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METHOD OF CLEANING A SHELL MOLDED CASTING

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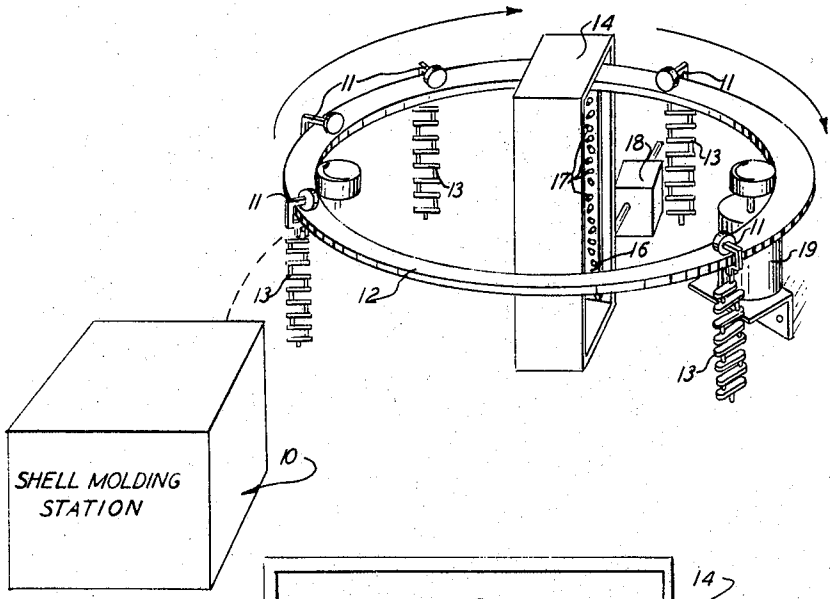


FIG. 1

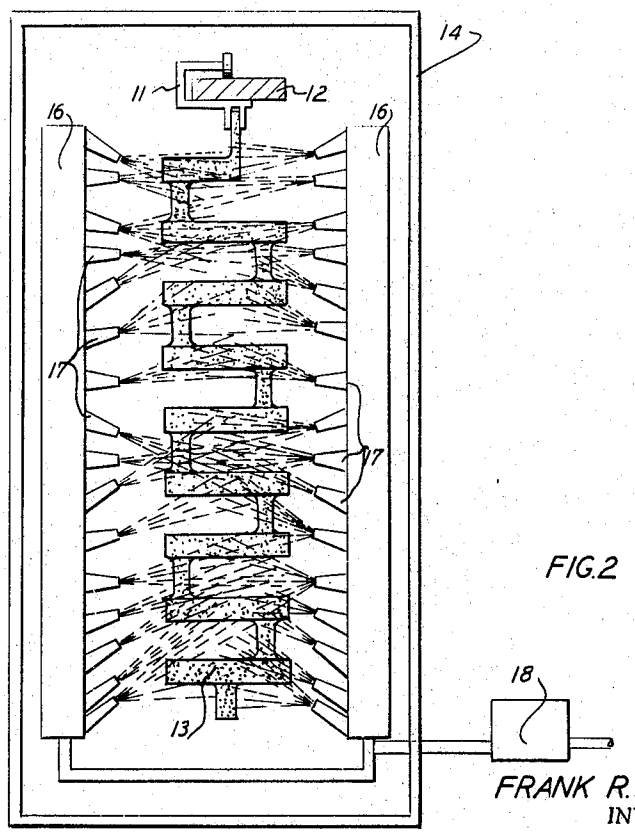


FIG. 2

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METHOD OF CLEANING A SHELL MOLDED CASTING

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ABSTRACT OF THE DISCLOSURE

A method of cleaning a shell molded casting to remove foreign material remaining thereon from the shell molding operation has the following steps. The casting is removed from the shell mold while the casting is at a temperature in the range of 1400° F. to 1500° F. The casting is suspended from a support and transported on the support to a cleaning station whereat a plurality of air streams concurrently intercept various portions of the suspended casting so that substantially all of the surface area thereof is engaged by the air. The speed of transportation of the casting is controlled so that the casting is at a temperature in the range of 600° F. to 800° F. when it passes the plurality of air streams.

BACKGROUND OF THE INVENTION

This invention relates to a method of cleaning a casting after the casting has been formed in a shell molding operation and, more particularly, to such a method wherein the casting is carried past a plurality of air streams which engage the same when the casting is at a temperature in the range of 600° F. to 800° F. whereby any foreign material remaining on the casting is removed therefrom.

In prior cleaning processes for a casting formed in a shell molding operation, the casting was generally removed from the shell mold and suspended from a suitable support on a conveyor for transportation along a predetermined path during which time the casting would cool from a temperature initially in the range of 1400° F. to 1500° F. to room temperature. In the prior processes, during transportation of the casting along the predetermined path, any sand and resin mixture utilized in forming the shell mold which remained on the surfaces of the casting was removed by directing a stream of abrasive particles at all areas of the shell molded casting. The small abrasive particles utilized with this general method were usually metal and these metal particles are, of course, expensive when used on a high volume basis.

SUMMARY OF THE INVENTION

It has been found that a casting formed in a shell molding operation may be cleaned of any retained sand and resin mixture by the method of this invention at a substantially reduced cost when compared with prior methods of cleaning shell molded castings. The reduction in cost is occasioned by the fact that the method of this invention does not employ a step wherein small abrasive particles are directed at the surface of a shell molded casting to remove the foreign material of sand and resin therefrom. The method of this invention has been predicated on the discovery that if a plurality of small air streams are impinged upon the casting, when the casting is at a temperature in the range of 600° F. to 800° F., any sand and resin mixture adhering to the surface of the casting will be removed therefrom.

The method of this invention for removing foreign material from a shell molded casting consists of the following steps. The casting is removed from the shell mold while the casting is at a temperature in the range of 1400° F. to 1500° F. and suspended from a support which is transported along a predetermined path. A plurality of air streams at a single location along the path are directed at the casting in such a manner that the air streams engage substantially all of the surface areas of a casting as it is transported along the path past the location of the streams. The speed of transportation of the casting is controlled such that the casting passes the location of air streams when the casting is at a temperature in the range of 600° F. to 800° F. Air engaging the casting while the casting is at a temperature in this prescribed temperature range results in a thorough cleaning of the surface of the shell molded casting and removal therefrom of all the sand and resin mixture adhering thereto as a result of the shell molding operation. In greater detail, the method of this invention employs air at a pressure of 15 to 40 p.s.i.g. with air streams positioned on both sides of the predetermined path and spaced 3 to 6 inches from the casting conveyed along the path.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic drawing which shows a general arrangement of equipment utilized to perform the method of this invention. FIGURE 2 is a schematic drawing which shows the equipment employed in the air cleaning step of the method of this invention as specifically applied in the cleaning of a shell molded crank shaft.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the method of this invention will be disclosed in conjunction with the manufacture of shell molded crank shafts. However, it should be realized that the method of this invention is applicable to the cleaning of any casting produced in a shell molding operation.

In the manufacture of shell molded crank shafts, as schematically outlined in FIGURE 1, a shell molding operation, generally designated by the numeral **10**, is carried out wherein sand and a resin, in proportion such as set forth in U.S. Patent 2,955,336, are mixed and compacted to form the various mold portions of a shell mold. The mold portions, assembled so that the cavity thereof defines a crank shaft, are inserted into a flask with a ferrostatic pressure resisting mass of refractory granular material placed between the interior walls of the flask and the exterior surfaces of the shell mold thereby to support the mold in the flask. A metal selected from the group of metals consisting of malleable iron, nodular iron and grey iron is poured into a gate of the shell mold to form a crank shaft and the mold is carried along in its flask until the metal has cooled to a temperature in the range of 1400° F. to 1500° F.

When the metal in the mold has cooled to 1400° F. to 1500° F., the metal is solidified and the flask containing the shell mold is overturned so that the shell mold and the granular material placed therearound are dropped onto a grate with a force sufficient to cause a rupture of

the shell mold. The crank shaft casting formed in the mold is thus at least partially exposed and an operator picks the casting up with a pair of tongs and suspends it from one of a plurality of supports **11** on an endless conveyor **12**. At this time, the crank shaft will generally have some of the sand and resin mixture, which forms the shell mold, adhering to various portions of the surface area thereof. Each crank shaft **13** assumes a substantially vertical position as it is transported along a predetermined path by the endless conveyor **12**.

As the crank shaft **13** is transported along the predetermined path, it passes through a booth **14** wherein a pair of opposed air manifolds **16** are located. The manifolds **16** are shown in detail in FIGURE 2. Each manifold **16** has a plurality of nozzles **17** extending therefrom, which nozzles are long, bendable tubes formed preferably of a metal such as copper. The manifolds **16** are connected to an air supply **18** which provides air to the nozzles at a pressure in the range of 15 to 40 p.s.i.g.

There are sixteen nozzles **17** on each side of the crank shaft **13** and the nozzles are positioned in such a manner that as the crank shaft **13** is transported along the predetermined path, the air streams issuing from the nozzles will intercept various portions of the surface area thereof to cover substantially the entire surface area of the crank shaft to which the sand and resin mixture normally adhere. The air engaging the various surface areas of the crank shaft is effective to remove therefrom any of the foreign material remaining on the surfaces of the crank shaft as a result of the shell molding operation without disturbing the normal, rust resistant oxide coating of the shell molded casting.

In accordance with the teaching of this invention, the speed of transportation of the casting on the conveyor **12** is controlled by control of a drive motor **19** which drives a conveyor drive sprocket **20** in such a manner that the crank shaft passes between the manifolds **16** when the crank shaft is at a temperature in the range of 600° F. to 800° F. It has been found that if the casting is transported past the nozzles **17** while having a temperature substantially above ambient temperature, and preferably in this particular range, the surface of the casting is easily cleaned of any sand and resin mixture which may have adhered thereto as a result of the shell molding operation without disturbing the rust resistant oxide coating of the casting. While no exact explanation of the theory of operation of this method is attempted, it is believed that when the casting is at a temperature in the range of 600° F. to 800° F., the resin is easily oxidized by the air impinged upon the surface of the casting, and once the resin is oxidized and burned away, it is a simple matter to carry away, in the air stream, any of the sand remaining as a contaminant on the surface of the casting.

There has been disclosed herein a method of cleaning a shell molded casting which is simple and efficient in operation and extremely economical to utilize. The method of this invention eliminates the necessity of employing any small, abrasive particles in cleaning shell molded particles which under high volume conditions proves to be extremely expensive.

It will be obvious to one skilled in the art that the method of this invention will have many modifications thereof which fall within the true spirit and scope of the invention. It is intended that all such modifications, which are directly within the spirit and teachings of this invention, be construed as being within the scope of the appended claims.

What is claimed is:

1. The method of cleaning a casting produced from a metal selected from the group of metals consisting of malleable iron, nodular iron and grey iron after the casting has been formed in a shell molding operation including the steps of removing the casting from the shell mold while the casting is at a temperature in the range of 1400° F. to 1500° F.; suspending the casting from a support; and transporting the casting to a cleaning station; the improvement which comprises the steps of:

directing an air stream at the casting when in the cleaning station in a manner such that the stream intercepts substantially all of the surface area of the casting; and

controlling the speed of transportation of the casting to the cleaning station such that the casting is at a temperature in the range of 600° F. to 800° F. when said air stream engages the same;

whereby air engaging the casting will remove therefrom any of the foreign materials remaining on the casting as a result of the shell molding operation without disturbing the normal, rust resistant oxide coating of the casting.

2. The method of cleaning a casting produced from a metal selected from the group of metals consisting of malleable iron, nodular iron and grey iron after the casting has been formed in a shell molding operation including the steps of removing the casting from the shell mold while the casting is at a temperature in the range of 1400° F. to 1500° F.; suspending the casting from a support; and transporting the casting on said support along a predetermined path; the improvement which comprises the steps of:

directing a plurality of air streams at a single location along said predetermined path in a manner such that the streams concurrently intercept various portions of the suspended casting so that substantially all of the surface area of the casting is engaged by the air; and

controlling the speed of transportation of the casting such that the casting is at a temperature in the range of 600° F. to 800° F. when it passes the location whereat said plurality of air streams engage the same;

whereby air engaging the casting will remove therefrom any of the foreign materials remaining on the casting as a result of the shell molding operation without disturbing the normal, rust resistant oxide coating of the casting.

3. The method of cleaning a shell molded casting as defined in claim **2** wherein said plurality of air streams have a pressure in the range of 15 to 40 p.s.i.g.

4. The method of cleaning a shell molded casting as defined in claim **3** wherein a portion of the plurality of air streams are positioned on respective sides of said predetermined path.

5. The method of cleaning a shell molded casting as defined in claim **4** wherein said plurality of air streams positioned on respective sides of said predetermined path are spaced from the casting transported along said path at a distance of 3 to 6 inches.

6. A method of cleaning a shell molded crank shaft including the steps of removing the crank shaft from the shell mold while the crank shaft is at a temperature in the range of 1400° F. to 1500° F.; suspending the crank shaft from a support; and transporting the crank shaft on said support along a predetermined path; the improvement which comprises the steps of:

directing a plurality of air streams in such a manner that the streams concurrently intercept various portions of the suspended crank shaft so that substantially all of the surface area of the crank shaft is engaged by the air, said streams being positioned on respective sides of said predetermined path and spaced from the crank shaft conveyed along said path at a distance of 3 to 6 inches, and said air being at a pressure of 15 to 40 p.s.i.g.; and

controlling the speed of transportation of the crank shaft such that the crank shaft is at a temperature in the range of 600° F. to 800° F. when it passes said plurality of air streams;

whereby air engaging said crank shaft will remove therefrom any of the foreign materials remaining on said crank shaft as a result of the shell molding op-

eration without disturbing the normal, rust resistant oxide coating of the casting.

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