

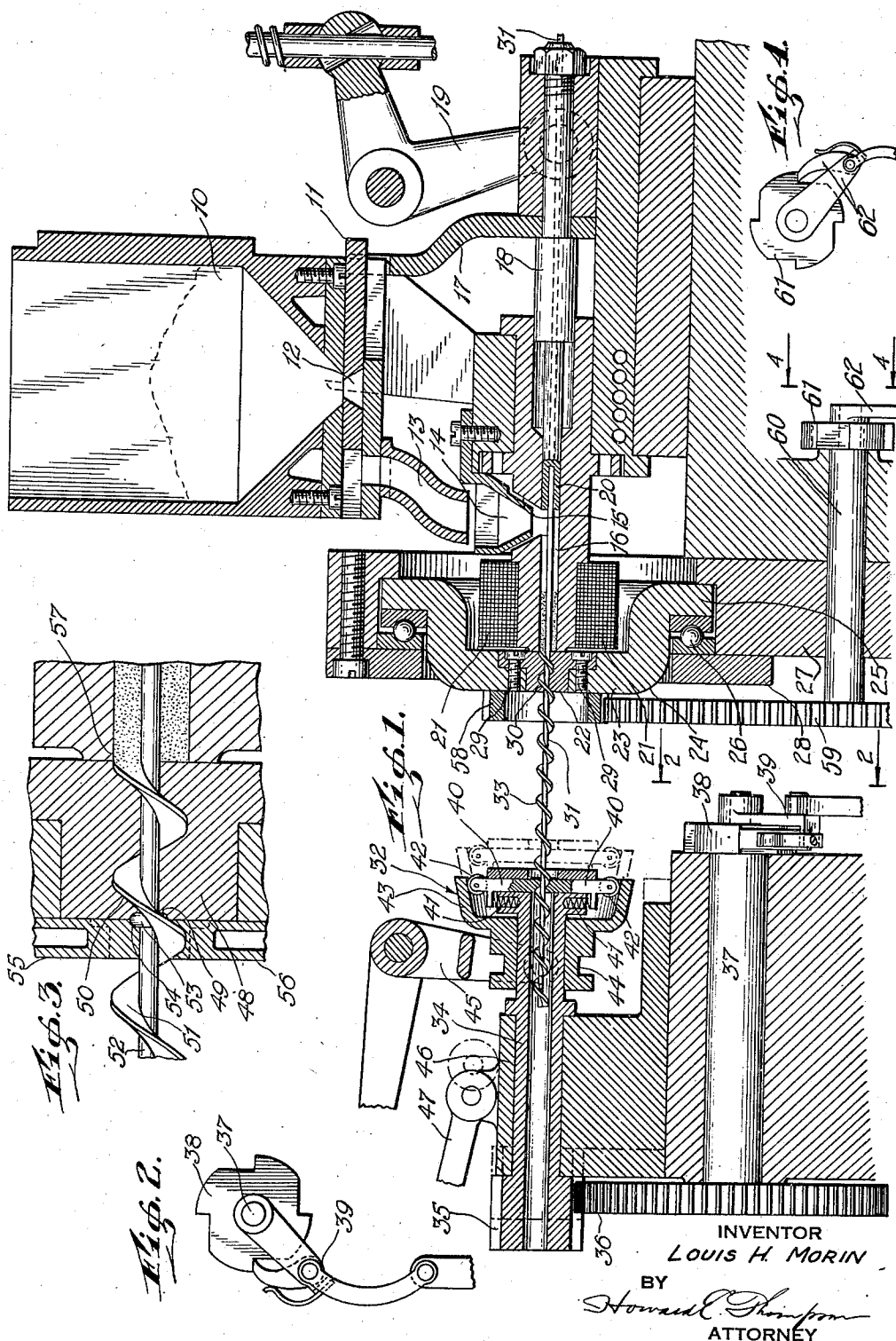
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L. H. MORIN

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PLASTIC CASTING MACHINE

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PLASTIC CASTING MACHINE

Louis H. Morin, Bronx, N. Y., assignor of one-half to Davis Marinsky, Bronx, N. Y.

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This invention relates to machines for die casting or forming plastic materials, and particularly in the production of continuous elongated plastic members. More particularly, the invention relates to machines of the kind defined employed for forming spiral or helix members longitudinally of a conductor in producing coaxial cable. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing 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 sectional view of a casting machine made according to my invention, showing the casting mechanism with the feed mechanism adjacent and in spaced relation thereto.

Fig. 2 is a detail view looking in the direction of the arrows 2—2 of Fig. 1, showing only a part of the construction.

Fig. 3 is a view similar to Fig. 1, showing only a part of the construction and showing a modification; and

Fig. 4 is a face view of a part of the construction shown in Fig. 1.

In machines for die casting plastic materials, particularly the various kinds of thermoplastic materials, it has been the common practice to form a casting in the die cavity or impression, then to separate the dies and remove the resulting casting therefrom. In the machine forming the subject matter of this application, a different method of procedure is followed, namely, a successive series of castings are formed in the cavity or impression of the die, each casting being formed directly upon the preceding casting, thus resulting in the formation of a continuous elongated cast member, such for example, as a spiral or helix arranged upon an electric conductor. In other words, it may be said that a casting machine is provided wherein an elongated spiral or helix member is formed by a successive series of intermittent casting operations. In other adaptations of the invention, the spiral or helix member may include at spaced intervals rings or bands encircling the conductor, the latter being formed by the use of supplemental die members which are movable relatively to one surface of the primary die.

The casting machine diagrammatically illustrated in the accompanying drawing, from the standpoint of the feed of the plastic material and operation of the plunger is substantially the same as the structures disclosed in prior Patents

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2,244,425, June 3, 1941, and 2,272,220, February 10, 1942.

In Fig. 1, 10 represents the hopper for the reception of powdered or granular plastic material. At the bottom of the hopper is a slide 11 having a measuring aperture 12 therein which measures the quantity of plastic material delivered in each stroke to the discharge chute 13 which is arranged over the funnel like member 14 arranged directly above the admission aperture 15 into the cylinder 16. The slide 11 has a depending arm 17 coupled with the outer end 18 of the tubular plunger, which plunger is actuated through the bell crank mechanism generally indicated by the reference 19. It will thus be seen that in the forward stroke of the plunger, the slide 11 is also moved forwardly.

The plastic material delivered into the funnel 14 in the forward stroke of the slide 11 drops upon the forward reduced end 20 of the tubular plunger and in the retracted movement of the plunger, to the position shown in Fig. 1 of the drawing, this material then drops into the cylinder in position to be advanced in the next injection stroke. The quantity admitted into the cylinder is sufficient to form at least a single casting.

At 21 is diagrammatically illustrated the heating coil at the discharge end of the cylinder 16 for heating the plastic material in the cylinder, and this coil is automatically controlled to regulate the required temperature, as is known in this art. Arranged at the discharge end of the cylinder is a die 22, the die being mounted in the offset portion 23 of a die holder 24, this holder having a flange portion 25 adapted to bear against a ball thrust bearing 26 supported between suitable plates 27 and 28. The purpose of this construction is to provide free rotation of the holder 24 as well as the die 22 mounted therein. To simplify the construction of the die 22, it may be composed of separate parts, each part being secured to the holder 24 by screws 29. The die 22 has formed therein an impression or cavity 30 fashioned to receive a conductor 31, and to form around the conductor a portion of a continuous spiral or helix member, as more fully hereinafter set forth. The length of the spiral or helix in the die 20 is substantially equal to what might be considered a complete turn.

It will, of course, be understood that the die holder will be water cooled, as in conventional machines of this kind in order to chill the casting material, but this has been omitted in the present diagrammatic illustration, as in itself, it forms no part of the present invention.

At 32 is generally indicated the feeder mecha-

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nism, for feeding the conductor including the helix insulator 33 thereon from right to left, as appearing in Fig. 1 of the drawing. The feeder mechanism comprises an elongated tubular shaft 34, at one end of which is an elongated pinion 35 which meshes with the gear 36 arranged upon one end of a shaft 37. At the other end of the shaft is a ratchet wheel 38 and a suitable pawl and lever mechanism 39 is employed to intermittently rotate the shaft 37 a quarter revolution which in turn will rotate the shaft 34 one complete revolution.

Supported in connection with the end of the shaft 34 adjacent the die 22 are radially movable jaw members 40 which are adapted to engage and grip the conductor 31 in the intermittent feed of the conductor, as later described. Springs 41 are employed to normally support the roller ends 42 of the jaw members in engagement with a conical or cup shaped sleeve 43 which is slidably mounted on the shaft 34. The sleeve 43 has a grooved end portion 44 adapted to be engaged by a yoke shaped lever 45 suitably operated in the machine to move the sleeve 43 to the right in moving the jaws 40 into their gripping position, as will be apparent.

The shaft 34 is supported in a slide 46, mounted to move back and forth in the machine with respect to the die 22, a suitable link 47 being coupled with operating mechanisms of the machine in performing this operation timely with the operation of the plunger 18.

In Fig. 3 of the drawing is shown a slight modification. In this figure, 48 represents a die which differs from the die 22 simply in having an annular recess 49 in the outer surface thereof, which recess is interrupted solely by the passages 50 in the die which form the helix or spiral 51 on the conductor 52. The helix or spiral differs from the helix or spiral 33 in that it includes at spaced intervals the collars or sleeve portions 53 which are partially formed by the recess 49. The remainder of the collars are formed by the recess or cavity 54 in two supplemental die members 55 and 56, which are movable toward and from the conductor 52 over the outer surface of the die 48. These supplemental dies 55 and 56 will also include cavity portions conforming with the spiral or helix 51, as will clearly appear from a consideration of Fig. 3 of the drawing. At 57 is shown the discharge end of a cylinder similar to the cylinder 16.

To rotate the die holder 24, a tubular pinion 58 is arranged upon and secured to the outer surface of the holder 24. The gear 59 meshes with the pinion 58, the gear being arranged on a shaft 60, intermittently rotated through a ratchet wheel 61 similar to the wheel 38 and the pawl and lever mechanism 62, the latter being shown in detail in Fig. 4, a view looking in the direction of the arrows 4—4. This construction provides positive rotation of the die holder in the operation of feeding the wire 31 through the die 22 and in injecting plastic material into the die. With the construction shown in Fig. 3 of the drawing, the die holder will be rotated in a manner illustrated in the companion application Serial No. 532,660, filed April 25, 1944.

The operation of the machine will be readily understood from the foregoing description when taken in connection with the accompanying drawing and the following statement.

Let us assume that in the full line illustration of Fig. 1, particularly with respect to the gripper mechanism, the machine has just completed the

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formation of a cast section of the spiral or helix 33 in the die 22. The sleeve 43 is then moved to the left to release the jaws 40, which are then moved outwardly by the springs 41, this movement is slight and sufficient to disengage the conductor 31. The slide 46 together with the sleeve 43 are then moved to the right, and during this operation, the shaft 34 is rotated to move the jaws around the spiral or helix 33. During this operation, the plunger 18 has been moved to the right, assuming the position similar to that shown in Fig. 1 of the drawing, after which the powdered or granular plastic material which had previously been deposited in the funnel 14 will drop into the cylinder 16 in front of the end 29 of the plunger. During the above operation, the cast section or unit of the spiral or helix 33 remains stationary in the die 22.

The machine is now ready for the next operation which can be regarded as the casting or injecting operation. The sleeve 43 is now moved to the right on the shaft 34 to force the jaws 40 inwardly into firm gripping engagement with the conductor 31. The plunger 18 will now be advanced to move the powdered or granular plastic material to the left in the cylinder 16 to a point where injection of the heated plastic material at the outer end of the cylinder is to begin. At this moment, the slide 46 is moved to the left, the jaws 40 being firmly supported in the sleeve 43 in this operation. This operation feeds the conductor 31 including the pre-cast section of the spiral or helix insulator 33 to the left and out of the die 22, the die holder 24 being positively rotated in this operation by the intermittent rotating means employed and simultaneously another cast unit or section of the spiral or helix insulator is formed on the conductor as the plunger 18 is moving forwardly simultaneously with the movement of the slide 46. At the completion of this last operation, the parts will again return substantially to the position shown in Fig. 1, excepting that in Fig. 1, the plunger has been shown in its retracted position, it being understood that pressure is relieved from the casting material immediately upon formation of the cast section as described above.

It will be understood that the above described cycle of operation is automatic and repeated at intervals to form the successive cast sections or portions of the insulator, and the speed of this operation will depend largely upon the amount of material in each unit cast section. However, each unit will be permanently united with the adjacent unit so as to form a continuous elongated spiral or helix insulator on the conductor. In other words, it will be apparent that the cavity 30 of the die is always exposed to the outer nozzle discharge end of the cylinder 16, and in this sense, the cast insulator 33 may be said to be formed from a plurality of intermittently extruded sections.

The operation of the structure shown in Fig. 3 will be the same as that shown in Fig. 1, with the exception that at the beginning of the casting operation the dies 55 and 56 will be separated to allow for the feed of the workpiece to the left and substantially at the completion of the injection stroke the dies 55 and 56 will be quickly moved into engagement with the conductor 52 and in the final stroke of the plunger casting material will be forced into the cavity recesses 49 and 54 in forming the ring like or sleeve like members 53 which completely encircle the con-

ductor 52. It will be apparent that the die 48 or the holder therefor will be intermittently rotated by means similar to that shown in Fig. 1, except that the gear such as 59 will engage a gear face on the flange portion 25, as is disclosed in the companion application referred to.

From the foregoing, it will be apparent that the feeder mechanism draws the conductor 31 including the insulator 33 thereon from right to left in a series of intermittent feeds, each feed stroke being governed by the length of the cavity or impression in the die. During this feed stroke, the die is rotated to feed the die around the pre-cast insulator as the casting material is pressure injected into the die cavity so that when the die again comes at rest, the cavity will again be filled, and a new section of the insulator formed. The ball bearing employed provides free rotation of the holder, and at the same time, takes up the thrust during the injection stroke of the plunger 18.

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

1. A machine for forming helical die castings comprising a casting mechanism and a feed mechanism; the casting mechanism comprising a cylinder for receiving casting material and having a nozzle discharge end, a die abutting said nozzle discharge end having a helically shaped cavity opening through opposed ends thereof, means supporting the die to maintain one end of the cavity in constant registration with said cylinder, means for intermittently feeding casting material into the cylinder, a plunger in said cylinder movable toward said die for pressure injecting casting material into the cavity of said die, said casting mechanism having a passage extending therethrough longitudinally of said cylinder for receiving a strand whereby a casting of helical contour may be cast on the strand in said die; said feed mechanism being movable toward and from the die and having grippers which are themselves movable to engage said strand with the casting thereon, said feed mechanism including said grippers serving to draw said strand and casting out of said die.

2. A machine for forming helical die castings comprising a casting mechanism and a feed mechanism; the casting mechanism comprising a cylinder for receiving casting material and having a nozzle discharge end, a die abutting said nozzle discharge end having a helically shaped cavity opening through opposed ends thereof, means supporting the die to maintain one end of the cavity in constant registration with said cylinder, means for intermittently feeding casting material into the cylinder, a plunger in said cylinder movable toward said die for pressure injecting casting material into the cavity of said die, said plunger and die having a passage extending therethrough for receiving a cable whereby a casting of helical contour may be cast about the cable in said die; said feed mechanism being movable toward and from the die and having grippers movable to intermittently engage said cable with the casting thereon, said feed mechanism including the grippers serving to intermittently move said cable and casting out of said die.

3. A machine for forming helical die castings comprising a casting mechanism and a feed mechanism; the casting mechanism comprising a cylinder for receiving casting material and having a nozzle discharge end, a die abutting said nozzle discharge end having a helically shaped

cavity opening through opposed ends thereof, rotatable means supporting the die to maintain one end of the cavity in constant registration with said cylinder, means for intermittently feeding casting material into the cylinder, a plunger in said cylinder movable toward said die for pressure injecting casting material into the cavity of said die, said plunger and die having a passage extending therethrough for receiving a cable whereby a casting of helical contour may be cast about the cable in said die; said feed mechanism being movable toward and from the die and having grippers movable to intermittently engage said cable with the casting thereon, said feed mechanism including the grippers serving to intermittently move said cable and casting out of said die, and means for intermittently rotating the die during movement of said cable and casting therefrom.

4. A machine for forming helical die castings comprising a casting mechanism and a feed mechanism; the casting mechanism comprising a cylinder for receiving casting material and having a nozzle discharge end, a die abutting said nozzle discharge end having a helically shaped cavity opening through opposed ends thereof, a second die comprising a pair of die members movable toward and from each other, said second die having a cavity registering with the cavity of said first named die, means supporting said dies to maintain one end of the cavity of said first named die in constant registration with said cylinder, means for intermittently feeding casting material into the cylinder, a plunger in said cylinder movable toward said dies for pressure injecting casting material into the cavity of said dies, said casting mechanism having a passage extending therethrough longitudinally of said cylinder for receiving a strand whereby a casting of helical contour may be cast on the strand in said dies; said feed mechanism being movable toward and from the dies and having grippers which are themselves movable to engage said strand with the casting thereon, said feed mechanism including said grippers serving to draw said strand and casting out of said dies.

5. A die casting machine comprising means for intermittently forming die castings one directly upon the other in producing an elongated cast product, a feeder mechanism for intermittently moving the product in synchronism with the formation of successive cast portions of said product, said mechanism comprising jaw members movable toward and from the product, means for intermittently rotating said jaw members, and means for moving said jaw members longitudinally of and with the product in successive intermittent feeds of the product through the machine.

6. A die casting machine comprising means for intermittently forming die castings one directly upon the other in producing an elongated cast product, a feeder mechanism for intermittently moving the product in synchronism with the formation of successive cast portions of said product, said mechanism comprising jaw members movable toward and from the product, means for intermittently moving said jaw members longitudinally of and with the product in successive intermittent feeds of the product through the machine, and means for rotating the jaw members during a movement thereof longitudinally of the product.

7. A die casting machine comprising means for intermittently forming die castings one directly

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upon the other in producing an elongated cast product, a feeder mechanism for intermittently moving the product in synchronism with the formation of successive cast portions of said product, said mechanism comprising jaw members movable toward and from the product, means for intermittently moving said jaw members longitudinally of and with the product in successive intermittent feeds of the product through the machine, means for rotating the jaw members during a movement thereof longitudinally of the product, and said first named means including a die, and a rotatable mounting for said die to provide rotation of the die in the operation of feeding the product therethrough.

8. In a die casting machine for forming intermittent and united castings, a die having a cavity opening through opposed ends thereof, means maintained in constant engagement with one end of the die cavity for intermittently injecting casting material into said cavity, and gripping means for intermittently gripping and withdrawing one cast part of a product from the cavity of the die through the other open end of said cavity during the operation of injecting casting material into said cavity to form the next cast part directly upon and united with the first mentioned cast part.

9. In a die casting machine for forming intermittent and united castings, a rotatable die having a cavity opening through opposed ends thereof, means maintained in constant engagement with one end of the die cavity for intermittently injecting casting material into said cavity, means for withdrawing one cast part of a product from the cavity of the die through the other open end of said cavity during the operation of injecting casting material into said cavity to form the next cast part directly upon and united with the first mentioned cast part, and means for rotating the die during the operation of injecting casting material into the cavity thereof.

10. In a die casting machine for forming intermittent and united castings, a die having a cavity opening through opposed ends thereof, means maintained in constant engagement with one end of the die cavity for intermittently injecting casting material into said cavity, means for withdrawing one cast part of a product from the cavity of the die through the other open end of said cavity during the operation of injecting casting material into said cavity to form the next cast part, rotatable mounting means for said die, and means for rotating said rotatable mounting means during the withdrawing of each cast product part from the cavity of the die.

11. In a die casting machine for forming intermittent and united castings, a die having a cavity opening through opposed ends thereof, means maintained in constant engagement with one end of the die cavity for intermittently injecting casting material into said cavity, means for withdrawing one cast part of a product from the cavity of the die through the other open end of said cavity during the operation of injecting casting material into said cavity to form the next cast part directly upon and united with the first mentioned cast part, a pair of dies movable over one surface of the first named die, said pair of dies having cavities registering with the cavity of the first named die, and said pair of dies being movable toward and from each other in each cycle of successive casting operations of the machine.

12. A die casting machine for forming a cast-

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ing in an elongated member comprising a rotatably mounted die having a cavity opening through opposed surfaces of the die, means at one side of the die for intermittently feeding the member through the cavity of the die, means at the other side of the die for intermittently pressure feeding casting material into the die cavity simultaneously with the feed of the member through the die cavity, and means for intermittently rotating said die during the feeding of said member through the cavity of the die.

13. In a die casting machine, the combination with a heated cylinder and means for intermittently feeding casting material into the cylinder and discharging the same from the discharge end thereof, of a die having a cavity therein opening through opposed surfaces of the die, rotatable supporting means for maintaining one of said surfaces of the die in constant engagement with the discharge end of said cylinder, one end of the cavity opening through said surface being thus maintained in constant registration with the discharge end of the cylinder, means for intermittently rotating said rotatable supporting means during the operation of injecting casting material into the cavity of said die, and means for drawing a casting through the other open end of the cavity during the rotation of said rotatable supporting means.

14. In a die casting machine, the combination with a heated cylinder, means for feeding casting material into the cylinder and for discharging the same therefrom, of a die having a cavity therein opening through opposed surfaces of the die, a pair of supplemental dies movable relatively to the first die and to each other and forming a cavity which is an extension to the cavity of the first die, rotatable supporting means for maintaining one of said die surfaces in constant engagement with the discharge end of said cylinder, one end of the cavity opening through said surface being thus maintained in constant registration with the discharge end of the cylinder, means for rotating said rotatable supporting means during the operation of injecting casting material into the cavity of said die, and said pair of dies being movable into position to form said cavity extension at the completion of the rotary movement of said die.

LOUIS H. MORIN.

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