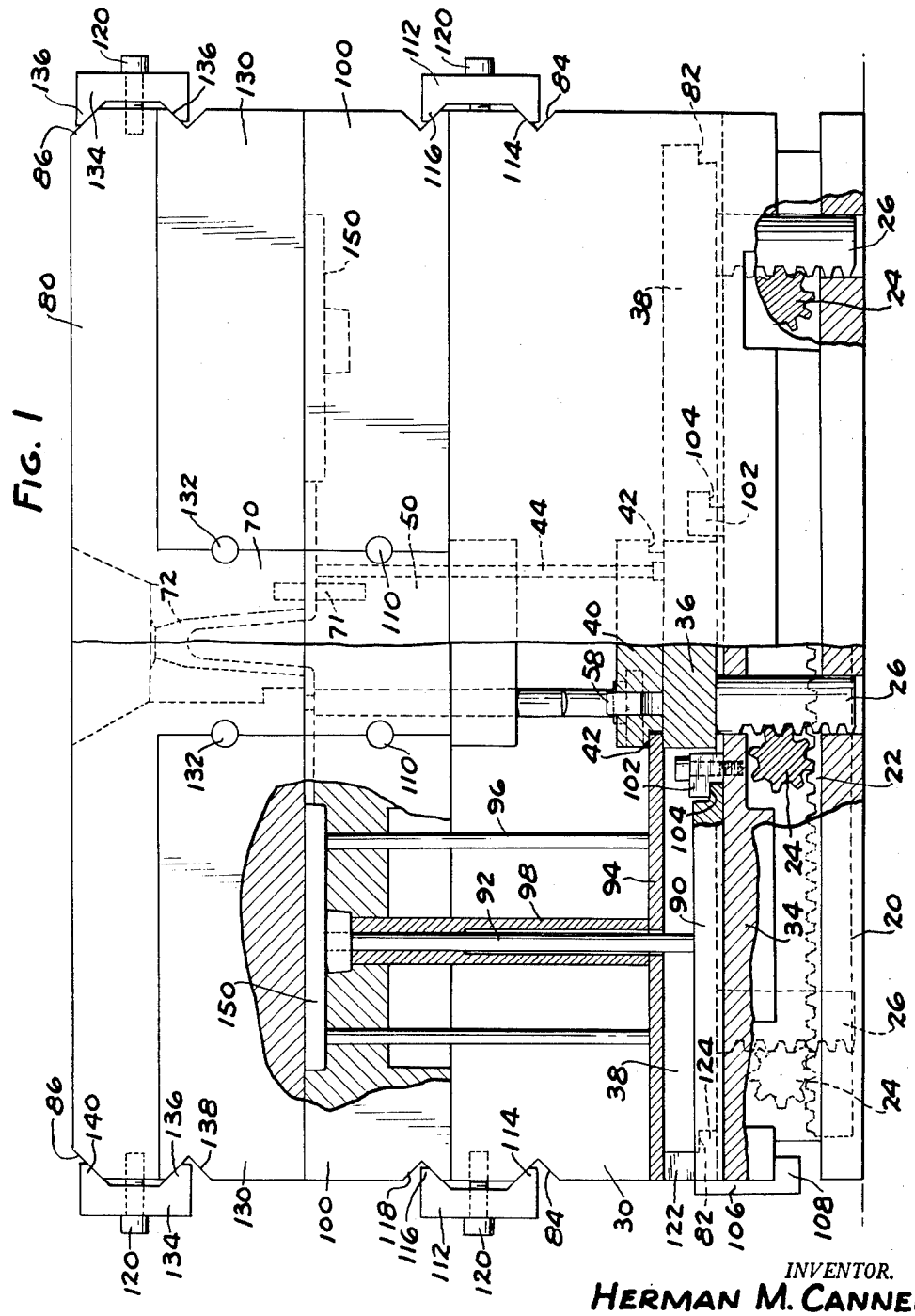
May 26, 1964 H. M. CANNER 3,134,142

UNIT DIE ASSEMBLY

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FIG. 1



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FIG. 2

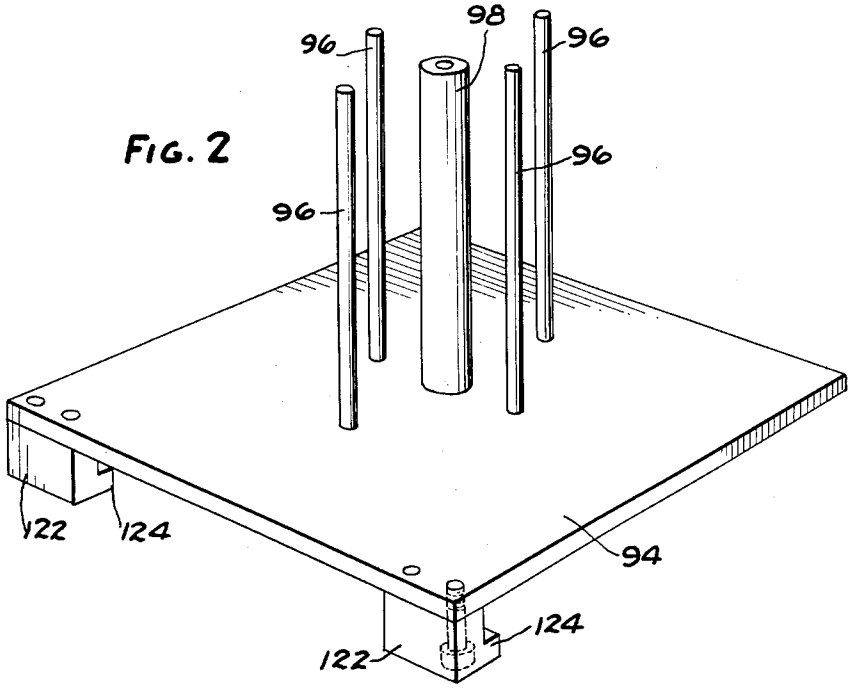
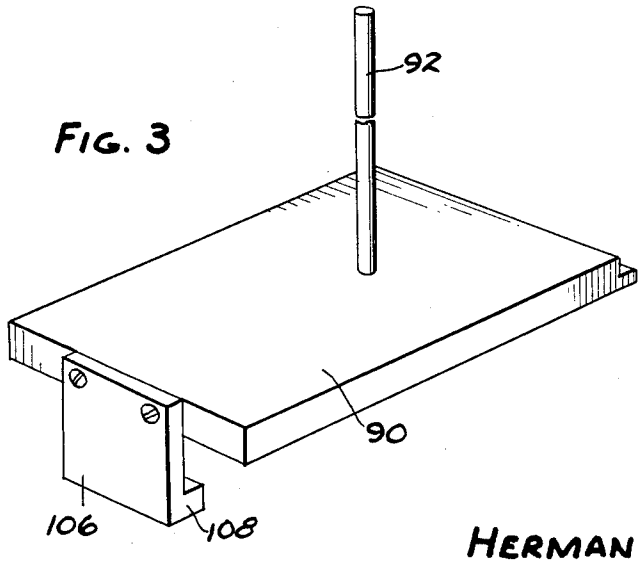


FIG. 3



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FIG. 5

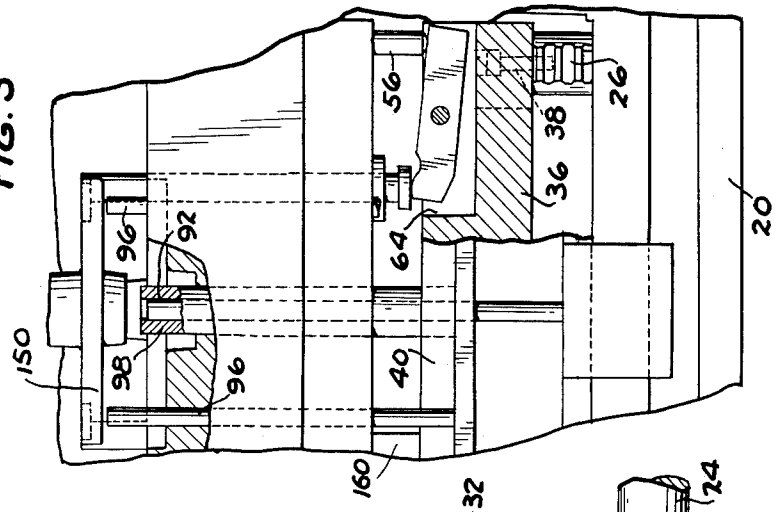
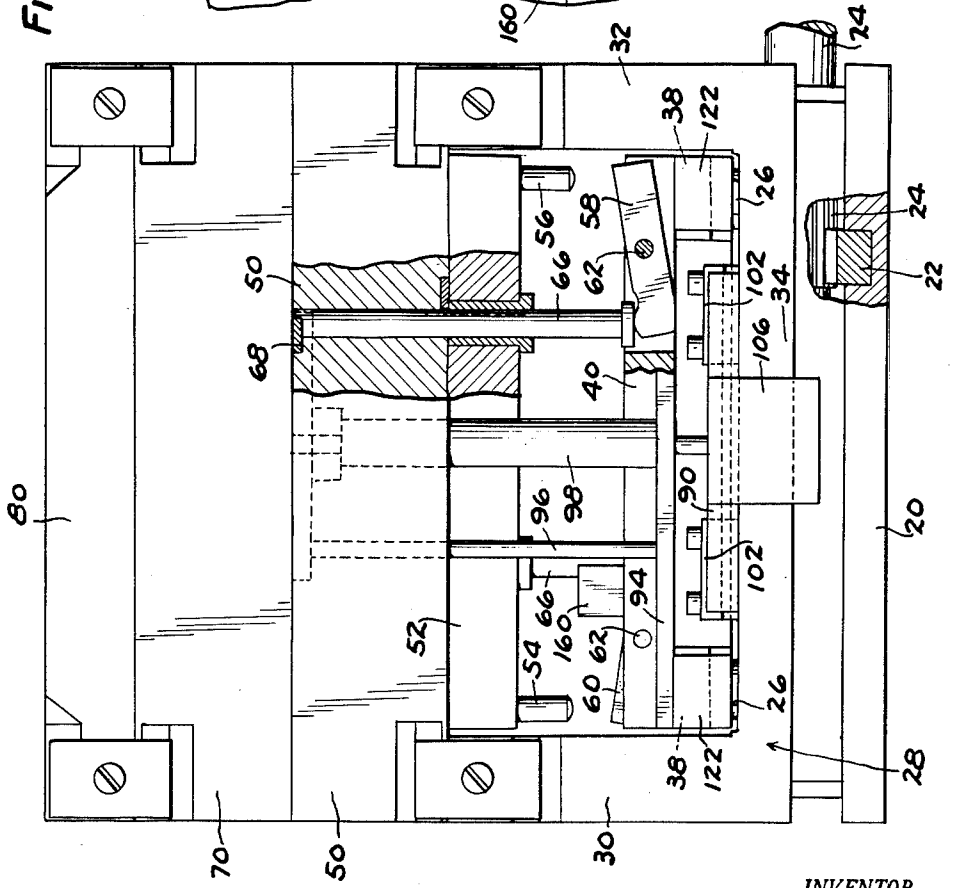


FIG. 4



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3,134,142

UNIT DIE ASSEMBLY

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12 Claims. (Cl. 18—42)

This invention relates to injection die molds and has particularly to do with that type of mold which is utilized for molten zinc or aluminum. It is equally adaptable to a plastic molding operation.

It is an object of the invention to provide a die unit which can accommodate different mold cavities and which has a simple and effective device for locking the respective mold cavity plates in position in the die actuating mechanism.

It is another object to provide a die mechanism with ejector pins which can be assembled with ejector plates and utilizing support pillars under the units.

It it a further object to provide a device with an accelerated ejector pin feature for use in automatic die casting.

It is a further object to provide a device in which the ejector plate and the core retainer plate can be assembled simultaneously and readily locked in position.

Other features and objects 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 is a side elevation of the device partially in section showing the relationship of the assembled parts.

FIGURE 2 is a view of the ejector plate unit in perspective.

FIGURE 3 is a view of a core retainer plate in perspective in a position relative to the plate of FIGURE 2.

FIGURE 4 is an end view of the device partially in section showing ejector pins and accelerating mechanism thereof.

FIGURE 5 is a partial end view showing the die in open position.

Referring to the drawings:

The machine has a base plate **20** with a longitudinally extending rack bar **22** between the sides, this bar cooperating with a plurality of elongate pinion rods **24** to control the vertical movement of actuator posts **26**. There are six of these rack posts **26**, two at the center area of the device, and two at each end to act on a lifter plate which is described later. These posts are preferably secured directly to the lifter plate by suitable screws.

One of the elongate pinion rods **24**, such as the middle one, can serve as the actuator for the rack bar which causes a lifting of the ejector plates at the proper sequence in the operation. On the base **20** is mounted a channel shaped body member **28** having side walls **30** and **32** (FIGURE 4) and a bottom wall **34**.

Within this channel-shaped member and mounted on the six rack posts **26** which are actuated by the pinion rods **24** is a H-shaped lifter plate which has a cross bar portion **36** shown in section in FIGURE 1 and arms **38** extending in each direction from this cross bar plate to the end of the channel and located adjacent the inner sides of the channel **30**. On the top of the cross bar **36** of the H plate is a pin mounting bar **40** having recessed sides to provide transverse grooves **42** facing outwardly. On the plate **40** will be mounted permanently sprue ejector pins **44** of standard construction.

A center portion of the mold containing the sprue comprises a lower sprue bar or block **50** bridging the two side walls **30**, **32** of the member **28** and supported on the top edges thereof at the center. A parallel plate **52** on

this bridging block lies between the side walls **30** and **32** transversely of the assembly and centrally thereof. This block **52** contains two fixed pins **54** and **56** which cooperate with an accelerator device which is mounted in the plate **40**. This device comprises jack levers **58** and **60** pivoted centrally on pins **62** in recesses **64** at opposite ends of the plate **40**. Resting on a toe portion of the inner end of the levers **58** and **60** is an accelerator ejector pin **66**, this pin having a slidable mounting in plate **52** and block **50** projecting upwardly to the sprue portion of the mold recess **68**.

As will be seen from FIGURE 4 and FIGURE 5, a lifting of the plate **40** will cause a lifting action of the sprue pins **44** as well as the pin **66**, and, at a certain stage in the lifting motion, the heel end of the levers **58** and **60** will contact the depending pins **54** and **56**, thus doubling the rate of lifting of the pins **66** for the purpose of rapidly increasing the eject force on the sprue portion of the mold to cause a snapping out of the part from the mold.

Above the lower sprue bar block **50** is a second transverse block forming an upper sprue bar **70** having suitable guide pins **71** to locate it slidably relative to the block **50**, this block **70** containing a sprue opening **72** for the entrance of molten material.

The above-described mechanism might be called the unit die which is ready to receive the special die cavities for any particular product. It will be noted that between the lower surface of plate **30** and the top surface of the bottom **34** of the channel-shaped body there is a considerable space. It will be noted that ends of the arms **38** of the H member are undercut at **82**. Similarly, notches **84** are cut into the end faces of the sides **30** and **32** spaced from the top edge on each side and also the top ends of the plate **80** are beveled at **86** to provide a gripping surface for a purpose to be later described.

Insertable into the recesses described in connection with the unit die are the die plates and also a combination ejector plate and a core retainer plate. It will be understood that the ejector plate and the core retainer plate must be moved in together since the core pin is inserted into the support pillar and similarly the pins of both plates must lie in proper position in the bottom die before insertion. Consequently, the assembly consists of a core pin plate or core retainer plate **90** and a core pin **92** (FIGURE 3) and an ejector plate **94** having, for example, four ejector pins **96** and a support pillar **98** which receives the core pin **92**. All of these pins project into a lower die block **100**.

Before describing the assembly, it should be pointed out that retainer bars **102** having an undercut recess **104** are mounted in the bight of each H member of plate **36** and anchored to the bottom **34** of the channel member **30** (FIG. 1, FIG. 4).

In the assembly of plates **90**, **94** and **100** the pins and the cores are telescoped together outside the die unit. Then the entire three plates are moved endwise into the cavity of the die unit. The forward edge of plate **94** moves into the recess **42** of plate **40**. The leading edge of the core plate **90** moves into the recess **104** under the bars **102**. At the trailing edge of the plate **90** is a L-shaped bracket member **106** which has a toe portion **108** which locks under the end of the plate **40**.

The lower die cavity block **100** overlies and bridges the channel sides **30**, **32** and the forward edge of the cavity block **100** has a recess which registers with a pin **110** to lock it in place relative to block **50**. A clamping yoke or tie block **112** having toe portions **114** and **116** is then applied to engage the notch **84** in wall **30** and to engage a notch **118** in block **100**. Screws **120** when tightened secure the block **100** to the base. The trailing corner of the plate **94** are also provided with locking brack-

ets **122** having a toe portion **124** which engages in recess **82** at the end of the legs **38**. An upper die cavity block **130** overlies the block **100** and is keyed at the forward edge by pin **132** to the block **70**. This upper die block is locked to the upper plate **80** by a tie block **134** secured by screws **120** and having a foot **136** entering a recess **138** in the die block **130** and a foot **140** engaging the surface **86** previously described on plate **80**. The block **100** has a die cavity **150** on its upper surface in which the product is manufactured, this cavity being connected through suitable sprue passages to the sprue opening **72** in the top of the plate **80**.

In the operation of the device when assembled as above described, it will be seen that with the parts as viewed in FIGURE 1 or FIGURE 4 the assembly is ready for a die casting in which molten material is either poured or injected into the opening **72**. When it is desired to eject the molded product, the pinion rod **24** is actuated to lift the H plate **36** with its center bar **36** and its outwardly extending legs **38** through the rack and post supports. The core plate **90** with the core pin **92** remains stationary but the tin plate **94** raises with the lifting plate as does also the block **70** and the upper die cavity blocks **130** with the supporting plate **80**. The pins **66** act not only on a portion of the sprue passages but also on the bottom surfaces of the plate **70**, thus lifting the upper assembly. At the same time, the pins **96** exert upward force on the product in the die cavity. As the upward motion continues, as previously explained, the lifting pins **66** contact at the heel and the pins **54** and **56** and thus the upper plate and the center portion of the sprues begins to move more rapidly in an upper direction than the pins **96**. This tends to give an added acceleration to the sprue relative to the product which exerts a force on the product to strip out the molded product permitting it to fall out of the lower die cavity or to be easily retrieved from the cavity. A stop pin **160** on plate **40** limits the upward motion of the lifter plate. It will also be seen that because of the use of the single lifter plate which is simultaneously elevated at several different points, the wracking of the mold is prevented.

It will thus be seen that there is described a unit die assembly which can be readily adapted to different die cavity blocks and at the same time being so designed that the cavity blocks may be assembled simultaneously with the core plate and the stripper pin plate which in connection with the accelerated central pin action provides automatic ejection. In addition, the device is so constructed that the assembled parts are securely and simply held in position for ready removal in a fast dismantling operation and a ready assembly for a new operation with different die blocks. It will be seen that the device described is provided with a double cavity but it could equally well be a single cavity die or have other multiple cavities.

While in the disclosure and the claims reference is made to base and top in vertical relationship, it will be recognized that the entire device could be turned 90° to operate in a horizontal relation if desired.

I claim:

1. A unit die combination comprising a base, a bottom spruce bar rigidly mounted on said base, an upper sprue bar slidably mounted with respect to said bottom sprue bar, a top plate on said upper sprue bar overlying said base, said base and said top plate defining a laterally exposed opening, a lifter plate, means for mounting said lifter plate on said base for movement in direction perpendicular to the base and to the top plate, said lifter plate having a central portion carrying sprue ejector pins and lifter pins for said upper sprue bar, upper die cavity blocks mounted on the lower surface of said top plate, and a lower die cavity assembly comprising a lower die cavity block, a core plate and an ejector pin plate movable as a sub-assembly endwise into said opening between said base and said top plate below said top cavity bars, and means

operable to lock said core plate and said ejector pin plate in position in spaced relation upon endwise movement into said die unit, said ejector pin plate being thus engaged with said lifter plate to operate simultaneously therewith.

2. A device as defined in claim 1 in which the base comprises a channel-shaped body member having longitudinally extending side walls, and a lower sprue plate bridging said side walls serving as a support for said top plate.

3. A device as defined in claim 2 in which a sprue pin plate underlies said bridging member, and pins are mounted on said plate extending into said bridging member for removing sprue portions of a mold upon relative movement between said top plate and said base.

4. A device as defined in claim 1 in which the means operable to lock said core plate and said ejector pin plate comprises undercut recesses in said base and said lifter respectively to receive the leading edges of said plates and hook means on the trailing edges of said plates to engage the base and the lifter plate respectively, said core plate then being fixed to said base and said ejection plate being fixed to said lifter plate.

5. A device as defined in claim 1 in which the upper and lower die cavity blocks are secured to the base and the top plate by tie bars having wedging toe portions to lock said parts securely while mounting said core plate and said ejector pin plate in locked position.

6. A device as defined in claim 1 in which the base comprises a channel shaped body, the lower die cavity block overlying and bridging the sides of said channel, the core plate being fixedly positioned between said sides adjacent the bottom of the channel, the ejector pin plate lying also between the sides of said channel affixed to said lifter plate.

7. A device as defined in claim 6 in which the lifter plate has spaced legs to receive the core plate on the base and the ejector pin plate overlies and bridges said legs.

8. A unit die mechanism for injection molding and casting which comprises a base, a bottom sprue bar on said base spaced upwardly from the bottom thereof, a lifter plate on said base between said sprue bar and the bottom of said base, a top plate and upper sprue bar on said top plate overlying said bottom sprue bar, said top plate overlying said base, means between said base and said top plate adjacent said sprue bars for mounting upper and lower die cavities affixed respectively to the base and the top plate, and means for elevating said lifter plate comprising a plurality of rack posts operatively associated with said lifter plate at spaced points in its geometric area, a plurality of pinion rods associating said rack posts in pairs transversely of said plate and means operatively connecting said pinion rods to cause simultaneous operations of said rods when any one of them is actuated wherein actuation of any of said pinion rods causes an equal and simultaneous actuation of all of said rods and said pinion posts and thus a plurality of simultaneous lifting forces on said lifter plate.

9. A device as defined in claim 8 in which the means associating said pinion rods comprise a straight, toothed rack slidably mounted in said base and engaged with the said pinion rods.

10. A device as defined in claim 8 in which the lifter plate comprises a plate having spaced parallel arms, and said rack posts are associated with the digital and proximal ends of said arms to create an equal lifting force thereon.

11. A device as defined in claim 10 in which the arms of said lifter plate are projecting toward the end of said die unit, and an ejector pin plate mounted on said arms having pins projecting upwardly to pass through a lower die cavity to serve as ejector pins for a workpiece.

12. A unit die combination comprising a base, a bottom sprue bar rigidly mounted on said base, an upper sprue bar slidably mounted with respect to said bottom sprue

bar, a top plate on said upper sprue bar overlying said base, said base and top plate defining an opening therebetween, a lifter plate, means for mounting said lifter plate on said base for movement in direction perpendicular to the base and to the top plate, said lifter plate having a central portion carrying sprue ejector pins, an upper die cavity block mounted on the lower surface of said top plate, and a lower die cavity assembly comprising a lower die cavity block, a core plate and an ejector pin plate movable as a sub-assembly into said opening between said base and said top plate, and means operable to lock said core plate and said ejector pin plate in position in spaced relation, said ejector pin plate being thus engaged with said lifter plate to operate simultaneously therewith, and means for accelerating the movement of

at least one of said ejector pins relative to said lifter plate after a predetermined movement of said lifter plate to increase the lifting rate of said one ejector pin above that of the plate.

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