

[54] **REINFORCEMENT DISPENSING MECHANISM**

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[56] **References Cited**

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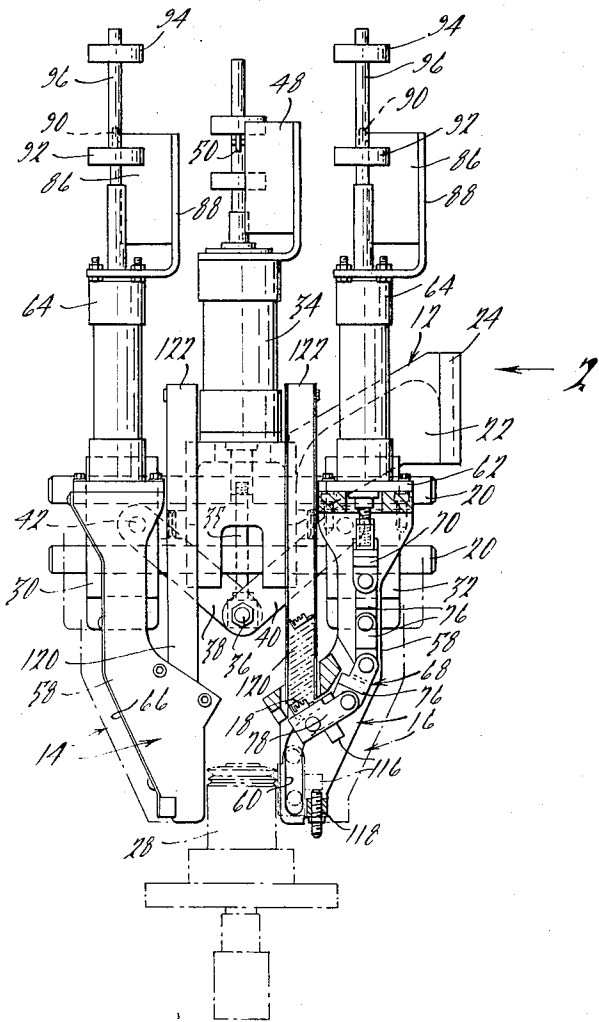
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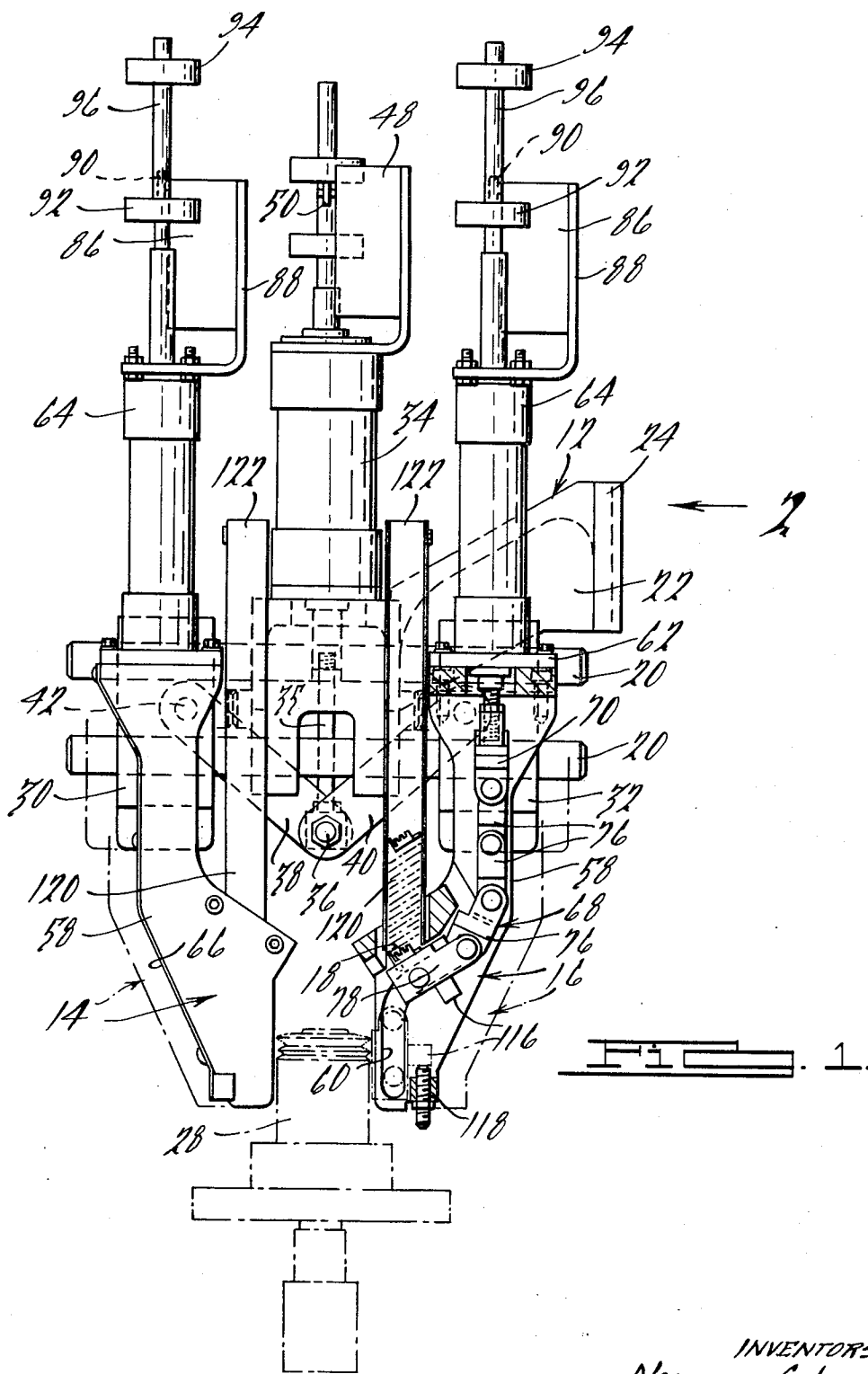
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[57] **ABSTRACT**

A mechanism for dispensing and accurately positioning metallic reinforcing elements within a mold cavity of an automatic casting machine in appropriate timed relationship relative to the mold assembly cycle.

10 Claims, 10 Drawing Figures





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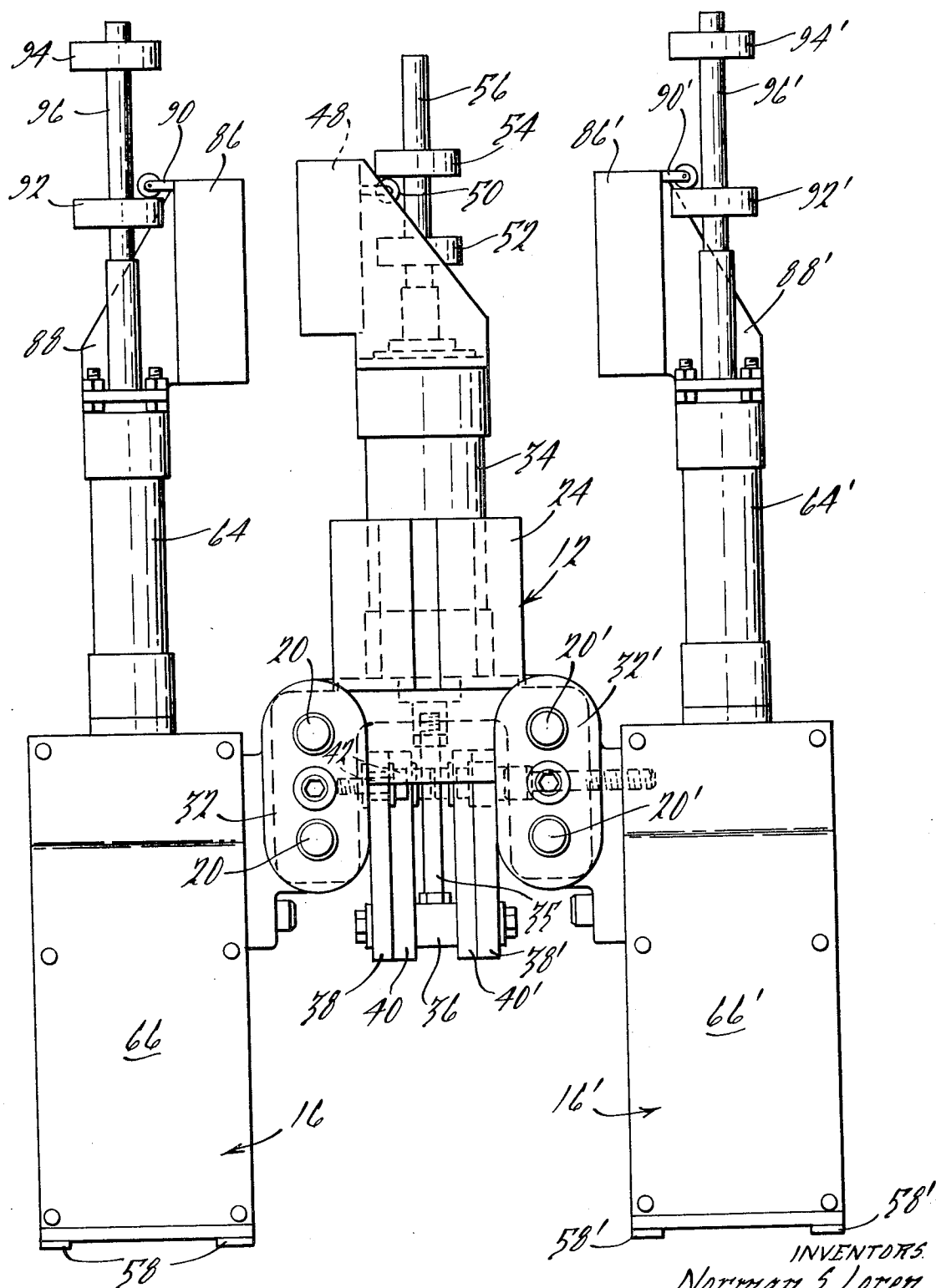
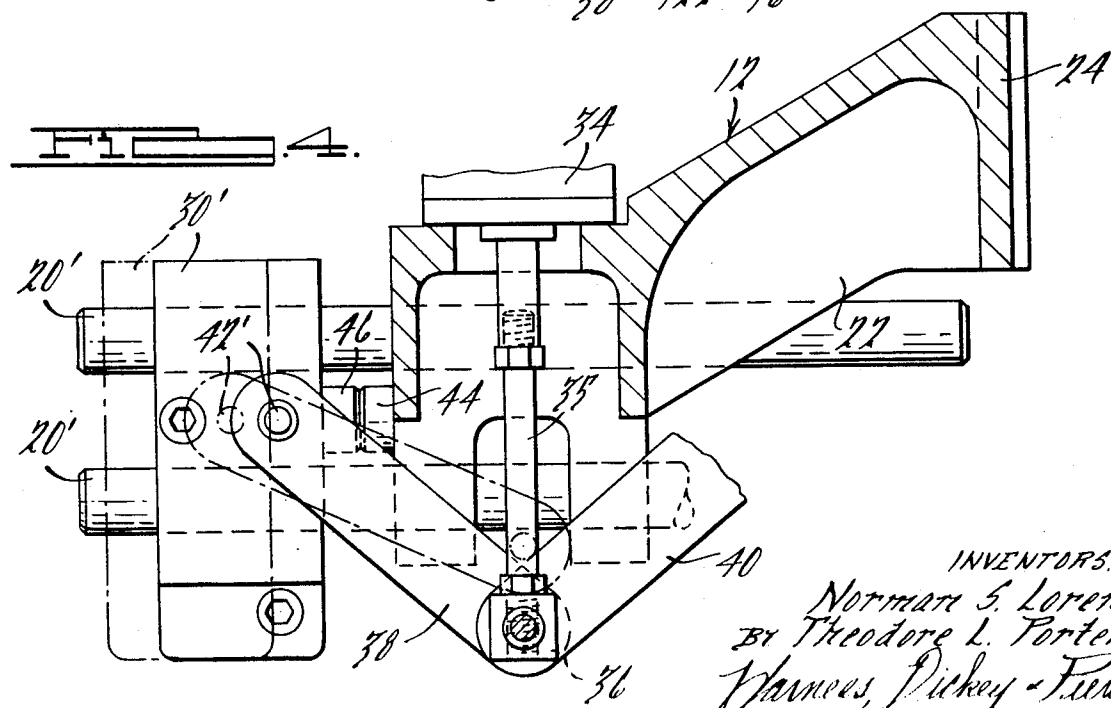
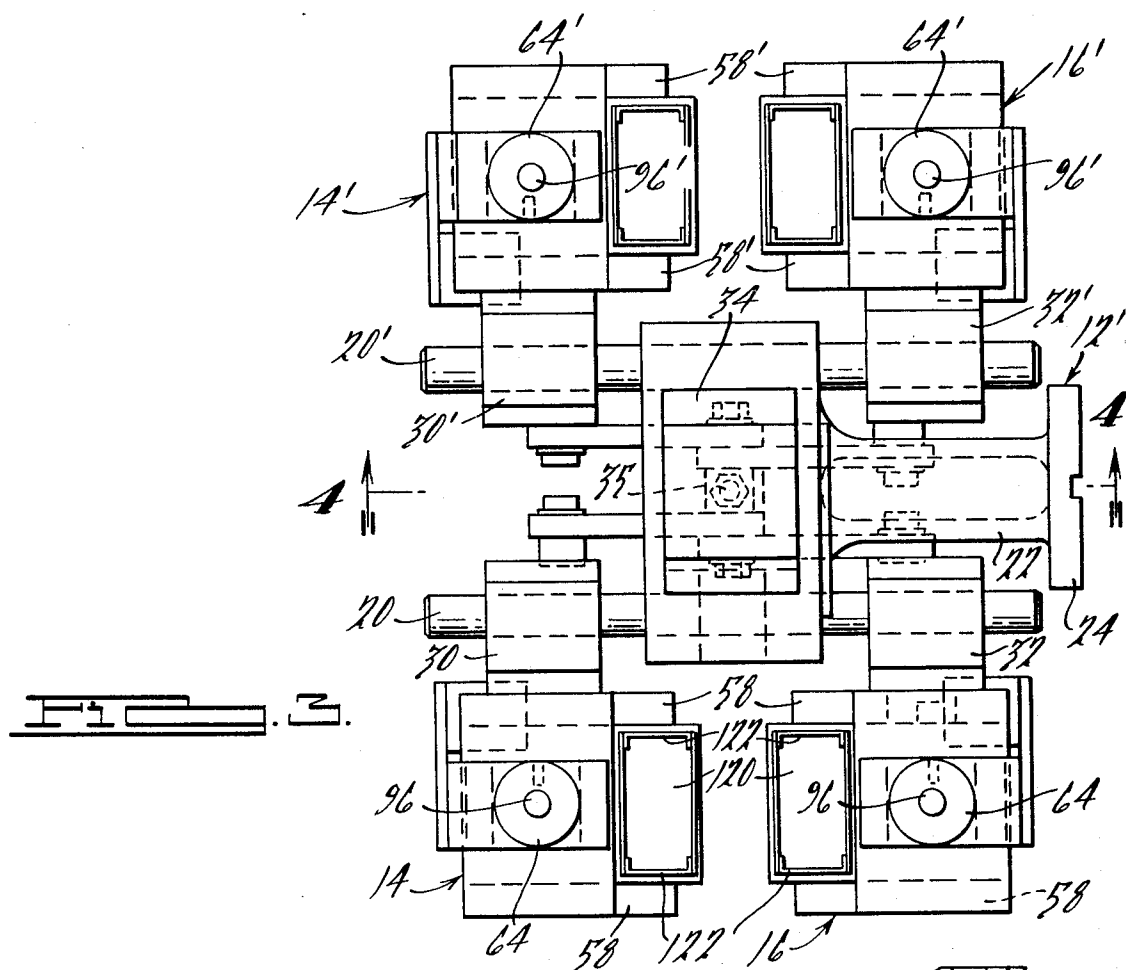


FIG. 2.

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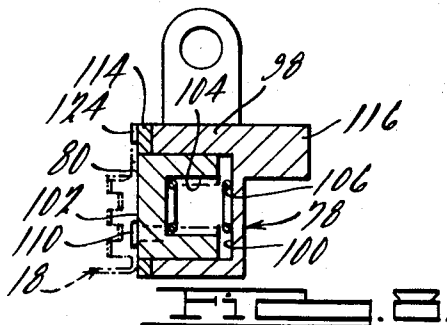
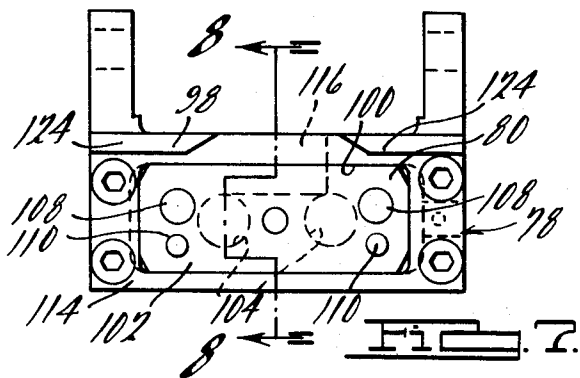
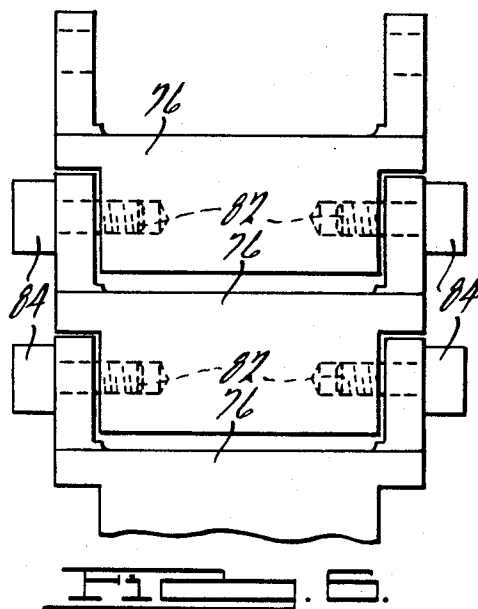
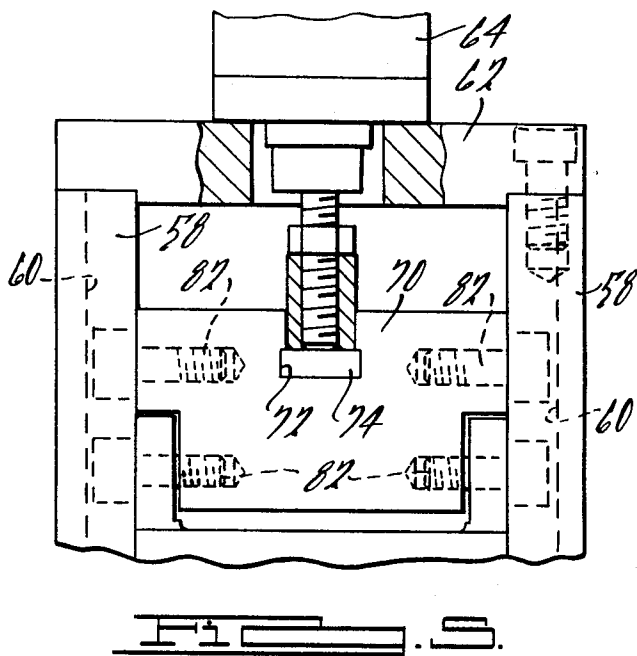
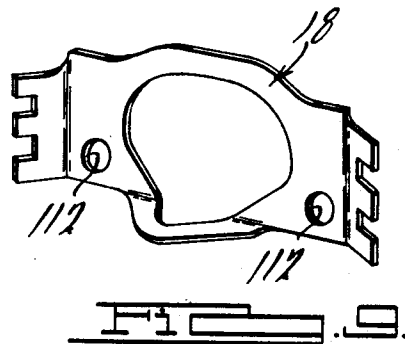
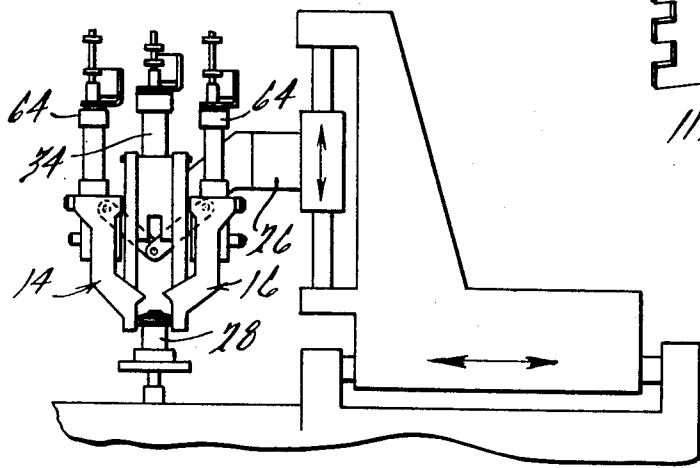


FIG. 10.



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REINFORCEMENT DISPENSING MECHANISM

BACKGROUND OF THE INVENTION

Cast aluminum pistons incorporating steel reinforcing elements embedded therein are in widespread use in various internal combustion engines and particularly modern passenger car engines. Aluminum pistons of the foregoing type are conveniently manufactured by using automatic piston casting machines incorporating one or a plurality of sectionalized permanent molds into which the molten aluminum alloy is poured and upon solidification, the mold is automatically disassembled, enabling an extraction of the cast piston therefrom. Improved strength and thermal expansion characteristics of such aluminum pistons are attained by incorporating one or a plurality of steel reinforcing elements at strategic locations in the casting. At the present time, the use of two so-called steel struts for reinforcing aluminum pistons is the most common practice.

The placement and retention of such reinforcing struts in the mold cavity is most conveniently performed after the core has been assembled by depositing such struts on suitable coacting means such as magnets incorporated in the sectionalized permanent core, whereafter the sectionalized permanent mold is closed around the core preparatory to the next pouring cycle. The placement of such reinforcing struts on the core has been performed manually and more recently by automatic loading mechanisms which have not been entirely satisfactory because of a number of reasons. Perhaps the most important deficiency is the failure of dispensing mechanisms of the types heretofore known to deposit and accurately position one or a plurality of such reinforcing elements on the mold core each and every cycle of the operation of the piston casting machine. In addition to the foregoing, the large size, complexity, service difficulties and high cost of such prior art type dispensing mechanisms has generally detracted from a more widespread adaptation thereof in automatic casting equipment.

SUMMARY OF THE INVENTION

The benefits and advantages of the present invention are achieved by a dispensing mechanism which comprises a transportable framework having one or a plurality of dispenser heads movably mounted thereon and transportable thereby to and from an operative position located proximate to a mold and a standby position spaced therefrom so as to permit unhindered assembly of the mold and a pouring of molten metal into the mold cavity. Each dispensing head on the framework is provided with a supply magazine containing a plurality of reinforcing elements which are successively removed by transfer means movably mounted on each head for travel to and from a loading position at which a reinforcing element is extracted from the supply magazine and a dispensing position in which the reinforcing element is retained in engaged relationship by the transfer means preparatory to being deposited on the core of a permanent type mold. Actuating means are provided for moving the transfer means and reinforcing element disposed thereon in the dispensing position toward the core, effecting the transfer and deposition of the reinforcing element in proper registration on the core. Thereafter the head is retracted to

the operative position and the framework is moved to the standby position. In view of the inclusion of the supply magazine and transfer means on the same head, a substantial simplification of the dispensing mechanism is achieved, accompanied by a reduction in its size and weight, along with the assurance that each reinforcing element is accurately positioned in appropriate registry within a mold cavity during each operating cycle of the casting machine.

Additional advantages and benefits of the present invention will become apparent upon a reading of the description of the preferred embodiments taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in section, of a reinforcement dispensing mechanism disposed adjacent to the core of a permanent-type mold used for casting pistons;

FIG. 2 is a side elevational view of the dispensing mechanism shown in FIG. 1 as viewed in the direction of the arrow indicated at 2;

FIG. 3 is a plan view of the dispensing mechanism shown in FIGS. 1 and 2;

FIG. 4 is a fragmentary transverse vertical sectional view of the actuating mechanism of the dispensing heads shown in FIG. 3 and taken substantially along the line 4—4 thereof;

FIG. 5 is a fragmentary side elevational view of the upper portion of the flexible linkage and track arrangement of the transfer mechanism;

FIG. 6 is a fragmentary plan view of two interconnected links of the transfer mechanism;

FIG. 7 is a fragmentary side elevational view of the face of the transfer head;

FIG. 8 is a side elevational view of the transfer head shown in FIG. 7;

FIG. 9 is a perspective view of a typical steel reinforcing strut; and

FIG. 10 is a fragmentary diagrammatic side elevational view of a typical arrangement of the reinforcement dispensing mechanism comprising the present invention in association with an automatic piston casting machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in detail to the drawings, and as may be best seen in FIGS. 1-3, inclusive, a reinforcement dispensing mechanism is shown which is comprised of a framework 12 having two pairs of opposed dispensing heads 14, 16 and 14', 16', respectively, movably supported thereon. The specific arrangement shown in the drawings is intended to exemplify a dispenser mechanism of the type used in a piston casting machine incorporating two molds disposed in side-by-side relationship and at a transverse center-to-center spacing corresponding to the distance between the pairs of dispensing heads 14, 16 and 14', 16', respectively. It will be understood that only one pair of dispensing heads or more than two pairs of dispensing heads can be incorporated in the dispensing mechanism consistent with the number of mold cavities and their relative arrangement on an automatic-type piston casting machine. It will be further appreciated that while two

steel reinforcing struts, such as the strut 18 shown in FIG. 9, are normally incorporated in cast aluminum pistons adjacent to the piston pin boss thereof, a satisfactory dispensing mechanism may comprise only one dispensing head for depositing an alternative satisfactory type reinforcing element in appropriate position within a mold cavity.

Since the pair of dispensing heads 14, 16 are identical in structure and operation to the dispensing heads 14', 16', a detailed description of only one such pair will suffice for a complete understanding of the reinforcement dispensing mechanism. In addition, since each dispensing head is identical in structure and operation to the opposed dispensing head of a pair, only one such head will be described in detail and corresponding components of the other head will be designated by corresponding numerals.

The framework 12, as best seen in FIGS. 1-4, is comprised of a body section of a generally inverted U-shaped configuration on which two pairs of guide rods 20, 20' are securely mounted in spaced substantially parallel relationship. The framework 12 is further formed with a strut section 22 integrally affixed to the body portion and which terminates in a grooved flange 24 suitable for fastening the dispenser mechanism to a supporting arm 26 as diagrammatically shown in FIG. 10 for transporting the dispensing mechanism between an inoperative or standby position located remotely from the mold area to provide unrestricted access thereto and an operative position adjacent to a mold core 28 as shown in FIG. 1.

The dispensing head 14 is fastened to a slide 30 slidably mounted on guide rods 20 while dispensing head 16 similarly is mounted on slide 32 slidably mounted on the opposite end portion of guide rods 20. Each pair of dispensing heads are reciprocable between a retracted or open position, as shown in phantom in FIG. 1, and a closed position in opposed engaging relationship relative to the sides of the core 28, as shown in solid lines in FIGS. 1, 3 and 4, in which the faces of the heads overlie the side surfaces of the core for depositing reinforcing struts on opposite sides thereof. The reciprocation of the two pairs of dispensing heads is achieved in unison by means of a double-acting fluid-actuated cylinder 34 having the head of its rod end portion securely fastened to the body of the framework 12 and the end of its piston rod 35 affixed to a cross head 36, which in turn is pivotally secured to the ends of a scissor-type linkage arrangement comprising link arms 38, 38' and 40, 40'. The opposite ends of the link arms 38, 40 are pivotally secured to slides 30, 32, respectively, by means of pins 42.

The extent of inward travel of each slide 30, 32 and the dispenser heads mounted thereon is controlled, as best seen in FIG. 4, by means of a pad 44 affixed to the body of the framework 12 and a stop 46 affixed to the inward face of the sides which, upon abutment, provide a positive stop. Travel of the slides and dispenser heads connected thereto beyond the retracted position is controlled by a bottoming of the piston in actuating cylinder 34. The particular position of the rod of the cylinder 34 and the link arms connected thereto is communicated to the control circuit of the machine by means of a limit switch 48 having a roller arm 50 thereon, which is adapted to be tripped by actuators

52, 54 adjustably affixed to a vertically extending extension 56 of the piston rod of the cylinder 34. A tripping of the position limit switch 48 accordingly communicates to the central control circuit through conventional interlocking circuitry the fact that the cylinder and the heads actuated thereby have arrived at the appropriate position, whereupon the next operating sequence can be initiated.

Each dispensing head, as best seen in FIGS. 1-3 and 5, is comprised of a pair of spaced side panels 58 formed with opposed grooves 60 along the inside faces thereof and are interconnected at their upper ends by a top panel 62 on which a double-acting fluid-actuated cylinder 64 is securely fastened. A sheet metal cover 66 overlies and is affixed to the outer edges of the side panels 58, such as by means of sheet metal screws shown in FIG. 1. In accordance with this arrangement, the side panels 58, top panels 62 and cover 66 define a three-dimensional enclosure including an opposed trackway within which an articulated transfer mechanism 68 is guidably mounted for movement between a loading position, as shown in solid lines of dispensing head 16 in FIG. 1, and a dispensing position, as fragmentarily shown in phantom.

The articulated transfer mechanism 68 comprises a top link 70, as shown in FIG. 5, which is adapted to be operatively connected through a dovetailed slot 72 to a headed portion of the projecting piston rod 74 of the actuating cylinder 64. A plurality of individual links 76, as shown in FIG. 6, are pivotally secured to the lower portion of top link 70. The lower most link 76, as seen in FIG. 1, is pivotally secured to a transfer link 78 formed with a face 80, as shown in FIG. 7, adapted to removably engage the strut 18 for deposition on the mold core. The top link 70, intermediate links 76 and transfer link 78 are pivotally secured to each other by means of screws 82, as best seen in FIGS. 5 and 6, which are formed with roller heads 84 journaled in needle bearings and which roller heads are of a diameter and height so as to rotatably engage the side surfaces of the grooves 60 to provide guided movement of the articulated transfer mechanism during its travel between the two positions. The S-shaped configuration of the grooves 60 defining the arcuate track provides for an appropriate angular disposition of the transfer link in response to movement of the articulated transfer mechanism between the load position and dispensing position.

The position of the transfer mechanism is communicated through the central control circuit by means of a position limit switch 86 affixed to an L-shaped bracket 88 mounted on the upper end of the cylinder 64 which is provided with a roller arm 90, which is adapted to be tripped by spaced actuators 92, 94 adjustably secured to an extension 96 of the actuating cylinder piston rod. The actuation of position limit switch 86 through conventional interlocking circuitry is operative to communicate to the machine control circuit that the articulated transfer mechanism is in the proper position preparatory to the next operating sequence of the machine.

The transfer link 78, as best seen in FIGS. 1, 7 and 8, comprises a body 98 formed to define a generally rectangular-shaped cavity 100 in which a correspondingly shaped plunger 102 is slidably mounted

and is formed with two rearwardly extending cylindrical cavities 104 in which coil springs 106 are adapted to be seated for biasing the plunger outwardly relative to the body 98. The plunger 102 which is of a suitable nonmagnetic material, further incorporates two permanent or electromagnets 108 embedded adjacent to the face thereof for magnetically attracting and removably engaging a steel reinforcing strut which is retained in appropriate position thereon by means of the coaction of pins 110 with the apertures 112 formed in the strut as best seen in FIG. 9. Movement of the plunger 102 outwardly of the cavity 100 is restricted by the coaction of cover plate 114 overlying the recessed edges of the plunger face.

The transfer link 78 is further formed with a flange 116 extending rearwardly of the body thereof which is adapted, as shown in FIG. 1, to coact with an adjustable threaded stop 118 at the lower end portion of the dispenser head to restrict further downward movement of the articulated transfer mechanism, assuring proper vertical alignment between the reinforcing element carried thereby and the adjacent core face.

As best seen in FIG. 1, each dispenser head is provided with its own supply of reinforcing elements which are stored in a magazine 120 comprising two vertically oriented U-shaped channels 122 disposed in opposed relationship between which the reinforcing struts 18 are guidably disposed for downward gravitational movement to a position in overlying engagement with the face of the transfer link 78. Periodic replenishment of the supply of struts is conveniently achieved through the upper end of the magazine, whereby they are disposed in stacked nested relationship as shown in FIG. 1.

In accordance with the foregoing relationship, the face 80 of the transfer link, when in a loading position, as shown in solid lines in FIG. 1, is disposed beneath the outlet end of the magazine, whereby the lowermost strut is magnetically and physically engaged on the face of the transfer link. Upon movement of the articulated transfer mechanism from the loading position, as shown in solid lines in FIG. 1, to the dispensing position, as shown in phantom, an upstanding rib 124, as best seen in FIGS. 7 and 8, projecting along the rear edge of the face 80 of the transfer link is operative to overlie the trailing edge of the lowermost strut, effecting a stripping thereof from the nested column of struts in the magazine in response to the transfer movement downwardly to the dispensing position adjacent the core of a mold. The remaining stacked and nested column of struts is retained in appropriate position by the supporting coaction of the surfaces of the links 76 passing therebelow. Upon subsequent retraction of the transfer link to the dispensing position, the next successive strut becomes engaged on the face thereof and is stripped in a similar manner with successive replenishment of the stripped strut by downward movement of the stacked column through the action of gravity.

In accordance with the specific embodiment of the transfer link 78 shown in FIGS. 1, 7 and 9 of the drawings, the strut is effectively transferred from magnetic engagement on the face of the plunger 102 to accurate registration on the face of the mold core by suitable pins (not shown) affixed to and projecting from the mold core which are disposed in axial align-

ment with the pins 110 projecting from the face of the plunger. In response to the movement of the heads from the retracted position toward the mold core, the pins on the core coact with the pins 110, effecting a retraction of the plunger including the magnets 108 thereon, whereby the strut is released and transferred and retained by corresponding magnets incorporated adjacent to the surface of the core. It will be understood that alternative satisfactory means can be incorporated in the face of the transfer link for providing a satisfactory transfer of a strut from the dispensing mechanism to accurate registration on a core, as may be desired or required, depending upon variations in core configuration and reinforcement material and configuration.

In operation, the actuation of the reinforcement dispensing mechanism comprising the present invention can be accomplished remotely and preferably automatically in accordance with the central control circuit of an automatic piston casting machine on which the dispensing mechanism is mounted. The operating cycle of the dispensing mechanism is initiated after the permanent sectionalized mold has been disassembled to enable extraction and removal of the previously cast piston, whereafter the core is at least partially assembled and the faces thereof are in position for receiving appropriate reinforcing struts. Upon signal to the central control circuit, the supporting arm 26 (FIG. 10) is energized, whereby the transportable framework and dispensing mechanism is moved from a standby position to an operative position in which the opposed faces of the dispensing heads are positioned adjacent to opposite sides of a core. The articulated transfer mechanism is in the load position, as shown in solid lines in FIG. 1, and upon attaining the operative position, cylinders 64 are energized, effecting a stripping of the lowermost strut in each magazine and a transfer thereof to the dispensing position by the transfer link in each head. The arrival of the transfer link in the dispensing position is signaled by actuation of the position limit switch 86.

Thereafter, cylinder 34 is actuated whereupon the heads move from the retracted position, as shown in phantom in FIG. 1, to overlying engaging relationship with the side surface of the core, effecting a transfer of the reinforcing struts carried thereby to the core faces. Upon attainment of the closed position, as signaled by the tripping of position limit switch 48, the cylinder 34 is again actuated to retract the heads. The completion of the retracting movement is again signaled by the tripping of limit switch 48. Thereafter, the dispensing mechanism is moved by the supporting arm from the operative position to a standby position in which the remaining portion of the mold can be assembled and the molten metal cast into the resultant mold cavity defined thereby. The articulated transfer mechanism including the transfer link 78 is again moved to the load position at any time after the heads are opened for removably engaging the next strut in the magazine in preparation for the next operating cycle.

While it will be apparent that the invention herein described is well calculated to achieve the benefits and advantages set forth above, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the spirit thereof.

What is claimed is:

1. A mechanism for dispensing and depositing reinforcing elements on a mold core or the like comprising a transportable framework, a dispenser head movably mounted on said framework and transportable thereby to and from an operative position adjacent to a core and a standby position disposed in clearance relationship to a core, said dispensing head including supply means containing a plurality of reinforcing elements and transfer means movably mounted on said head for movement to and from a loading position adjacent to said supply means for removably engaging a reinforcing element and a dispensing position spaced therefrom in which a reinforcing element engaged thereby is in a position for dispensing, and means for moving said dispensing head from said operative position toward a core for depositing a reinforcing element in said dispensing position on the core and thereafter retracting said head to said operative position.

2. The mechanism as defined in claim 1, including two of said dispensing heads disposed in opposed relationship for depositing a reinforcing element on opposite sides of a core.

3. The mechanism as defined in claim 1, in which said supply means comprises a magazine in which the reinforcing elements are arranged in stacked nested relationship and move downwardly for engagement by said transfer means through the influence of gravity.

4. The mechanism as defined in claim 1, in which said transfer means comprises a flexible element of which a portion is comprised with an engaging face for removably engaging a reinforcing element at said supply means effecting a loading and transfer thereof

upon movement to said dispensing position in which said reinforcing element is presented for transfer to a core disposed adjacent thereto.

5. The mechanism as defined in claim 1, in which said transfer means includes an engaging face formed with mechanical and magnetic means thereon for removably engaging a reinforcing element in appropriate registry thereon.

6. The mechanism as defined in claim 1, wherein said transfer means is comprised of an articulated member formed of a plurality of pivotally connected links guidably mounted for movement on said head to and from said loading position and said dispensing position.

7. The mechanism as defined in claim 2, wherein said two dispensing heads are slidably mounted on said framework and the last-mentioned said means comprises a fluid-actuated cylinder mechanically coupled to said heads for effecting movement thereof in a linear direction to and from said operative position and toward and away from the core.

8. The mechanism as defined in claim 1, further including sensing means for sensing the position of said dispensing head and said transfer means thereon.

9. The mechanism as defined in claim 6, further including a double-acting fluid-actuated cylinder for moving said articulated member between said positions.

10. The mechanism as defined in claim 4, in which said portion formed with said engaging face is movable through an arcuate path between said loading position and said dispensing position.

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