

July 8, 1952

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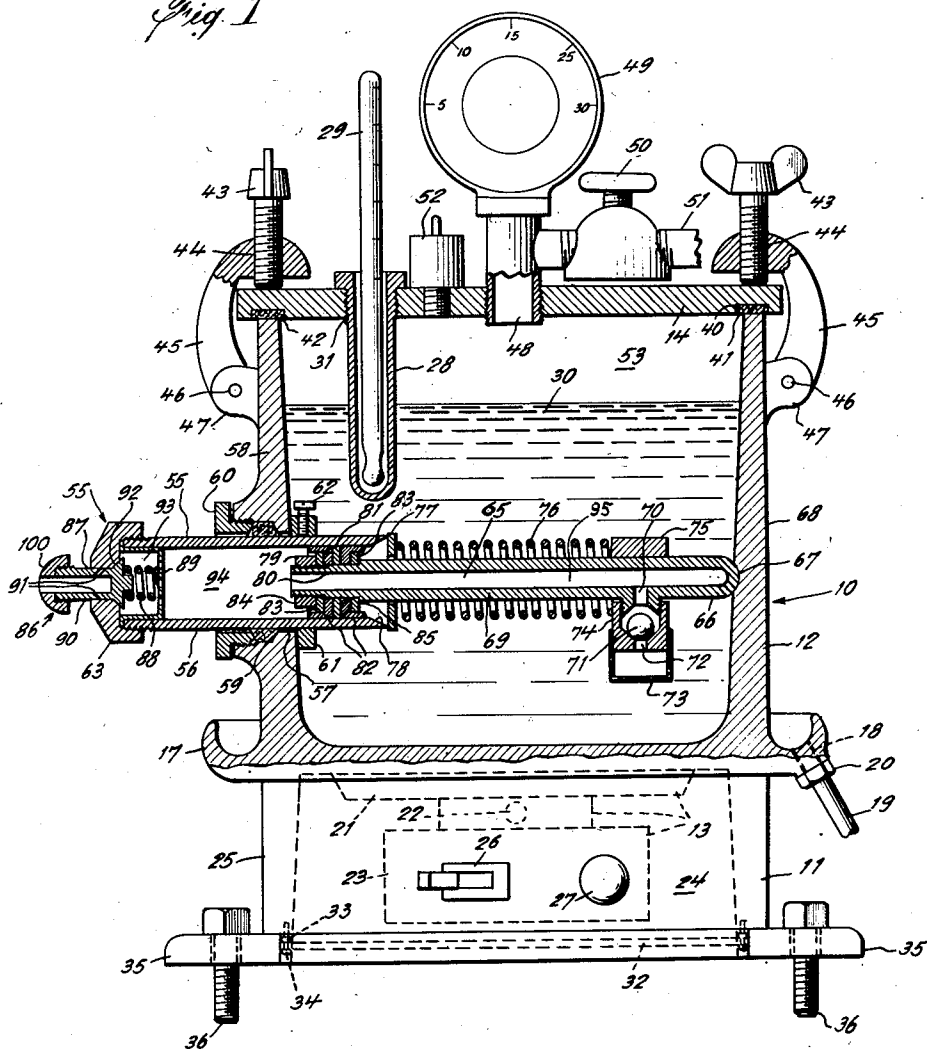
2,602,189

WAX INJECTING MACHINE

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2 SHEETS—SHEET 1

Fig. 1



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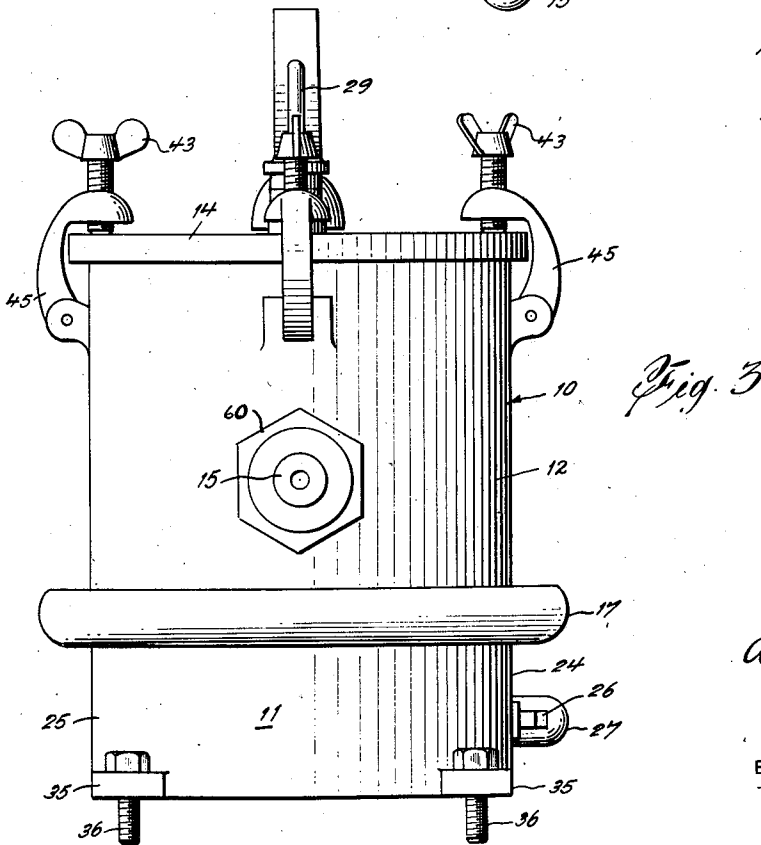
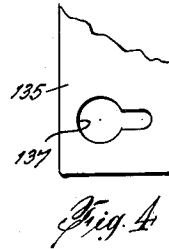
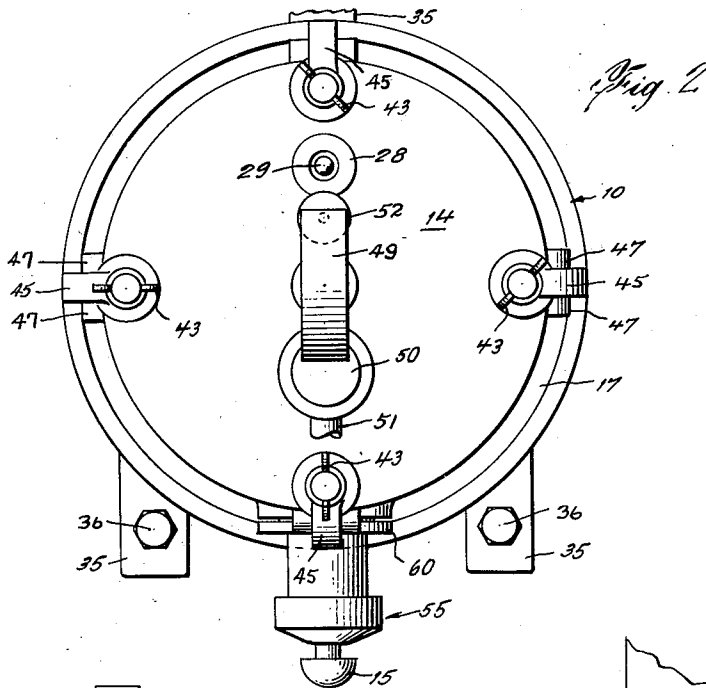
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2 SHEETS—SHEET 2



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WAX INJECTING MACHINE

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5 Claims. (Cl. 18—30)

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This invention relates generally to the art of metal casting and more particularly to the production of wax replicas of articles to be cast.

As is well known in the art to which the present invention relates the forming of parts, principally of castable metals, may be obtained by making a negative mould of the original object and then filling this mould repetitively with a series of molten wax injections to produce wax replicas. These replicas in turn are used to form negative impressions in casting flasks. The wax is melted and burned out of the casting flasks which will then fill with molten metal preferably on a centrifugal casting machine. It is among the objects of the present invention to provide a machine for rapidly, effectively, and conveniently filling the mould.

Another object herein lies in the provision of reducing the contamination of the molten wax so that blemishes and porosity of the finished casting are reduced to a minimum.

Another object herein lies in the provision of a wax injecting machine in which adequate pressure to completely fill the mould with molten wax is obtained.

Another object herein lies in the provision of structure wherein the wax injection operation is a relatively safe one, since in the event of incomplete juncture at the nozzle, the hot wax is splashed toward the machine and away from the operator.

Another object herein lies in the provision of means for reducing the entrance of wax into the electrical heating unit with a consequent improvement in the operation of the latter.

Another object herein lies in the provision of pressure operated means for the injection of the hot wax and which automatically recharges itself.

A feature of the present machine lies in the fact that the pressure upon the wax being ejected from the machine and injected into the mould may be manually obtained or from an external pneumatic source.

A feature of the invention lies in the interchangeability of the nozzle head to accommodate different kinds of moulds.

Another feature lies in the ease of assembly and disassembly of the various parts so that the machine may be conveniently cleaned, adjusted and serviced.

These objects and other incidental ends and advantages will more fully appear in the progress of this disclosure and be pointed out in the appended claims.

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In the drawings in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a side elevational view partly in central section of an embodiment of the invention.

Figure 2 is a plan view with the cover in an altered position.

Figure 3 is a front elevational view.

Figure 4 is a view of an alternate form of foot.

The device generally indicated by reference character 10 comprises broadly a base 11, a pot 12, heating means 13, a pot cover 14 and injecting means 55.

The pot 12 is preferably in the form of an upwardly opening hollow vessel and as shown may be circular in horizontal section. Disposed about the base of the pot 12 outwardly of the bottom 16 is an annular trough. Leading from the trough 17 is an outlet 18 which may be connected to the conduit 19 by the coupling 20. The conduit 19 may travel to any suitable container (not shown) for collecting the wax which has been gathered by the trough 17. It is preferable that the tubing 19 be relatively short so that it may remain at a sufficiently elevated temperature by virtue of heat conducted to it from the pot and trough so that during normal operation the wax will not congeal therein.

The base 11 is preferably formed by a downward extension of the vertical cylindrical wall of the pot and encloses the heater means which includes a heating element 21, a thermostat 22 and a control box 23. Projecting through the side portion 24 of the wall 25 of the base 11 are a switch 26 and a pilot 27. The thermostat 22 is preferably set to open circuit at a temperature only slightly above the melting point of the wax 30 and is hooked in series with the switch 26 and the heating element 21. Electrical energy is conveyed to the heating element 21 by well known conductors (not shown). The pilot 27 may be hooked across the power lines between the switch 26 and the thermostat 22 to show when the switch is in its on position or it may be hooked across the power lines between the thermostat and the heating element in which case it will indicate when current is flowing into the heating element. The thermostat 22 may be of the adjustable type and may be regulated to produce the desired amount of heating in the wax 30 as may be determined by an inspection of the thermometer 29 which is detachably engageable by resting in the thermometer support 28. The support 28 is an elongated

gated cup shaped body threadedly engaged in an orifice 31 in the pot cover 14.

The base 11 is provided with a removable base plate 32 which is upwardly pressed against the gasket 33 by means of the screws 34 so that the electrical equipment enclosed within the base 11 is substantially sealed against contamination. The device in normal use over a period of time is subject to frequent changes in temperature and owing to the low viscosity of the wax at elevated temperatures the same has a tendency to seep through the gasket materials with a consequent contamination of the electrical parts. I have prevented this from occurring by the use of the trough 17 which collects any of the wax which may be running down the outside of the pot 12 and conveying it away where it cannot damage the heating element and associated parts.

The base 11 is provided with a plurality of feet 35, each of which is penetrated by a screw 36 for securing the device upon any suitable working surface (not shown). To facilitate attachment or removal of my device from the working surface upon which it is used, the feet 30 may be provided with keyhole slots in a well known manner. See Figure 4 in which an alternate form of foot is shown. In this figure the foot 135 has a keyhole slot 137.

The cover 14 is preferable in the form of a flat plate having an annular recess 40 containing a gasket 41 which is adapted to coact with the rim 42 of the pot 12. Adequate compression upon the gasket 41 is maintained by the thumb screws 43 which are threadedly engaged in orifices 44, in the arms 45 which are pivotally mounted by pins 46 in the ears 47. When it is desired to remove the pot cover 14 the thumb screws are loosened and the arms swung downwardly and outwardly allowing convenient access to the inside of the pot 12. The cover 14 is provided with a pneumatic or fluid pressure inlet 48, a pressure gauge 49, a pressure control valve 50 and a pressure supply conduit 51. A relief valve 52 is mounted upon the cover 14 and acts to dissipate excess pressure occurring in the chamber area 53 above the wax 30.

The mould filling means 55, as previously stated, is adapted for manual or automatic pressure operation. When the means 55 is manually operated the main cylinder 56 is adapted to reciprocate forwardly and rearwardly of the pot 12 and is slideably supported in an orifice 57 in the forward portion 58 of the vertical wall of the pot. The orifice 57 centrally thereof has an annular channel within which is disposed the gland packing 59. The packing is maintained under compression by the gland nut 60 which engages the threads bordering the forward portion of the orifice 57. Outward movement of the cylinder 56 is regulated by the adjustable collar 61 having a set screw 62 while rearward movement is limited by the cap nut 63. The limit of movement of the cap nut 63 would occur normally only when the capacity of the mould filling means 55 is insufficient to fill the mould. The piston element 65 is relatively stationary in normal operation and is supported at the forward portion thereof by a plurality of rings which engage the inner cylindrical surface of the cylinder 56, and said piston element is supported at the rear end 66 in a socket 67 in the rear portion 68 of the vertical wall of the pot 12. The piston element is in the form of an elongated tube 69, the rear end 66 of which is closed. The

rear portion of the tube 69 is provided with an inlet port 70 which is fitted with a ball check valve 71, and the entrance 72 to said valve is protected with a screen or filter 73. The ball check valve housing 74 and a stationary projection 75 act as a rear support for the expansive helical spring 76. The forward end of the spring 76 bears against an orificed disc 77 which rides upon the tube 69 and bears against the rear edge of the cylinder 56. The rear end of the cylinder 56 has an inside taper 78, forwardly converging, which facilitates the insertion of the piston head 79 into the cylinder 56. The piston head is preferably formed by mounting upon a portion 80 of a reduced diameter a central ring 81, and outwardly thereof a pair of cup shaped members 82. The ring 81 is preferably composed of rigid material while the cup shaped members are preferably composed of a yielding material such as leather and said members are oppositely disposed so that their cup openings extend in opposite directions. Disposed within the cup openings of the members 82 are a pair of washers 83. The piston head 79 is maintained in operative condition by the compression afforded by the nut 84 engaged upon the threaded forward end of the tube 69. The nut 84 compresses the washers 83, the members 82 and the central ring 81 against the shoulder 85 in the tube 69.

The feeding valve 86 has a hollow valving member 90 mounted for reciprocation forwardly and rearwardly of the device 10 within the central cylindrical opening 87 in the cap nut 63. The feeding valve 86 includes a nipple 100, a spring 88 and a spring support 89 as well as the member 90 and the cap nut 63. The valving member 90 includes a plurality of angularly disposed passages 91 which are opened by the rearward movement of the member 90 which is accompanied by a compression of the spring 88. The rear portion of the member 90 has a frusto-conical flange 92 which is adapted to seat within a correspondingly tapered flare in the rear-most portion of the orifice 87. The rear end of the valving member 90 also has a central and rearwardly extending projection which supports the spring 88 by axially engaging said spring. The forward end of the valving member 90 is provided with an external thread upon which the nipple 100 is threadedly engaged. This construction permits the substitution of various shaped nipples, having a standard internal thread, for the nipple 100, to accommodate moulds having variously shaped wax receiving openings. The spring support 89 is in the form of a hollow flanged cup having a perforated rear wall as seen in Figure 1. The flange portion of the support engages upon the forward end of the cylinder 56 and is maintained in position by the cap nut 63.

Manual operation may be substantially as follows. A few reciprocations of the mould filling means 55 are preferably made to fill all of the desired channels with molten wax and by virtue of the thermal contact between the front portion 58 of the pot 12 and the gland nut 60 with cylinder 56, the various parts are maintained at a sufficiently high temperature to prevent congealing of the wax therein. Furthermore, the tube 69 and the valve housing 74 are immersed in the molten wax so that adequate temperature is maintained at these points also. With oscillation of the cylinder 56 it too is brought into contact with the molten wax and takes on heat therefrom. Assuming the means 55 to be filled with molten wax, the mould (not

shown) is placed with its opening against the nipple 100 and the mould is moved rearwardly toward the device 10. Since the spring 88 is relatively stronger than the spring 76, the valving member 90 moves rearwardly so that the passages 91 communicate with the chamber 93 within the spring support 89 as soon as the hydraulic back pressure is sufficient. Further rearward movement of the mould causes the cylinder 56 to move rearwardly and through the disc 77 compresses the spring 76. This reduces the effective internal capacity of the chambers 94 and 95 producing positive pressure in said chambers against the ball in the check valve 71 which seats and the wax within the chambers 93, 94 and 95 is injected into the mould through the nipple 100. As soon as the mould is filled, since the wax is relatively incompressible, further movement of the mould and the parts just described of the means 55 is inhibited.

As soon as the wax strikes the mould, since the wax has been maintained within the pot 12 at a critical melting temperature, the wax congeals and as soon as the pressure of the mould is removed from the nipple the spring 88 closes the valving member 90 to prevent entrance of air thereat while the spring 76 then moves the cylinder 56 forwardly which produces reduced pressure in the chambers 93, 94 and 95. Gravity and atmospheric pressure force a new supply of wax from that contained in pot 12 into the chambers 93, 94 and 95.

Where the present device is operated from a source of external pressure the cap nut 63 may be moved into contact with the gland nut 60 and the washer 61 may have its set screw 62 manipulated to keep the parts in this condition. The pressure is adjusted by means of the valve 50 and the gauge 49 to the desired value and when the mould is pressed against the nipple 100 the valving member 90 moves rearwardly to clear the passages 91, and the wax flows through the ball valve 71, the chamber 95, a relatively reduced size chamber 94, the chamber 93, passages 91, and through the valving member 90 and the nipple 100. When the mould is removed from the nipple 100 the valving member 90 shifts forwardly under pressure of the spring 88.

It may thus be seen that I have disclosed a novel and useful wax injecting machine which permits complete filling of moulds and which may operate for long periods of time with a minimum of servicing attention, except the replacement of the consumed wax.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. A device of the character described comprising: a receptacle having an opening in the front wall thereof, a threaded supporting nut removably secured therein adapted to support an injector unit, said unit comprising a cylindrical relatively movable barrel passing through said nut and supported thereby in horizontal position, a perforated disk secured to the inner end of said barrel, said disk having a central opening, a tubular relatively stationary plunger passing through the central opening in the disk and supported thereby, a piston packing disposed in said barrel and fixed to the plunger near the outermost end thereof, a radially extending member secured to the plunger near its inner end, a helical expansion spring mounted around said

plunger, the ends of said spring bearing respectively against said radial member and disk so as to keep the inner end of the plunger in engagement with the rear wall of said receptacle, and normally to keep the barrel in projected position, a sleeve in threaded engagement with the outer end of the barrel, a conical stem valve slidably supported by the sleeve, a nozzle mounted on the outer end of the stem valve, a spring within the sleeve acting on the stem valve to hold it normally closed, said valve stem having a longitudinal duct and transverse ducts formed therein to afford a communicating passage from the sleeve through the stem valve and nozzle when the stem valve is pushed inwardly, and a check valve located on said plunger near the inner end thereof, whereby when the nozzle and barrel are pushed inwardly fluid within the receptacle is ejected through the plunger barrel and nozzle.

2. A device of the character described comprising: a receptacle having an opening in the front wall thereof adapted to support an injector unit, said unit comprising a cylindrical relatively movable barrel passing through said opening and in horizontal position, a perforated disk secured to the inner end of said barrel, said disk having a central opening, a tubular relatively stationary plunger passing through the central opening in the disk and supported thereby, a piston packing disposed in said barrel and fixed to the plunger near the outermost end thereof, a radially extending member secured to the plunger near its inner end, a helical expansion spring mounted around said plunger, the ends of said spring bearing respectively against said radial member and disk so as to keep the inner end of the plunger in engagement with the rear wall of said receptacle, and normally to keep the barrel in projected position, a sleeve in threaded engagement with the outer end of the barrel, a conical stem valve slidably supported by the sleeve, a nozzle mounted on the outer end of the stem valve, a spring within the sleeve acting on the stem valve to hold it normally closed, said valve stem having a longitudinal duct and transverse ducts formed therein to afford a communicating passage from the sleeve through the stem valve and nozzle when the stem valve is pushed inwardly, whereby when the nozzle and barrel are pushed inwardly fluid within the receptacle is ejected through the plunger barrel and nozzle.

3. A wax injecting machine for use with a mold comprising: a first chamber adapted to contain wax, said chamber including a vertical wall having an opening; pump means slidably disposed within said opening and forming a substantially fluid tight seal, and including a second chamber the effective size of which may be varied; first resilient means urging said chamber in the direction of its maximum capacity; uni-directional means to admit fluid from the first chamber to the second chamber; and an exit means on said second chamber, said exit means being disposed outwardly of the first chamber; and means to lock said pump means in such position that the effective size of said second chamber is at its minimum capacity.

4. A device of the character described comprising: a receptacle having an opening in the front wall thereof adapted to support an injector unit, said unit comprising a cylindrical relatively movable barrel passing through said opening and in horizontal position, a tubular relatively stationary plunger extending into said barrel,

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means on said plunger forming a packing between said plunger and the inner surface of said relatively movable barrel, an enlargement on said plunger, mounting means having a resilient component disposed between the enlargement on the plunger and the inner end of said barrel, whereby the inner end of the plunger is engaged with the rear wall of said receptacle, and normally to keep the barrel in a projected position, a downwardly projecting inlet valve on said plunger, and an outlet valve on the outer end of said movable barrel, whereby fluid wax may travel in an upward direction through said inlet valve into said plunger.

5. Structure as claimed in claim 4 in which the inlet valve is gravity actuated to the closed position thereof.

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