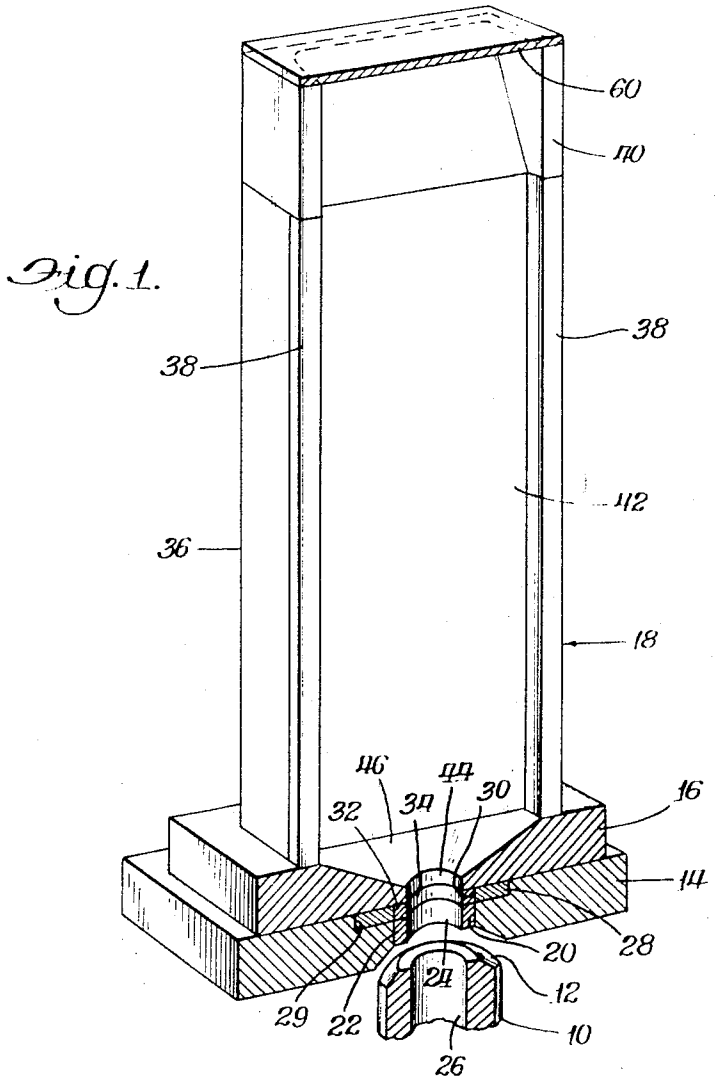
Sept. 9, 1969 E. Q. SYLVESTER 3,465,810

APPARATUS FOR CASTING METAL

Filed Dec. 4, 1967

Fig. 1.



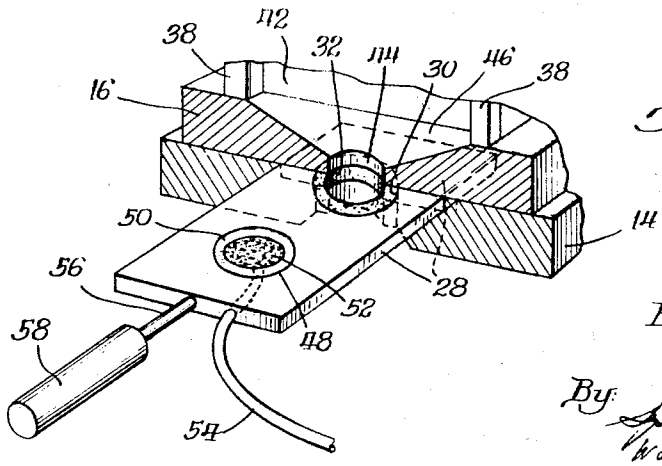


Fig. 2.

Inventor:
Edmund Q. Sylvester

By: Spencer & Blaylock, Jr.
Walter J. Schlegel, Jr. Attys.

United States Patent Office

3,465,810
Patented Sept. 9, 1969

3,465,810

APPARATUS FOR CASTING METAL

Edmund Quincy Sylvester, Shaker Heights, Ohio (% Sylvester Enterprises, Inc., 850 Hanna Bldg., Cleveland, Ohio 44115)

Filed Dec. 4, 1967, Ser. No. 687,775
Int. Cl. B22d 27/00, 21/02
U.S. Cl. 164—259 2 Claims

ABSTRACT OF THE DISCLOSURE

Molten metal is poured into a mold and during solidification of the metal within the mold an inert gas, such as argon, is bubbled upwardly through the metal.

It has been the practice to cast metal by pressure pouring and by continuous casting. If a rimming grade steel is desired, it has been the practice to vacuum degas the melt in order to control the oxygen content of the melt to reduce the rimming action during cooling of the molten metal in a pressure casting mold. Vacuum degassing of the melt has also been used to reduce the oxygen content for ingot casting as well as continuous casting. Vacuum degassing of the molten metal requires expensive equipment with the result that rimmed steel, produced by such a process is expensive.

It is, therefore, an object of this invention to provide a method and apparatus for casting metal.

A further object of this invention is to provide a method and apparatus for the casting of rimmed steel.

It is a further object of this invention to provide a method and apparatus for the casting of rimmed steel slabs, billets, blooms and other similar articles without the attendant increase in cost of the prior art process.

These and other advantages and objects of this invention will become apparent from a reading of the following detailed description of this invention, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of the apparatus of this invention; and

FIGURE 2 is a perspective view of a portion of the apparatus of this invention, which portion is capable of introducing an inert gas into the mold cavity.

Referring now to the drawings, reference numeral **10** denotes the pouring tube of a conventional pressure pouring apparatus (not shown). The pouring tube **10** is open at its upper end **12** for communication with an ingate assembly **14**. The ingate assembly is secured to the cast iron bottom block **16** of a vertical slab mold **18**. The ingate assembly **14** is provided with a central aperture **20** having inserted therein a ceramic sleeve **22**, the bore **24** of which is in open communication with the bore **26** of the pouring tube **10**. Also positioned in and forming a part of the ingate assembly **14** is a slide cut-off plate **28** having a bore **30** which plate **28** slides in a recess **29** in the ingate assembly **14**. A ceramic insert **32** is positioned within the bore **30** of the slide cut-off plate **28** and is provided with a bore **34** of the same internal diameter as the internal diameter of the sleeve **22**.

The mold **18** consists of a pair of graphite side blocks **36**, a pair of cast iron end blocks **38**, the bottom block **16** and a cast iron riser **40**. Only one side block **36** has been shown, it being understood that the other side block **36** is of identical construction. The side blocks **36**, end blocks **38**, bottom block **16** and riser **40** form therebetween a slab molding cavity **42**. The bottom block **16** is provided with a central aperture **44** of the same internal diameter as the internal diameter of the insert **32** and is in open communication therewith. Preferably, the bottom block **16** is provided with a frustoconical cavity **46** communicating with the mold cavity **42**.

Referring now to FIGURE 2 for a more complete showing of the slide cut-off plate **28** and associated structure, wherein the plate **28** is provided with a second aperture or bore **48**. A ceramic sleeve **50** is positioned snugly within the bore **48** and retains a porous plug **52** of suitable refractory material such as a spinel. Means such as a pipe **54** are provided to supply inert gas such as boron to the porous plug **52**.

The slide plate is moved from its position wherein sleeve **32** is aligned as shown in FIGURE 2 to its position wherein the porous plug **52** is aligned with the aperture **44** by a piston rod **56** operatively connected to an air or hydraulic cylinder **58**.

In operation, the mold **18** is positioned over the pouring tube **10** of a conventional pressure pouring apparatus (not shown). The slide cut-off plate **28** is positioned with the ceramic sleeve **32** in alignment with the bore **26** of the pouring tube and the aperture **44** of the bottom block **16**. Molten metal is forced upwardly by the conventional pressure pouring method through the pouring tube into the mold cavity **42** until the cavity has been filled. The piston **58** is actuated to move the slide cut-off plate from its position in FIGURE 1 to its position wherein the porous plug is aligned with the aperture **44** of the bottom block **16**. The air pressure is shut off and the inert gas supply is started which forces the inert gas through line **54**, and the porous plug **52** upwardly into the still molten central portion of the casting. The inert gas bubbles upwardly through the casting thereby removing deleterious substances such as hydrogen from the melt. It also deoxidizes the melt.

Since the inert gas bubbles in from the bottom, rimming action is obtained throughout the slab rather than only in a portion of the slab in ingot pouring. This process will result in interanl cooling of the melt which will reduce the shrinkage and the solidification time.

In the preferred embodiment of this invention, the top **60** of the mold **18** is covered with a light refractory brick or asbestos to prevent the introduction of oxygen into the mold during the inert gas introduction.

It can be seen from the foregoing that this method and apparatus will produce an improved product. It should be understood that various modifications may be made in the invention without departing from the spirit and scope of the following claims.

I claim:

1. An apparatus for casting metal articles comprising a mold having a cavity of the configuration of the article to be formed, means for forcing molten metal upwardly into the mold, an ingate assembly having a passageway to provide communication between said means and said mold, a slide plate forming a part of said ingate assembly, said slide plate being provided with an aperture and a porous plug alignable with said passageway, said porous

plug being in open communication with inert gas supply means, and means for aligning said aperture with said passageway during filling of the mold and for aligning said plug during solidification of said article.

2. An apparatus according to claim 1 wherein said mold is a vertical mold comprising a pair of cast iron end blocks, a cast iron bottom block, a cast iron riser and a pair of graphite side blocks.

References Cited

UNITED STATES PATENTS

2,426,814	9/1947	Burkhardt	164—66 X
3,192,581	7/1965	Sylvester	164—66
3,208,117	9/1965	Goedecke et al.	164—56 X
3,265,348	8/1966	Sylvester	164—66
3,342,248	9/1967	Bonis et al.	164—55
3,344,840	10/1967	Buehl et al.	164—66 X
3,353,585	11/1967	Wentzell	164—68 X
3,367,401	2/1968	Bonis et al.	164—259 X
2,865,068	12/1958	Dunn	164—259
535,671	3/1895	Casgrain	164—306

FOREIGN PATENTS

622,217	6/1961	Italy.
16,609	2/1963	Japan.

J. SPENCER OVERHOLSER, Primary Examiner

V. RISING, Assistant Examiner

U.S. Cl. X.R.

164—66