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2,486,053

GOOSENECK MOTION FOR DIE CASTING MACHINES

Filed Jan. 3, 1945

2 Sheets-Sheet 1

Fig. 1.

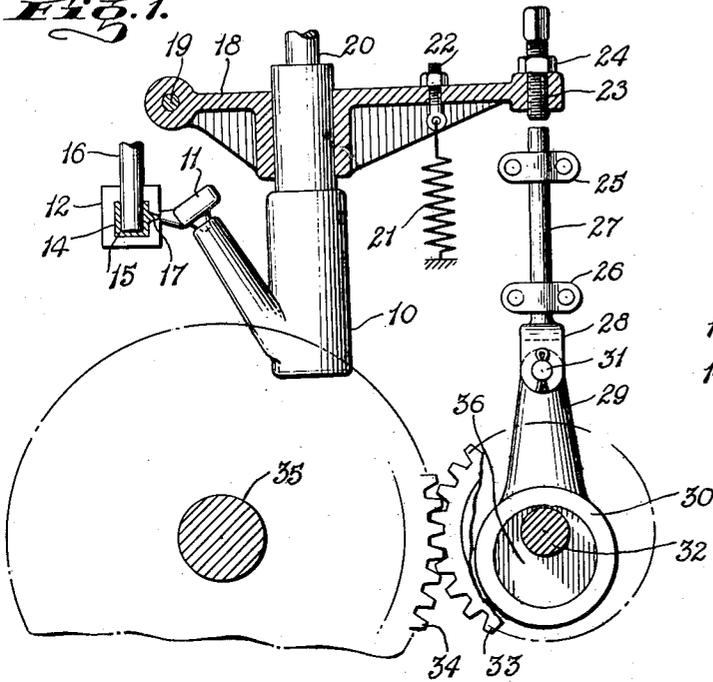


Fig. 2.

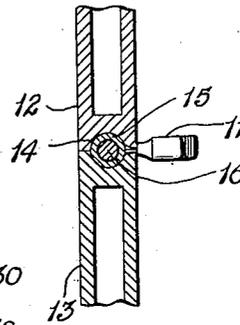


Fig. 3.

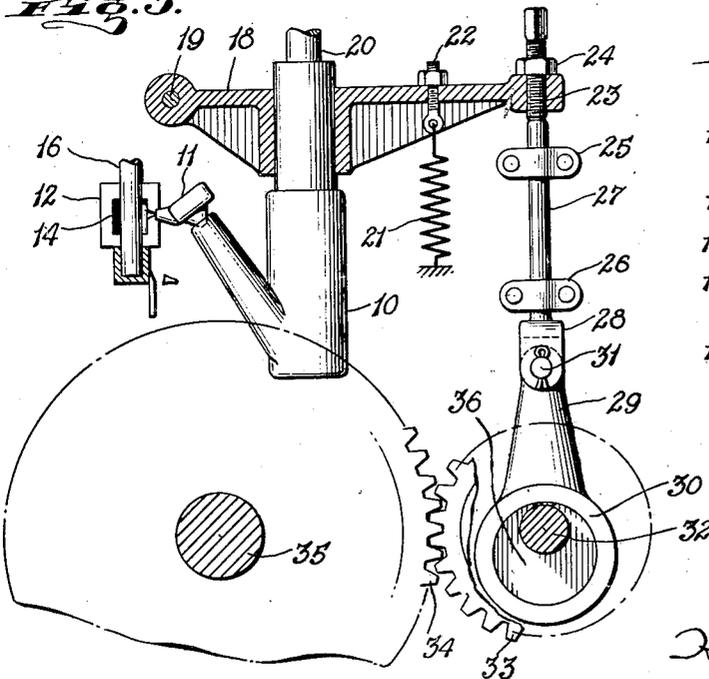
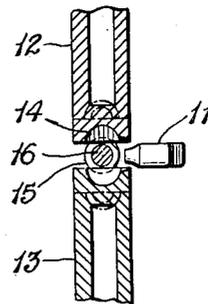


Fig. 4.



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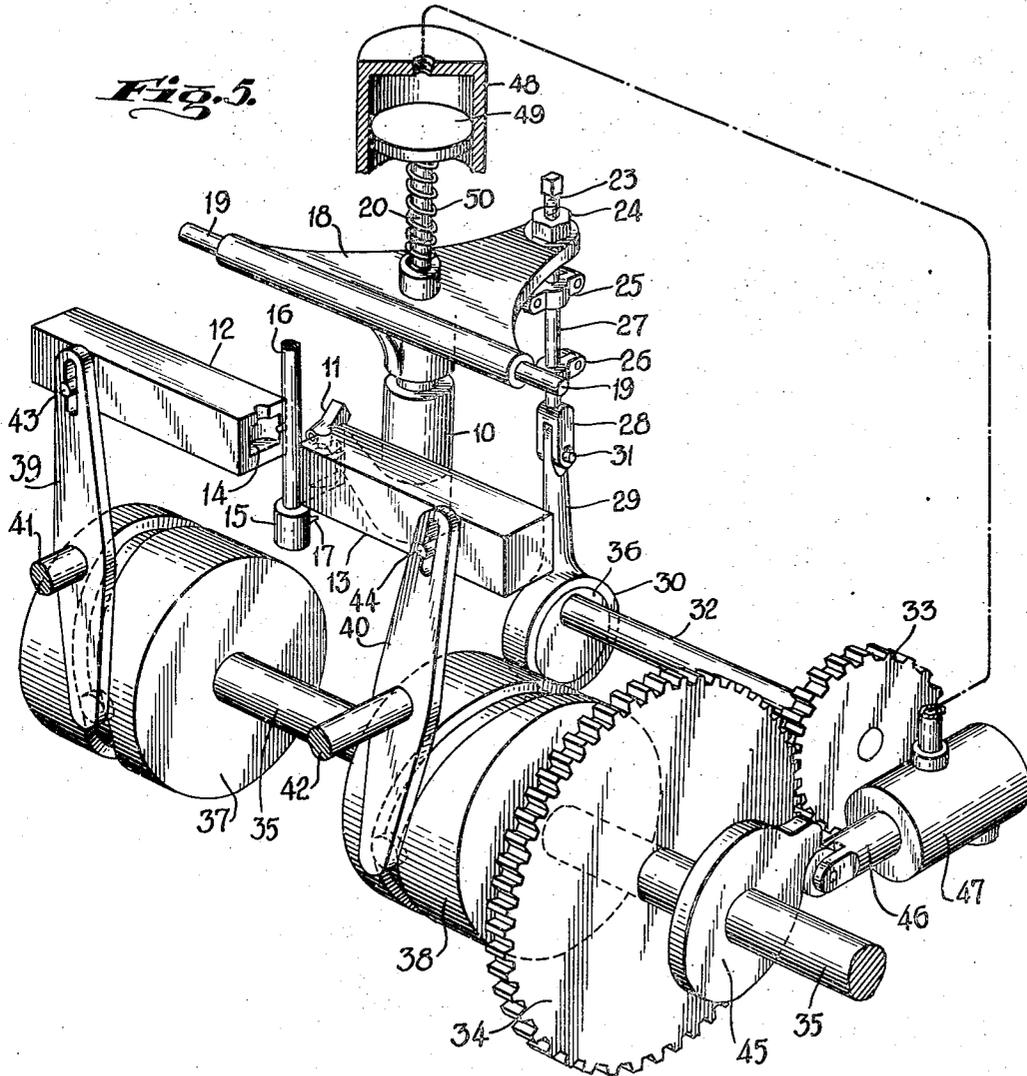
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2 Sheets-Sheet 2



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GOOSENECK MOTION FOR DIE CASTING MACHINES

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8 Claims. (Cl. 18—30)

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This invention relates to die casting machines of the type and kind where heated casting material is pressure injected into the cavities of dies in forming die castings. More particularly, the invention deals with a mechanism for controlling the motion or operation of the gooseneck of machines of this type and kind, particularly machines operating at high speed, for the purpose of minimizing the time period in the cycle of operation of the machine during which the casting or shot actually takes place, thereby providing a greater amount of time in each cycle of machine operation for performing several functions or operations which are desirable in automatically actuated machines. For example, as performing trimming operations, keeping in mind in this connection, that such operations as opening the die and moving a casting to a trimming station is essential during the cycle of operation of the machine. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawings, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a diagrammatic view illustrating a gooseneck in the position assumed thereby during the injection or shot of casting material into the cavities of a pair of dies.

Fig. 2 is a diagrammatic sectional view through the dies, showing a part of the gooseneck nozzle in the position as illustrated in Fig. 1.

Fig. 3 is a view similar to Fig. 1, showing the gooseneck in the second position assumed thereby in a cycle of operation of the machine with the dies in an open position.

Fig. 4 is a diagrammatic sectional view showing the dies in open position with the position of the gooseneck nozzle therebetween, as illustrated in Fig. 3; and

Fig. 5 is a perspective view diagrammatically illustrating the operation of the several devices of the machine in carrying out the gooseneck operation.

In die casting machines, it is a known fact that the dies are water cooled to quickly freeze or harden the casting in the injection of heated material into the dies, and this is especially true in high speed die casting machines where two hundred or more castings are formed per minute in the operation of the machine and considerably higher number of castings where a plurality of castings are formed in each injection of casting

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material into the cavities or impressions of dies.

In such machines, where the nozzle or gooseneck is moved toward and from the dies through the medium of eccentric motions once during each cycle of operation of the machine, a comparatively long period of contact is maintained of the nozzle with the dies, establishing what is termed a freezing action, which results in a clogging of the discharge nozzle of the gooseneck. In this connection, it is also to be borne in mind that a sudden or jerky motion of the gooseneck is not desirable.

To overcome these objections, I have conceived what might be termed a duplicated eccentric motion which is a harmonic motion in each cycle of operation of the machine. That is to say, I move the gooseneck toward and from the dies a number of times and utilize one of these motions as the shot or injection motion, timing it with the period when the dies are in closed position to receive the injected casting material. In this way, I also materially shorten the casting or shot period in each cycle of operation, providing a greater time period for the performance of other operations in an automatic die casting machine, such for example, as an added trimming operation for trimming the casting after it has been ejected or freed from the dies when the latter are in open position.

In the present illustration, and in showing one adaptation and use of my invention, I have diagrammatically illustrated what may be termed a dual motion, by providing a ratio of two to one in the drive of the eccentric for imparting swinging motion to the gooseneck of the machine.

In Figs. 1 and 3 of the drawing, 10 represents the gooseneck having a discharge nozzle as at 11, which is movable toward and from a pair of relatively movable dies 12 and 13. The dies 12 and 13 collectively form a cavity or impression 14 on adjacent surfaces thereof to form any type or kind of casting 15 on a suitable core 16. At 17 is shown the gate through which the casting material passes from the nozzle 11 into the cavity 14. The trimming operations mentioned above are primarily to trim off the gate 17 or any other part of the casting after the casting has been moved out of alinement with the dies 12 and 13, as in other machines of this type and kind.

The gooseneck 10 is suitably supported in a swinging arm 18 having a pivot as at 19. At 20 is shown a part of a plunger employed to eject casting material from the gooseneck. Goosenecks of this type and kind are commonly arranged in pots from which the metal or heated

casting material flows into the gooseneck, but as this structure is well known in the art, no showing or description thereof is made, as the invention deals with the mechanism for operating the gooseneck as more specifically hereinafter described. Coupled with the outer end portion of the arm 18 is a suitable spring 21 which tends to normally support the gooseneck in engagement with the surface of the dies 12 and 13. One end of the spring will be secured to a suitable support on the machine, and the coupling of the spring with the arm 18 is through an adjustable eye-bolt 22 by means of which the tension of the spring 21 can be controlled. Adjustably supported in the free end of the arm 18 is a screw 23 having a lock nut 24 to retain the adjusted position thereof in the arm. Arranged in suitable bearings and guides 25 and 26 is a plunger rod 27 adapted to operatively engage the screw 23. The other lower end of the rod has a fork 28 pivoted at 31 to a projecting arm 29 on a sleeve 30. At 32 is shown a shaft on which a gear 33 is mounted to mesh with a larger gear 34 on the cam shaft 35 of the casting machine. The ratio of the gears 33 and 34 is two to one so that the shaft 32 rotates two revolutions in each revolution of the cam shaft, or in each cycle of operation of the machine. The sleeve 30 is mounted on and operates upon an eccentric 36 on one surface of the gear 33 so that as the gear 33 is rotated, the eccentric will move the rod 27 upwardly and downwardly in each rotation of the gear 33. In Figs. 1 and 3 of the drawing, the eccentric is shown in the position which moves the rod 27 downwardly to the greatest degree. It will be understood that in the raised position of the eccentric, the rod will be moved upwardly and the gooseneck 10 swung on the pivot 19 out of engagement with the dies 12 and 13.

It will be noted that a slight clearance is provided between the rod 27 and screw 23 so that when the eccentric 36 is in its lowered position as seen in Fig. 1, the spring 21 will operate to support the nozzle under pressure upon the surface of the dies and unchecked by the screw 23 coming into engagement with the rod 27. However, as seen in Fig. 3 of the drawing, the screw 23 limits the swinging movement of the arm 18, and in this position, the nozzle 11 assumes a position between the then open dies, as illustrated in Fig. 4 of the drawing.

The diagrammatic illustration of Fig. 5 has been included in order to illustrate the co-relation of the various devices or mechanisms. In said figure, two die cams 37 and 38 are shown arranged upon the cam shaft 35 for actuating the dies 12 and 13 through suitable levers 39 and 40, pivoted as seen at 41 and 42. One end of the levers operate in the grooves of the cams 37 and 38, and the other end of the levers have a sliding coupling with pins on the dies 12 and 13, as seen at 43 and 44. Also arranged on the cam shaft 35 is a cam 45 for operating the control plunger or piston 46 of an air valve 47 for supplying air to a cylinder, part of which is shown at 48. In the cylinder 48 is a piston 49 with which is connected the plunger rod 20 of the gooseneck for discharging casting material through the nozzle 11 into the cavities of the dies in forming a casting, as at 15. A spring 50 is employed to raise the piston 49 in the cylinder 48 when the air is exhausted therefrom.

Fig. 5 of the drawing shows the other parts of the mechanism which are diagrammatically illustrated in Figs. 1 and 3 of the drawing, and for

this reason, no further description of these parts will be applied, the parts being designated by the reference characters as more specifically applied to Figs. 1 and 3 of the drawing.

From the foregoing, it will be apparent that in each cycle of operation of the machine, or in other words, in each complete rotation of the gear 34, the gear 33 will have rotated two complete revolutions, during which the arm 18 is swung on its pivot to move the nozzle 11 toward and from the dies two operations, and also supporting the nozzle adjacent the dies for two periods, such as shown in Figs. 1 and 3 of the drawing. It will thus be seen that the particular part of the cycle utilized in actually injecting casting material into the cavities of the closed die is relatively small, thus providing ample time for the performance of such other operations as may be necessary in completing the final casting discharged from the machine, and especially in performing the stripping and the trimming operations diagrammatically illustrated in Fig. 3 of the drawing.

In Fig. 5 of the drawing, a means for actuating the dies is diagrammatically illustrated, as well as the means for actuating the plunger of the gooseneck in discharging casting material from the nozzle 11 into the cavity of the dies. The opening and closing movement of the dies is controlled by the cams 37 and 38, whereas the actuation of the piston 49 is controlled by the cam 45 actuating the plunger or piston of the air valve in controlling the supply of air to the cylinder 48. The shaft 32 operation, namely, two complete revolutions to each single revolution of the shaft 35, will result in imparting the two movements to the gooseneck previously described in each cycle of operation. It will thus be apparent that the co-relation of movement is established between the multiple oscillations of the gooseneck with respect to the opening and closing movement of the dies and in the timely injection of casting material into the dies when in their closed position.

It will be understood that various types of casting material are suitable for use in this invention. Fusible metals in general are useful, such as, for example, zinc alloys, preferably of high zinc content. Also, conventional thermoplastic resinous materials may be employed.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a high speed automatic die casting machine having a pair of dies and a casting material injection gooseneck, the combination of means for opening and closing the dies, harmonic eccentric means for advancing the gooseneck toward the dies to injecting position and then withdrawing it to an idle position, means for correlating the gooseneck-moving means to the die-moving means to advance the gooseneck to its said injecting position when the dies are in closed position, withdraw the gooseneck, and again advance it to injecting position when the dies are in an open position, means for supplying casting material to the gooseneck, and means coordinated with said gooseneck-moving and die-moving means and adapted to actuate said casting material supply means to supply casting material to the gooseneck only when the same is in its said injection position and the dies are in closed position.

2. In a die casting machine comprising a pair of relatively movable dies, means for opening

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and closing said dies once in each cycle of operation of said machine, drive means for driving said last mentioned means, and injecting means movable to and from said dies for introducing casting material to said dies, the combination therewith of means for continuously urging said injection means towards said dies, harmonic eccentric means for periodically moving said injecting means away from said dies against the action of said urging means, and means for operating said harmonic eccentric means at a speed to move said injecting means away from said dies a plurality of times in each cycle of operation of said machine.

3. In a die casting machine comprising a pair of relatively movable dies, means for opening and closing said dies once in each cycle of operation of said machine, drive means for driving said last mentioned means, and injecting means movable to and from said dies for introducing casting material to said dies, the combination therewith of tension means for moving said injecting means towards said dies, harmonic means for periodically moving said injecting means away from said dies against the action of said tension means, and means actuated by said drive means for operating said harmonic eccentric means at a speed to move said injecting means away from said dies a plurality of times in each cycle of operation of said machine.

4. In a die casting machine comprising a pair of relatively movable dies, cam means for opening and closing said dies once in each cycle of operation of said machine, drive means for driving said cam means, and injecting means movable to and from said dies for introducing casting material to said dies, the combination therewith of tension means for moving said injecting means towards said dies, harmonic eccentric means for moving said injecting means away from said dies against the action of said tension means, and means actuated by said drive means for operating said harmonic eccentric means at a speed sufficient to move said injecting means away from said dies twice in each cycle of operation of said machine.

5. In a die casting machine comprising a pair of relatively movable dies, means for opening and closing said dies once in each cycle of operation of said machine, drive means for driving said last mentioned means, and a gooseneck for introducing casting material to said dies in closed position, the combination therewith of means for pivotally supporting said gooseneck adjacent said dies, harmonic eccentric means for reciprocating said gooseneck relative to said dies, and means actuated by said drive means for correlating the speed of said harmonic eccentric means to reciprocate the gooseneck at least twice in each cycle of operation of said machine.

6. In a die casting machine comprising a pair of dies, means for opening and closing said dies,

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nozzle means movable forward and from said dies for introducing casting material thereto, pressure means operative to force casting material through said nozzle means to the dies in closed position, and drive means for operating said die opening and closing means and for coincidentally rendering said pressure means operative, the combination therewith of harmonic eccentric means actuated by said drive means for moving said nozzle means relative to said dies, and means for correlating the movement of said nozzle means toward the dies when the dies are open and when the dies are closed.

7. In a die casting machine comprising a pair of dies; means for opening and closing said dies once in each cycle of operation of said machine; nozzle means movable to and from said dies for introducing casting material thereto; and pressure means operative to force casting material through said nozzle means; the combination therewith of means for moving said nozzle means to said dies at least twice during each said cycle; drive means for coincidentally operating said die opening and closing means, said pressure means, and said nozzle moving means; and means on said drive means for rendering the pressure means operative when the dies are in closed position.

8. In a die casting machine the combination with a pair of dies and means for opening and closing said dies in each cycle of operation of the machine, of nozzle means movable to and from said dies for introducing casting material thereto, pressure means operative to force casting material through said nozzle means, drive means for operating said die opening and closing means and for coincidentally rendering said pressure means operative when the dies are in closed positions, means operated by said drive means for moving said nozzle means, and cooperative means on the drive means and on the nozzle moving means for moving the nozzle means toward the dies at least twice for every operation of said pressure means.

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