ABSTRACT

In the manufacture of a casting having a cavity, wherein a water-soluble salt core is suspended in a mold, molten material is poured into said mold about said core, the molten material is allowed to harden to the desired casting, and the core is washed away with water to leave a hollow casting, the improvement which comprises employing as said core one comprising a water-soluble salt, about 5 to 20 percent by weight of water-glass and about 2 to 15 percent by weight of a synthetic resin as binder. The invention also extends to the core and the process by which it is produced.

8 Claims, No Drawings
SALT CORE CONTAINING SYNTHETIC RESIN AND WATER-GLASS AS BINDERS

This invention relates to a water-soluble salt core for use in foundries.

Cavities in castings are generally formed with the aid of sand cores. With cores which are difficult to prepare and use, the application of that method is limited because the complete removal of residues of the sand core after the casting operation is not always ensured. In view of these difficulties it is better to embed hollow cores of steel or copper in the casting and subsequently to remove the same by etching with nitric acid. That process too has serious disadvantages, which oppose its commercial application in foundries.

For this reason it has been proposed in the Swiss Pat. specification No. 246,046 to use cast cores of potassium carbonate in the manufacture of aluminum castings. Such cores have not been successful in foundries because they are hygroscopic.

These disadvantages have been eliminated to a large extent by the use of cast cores of sodium silicate (French Pat. specification No. 813,689). The latter cores have the disadvantage, however, that the silicates have relatively high melting points and a relatively low solubility so that the castings must be rinsed with water for a long time to remove the core. The cores are too brittle to be used in ingot molds because the contact with the hot melt results in a premature formation of incipient cracks in the core. Molten material can enter these incipient cracks so that the casting has an irregular surface.

To eliminate this disadvantage, it is taught in the U.S. Pat. specification No. 3,356,156 to use cores of water-soluble salts, such as sodium chloride or potassium chloride, which are pressed and subsequently sintered at temperatures between 500° and 750°C. When the casting has been cooled, the salt cores embedded therein are completely removed from the casting with water. That process has been fully satisfactory with castings having simple contours. With complicated contours, e.g., with abrupt changes in cross-section, the changes in temperature and the mechanical stresses result in higher stresses in such salt cores which may cause a destruction of the salt cores at the critical points.

For this reason it has been proposed in the Published German application No. 1,483,641 to improve the thermal and mechanical properties of pressed and sintered salt cores by adding up to 10 percent of borax, magnesia or talcum, individually or in admixture, to the salt in order to promote the sintering process so that the compressive and bending strengths are much improved.

It is an object of the invention to provide an inexpensive core which can be produced without compression and sintering which nonetheless is of adequate compressive and bending strength.

This and other objects and advantages are realized in accordance with the present invention wherein there is provided a salt core composition comprising a water-soluble salt, about 5 to 20 percent by weight of water-glass and about 2 to 15 percent by weight of a synthetic resin as binder.

The water-soluble salt, which may range from about 65 to 93 percent and preferably from about 76 to 87 percent by weight of the composition, preferably comprises an alkali or alkaline earth metal chloride, sulfate or borate. The water-glass is preferably present in about 8 to 12 percent by weight. The synthetic resin binder advantageously comprises a condensation product based on furane or phenol and preferably is present in about 5 to 12 percent by weight.

To make the salt core, it is sufficient to ram the salt core composition according to the invention into a suitable core die and, in accordance with another feature of the invention, to cure the composition at a temperature of about 100° to 150°C. Cores so made may be subjected to the machining operations required for the mounting of such cores, such as thread cutting, milling or turning, without destruction of or damage to the cores.

To avoid evolution of gases when the salt cores made from the core composition according to the invention are embedded in molten material, the salt core may be heated to a temperature of about 450° to 650°C and preferably about 500° to 600°C for a short time, e.g., for about 5 to 30 minutes and preferably for about 10 to 20 minutes, before it is thus embedded. By these high temperatures carbonization of the synthetic resin binder occurs without undue reduction in the compressive and bending strengths of the salt cores. When the casting has solidified, the salt core can be removed from the cavity by rinsing without difficulty and without need for special measures.

In a preferred embodiment of the invention the salt core is coated with a layer of water-glass in a thickness of up to 0.1 millimeter to ensure the formation of a smooth surface on the casting and to increase the compressive and bending strengths of the salt core. This is done before heating to 450° to 650°C.

The invention will now be explained more fully with reference to the following illustrative embodiment:

EXAMPLE

A core composition consisting, by weight, of 80 percent NaCl, 11 percent water-glass and 9 percent synthetic resin is rammed into an annular core mold of wood and then cured in a drying oven at a temperature of 120°C for 2 hours. The annular salt cores are then provided with tapped bores and milled planar surfaces. The salt core is heated at 550°C for 15 minutes in an electrically heated air-circulating furnace embedded in an eutectic aluminum-silicon alloy melt. When the casting has been cooled, the salt core is dissolved out of the cavity, without leaving any residue, by passing cold water therethrough for 2 minutes.

It will be appreciated that the instant specification and examples are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention.

We claim:

1. A core for use in making foundry castings having cavities, comprising a water-soluble salt, about 5 to 20 percent by weight of water-glass and about 2 to 15 percent by weight of a synthetic resin as binder.

2. A core according to claim 1 wherein said water-soluble salt is present in about 76 to 87 percent by weight and comprises one or more alkali or alkaline earth metal chlorides, sulfates or borates.

3. A core according to claim 2 wherein said water-glass is present in about 8 to 12 percent by weight and
said synthetic resin is present in about 5 to 12 percent by weight.

4. A core according to claim 1 wherein said synthetic resin comprises a condensation product based on furane or phenol.

5. A process for manufacturing a core for use in making foundry castings having cavities, comprising forming a mixture of a water-soluble salt, about 5 to 20 percent by weight of water-glass and about 2 to 15 percent by weight of a synthetic resin as binder, forming said mixture into a pre-determined shape, and hardening said shaped composition.

6. A process according to claim 5, wherein hardening is effected by heating at about 100° to 150°C.

7. A process according to claim 6, including the further step of thereafter heating said core at about 450° to 650°C whereby any gases contained therein are evolved.

8. A process according to claim 6, including the further step of thereafter heating said core at about 500° to 600°C for about 5 to 30 minutes whereby any gases contained therein are evolved.

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