United States Patent

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[54] **APPARATUS FOR HANDLING DIE CASTING SHOTS**
25 Claims, 11 Drawing Figs.

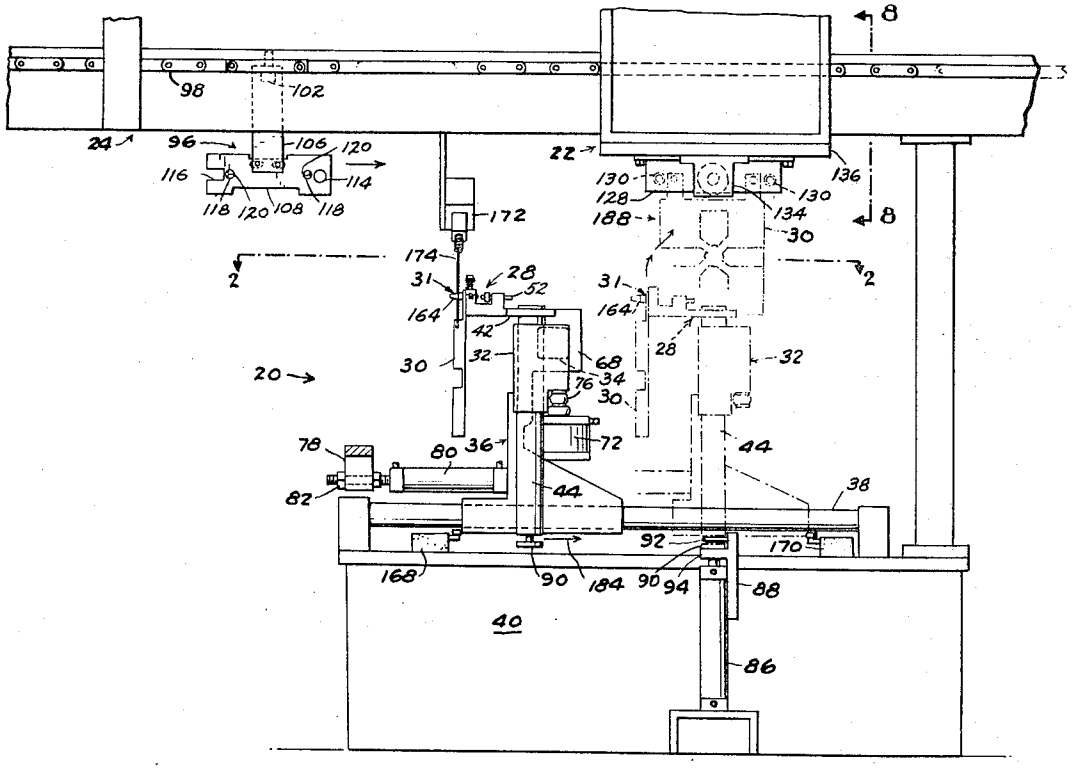
[52] **U.S. Cl.** ..... **214/1 BB,** 214/1 Q
[51] **Int. Cl.** **B66c 1/66**
[50] **Field of Search** ..... 214/1 B, 1 R

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ABSTRACT: Apparatus for removing a shot from a die casting machine and transferring it to a carrier. The shot is cast with studs extending in opposed directions from the shot and a pickup is placed between the open dies to receive and hold the studs on one side when the shot is ejected from the movable die. The pickup is removed from between the dies and rotated and extended vertically upward to present the shot for transfer to the carrier by moving the studs axially so that the studs on one side of the shot are received and held by the carrier while the opposed studs are disengaged from the pickup.



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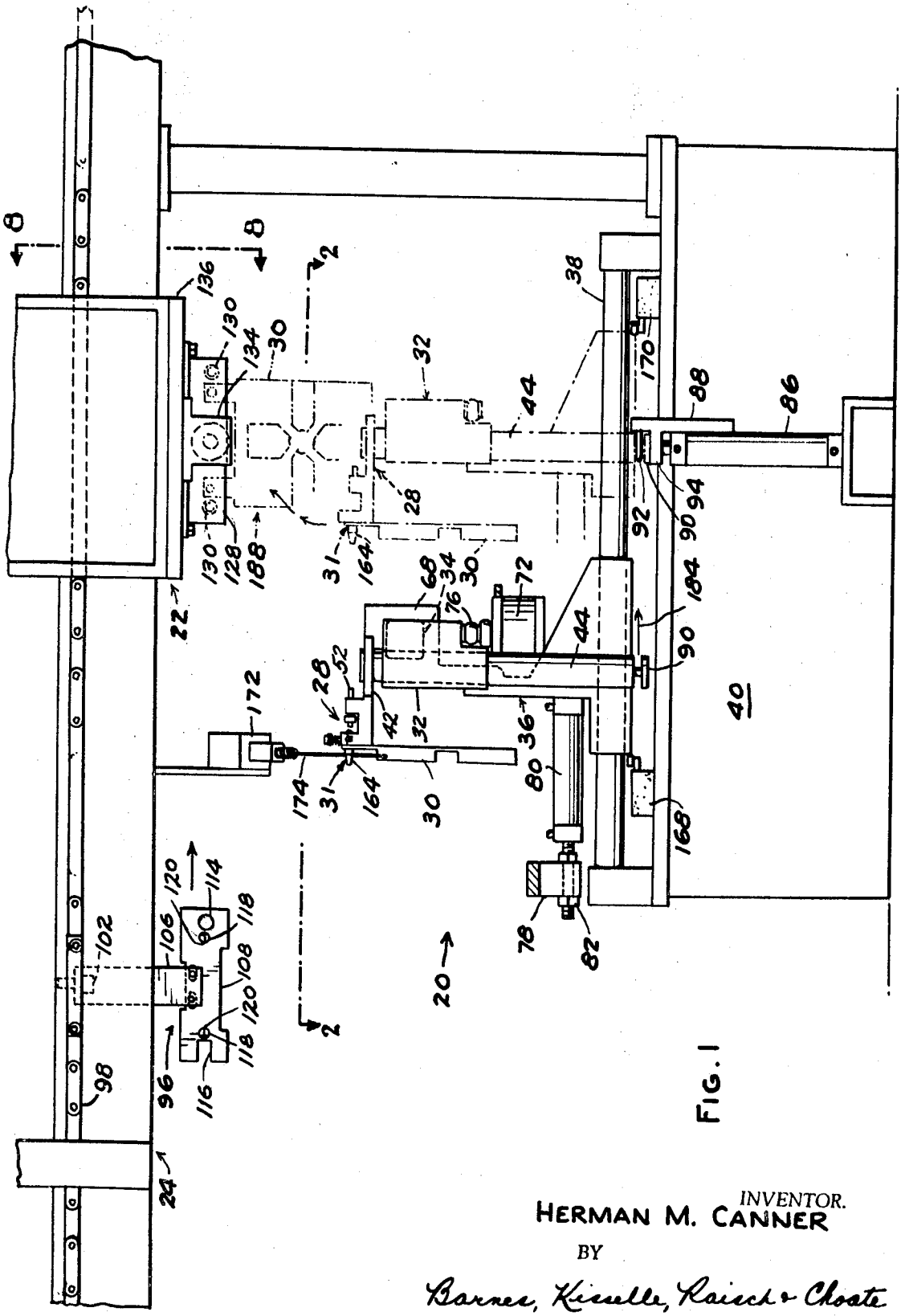


FIG. 1

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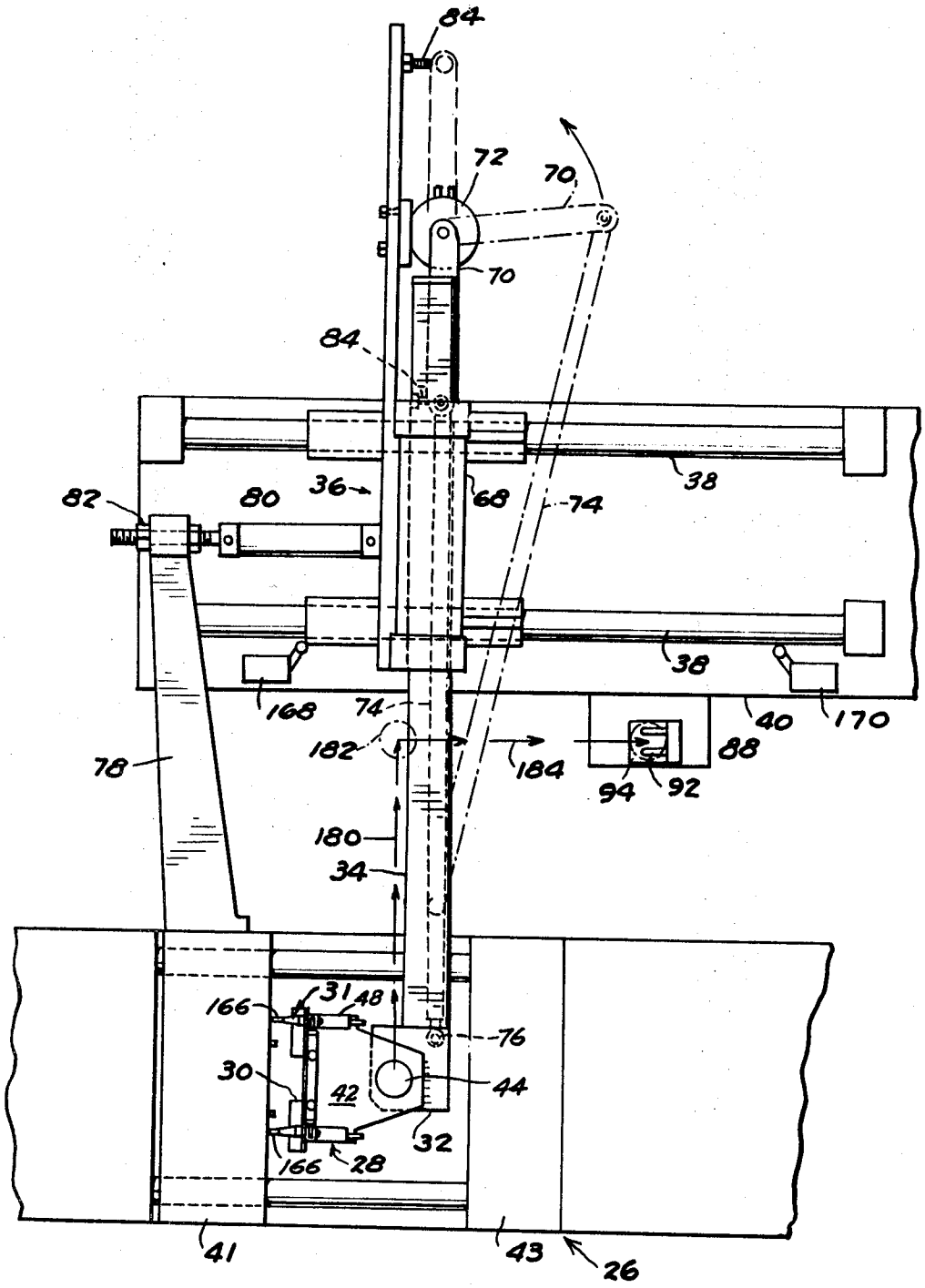


FIG. 2

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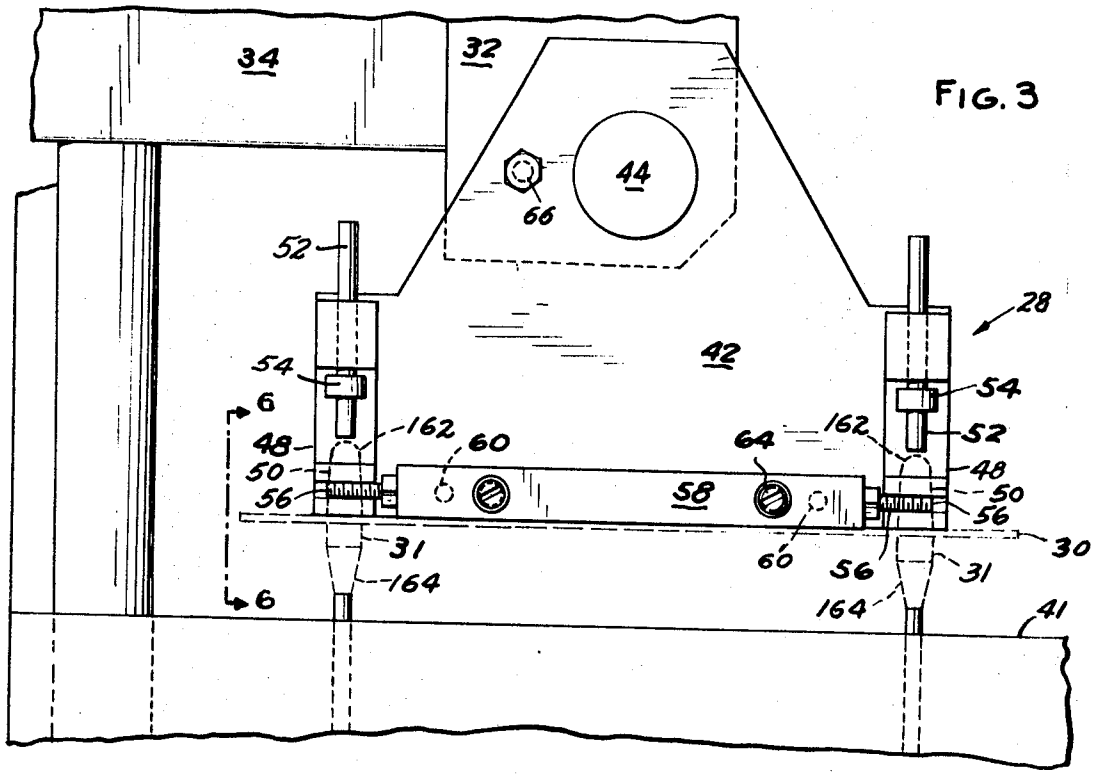


FIG. 3

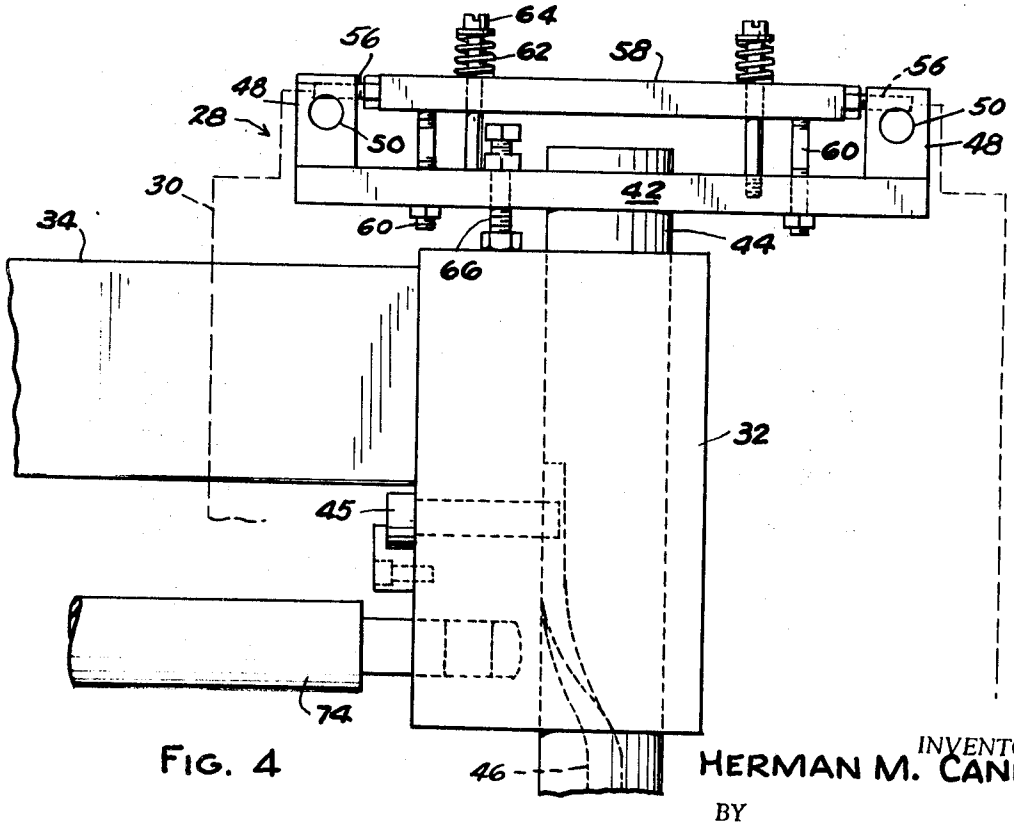


FIG. 4

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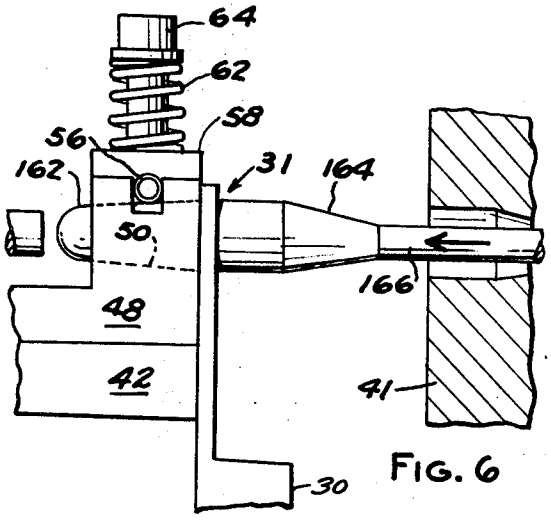


FIG. 6

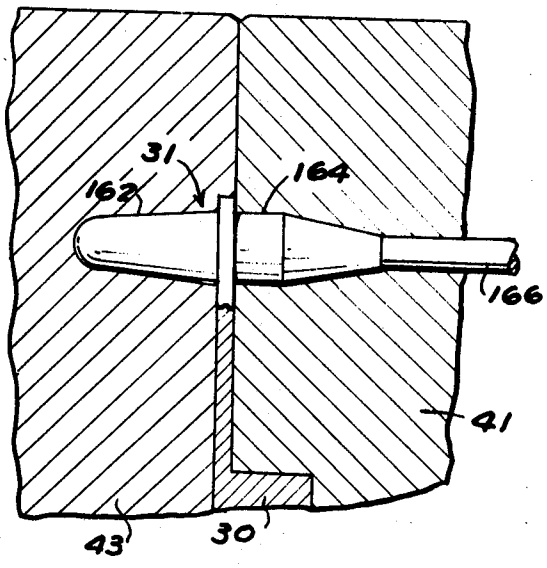


FIG. 5

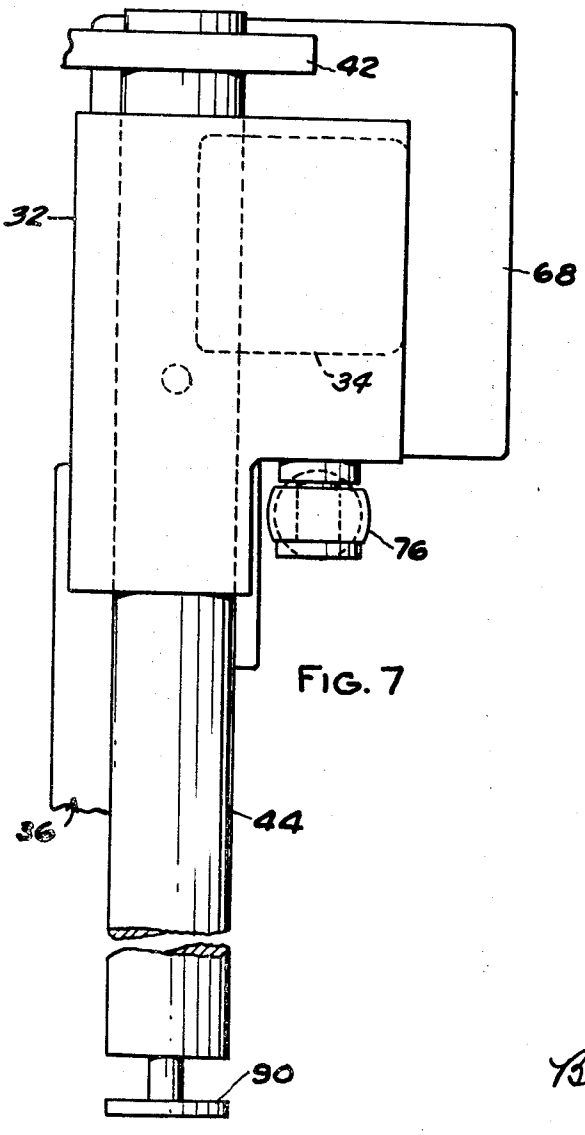


FIG. 7

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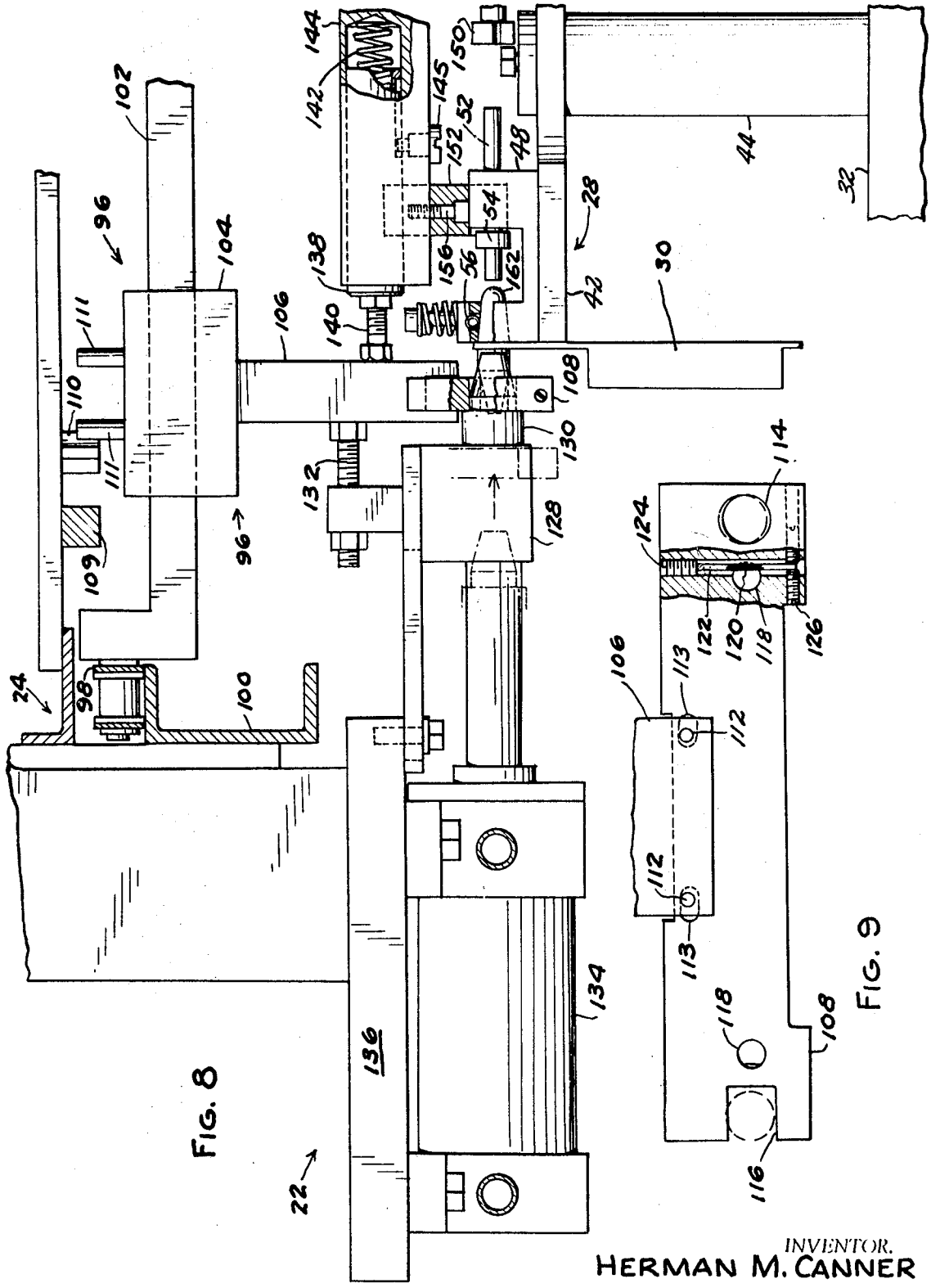


FIG. 8

FIG. 9

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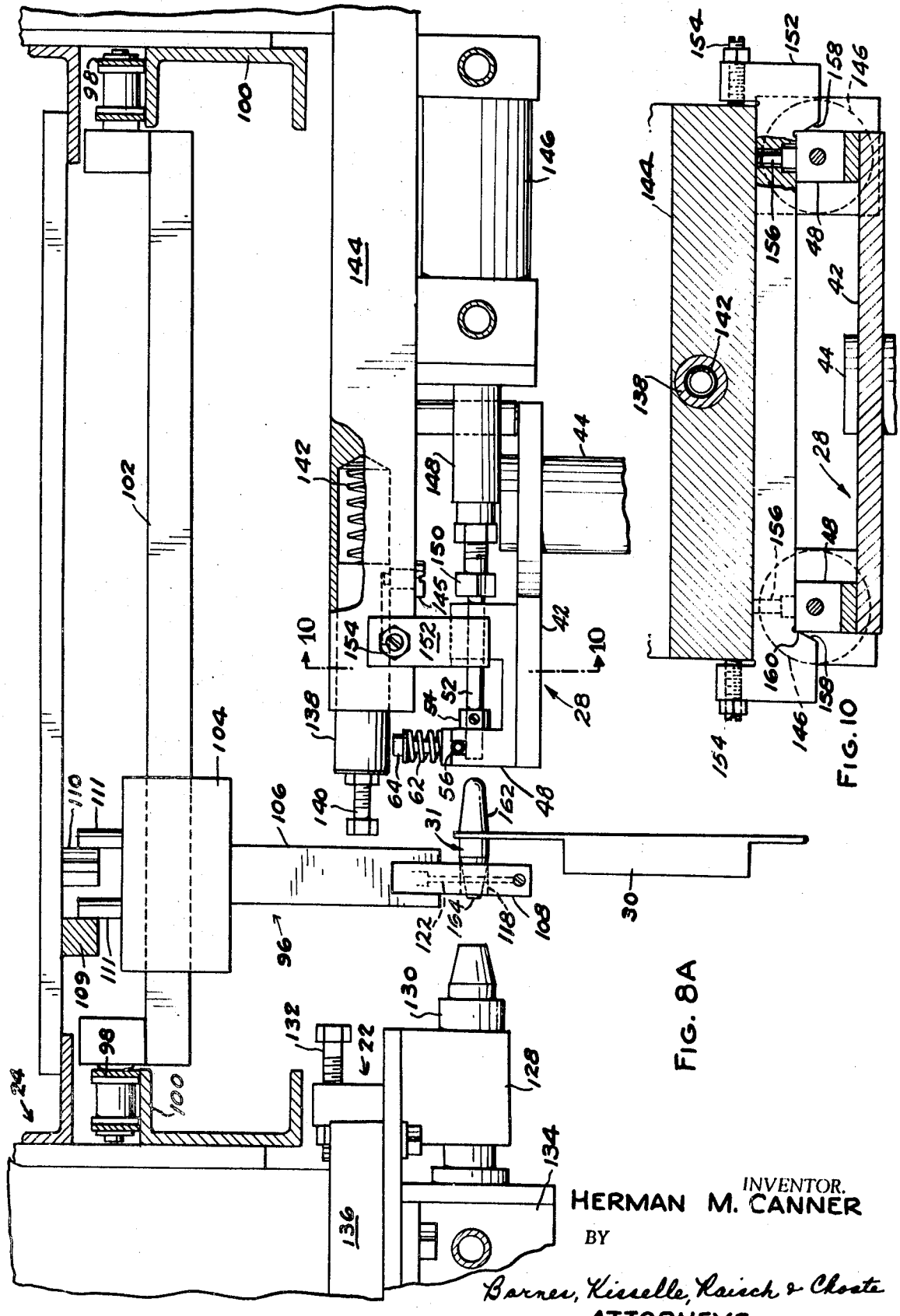


FIG. 8A

FIG. 10

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APPARATUS FOR HANDLING DIE CASTING SHOTS

This invention relates to transfer units and more particularly to a shuttle unit for removing case shots from a die casing machine and transferring the shot to a conveyor line.

In using die casting machines it is normally the practice to remove the so-called shot or integral cast parts, runners and sprue either manually or by a transfer apparatus especially designed for use with the particular die casting machine and parts being cast. There is a comparatively high labor cost associated with manually removing the parts and the operator is subjected to a safety hazard in that the die casting machine may accidentally close the dies on the operator when he is removing the shot from the machine. The usual shuttle unit requires a substantial capital investment and cannot be readily adapted for use with other die casting machines or other parts cast in the machine. With the usual transfer unit there is also a problem of being able to rapidly remove a shot from a die casting machine without jerking it loose or dropping it from the transfer apparatus.

In this invention preferably each shot is cast with one or more integral spuds having studs extending axially in opposite directions from the shot. The studs are generally perpendicular to the parting plane of the ejector and cover dies so that they can be removed from the dies and the studs on one side of the shot will be exposed when the dies are opened. When the dies open, a pickup head is positioned between the dies to receive and hold the exposed studs as the shot is ejected from the ejector die. The pickup head is removed from the die and can be extended vertically upward and rotated to present the shot for removal from the pickup head. The pickup can orient a shot with respect to a carrier so that movement of a shot away from the pickup head causes the studs opposed to the studs in the pickup head to be received and held by the carrier while the studs held by the pickup head disengage and become free of the pickup head. Hence the movement of the shot away from the pickup head transfers the shot from the pickup head to the carrier. The pickup head can be retracted from between the dies in an accelerating-decelerating motion to smoothly remove a shot from the dies without jerking the shot loose from the pickup head and dropping the shot. The pickup head is mounted for rotary and vertical movement on one end of a horizontally extendible pickup arm which is mounted on a laterally movable carriage carried by a base. The carriage is connected by a bridge arm to a movable ejector die of a die casting machine so that it is shifted laterally with the movable die. The pickup arm is moved by a lever arm to extend and retract the pickup head from between the open dies to pick up a shot and remove it from the die casting machine. The pickup head carrying the shot is moved laterally by the carriage and is extended vertically upward and rotated to align the shot with a carrier on a conveyor. The shot is transferred by a pusher from the pickup head to the carrier.

Objects of this invention are to provide an apparatus which (1) can be readily adapted for use with a variety of different cast parts and die casting machines, (2) provides a smooth and rapid removal of a shot from a die casting machine, and (3) can be constructed as a standardized unit of comparatively simple design, ease of assembly and economy of manufacture and service.

These and other objects, features and advantages of this invention are disclosed in this description and the accompanying drawings in which:

FIG. 1 is a side elevational view of the transfer unit of this invention positioned to cooperate with a conveyor of a shot trimming and machining line with several positions of a pickup head of the shuttle unit illustrated in phantom line.

FIG. 2 is a plan view of the shuttle unit of FIG. 1 illustrating the positioning of the shuttle unit for cooperation with a die casting machine.

FIG. 3 is a fragmentary plan view on an enlarged scale of the pickup head and the movable die of the casting machine of FIG. 2.

FIG. 4 is a fragmentary side elevational view of the pickup head.

FIG. 5 is a fragmentary sectional view of the dies in closed position illustrating the casting of spuds in the shot.

FIG. 6 is a fragmentary side view partially in section on line 6—6 of FIG. 3 illustrating the ejection from a die cavity and pickup of a shot.

FIG. 7 is a fragmentary side view of carrier housings for the pickup head and arm of the shuttle unit.

FIG. 8 is a sectional view on line 8—8 of FIG. 1 illustrating the mechanism for transferring a shot from the pickup head to a carrier on a conveyor.

FIG. 8*a* is a side view similar to FIG. 8 illustrating the position of the transfer mechanism and pickup head after the shot has been transferred from the pickup head to the carrier of the conveyor.

FIG. 9 is a fragmentary side view partially in section of the carrier of the conveyor.

FIG. 10 is a sectional view on line 10—10 of FIG. 8*a* illustrating the mechanism for locating the pickup head with respect to the conveyor for transferring a shot to a carrier on the conveyor.

Referring to the drawings:

FIGS. 1 and 2 illustrate a shuttle unit designated generally as 20 positioned with respect to a loading station 22 of a conveyor 24 and a die casting machine 26 so that a pickup head 28 of the shuttle unit can remove a shot 30 with spuds 31 from the die casting machine and transfer it to the conveyor. Pickup head 28 is movably mounted in a housing 32 connected to an extendible arm 34 carried by a carriage 36 mounted on ways 38 secured to a base 40 so that head 28 can be positioned and extend between movable die 41 and fixed die 43 of die casting machine 26 when the dies are open.

Pickup head 28 is mounted for rotary and vertical movement in housing 32 so that it can correctly position a shot for transfer to conveyor 24. As illustrated in FIGS. 3 and 4, pickup head 28 has a baseplate 42 secured to a shaft 44 movably mounted in housing 32. A pin 45 is secured to housing 32 and engages with a cam track 46 so that when shaft 44 is moved vertically upward rotary motion is imparted to head 28 to orient a shot 30 for transfer to the conveyor as explained in greater detail hereafter. Blocks 48 with tapered holes 50 are secured to baseplate 42 and positioned to receive spuds 31 on shots 30. Ejector pins 52 with stops 54 are mounted for sliding movement in blocks 48 and positioned so that they can engage with spuds 31 to eject them from holes 50. Spuds 31 are held in blocks 48 by threaded studs 56 secured to a bar 58 resiliently urged toward adjustable fixed stops 60 by springs 62 carried by guide bolts 64. Positive stops 60 are adjusted so that the threads of stud 56 engage with or dig into the comparatively soft metal of spuds 31 when they are inserted in holes 50 of blocks 48. An adjustable stop 66 controls the retracted position of head 28 with respect to housing 32.

Arm 34 moves pickup head 28 between the open dies to pick up and remove a shot from the die casting machine. As shown in FIGS. 1, 2 and 7, rectangular pickup arm 34 is mounted for sliding movement in a housing 68 rigidly fixed to carriage 36. Arm 34 is extended and retracted by a lever arm 70 fixed at one end to a drive shaft of an air motor 72 and pivotally connected at its other end to one end of an intermediate lever 74. The other end of intermediate lever 74 is pivotally connected to housing 32 at 76. When lever arm 70 is moved in an arcuate path by air motor 72, it provides an accelerating-decelerating linear movement to arm 34 so that head 28 will smoothly and rapidly pick up and remove a shot 30 as explained in greater detail hereafter. Carriage 36 is moved laterally by a bridging arm 78 rigidly connected at one end to movable die 41 and attached at the other end to the carriage through an air cylinder 80. Arm 78 initially positions pickup head 28 with respect to the movable die and cylinder 80 laterally traverses the pickup head with respect to the movable die as explained in greater detail hereafter. Nuts 82 cooperate with the shaft of air cylinder 80 to adjust the initial

position of head 28 with respect to the movable die. Adjustable positive stops 84 are provided at each end of actuator arm 70 to provide positive control of the fully extended and retracted positions of arm 34. When carriage 36 and head 28 are moved to the position shown in phantom line in FIG. 1, an air cylinder 86 extends shaft 44 vertically upward. Cylinder 86 is fixed to base 40 and has a fixture 88 secured to its plunger which is positioned to engage with a disc 90 fixed to the lower end of shaft 44. As shown in FIG. 2, fixture 88 has two fingers 92 which slide between disc 90 and the lower end of shaft 44 and a base 94 which bears on disc 90.

Shots 30 are carried on conveyor 24 by a plurality of carrier units 96. As shown in FIGS. 1, 8 and 8*a*, conveyor 24 has endless chains 98 mounted in tracks 100 with a carrier mounting bar 102 being positioned transverse to the tracks and connected at each end to chains 98. A collar 104 is mounted for sliding movement on bar 102 and has a depending arm 106 connected to a carrier plate 108 so that the carrier plate can be shifted laterally with respect to the direction of travel of conveyor 24. Fixed guides 109, 110 cooperate with pins 111 mounted on housing 104 to control and limit the lateral movement of housing 104 with respect to conveyor 24. As shown in FIG. 9, carrier plate 108 is attached to arm 106 by pins 112 extending through elongated slots 113 in the carrier plate so that it can be shifted slightly with respect to arm 106 to compensate for any misalignment between carrier plate 108 and the mechanism for transferring a shot 30 from head 28 to the carrier plate. Carrier plate 108 has a hole 114 in one end and a slot 116 in the other end to facilitate alignment of the carrier plate with pickup head 28 for the transfer of a shot 30 to the carrier plate. Holes 118 in plate 108 engage with spuds 31 to carry a shot 30. Spuds 31 are retained in holes 118 by serrated portions 120 of flexible steel wire 122 positioned to partially block holes 118 so that they will engage with and dig into the soft metal of a spud. Each wire 122 is fixed at one end to a threaded screw 124 and is positioned to overlap hole 118 by set screws 126 engaging with and laterally shifting the free end of wire 122.

A shot 30 is transferred from pickup head 28 to conveyor 24 at loading station 22. As shown in FIGS. 8 and 8*a*, loading station 22 has a horizontally movable fixture 128 with two locator pins 130 spaced to engage with hole 114 and slot 116 in carrier plate 108, and an adjustable pusher 132 positioned to engage with arm 106 of the carrier. A rod of an air cylinder 134 mounted on a fixed support 136 carries and moves fixture 128. On the opposite side of carrier 96 a piston 138 with an adjustable plunger 140 biased by a spring 142 is retained in a fixed support 144 by a screw 145 to yieldably urge carrier 96 toward guide tracks 109, 110. Two air cylinders 146 are mounted on fixed support 144 and positioned so that when their rods 148 with adjustable plungers 150 are extended the plungers will engage with and move ejector pins 52 in head 28 thereby forcing spuds 31 from the pickup head and into engagement with carrier plate 108 as shown in FIG. 8*a* and explained in greater detail hereafter. As shown in FIG. 10, an alignment bar 152 is positioned with respect to fixed plate 144 by screws 154 and secured to the fixed plate by cap screws 156. Inclined surfaces 158 and notches 160 engage with the upper outside corners of blocks 48 on head 28 to guide and locate the pickup head with respect to loading station 22 so that the pickup head will be properly aligned with carrier 96 for transfer of a shot to the carrier.

As shown in FIG. 5, spuds 31 are cast in dies 41 and 43 as an integral part of the overall shot 30 which includes the spuds, runners, sprue and cast parts. While spuds 31 can have several different shapes or configurations, the use of a spud with a generally bulbous-shaped stud 162 for engagement with the pickup head and a cylindrical and frustoconical shaped stud 164 for engagement with the carrier 96 on conveyor 24 has proved to be highly satisfactory for transferring the shot and a shape which can be readily formed in and removed from the dies. Spuds 31 are removed from movable die half 41 by ejector pins 166 as explained in greater detail hereafter. Each spud has studs extending axially from generally opposed sides of the shot and generally perpendicular to the parting plane between dies 41 and 43 so that stud 162 is readily removed from die 43 when the dies are opened by the casting machine and stud 164 is readily removed from movable die 41 when shot 30 is ejected. Preferably, more draft is provided on studs 162 formed in the stationary die than on studs 164 in the movable die to assure that the shot will remain in the movable die when the dies are opened. While studs 162 and 164 of each spud can be staggered or axially offset with respect to each other, it is preferable for the studs of each spud to have a common axis so that there is no couple or moment arm tending to cock or skew the shot when it is ejected from the movable die and received by the pickup head or when it is transferred to a carrier plate 108.

When carriage 36 is adjacent the ends of ways 38, its position is detected by limit switches 168 and 170 mounted on base 40 and the presence of a shot 30 in pickup head 28 after it has been retracted from die casting machine 26 is sensed by a limit switch 172 with a flexible finger 174. The circuitry for energizing and controlling air motor 72 and air cylinders 80, 86, 134 and 146 and hence the cycling and operation of the transfer unit and conveyor loading station is of a conventional electropneumatic type well known to those skilled in the art and hence need not be described in detail. It is sufficient to note that limit switches 168 and 172 are electrically interlocked with the cycling of die casting machine 26 so that dies 41 and 43 cannot be closed when arm 34 has been retracted and pickup head 28 is not holding a shot 30. In short, die casting machine 26 is electrically interlocked with shuttle unit 20 so that dies 41, 43 cannot be closed unless both the pickup head 28 has been retracted from the dies and the shot 30 has been removed from the die cavity. Limit switch 172 also prevents shuttle unit 20 from completing its cycle unless head 28 is carrying the shot 30. Limit switch 170 and appropriate circuitry momentarily stops the conveyor with a carrier 96 properly positioned in loading station 22 so that a shot 30 can be transferred from pickup head 28 to carrier 96.

MODE OF OPERATION

In operating unit 20 all of the air cylinders 80, 86, 134 and 146 and motor 72 are energized so that the rod of each cylinder is retracted and arm 34 and hence head 28 are in the retracted position. In cooperation with bridging arm 78 this positions carriage 36 and hence head 28 so that it can be extended between dies 41 and 43 as they are opened after a shot is cast in the dies. Air motor 72 is energized to rotate lever arm 70 and through intermediate arm 74 rapidly and smoothly extend arm 34 and head 28 in a harmonic accelerating-decelerating motion in between dies 41 and 43 to pick up a shot 30. As movable die 41 is moved to the fully opened position, ejector pins 166 are actuated which force (as shown in FIGS. 2 and 6) spuds 31 out of the die cavity and into engagement with holes 50 in blocks 48 in head 28. As spuds 31 are forced into holes 50, threaded studs 56 dig into the soft metal of the spuds and securely hold the spuds in head 28. Air motor 72 is energized in the reverse direction which moves head 28 along the path indicated by arrows 180 in a harmonically accelerating-decelerating motion into the fully retracted position indicated in phantom line at 182 (FIG. 2). If limit switches 168 and 172 and their associated circuitry indicate that a shot 30 is being carried by head 28, die casting machine 26 is cycled to close dies 41 and 43 and air cylinder 80 is energized so that its rod is fully extended. The closing of movable die 41 and extension of the rod of cylinder 80 moves carriage 36 on ways 38 and hence pickup head 28 laterally in the direction of arrows 184 (FIGS. 1 and 2) to the position shown in phantom line at 186 in FIG. 1 so that disc 90 on the lower end of shaft 44 engages with connector 88 attached to the rod of air cylinder 86. Carriage 36 trips limit switch 170 which through appropriate circuitry momentarily stops conveyor 24 with a carrier 96 in the correct position in loading station 22.

Cylinder 86 is energized so that its rod is fully extended which moves shaft 44 and hence pickup head 28 vertically upward and due to cam track 46 rotates head 28 so that shot 30 is parallel to the plane of and spuds 31 are aligned with a carrier 96 as shown in phantom line at 188. Cylinder 134 is energized so that its rod is extended which causes locator pins 130 to move into firm engagement with hole 114 and slot 116 in carrier plate 108 and adjustable stop 132 to urge arm 106 into firm engagement with movable plunger 140. This causes housing 104 to be laterally displaced on carrier bar 102 as shown in FIG. 8 with pins 111 passing through a discontinuity or opening in guide track 110. Cylinders 146 are energized so that rods 148 are fully extended causing ejector pins 52 to move to the left (as shown in FIG. 8) thereby forcing spuds 31 out of head 28 and into holes 118 in carrier plate 108. Serrations 120 on resilient steel wires 122 dig into the soft metal of spuds 31 and hold shot 30 in firm engagement in the carrier. Cylinder 134 is reenergized in the opposite direction so that locating pins 130 and adjustable stop 132 are retracted so that they clear carrier 96 and spring biased plunger 140 shifts the carrier laterally to the left (as shown in FIG. 8*a*) so that the carrier is aligned with guides 109 and 110 and spuds 31 are clear of pickup head 28. Cylinders 146 and 86 are reenergized in the opposite direction so that head 28 is moved vertically downward and rotated by cam track 46 so that it is properly oriented to pickup a part from movable die 43. Cylinder 80 is reenergized in the opposite direction so that carrier 36 and hence head 28 is moved back to the starting position. Once the shot is oriented and mounted on the conveyor it can move through a series of stations (not shown) where various punching and drilling operations can be performed on the shot including removal of offal and final deposit of the completed part or parts in a suitable receptacle.

The disclosed shuttle unit 20 provides a device for picking up and transferring to a conveyor die cast shots which can be constructed as a standardized unit which is readily adaptable for use with a variety of different die cast parts and die casting machines. The use of cast spuds as an integral part of the shot allows the unit to be utilized in handling all different types of cast parts with a great variety of different die cast machines. The harmonic acceleration and deceleration of the arm carrying the pickup head provides a very rapid and smooth movement or transfer of the shot so that it is not suddenly jerked and jarred loose from the pickup head. In fact, a unit has been constructed which smoothly and rapidly moves the pickup head a distance of five feet in less than two seconds without jerking or jarring a shot loose from the pickup head. Since this device can be constructed as a standardized unit for use with all types of parts and die casting machines, it is of very economical manufacture and assembly when compared to prior shuttle units specially designed and constructed for each part cast in a particular die casting machine. This standardized structure with its comparatively simple design also provides a unit which is economical to assemble and requires a minimum of service and maintenance.

I claim:

1. A device for removing from a die casting machine having ejector and cover dies, a cast shot having at least one spud with studs extending in opposite directions and being generally perpendicular to the parting plane of the dies comprising:

a. a base,

b. a pickup arm carried by said base for generally rectilinear movement with respect to said base,

c. a pickup head connected to said arm and adapted to receive and releasably retain a stud of at least one spud, said pickup head being adapted for generally vertical movement with respect to said pickup arm,

d. means operably connected to said arm for selectively extending and retracting said arm with respect to said base, and

e. means for moving said pickup head with respect to said arm,

whereby said pickup arm can be extended to position said head between said dies to receive and retain a stud of a spud when a shot is ejected from the ejector die and retracted to remove the shot from between the dies.

2. The apparatus as defined in claim 1 which also comprises means for rotating said pickup head with respect to said arm, whereby said head can be both rotated and moved with respect to said pickup arm to present a shot for removal from said head.

3. An apparatus for removing from a die casting machine having ejector and cover dies, a cast shot having at least one spud with studs extending in opposite directions and being generally perpendicular to the parting plane of the dies comprising!

a. a base,

b. a pickup arm carried by said base for generally longitudinal extension and retraction with respect to said base in a path generally parallel to the parting plane of the dies,

c. means operably connected to said arm for selectively extending and retracting said arm with respect to said base,

d. a pickup head connected to said arm, said pickup head having at least one female receptacle adapted to generally axially receive a cast stud of one spud in response to ejection of the shot from the ejector die, clamp means releasably engaging and firmly frictionally retaining said cast stud in said receptacle, and

e. means for moving each stud of a spud received in a receptacle of said pickup head generally axially outward thereof to disengage the stud from said receptacle and thereby remove and release the cast shot from said pickup head,

whereby said pickup arm is extended to position said head between the dies when they are opened by the die casting machine for said receptacle of said head to receive a stud of a cast shot when the shot is ejected from the ejector die, said arm is retracted to remove the shot from between the dies, and the cast shot is thereafter released and disengaged from said last mentioned means moving the stud in each receptacle of said head generally axially outward thereof.

4. The apparatus as defined in claim 3 in which said receptacle of said pickup head has a hole positioned to receive a stud and said clamp means has means having serrations biased to engage and dig into a stud inserted into said hole, whereby said stud is firmly held in said head.

5. A device for removing from a die casting machine having ejector and cover dies, a cast shot having at least one spud with studs extending in opposite directions and being generally perpendicular to the parting plane of the dies comprising:

a. a base,

b. a pickup arm carried by said base for generally rectilinear movement with respect to said base,

c. a pickup head connected to said arm and adapted to receive and releasably retain a stud of at least one spud,

d. means operably connected to said arm for selectively extending and retracting said arm with respect to said base, and

e. a bridging arm interconnecting the ejector die and said pickup arm for moving said pickup arm and said pickup head with the opening and closing of the ejector die in a direction generally transverse to the parting plane of the dies,

whereby said pickup arm can be extended to position said head between said dies to receive and retain a stud of a spud when a shot is ejected from the ejector die and retracted to remove the shot from between the dies.

6. The apparatus as defined in claim 5 which also comprises:

a. means for moving said pickup head vertically with respect to said pickup arm,

b. means for rotating said pickup head with respect to said pickup arm, and

c. means connected to said bridging arm and said pickup arm for moving said head with respect to said bridging

arm generally transversely to the parting plane of the dies,

whereby said pickup arm can extend said head between the dies in a position to receive a stud of at least one spud when a shot is ejected from the ejector die with the shot carried by the pickup head being removed from between the dies when the pickup arm is retracted, the shot and pickup head can move transversely to the parting plane of the dies, and the shot and pickup head can be rotated and moved vertically upward to present the shot for removal from the head.

7. An apparatus for removing a cast shot from a die casting machine having ejector and cover dies, comprising:

a. a base,

b. a carriage carried by said base for generally longitudinal movement generally transverse to the parting plane of the dies,

c. a pickup arm carried by said carriage for generally longitudinal movement with said carriage and for extension and retraction in a path generally parallel to the parting plane of the dies,

d. means operably connected to said carriage for moving said carriage and said arm carried thereby generally longitudinally with respect to said base,

e. means operably connected to said pickup arm for extending and retracting said pickup arm with respect to said carriage,

f. a pickup head connected to said arm and adapted to releasably engage and carry a cast shot, and

g. means operably associated with said pickup head for releasing a cast shot carried by said pickup head,

whereby said carriage is moved longitudinally with respect to said base and said pickup arm extended to position said head between said dies when they are opened by the die casting machine to releasably engage and carry a cast shot when the shot is ejected from the ejector die, said arm is retracted to remove the cast shot from between the dies, and said last mentioned means releases the shot from said head after removal of said head from between the dies.

8. The apparatus as defined in claim 7 in which said means extends and retracts said head with an accelerating-decelerating motion.

9. The apparatus as defined in claim 7 in which said means for moving said carriage generally longitudinally comprises a fluid actuated ram operably connected to said carriage.

10. The apparatus as defined in claim 9 in which said means for moving said carriage generally longitudinally also comprises a bridging arm connected to the ejector die and said carriage for moving said carriage with the opening and closing of the ejector die in a longitudinal direction generally transverse to the parting plane of the dies.

11. The apparatus as defined in claim 7 which also comprises means for rotating said pickup head with respect to said carriage to position the cast shot for disengagement and release from said pickup head.

12. The apparatus as defined in claim 7 which also comprises means for moving said pickup head generally vertically with respect to said carriage to vertically position said head for receiving and releasing the cast shot.

13. The apparatus as defined in claim 11 which also comprises means for moving said pickup head generally vertically with respect to said carriage to vertically position said head for either receiving or releasing the cast shot.

14. The apparatus as defined in claim 12 in which said means for moving said carriage generally longitudinally comprises a fluid actuated ram operably connected to said carriage.

15. The apparatus as defined in claim 7 in which said pickup head comprises at least one receptacle adapted to generally axially receive a cast stud of one spud in response to ejection of the shot from the ejector die, clamp means releasably engaging and retaining the cast stud in said receptacle, and means adapted to move the stud in each receptacle generally axially outward thereof to disengage and remove the cast shot from said head.

16. The apparatus of claim 15 which also comprises a carrier adapted to releasably receive and retain at least one stud extending from the cast shot in a direction generally opposite to a stud received in a receptacle of said pickup head and positioned such that as said last mentioned means disengages each stud from said receptacle said opposed stud is releasably received and retained in said carrier to transfer the cast shot from said head to said carrier in response to disengagement and release of the cast shot from said head.

17. The apparatus as defined in claim 16 which also comprises means for moving said head generally vertically with respect to said pickup arm, whereby said head can be vertically positioned for removing the cast shot from between the dies and for transferring the cast shot to said carrier.

18. The apparatus of claim 17 which also comprises means for rotating said pickup head with respect to said arm between a position to remove the cast shot from between the dies and a position to transfer the cast shot to said carrier.

19. An apparatus for removing from a die casting machine having ejector and cover dies and transferring to a carrier a cast shot having at least one spud with studs extending axially from the shot in opposite directions and generally perpendicular to the parting plane of the dies comprising:

a. a base,

b. a pickup arm carried by said base for generally longitudinal extension and retraction in a path generally parallel to the parting plane of the dies,

c. a pickup head connected to said pickup arm, said pickup head adapted to receive and releasably retain a cast stud of at least one spud,

d. means for extending and retracting said pickup arm with respect to said base in a path generally parallel to the die parting plane,

e. a carrier having a receptacle adapted to generally axially receive a stud of a spud in response to displacement of an opposed stud from said pickup head, means releasably retaining said stud in said receptacle, and

f. means for moving a spud axially so that at least one of its studs is received and held in said carrier while all of the studs are disengaged from the pickup head,

whereby said head can be extended between the dies to receive and hold a stud of at least one spud of a cast shot ejected from the ejector die and retracted to remove the shot from the die and transfer the shot from the head to the carrier.

20. The apparatus as defined in claim 19 which also comprises means for moving said head generally transverse to said pickup arm, whereby said head can be moved with respect to the arm to position it with respect to the carrier for transfer of the shot from the head to the carrier.

21. The apparatus as defined in claim 20 which also comprises means for rotating said head with respect to said pickup arm, whereby said head can be both rotated and moved transversely with respect to said pickup arm to position the head with respect to the carrier for transfer of the shot from the head to the carrier.

22. The apparatus as defined in claim 19 which also comprises a bridging arm connecting the ejector die with said pickup arm so that said head will move generally transverse to the die parting plane with the ejector die when the dies are opened and closed, whereby said head will be positioned with respect to said movable ejector die.

23. The apparatus as defined in claim 22 which also comprises means connected with said bridging arm and said pickup arm so that said pickup arm and head can be moved with respect to said bridging arm generally transverse to the die parting plane.

24. The apparatus as defined in claim 20 which also comprises a bridging arm connecting the ejector die with said pickup arm so that said head will move generally transverse to the die parting plane with the ejector die when the dies are opened and closed, whereby said head will be positioned with respect to said movable ejector die.

25. The apparatus as defined in claim 24 which also comprises means connected with said bridging arm and said pickup arm so that said pickup arm and head can be moved with respect to said bridging arm generally transverse to the die parting plane.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,604,570 Dated September 14, 1971

Inventor(s) Herman M. Canner

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 38, after "said" insert -- head by said --.

Signed and sealed this 14th day of March 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents