until the toggle links **39** are in the locked position shown in FIG. 3.

Referring in particular to FIG. 2, cylinder means are provided for moving the sliding plate **25** between a retracted position (shown in FIG. 1) and an extended position (shown in FIG. 3) wherein the sliding plate **25** and its supporting structure are in a closed position to receive the forces generated by the die casting operation. In the present embodiment, the cylinder means includes a cylinder **41** which is connected to and carried by the auxiliary plate **31**. The cylinder **41** has a rod **42** which is connected to the sliding plate **25**. In the present embodiment, the sliding plate **25** has a striking surface **43** adjacent the auxiliary plate **31**.

Blocking means including a plurality of compression blocks **44** are interposed between the auxiliary plate **31** and the striking surface **43** of the sliding plate **25** when the sliding plate **25** is in the extended position shown in FIG. 3. Each of the compression blocks **44** is a right parallelepiped in shape, having opposed parallel surfaces which lie in planes perpendicular to the longitudinal axis of the base **11**. The opposed parallel surfaces of the compression blocks **44** engage complementary surfaces on the auxiliary plate **31** and the sliding plate **25**. The blocks **44** have a length in the axial direction of the machine sufficient to provide an extended die opening (see FIG. 1).

Displacement means are provided for moving the compression blocks **44** between a rest position (shown in FIG. 1) which is exterior of the normal path of movement of the sliding plate **25** and a blocking position (shown in FIG. 3). When the compression blocks **44** are in their blocking position they are in force transmitting relationship with the auxiliary plate **31** and the striking surface **43** of the sliding plate **25**. In the present embodiment, the displacement means comprises cylinders **45** having rods **46** which are operably connected to the compression blocks **44**. The cylinders **45** are supported by brackets **47** which are mounted on and carried by the auxiliary plate **31**. It should be noted that other types of displacement means may be utilized and still fall within the scope of the present invention.

In a typical operation of the die casting machine **10**, the die halves **15** and **29** are secured to the front plate **13** and to the sliding plate **25**. The machine is adjusted to the proper closing position by setting nuts **24** in the guide rods **23**. Thereafter, the operation will be described with the parts standing in the die open position, assuming that a casting has just been ejected.

To close the machine in preparation for a casting operation, the cylinder **41**, carried by the auxiliary plate **31** is actuated and the cylinder rod **42** moves to the right (as shown in FIG. 1) thereby moving the sliding plate **25** to its extended position. When the sliding plate **25** has reached its extended position, the displacement means cylinders **45** are actuated and the compression blocks **44** move inwardly to their blocking position between the auxiliary plate **31** and the striking surface **43** of the sliding plate **25**. As will be seen in FIG. 2, when the die casting machine **10** has reached this position, the ejector die **29** has begun its mating engagement with the cover die **15**.

Next, the closing cylinder **35** of the crab mechanism **34** is actuated and the cylinder rod **36**, which carries the cross head **37**, moves to the right (see FIG. 3) moving the toggle links **39** to the locked position shown in FIG. 3, wherein the auxiliary plate **31** has moved from its retracted position to its extended position.

When both the sliding plate **25** and the auxiliary plate **31** are in the closed or extended position, shown in FIG. 3, the ejector die **29** and the cover die **15** are in a complementary relationship and are ready for the casting shot. At this time, metal is injected from the shot sleeve **19**, in the normal manner, and the die casting machine and its component parts are placed under high pressures. This force is transmitted rearwardly through the sliding plate **25**, the compression blocks **44**, the auxiliary plate **31**, aligned ones of the toggle links **39**, the back plate **21**, and to the massive guide bars **23** movement of which is resisted by the front plate **13** and the machine frame.

After a part has been cast, the die casting machine **10** is opened from the position shown in FIG. 3 to eject the cast part. At this time, the closing cylinder **35** of the crab mechanism **34** is actuated and the cylinder rod **36** carrying the cross head **37** is moved to the left (see FIG. 2) until the auxiliary plate **31** has reached the retracted position shown in FIG. 2. At this time, the ejector die **29** has not completely cleared the cover die **15** and the cast part still cannot be removed.

Next, the cylinders **45** are actuated and the compression blocks **44** are moved outwardly until they reach the rest position shown in FIG. 1. It has been found that the retraction movement of the toggle links **39** creates enough drag force on the surrounding components to free the compression blocks **44** from their locked position between the auxiliary plate **31** and the striking surface **43** of the sliding plate **25**, thereby permitting the compression blocks **44** to move outwardly easily.

After the compression blocks **44** have been displaced, the cylinder **41** carried by the auxiliary plate **31** is actuated and the sliding plate **25** is moved from its extended position, shown in FIG. 2, to its retracted position, shown in FIG. 1. At this time, the ejector die **29** has cleared the cover die **15** and the cast part may be ejected in the usual manner.

While the present invention has been disclosed in connection with a specific arrangement and disposition of the parts, it should be expressly understood that numerous modifications and changes may be made without departing from the scope of the appended claims.

I claim:

1. An extended opening die casting machine, comprising, a longitudinally extending base, a front plate fixedly mounted to said base, means on said front plate for mounting a cover die, a back plate spaced from said front plate and positioned on said base, a plurality of guide bars extending between and connected to said front plate and said back plate, a sliding plate positioned between said front plate and said back plate mounted for movement on said base, means on said sliding plate for mounting an ejector die in opposed and complementary relationship to a cover die mounted on said front plate, an auxiliary plate positioned between said sliding plate and said back plate mounted for movement on said base, blocking means including at least two compression blocks

removably mounted between said auxiliary plate and said sliding plate, each of said compression blocks having opposed parallel surfaces which lie in planes perpendicular to said longitudinally extending base, such compression block surfaces engaging complementary surfaces on said auxiliary plate and said sliding plate respectively, each of said compression blocks having a length sufficient to provide an extended die opening, displacement means for moving said compression blocks between a rest position exterior of the normal path of movement of said sliding plate and a blocking position wherein said compression blocks are between said sliding plate and said auxiliary plate and are within the normal path of movement of said sliding plate, and closing means for moving said auxiliary plate between a retracted position adjacent said back plate and an extended casting position, said closing means including a crab mechanism having toggle linkage extending between said back plate and said auxiliary plate.

2. An extended opening die casting machine according to claim 1, wherein said closing means comprises a crab mechanism having toggle links extending between said back plate and said auxiilary plate and at least one cylinder operatively connected to said toggle links and to said back plate.

3. An extended opening die casting machine according to claim 1, wherein said displacement means comprises at least one cylinder operatively connected to each of said compression blocks.

4. An extended opening die casting machine, according to claim 3, wherein said displacement means cylinders are carried by said auxiliary plate.

5. An extended opening die casting machine, according to claim 2, including at least one cylinder operatively connected between said auxiliary plate and said sliding plate.

6. In a die casting machine having a base, a front plate fixed to said base, a back plate spaced from said front plate, a plurality of guide bars extending between and connected to said front plate and said back plate, a sliding plate positioned between said front plate and said back plate and mounted for movement on said base, and means on said front plate and on said sliding plate for mounting a cover die and an ejector die in complementary positions, the invention comprising, an auxiliary plate positioned between said sliding plate and said back plate and mounted for movement on said base, closing means including a crab mechanism having toggle linkage extending between said back plate and said auxiliary plate, blocking means including at least two compression blocks removably mounted between said auxiliary plate and said sliding plate, each of said compression blocks having opposed parallel surfaces which lie in planes perpendicular to the longtudinal axis of said base, such compression block surfaces engaging complementary surfaces on said auxiliary plate and said sliding plate respectively, each of said compression blocks having a length sufficient to provide an extended die opening and displacement means for moving said compression blocks between a rest position exterior of the normal path of movement of said sliding plate and a blocking position wherein said compression blocks are between said sliding plate and said auxiliary plate and are within the normal path of movement of said sliding plate.

7. Die casting apparatus, according to claim 6, said displacement means comprising cylinders carried by said auxiliary plate, each of said cylinders being operatively connected to a respective one of said compression blocks.

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J. SPENCER OVERHOLSER, Primary Examiner

U.S. Cl. X.R.

18—30; 164—343, 344