Aug. 24, 1965 G. NYSELIUS 3,201,836

METHOD OF, AND APPARATUS FOR, DIE CASTING METALS

Filed Sept. 21, 1964

Fig. 1.

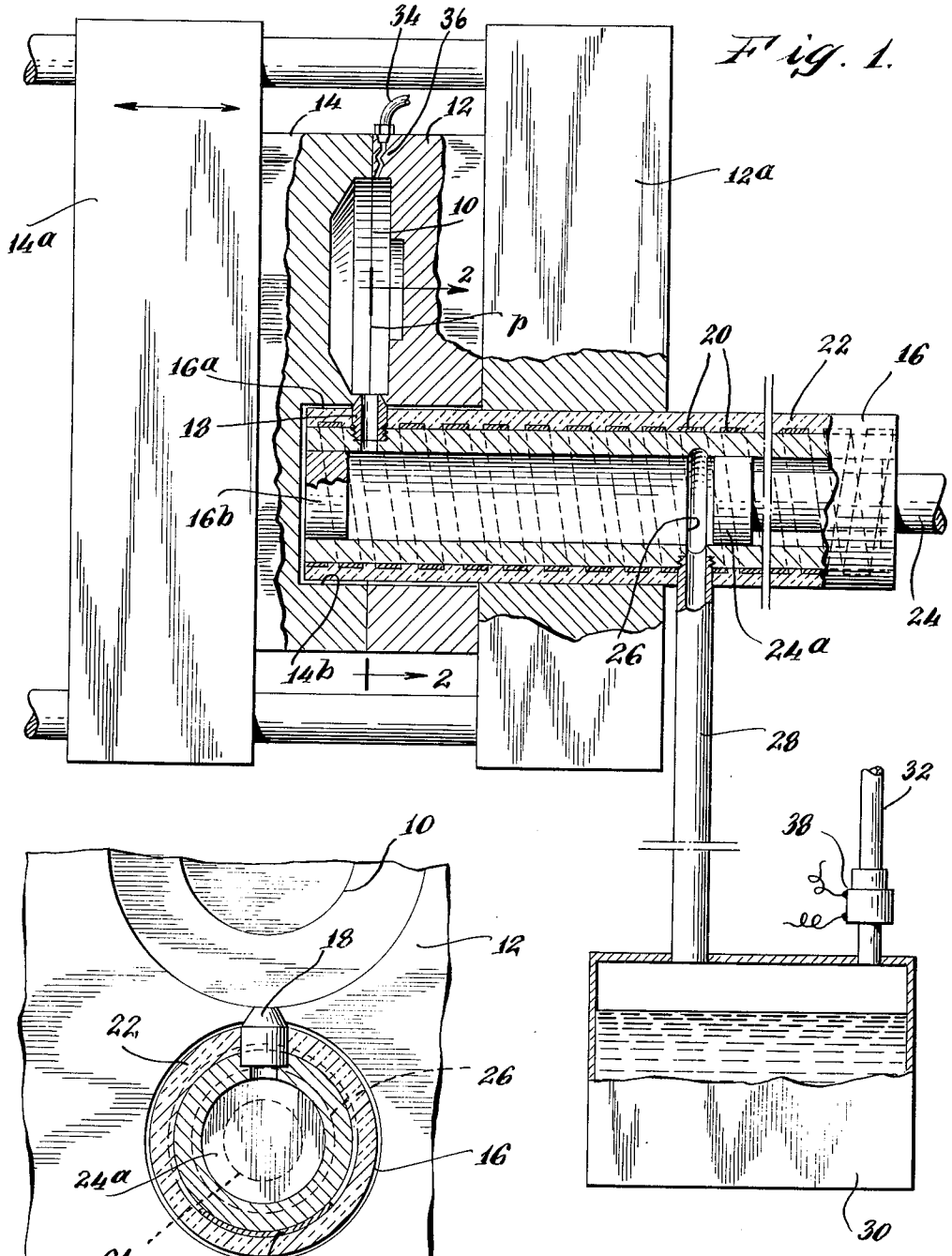

Fig. 2.

INVENTOR.
Gustav Nyselius
BY
John W. Hoag
ATTORNEY.

United States Patent Office 3,201,836 Patented Aug. 24, 1965

3,201,836

METHOD OF, AND APPARATUS FOR, DIE CASTING METALS

Gustav Nyselius, Stamford, Conn., assignor to Mount Vernon Die Casting Corporation, Stamford, Conn.

Filed Sept. 21, 1964, Ser. No. 398,126
2 Claims. (Cl. 22—68)

This invention relates to improved apparatus for die casting, the present application for letters patent thereon being a continuation-in-part of my application S. No. 225,412, filed September 19, 1962, in turn a continuation-in-part of my application S. N. 176,262, filed February 28, 1962, both now abandoned. While the herein apparatus is applicable to casting of any metal, it is particularly valuable when applied to the casting of aluminum, as will hereinafter appear.

The purpose of the invention is to eliminate slag formation during casting i.e. to prevent the formation of a plug and other waste metal while forming the desired casting.

Die casting operations as now and previously practiced are very inefficient since for each casting operation a great deal of casting material is solidified in addition to the desired casting. This additional solidified material is waste and must be separated from the desired casting and collected and remelted. In apparatus in use at the present time for casting aluminum a plug of metal solidifies at the front end of the sleeve and is integral with the metal solidifying in the runner cavity, the gate cavity and the die cavity. The amount of waste metal so "cast" is often as much as 50% of the metal usefully cast in the die. It must, of course, be separated from the desired casting, i.e., the aluminum which solidifies in the die, and separately collected in containers which must be stored and eventually transported to a melting furnace to be remelted and resupplied to the casting machines. When it is considered that a large proportion of this separated, stored, transported and remelted casting material will again be solidified outside the die cavity and will again have to be separated from the desired casting, separately collected and stored and transported to the melting furnaces and remelted, and that a portion of the remelted casting material will go through the same steps again and again, it becomes apparent how inefficient are the present method and apparatus.

In the prior art are die casting machines which for one reason or another supply molten metal to a charging sleeve from a reservoir disposed below the sleeve, and intermittently force a charge of metal from the sleeve through a runner into a die cavity located above the sleeve. However no excess aluminum can be returned from the runner by gravity since a plug forms which seals the runner from the cavity.

In the operation of the apparatus described herein no plug is formed and all molten aluminum supplied from a reservoir for a casting operation is returned to the reservoir between casting cycles. This makes it practical to use a steel charging sleeve. It would not be practical to do so unless the molten aluminum is returned between cycles for a steel sleeve would be damaged and eventually ruined by continuous contact with molten aluminum.

The invention will best be understood by reading the following description in connection with the drawings in which:

FIG. 1 is a side elevation partly in cross-section, and partly cut away, and

FIG. 2 is an end view taken on the line 2—2 of FIG. 1.

In the embodiment of this invention as illustrated in FIG. 1 molten casting metal is forced into a die cavity **10**, formed between die plates **12** and **14**, from a cylindrical charging sleeve **16**, through the nipple **18**. Die plate **12** is supported on stationary die platen **12***a* and die plate **14** is supported on movable platen **14***a*. The sleeve **16** extends through platen **12***a* and its projecting rear end is received in the recess **14***b* in platen **14***a* when the platens are together and the die cavity is closed. The rear end of the sleeve is closed by the end wall **16***b*. The vertical center line or axis of nipple **18**, which projects radially from the sleeve adjacent its closed end to the die cavity and thus communicates between the sleeve **16** and the die cavity, is aligned with the line of parting *p* of the die plates **12** and **14**. To accommodate the nipple **18** in this position, the adjacent faces of the die plates **12** and **14** are complementally cored out or otherwise recessed to seat said nipple.

Disposed around the full length of sleeve **16** is a heating coil **20** which is employed to keep the interior of sleeve **16** heated sufficiently to maintain the casting material therein in molten state. Surrounding the sleeve and the heating coil is the insulation **22**. The placement of nipple **18** short of the closed end of the sleeve **16** as shown also results in the nipple being similarly heated by the heating coil **20**.

Within sleeve **16** a charging piston **24** is provided, which may be of any known, suitable kind and reciprocated in any known, suitable way in timed relation to the opening and closing of the platens **12***a* and **14***a*.

It is conventional in the type of machine in connection with which is illustrated an embodiment of this invention to reciprocate both the movable die platen **14***a* and the charging piston **24** by means of hydraulic pressure operated by known timing mechanism, and such means is not illustrated herein since it is well known

In FIG. 1 the charging piston **24** is shown fully retracted, at the end of its stroke, and it will be noted that its head portion **24***a* is just behind the groove **26** provided in the inner surface of sleeve **16**. A conduit **28** extends between reservoir **30** and groove **26** and casting material is supplied from the reservoir into the charging sleeve **16** through conduit **28**, by pressure applied within reservoir **30** as through the air line **32**, or alternatively by reduced pressure applied through the vacuum line **34** and communicated to reservoir **30** through the zig zag exhaust gate **36**, die cavity **10**, nipple **18**, the sleeve **16**, groove **26** and conduit **28**. It will be understood that the application of pressure within reservoir **30** will be controlled by suitable means, such as, for example, the solenoid valve **38** shown in connection with the pressure line **32** to operate in timed relation with the cycle of operation of the casting machine.

If the vacuum line **34** is used it will be actuated only after the die plates are closed, and when the charging piston is in its fully retracted position, and it will be cut off by the hardening of casting material in the zig zag exhaust gate. If the pressure line **32** is employed it will be actuated only after the die plates are closed, and when the charging piston is in its fully retracted position, and and it will be cut off when the piston has advanced sufficiently to cover groove **26**.

I have successfully supplied casting material from a reservoir such as **30**, through a supply line such as **28**, into a horizontally disposed charging sleeve such as **16**, by supplying a pressure of only **16** oz. through line **32**.

It will be understood that in the operation of the apparatus shown in FIGS. 1 and 2 part of the casting material supplied into sleeve or cylinder **16** will be forced through nipple **18** from sleeve **16** into die cavity **10** by the forward movement of the charging piston **24**. Upon the return stroke of the piston the casting material in nipple **18** falls back into sleeve **16**, and from sleeve **16** the casting material will return by gravity through groove **26** and conduit **28** into the reservoir **30**.

The space within sleeve **16** and nipple **18** is kept heated to a temperature above the melting point of the casting material. By arranging the die cavity above and very close to sleeve **16**, and the reservoir below sleeve **16**, and eliminating the formation of a plug, any excess aluminum below the die cavity is returned to the reservoir between charging cycles.

There has thus been provided a method and apparatus in which the above mentioned obects have been provided in a thoroughly practical manner.

What I claim is:

1. Apparatus for die casting metal which comprises: a stationary die plate and a movable die plate which when their relatively inner faces are closed together define a die cavity, the stationary die plate having an opening extending transversely through it directly below the die cavity, and the movable die plate having a recess in its relatively inner face extending in continuation of the opening in the stationary die plate, a sleeve fixedly disposed in the opening in the stationary die plate and having a closed forward end portion projecting beyond the relatively inner face of the stationary die plate and adapted to move into the said recess in the corresponding inner face of the movable die plate when the die plates are closed together, a short-length nipple affixed to and projecting radially from said forward end portion of said sleeve to the die cavity and communicating directly between the sleeve and the die cavity, the axis of the nipple being aligned with the line of parting between the die plates and the inner faces of said die plates being complementally recessed to provide a full tubular seat for said nipple, means extending the full length of said sleeve for maintaining the sleeve and nipple at a temperature above the melting point of the casting material, a reservoir for metal casting material disposed below said sleeve, and means for intermittently raising a charge of casting material from the reservoir to the die cavity including a conduit communicating between the reservoir and the rearward end portion of the sleeve and a charging piston reciprocable within the sleeve to force a charge of casting material from the sleeve through said nipple to fill the cavity, the conduit communicating to the sleeve at a point along the length thereof which is so located that when the plunger is at the rear end of its stroke the conduit connection to the reservoir is uncovered, thus allowing molten metal in the heated nipple and sleeve to return to the reservoir by gravity after each reciprocation of the plunger.

2. Apparatus according to claim **1**, wherein the molten metal being cast is aluminum and the sleeve is fashioned from steel.

References Cited by the Examiner

UNITED STATES PATENTS

2,131,955	10/38	Johnson	22—69
2,393,588	1/46	Cherry	22—70
2,660,769	12/53	Bennett	22—209
2,955,335	10/60	Morgenstern	22—68
2,985,928	5/61	Heskett	22—67
3,009,218	11/61	Rearwin	22—68
3,106,755	10/63	Moore	22—68

MARCUS U. LYONS, *Primary Examiner.*

WILLIAM J. STEPHENSON, *Examiner.*