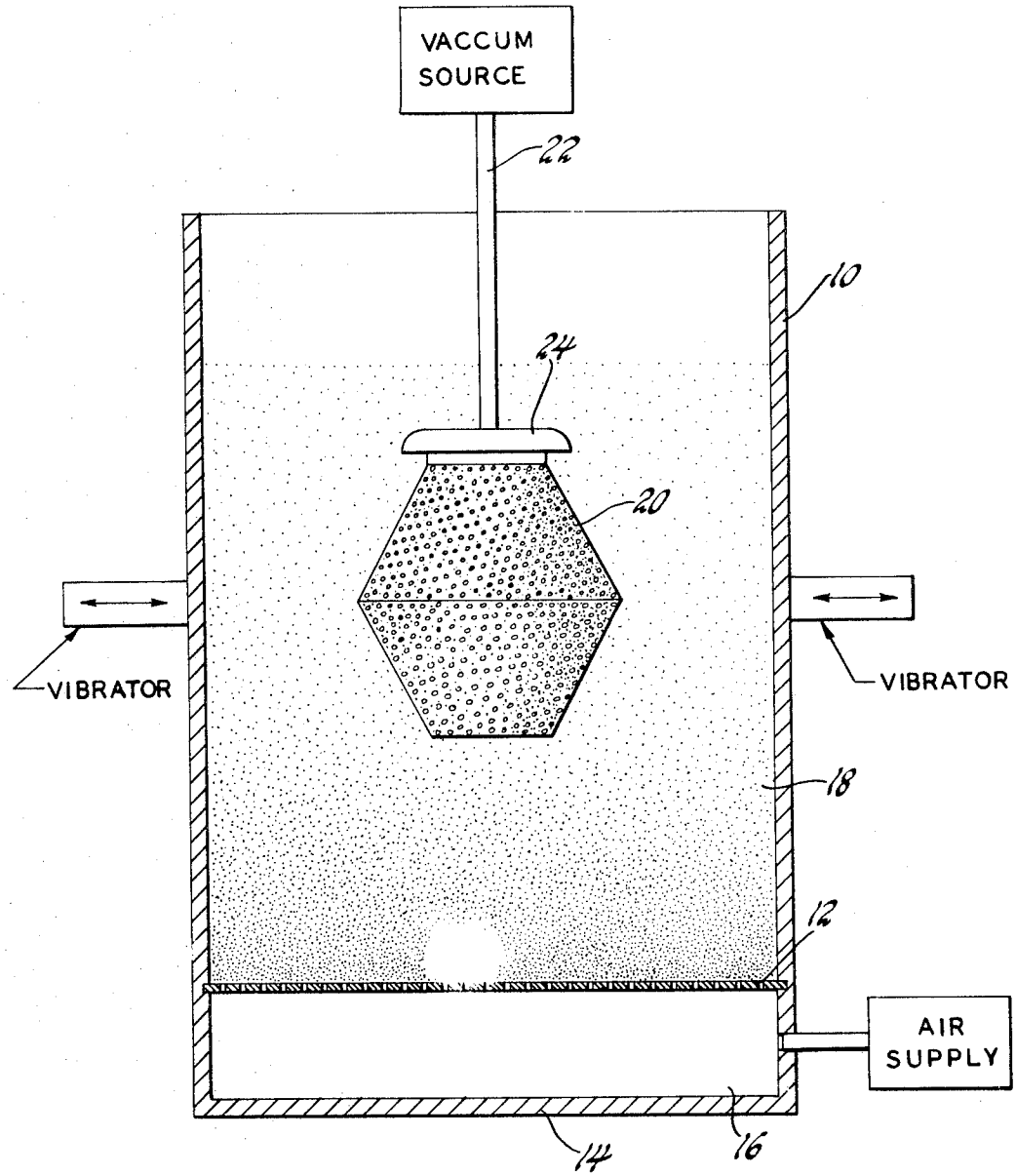
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METHOD OF COATING A PERMEABLE SAND CORE BODY

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METHOD OF COATING A PERMEABLE SAND CORE BODY

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ABSTRACT OF THE DISCLOSURE

A method is disclosed of applying core wash particles in the dry state to a permeable sand core. In a preferred embodiment, a fluidized bed of the particulate core wash is first prepared, a core is immersed and suspended in the fluidized bed and the core wash particles are drawn into the pores of the core body by means of a vacuum source connected to a portion of the surface of the core.

This invention relates to a method of applying a thin coating or wash in the preparation of a foundry core. More specificaly our invention relates to a method of directly applying a dry wash to a sand core.

It is common foundry practice in the preparation of a sand core to apply a wash material such as finely divided graphite, silica flour, or suitable inorganic refractory material to the core body. This core body coating advantageously reduces defects in the ultimate casting by preventing the sand from being burned onto the casting or molten metal from penetrating the mold, and also by reducing adherence to the mold of splashed molten metal which frequently oxidizes before the level of the molten cast metal reaches the splashing. In the past, suitable core body washes have been obtained by forming a suspension of the wash material in such wet fluids as water and bentonite, water and cereal, core oil, or just plain water or alcohol, and then pplying the suspension to the body by dipping, pinting, or sprying. While such application satisfactorily incorporates the wash material into the surface of the mold, a subsequent time-consuming drying step is necessary. Moreover, if the mold or core is not sufficiently dry, gas pores are formed in the casting.

Therefore, it is an important object of this invention to provide a method of applying a wash in dry form to a sand core, so as to avoid a drying step in the preparation of the core and to eliminate a possible cause of porous castings.

This and other objects are accomplished in accordance with our invention by first suspending particles of a suitable wash material in a stream of air or other dry or other dry gas which is inert with respect to the wash material and to the core body to be coated. Such a suspension of solid particles in a fluid is commonly known as a fluidized bed. Next, a permeable sand core is connected to a vacuum source and immersed and supported in the fluidized bed. By such immersion all the surfaces of the permeable sand core which are to be coated are brought into close relationship with the suspended wash particles. Then, by means of the vacuum source applied at one portion of the surface of the core, the air in the bed is caused to flow through the permeable body. Concomitantly, the wash particles are drawn into the pores between the grains of sand and impregnated therein providing a suitable surface layer coating. The coating is accomplished in a relatively short time, usually in the order order of ten seconds. Finally the body is removed from the bed and the vacuum source disconnected permitting any loose core wash particles to fall back into the fluidized bed. The coated core body is then ready for casting, no drying operation being required.

Other objects of our ivention will become apparent in view of the following detailed description, reference being made to the attached drawing which is a schematic representation of apparatus suitable for the performance of our invention.

A number of useful core wash compositions are known in the art and any of such compositions may be used in connection with our process. Our invention provides a means of applying wash particles, however, and is not limited to a specific composition. Core wash materials which are well known in the prior art include finely divided graphite, silica flour, various inorganic salts, and other refractory materials. For example, silica flour is used to close the pores between the larger grain sand particles comprising the core. Graphite is used both to close the pores and to provide a reducing environment during casting. Various ammonium phosphates and sulfates are employed to minimize the evolution of smoke during the casting operation. The particle size of all wash materials used with sand cores are typically 200 mesh or finer so that they will suitable impregnate the pores of the core. However, it is to be noted that this particle size limitation is not due to our process, but to the normal grain size of core sand.

Core wash particles are suspended in an upwardly directed stream of air or other suitable dry gas which is inert with respect to the wash material and the core sand. Air is prefered because of its availability and low cost. However, other dry gases such as nitrogen, argon or the like could be used. The rate of flow of the suspending fluid is a function of the size of the bed and the diameter of the particles. The rate may readily be determined in any coating aplication by techniques well known in the art. In accordance with our invention the fluidized bed is employed as a means of placing the wash particles in a spaced relationship wherein a small mold or a core may be located such that all of its surfaces which are to be coated are in juxtaposition with mobile wash particles. Once the mobile particles are placed in close proximity to the permeable sand core it then becomes necessary only to direct the particles into the pores of the core body.

This is accomplished by drawing the air or other inert suspending fluid through the porous body. Simultaneously the wash particles are carried into the pores between the sand particles. Of course, the wash particles will only penetrate the permeable core body to a depth of a fraction of an inch but this is suitable for foundry purposes. The suspending fluid and suspended particles are caused to flow into the core body by impressing a vacuum source against one part of the surface of the body. The reduced pressure in one section of the porous body results in the flow of the fluid and particles into the body. This vacuum source may be provided by means of a venturi tube, a steam jet ejector, a mechanical pump such as a Nash pump, or any other of a number of well known means of providing a reduced pressure. Of course the vacuum need not be as great as in other low pressure processes such as high vacuum distillation or the like, but it is apparent that the greater the pressure differential across the mold body the more rapidly the wash may be applied.

The core body which may be coated in accordance with our invention is made of sand, which structure is permeable and requires a wash or coating prior to casting. Our process is preferably applied to cores and to those small molds which may readily be immersed into a fluidized bed and have a relatively thin cross section so that the suspending fluid may be drawn through it. Foundry cores are typically made of bank or lake sand which is bonded with either a resin, such as furfural-urea; an oil, such as linseed oil or cod liver oil; or with sodium silicate.

The sand which is used preferably has an AFS number of 55–60, which means that 75% of the sand has a grain size of 55–60 mesh.

A specific example will further illustrate our invention. The drawing schematically shows apparatus suitable for the performance of our process in the relationship existing when a core is actually being coated. The suspended wash particles comprised of 200 mesh silica flour, (represented by dots) are shown contained in a cylindrical vessel **10** open at the top and having a porous plate **12** parallel to the bottom **14** thereof. When the fluidized bed is actually established in the container **10** compressed air from the air supply flows through the plenum **16** between the bottom **14** and plate **12** and up through the porous plate **12** into the fluidized bed chamber **18**. To establish the fluidized bed core wash material (silica flour in this example) is simply poured into the container on the porous plate **12**. Compressed air is then released up through the porous plate and silica particles which tends to suspend the particles and lift them out of the container. The flow rate of the compressed air is adjusted so that the suspended particles reach a level within a few inches of the top of the vessel. Vibrators attached to the side of the cylindrical vessel **10** may be used to reduce channeling by evening the flow of the air through the wash particles when the fluidized bed is being established. In the drawing a permeable core body **20** of AFS 55–60 lake sand, linseed oil bonded, is indicated. Prior to being immersed in the bed, it is connected to a vacuum source by means of a flexible hose **22** and the vacuum head **24**. The vacuum head **24** is impressed against a surface of the core **20** which is not to be coated. If the vacuum is sufficiently strong, the core **20** may be supported in the bed from the hose **22**. Otherwise other suitable support means such as hooks or wires must be provided. The effect of the vacuum source is to reduce the pressure in the upper side of the core body **20** which in turn causes air to flow into the pores toward the vacuum head **24**. The flow of air forces the suspended wash particles to flow into the pores being impregnated therein and providing a suitably coated surface. After a suitable immersion period, the core may be lifted from the fluidized bed, disconnected from the vacuum source, and the loose unimpregnated wash particles allowed to drop back into the fluidized bed. The required immersion period may be determined for each application by coating a number of cores for varying periods of time. Subsequently actual castings are made using the cores. The suitable immersion time is that required to obtain an acceptable casting. Usually an immersion period of about ten seconds is sufficient.

While our invention has been described in terms of a specific embodiment, it is to be understood that other embodiments could readily be adapted by one skilled in the art and therefore the scope of our invention is to be considered limited only by the scope of the following claims.

We claim:

1. A method of coating a permeable sand core body, having pores between the sand particles with a dry particulate coating material having a size sufficient to impregnate and close said pores, said method comprising the steps of immersing and supporting said core body in a fluidized bed of said particulate coating material, drawing said coating particles into the outer pores of said permeable core by means of a pressure differential between said fluidized bed and said core body and thus impregnating the surface layers of said core with said particles, removing said core from said fluidized bed and permitting any loose coating particles to fall back into said fluidized bed.

2. A method of coating a permeable sand core, having pores between the sand particles with a dry particulate core wash having a size sufficient to impregnate and close said pores, said method comprising the steps of preparing a fluidized bed of the particulate core wash material by suspending said particles in an upwardly directed stream of dry gas which is inert with respect to said wash and said core, immersing and supporting said core in said fluidized bed, drawing said gas in said bed through said permeable core by means of a vacuum source connected to a portion of the surface of said core and thus simultaneously impregnating the permeable surface layers of said core with said wash particles, and removing said core from said fluidized bed while ceasing to draw said gas therethrough thus permitting any loose wash particles to fall back into said fluidized bed.

3. A method as in claim **2** wherein said upwardly directed stream of dry gas is air.

4. A method as in claim **2** wherein said core wash material is finely divided graphite.

5. A method as in claim **2** wherein said core wash material is silica flour.

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