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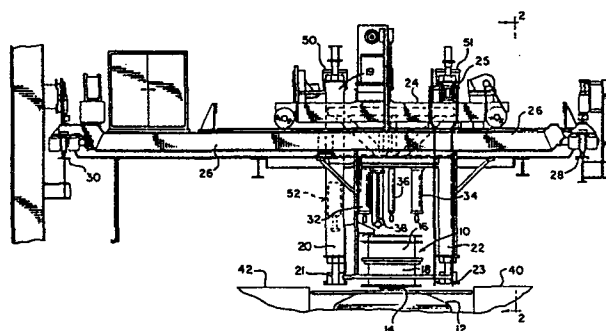
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54 **Mold transfer assembly.**

57 In a pouring assembly for use in the manufacture of cast metal articles, after a mold (10) is filled with molten metal at a pouring station (14), it is lifted by means of a crane assembly (19, 24, 25), movable on a bridge structure (26) to a set down station (42). Simultaneously, an empty mold (not shown) is lifted from a pick up location (40) to the pouring station (14). After a hold down mechanism (32, 34) mounted to the bridge structure (26) is set on the mold, the empty mold is filled with molten metal injected upwardly under pressure into the mold and a mold stopper is then closed by means of a mechanism (36) to prevent the molten metal from running out when the injection pressure is relieved.



MOLD TRANSFER ASSEMBLY

The present invention relates to the production of cast metal articles, and more specifically, to an apparatus and a method for holding a mold that is being filled and for transferring a mold filled with molten metal from a pouring station while moving an empty mold onto said pouring station.

5 In the manufacture of cast metal articles such as railway wheels, it is important from a cost savings and energy savings point of view to produce such wheels as rapidly as possible while maintaining the accuracy necessary to produce near finish castings. A typical wheel casting
10 plant layout is shown in U. S. Patent No. 2,999,281. A cope or top mold section is placed on top of a drag or bottom mold section to form a complete mold. Usually the mold is a reusable graphite mold. When the completed mold is moved
15 along a conveyor to a pick up station adjacent the pouring station, a pick-up crane is used to lift the mold and place it on the pouring station above the pouring tank. The mold is located above the pouring tank because a bottom pressure pouring method is used to inject the molten metal into the
20 mold. The ladle containing the molten metal is placed within a pouring tank. The pouring tank is capable of being pressurized with air, thereby forcing the molten metal upwardly through a refractory pouring tube into the bottom of the mold.

Prior to filling the mold, the mold must be held in
25 place, usually by air cylinders which extend downwardly to contact the cope. Further, a mold stopper assembly must be

lowered, again by air cylinder, over the stopper hole in the mold. Finally, a riser height control mechanism must be lowered into the mold riser whereby the height of the molten metal in the riser is determined and hence the pouring
5 operation is automatically controlled. These three mechanisms, the hold down cylinders, the mold stopper and the riser height control mechanism, were previously located on the mold set down crane legs used to pick up the filled mold and transfer it to the mold set down location from where the
10 mold would continue for processing along conveyors.

The mold set down crane and the mold pick up crane are each comprised of a column assembly having two legs, and both column assemblies are mounted on a single top frame assembly. Such top frame assembly is capable of lateral
15 movements along secondary girders, which secondary girders themselves comprise a crane assembly mounted on main girders giving the secondary girders the capability of moving longitudinally with relation to the pouring station. Because of the mounting of the pick up crane and set down crane on a
20 single top frame assembly, their lateral movements along the secondary girders are simultaneous and of equal lateral dimension.

In the pouring sequence of the previously known arrangement, a mold just filled with molten metal is at the pouring
25 station and a second, empty mold is at the mold pick up location. The mold hold down assembly, mold stopper and riser height control are attached to the set down crane, and, after pouring is completed, are raised from the mold. The set down crane then raises the filled mold while the

pick up crane raises an empty mold. The frame assembly supporting both cranes is moved laterally along the secondary girders. The filled mold is placed at the set down location by the set down crane and the empty mold is placed at the
5 pouring station by the pick up crane. The set down crane and the pick up crane are then moved via their frame assembly laterally along the secondary girders. When the set down crane reaches the pouring station, the mold hold down assembly and riser height control are lowered to the empty mold and
10 the pouring operation begins. The mold stopper is lowered after the mold has been filled.

It is an object of the present invention to provide an improved pouring station mold handling arrangement.

Viewed from a first aspect the invention provides a
15 pouring assembly for use in the manufacture of cast metal articles, said assembly comprising a mold transfer apparatus including a top frame movable along a bridge structure and two sets of depending legs, and a pouring tank located at a pouring station under the bridge structure, said pouring tank being
20 capable of being pressurized to permit the upward pouring of molten metal therefrom into a mold positioned thereabove, one set of said depending legs of said mold transfer apparatus being adapted to move an empty mold from a pick up location to said pouring station, and the second set of depending legs
25 of said mold transfer apparatus being adapted simultaneously to move a filled mold from said pouring station to a set down location, wherein said bridge structure includes means arranged to hold said mold at said pouring station whereby filling of an empty mold may begin shortly after such is positioned at said

pouring station.

In accordance with the invention there are significant time savings as compared with earlier arrangements wherein the mold holding mechanism is mounted to the set down crane
5 since with the inventive arrangement filling of the mold may commence before the set down crane is returned to the pouring station.

In a preferred embodiment the bridge member further includes a mold stopper closing mechanism and a riser height
10 control, and a mold filled with molten metal is moved from the pouring station by the set down crane after the mold hold down assembly, the mold stopper closing mechanism and the riser height control are lifted from the mold. The filled mold is moved from the pouring station by the set down crane while an
15 empty mold is moved to the pouring station by the mold pick up crane. However, since the mold hold down assembly, the mold stopper closing mechanism and the riser height control are not attached to the set down crane, but rather are attached to, for example, secondary girders of the bridge
20 structure, shortly after the empty mold is placed at the pouring station, the mold hold down assembly, the mold stopper and the riser height control can be lowered onto the mold. The pouring operation can therefore begin before the set down crane is returned to the pouring station.

25 In a preferred embodiment the time savings per casting is about 8 seconds, which, in a plant normally producing 1,000 castings in a 24 hour period, can increase production to about 1,100 castings in a 24 hour period, a 10% increase.

Viewed from a second aspect the invention provides a

method of producing cast metal articles comprising moving a mold transfer apparatus between first and second positions thereof whereby to move a mold filled with molten metal from a pouring station to a set down station and simultaneously to move an empty mold from a pick up station to said pouring station, and thereafter returning said apparatus to the first position thereof for subsequent like transfer operations, wherein each empty mold is held at said pouring station and filling thereof with molten metal is commenced before said transfer apparatus is returned to its first position.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view in partial cross section of a mold handling system, and Figure 2 is a side view along line 2-2 of Figure 1 of the mold handling system.

A pouring station and mold handling system are shown in Figures 1 and 2 of the drawings. The mold 10 is centrally located at the pouring station, being set atop pouring tank 12 and joined to pouring tank 12 by refractory pouring tube 14. Mold 10 is comprised of top or cope section 16 and bottom or drag section 18. Usually such molds are of a permanent composition, utilizing compressed graphite as the refractory material.

Set down crane 19 comprises a front depending leg 20 and a rear depending leg (not shown), and pick up crane 25 comprises front depending leg 22 and rear depending leg 62. All said depending legs are supported by top frame assembly

24. Lower section 21 of set down crane front depending leg
20 and a similar lower section of the rear depending leg
(not shown), and lower section 23 of pick up crane front
depending leg 22 and lower section 64 of rear depending leg
5 62 are moveable sections supported by compressed air cylinders
50 and 51 within each crane. The pairs of lower section 21
and the lower section of crane 19 not shown and lower sections
23 and 64 of crane 25 cooperate to contact and lift a mold
assembly 10. Top frame assembly 24 is a beam arrangement
10 which is adapted to move laterally across intermediate
support girders 26. Girders 26 can move longitudinally
across main support rails 28 and 30.

Hanging from intermediate support girders 26 are mold
hold down cylinders 32 and 34, usually compressed air type
15 piston cylinders, mold stopper 36, usually also a compressed
air type cylinder with a refractory stopper, and riser
height control mechanism 38. The refractory stopper is
usually mounted in the mold and not connected to the cylinder.
Riser height control mechanism 38 can be of various types,
20 but usually extend into the mold riser and, upon the detection
of molten metal rising to a preset height, will generate a
signal to end the pouring of the molten metal.

Upon the movement of frame assembly 24 to the right in
Figure 1, set down crane 20 will be aligned with mold 10
25 at the pouring station. Filled mold 10 will be picked up by
set down crane 20. At the same time, pick up crane 22 will
be at a mold pick up station 40, where it will pick up an
empty mold. As top frame assembly 24 moves left, the filled

5 mold will be set down at the mold set down station 42. At
the same time, pick up crane 22 will be setting the empty
mold down at the pouring station. Hold down cylinders 32,
34, and riser height control 38 will be lowered to the empty
mold, and pouring of molten metal can begin. Mold stopper
36 is lowered after the mold has been filled. Meanwhile,
top frame assembly 24 is moving to the right to prepare for
the pick up of the filled mold at the pouring station by set
down crane 20 and of an empty mold at pick up station 40 by
10 pick up crane 22.

15. Two secondary hold down cylinders 52 and 53 are attached
to set down crane front leg 20 and the rear leg (not shown).
These cylinders are usually compressed air type piston
cylinders. They are used to hold the full mold closed when
being transferred from the pouring station 12 to the set
down position 42.

CLAIMS:

1. A pouring assembly for use in the manufacture of cast metal articles, said assembly comprising a mold transfer apparatus including a top frame movable along a bridge structure and two sets of depending legs, and a pouring tank located
5 at a pouring station under the bridge structure, said pouring tank being capable of being pressurized to permit the upward pouring of molten metal therefrom into a mold positioned there-
above, one set of depending legs of said mold transfer apparatus being adapted to move an empty mold from a pick
10 up location to said pouring station, and the second set of depending legs of said mold transfer apparatus being adapted simultaneously to move a filled mold from said pouring station to a set down location, wherein said bridge structure includes means arranged to hold said mold at said pouring station
15 whereby filling of an empty mold may begin shortly after such is positioned at said pouring station.

2. A pouring assembly as claimed in claim 1 wherein said top frame of said mold transfer apparatus is mounted on said bridge structure so as to be movable along said bridge
20 structure.

3. A pouring assembly as claimed in claim 1 or 2 wherein said bridge structure further includes a mold stopper closing mechanism.

4. A pouring assembly as claimed in claim 3 wherein
25 said mold stopper is mounted on an air cylinder arranged to extend downwardly from the bridge structure to contact said mold.

5. A pouring assembly as claimed in any preceding claim wherein said bridge structure further includes a riser molten metal height control mechanism.

6. A pouring assembly as claimed in any preceding claim wherein each said set of depending legs includes a lifting cylinder that enables each set of legs to lift a mold.

7. A pouring assembly claimed in any preceding claim wherein said means to hold said mold at said pouring station includes two air cylinders arranged to extend downwardly from said bridge structure to contact said mold.

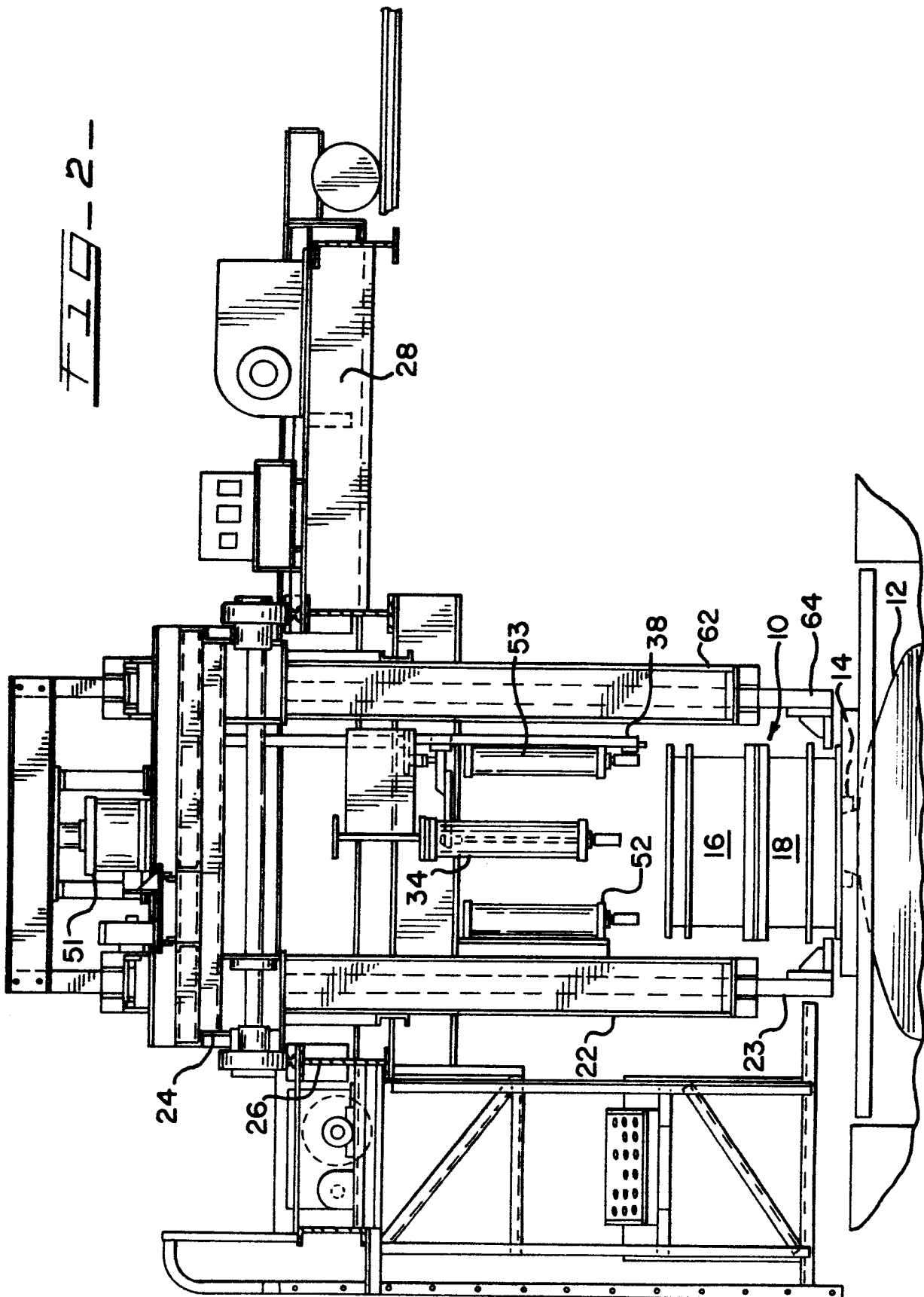
8. A pouring assembly as claimed in any preceding claim wherein said depending legs adapted to move a full mold to the set down location have secondary hold down air cylinders adapted to hold a full mold closed during transfer.

9. A method of producing cast metal articles comprising moving a mold transfer apparatus between first and second positions thereof whereby to move a mold filled with molten metal from a pouring station to a set down station and simultaneously to move an empty mold from a pick up station to said pouring station, and thereafter returning said apparatus to the first position thereof for subsequent like transfer operations, wherein each empty mold is held at said pouring station and filling thereof with molten metal is commenced before said transfer apparatus is returned to its first position.

10. A method as claimed in claim 9 wherein said transfer apparatus comprises a moving frame assembly.

11. A method as claimed in claim 9 or 10 wherein the molten metal is pressure injected into the bottom of the mold.

12. A method as claimed in any of claims 9 to 11 wherein the filling operation further comprises placing a riser height control mechanism in the empty mold and closing a mold stopper.

Fig. 2



European Patent
Office

EUROPEAN SEARCH REPORT

0177644
Application number

EP 84 30 6153

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-4 103 734 (MIKOTIN) * Column 2, line 66 - column 3, line 49 *	1,9-11	B 22 D 18/04
A	GB-A-1 180 370 (HEATLOCK LTD.) * Page 1, lines 23-43; page 2, lines 26-57 *	9-11	
A	DE-A-1 949 520 (PLUM LTD.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 22 D 18/04 B 22 D 18/00 B 22 D 33/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24-05-1985	Examiner SCHIMBERG J.F.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			