

# UNITED STATES PATENT OFFICE

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PROCESS OF AND PRODUCT FOR ATTACHING PORTIONS OF MOLDS OR CORES

No Drawing.

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My invention relates to a new and useful process of, and product for, attaching portions to molds or cores for the production of castings of molten steel, iron, brass, aluminum and the like high melting point metals where the molds or cores are formed of sand or other refractory particles molded to the form to produce the desired shape of the casting.

Heretofore in this art, cores have been formed in the portions, for instance, in halves, as the most convenient and economical means for their production, and such halves have been secured together by a paste which has heretofore been formed either of flour and water or molasses diluted with some water. Likewise, portions have been attached to molds with or without the employment of a wire or other anchor and with such paste to both seal the joint as well as aid in such attachment. The water content of such paste, as well as the water content of such paste that has been imparted to the mold or core to which the same has been applied, is not removable therefrom except by the application thereto of a substantial heat for a protracted period which results in the formation of an indurated or baked mold or core which will not ordinarily yield readily to the shrinkage of the casting, and which has resulted in many cracked or shrinkage-severed castings, and which also tends to produce a mold or core of such lessened permeability that the gases formed by the heat action or reaction of the metal casting therein with the mold or core constituents are not readily escapable through the material comprising such mold or core and which occasions substantial casting loss, due to what is commonly known as blows, that is, the pressure of the gas commingling with the fluid metal results in a casting which is defective due to its containing substantial voids.

Consequently, it has heretofore been the practice to employ molds or cores which, through the application of said paste or otherwise, have a substantial water content at the time when the cast metal is cast against the surfaces of such molds and cores. The head of the liquid metal vaporizes such water

content relatively slowly and fills the cavity of the mold with water vapor which oxidizes the surface of the metal being cast therein, and which water vapor tends to prevent the charring of the organic substances on the mold and core surfaces, thus causing contact of said oxidized surfaces of the cast metal with the uncoated or uninsulated particles of the mold or core, and which results in the fusion, embedding into, or adherence of said particles to the surfaces of the casting. This action also leaves a substantial oxygen content, residual from the air, in the casting cavity of the molds which is being filled with the hot liquid metal, and which oxygen also promotes oxidation of the metal surfaces and the removal of the char from the mold or core surfaces, thus contributing to such fusing of, and adherence to the casting surfaces.

This results in the outer surface or surfaces of the castings being formed of an integral, fused, or commingled layer of metal and sand or other constituent of the mold or core, which produces a casting of poor appearance as well as one, whose surfaces, which are required to be machined, quickly remove the edge from the machine cutting tools unless a sufficient amount of surplus metal is cast upon such surfaces in order to enable the machining tools at their first cut to penetrate below the area of such fused or commingled surfaces.

My present invention is a continuation in part of my co-pending applications, Serial Nos. 332,225 and 332,226, and of my companion application executed on the same date herewith. In my said applications the materials therein stated are either added to and intimately mixed with the molding sand or are coated upon the exterior surfaces of the mold and/or core which come in contact with the casting. I have found that the molds and/or cores so made which have their several parts pasted together with the core paste of the prior art are liable to, and do, result in a number of bad castings due to such core paste of the prior art producing a substantial gaseous or other reaction, activated by the heat of the cast metal. This has required substantial investigation and research to ascer-



tain both the cause and the remedy for such casting failures and which contributed to the present invention which is the development in fact of an improved new and useful core paste.

In the production of my new and useful improved core paste, I employ any of the materials of rubber, rubber-like or plastic characteristics described in my aforesaid co-pending applications. Such material is mixed with a solvent or with water or other liquid, according to the well-known plasticizing characteristics of the material employed, to obtain the desired consistency of the paste. This consistency is determined by the size and weight of the parts of the core or mold to be therewith cemented together, since a relatively thin and/or weak adhesive is capable of satisfactorily joining light portions while a thicker and/or stronger adhesive mixture is required to satisfactorily cement together heavier portions.

This paste may then be applied to either or both of the surfaces to be cemented together and then such portions juxtaposed.

Where such paste is naturally adhesive in the condition in which it is so applied the parts are satisfactorily cemented together by the natural process arising between the time such surfaces are juxtaposed and the making of the casting. In cases where such paste ingredient or ingredients are not substantially adhesive in the state in which the paste is so applied, as well as where a stronger cementing of the joined parts is required an atmospheric or a higher temperature vulcanizing accelerant of any of the well-known kinds should be added to the degree well-known to produce the required result, and the cemented core and/or mold subjected, before being used in making castings, to the atmospheric or high temperature required to produce the desired vulcanization.

While the ingredients of my core paste are higher in price than the core pastes of the prior art, yet the superior advantages it attains render highly economic the use of my core paste.

The rubber or rubber-like content of my core paste is present therein incidentally for its known adhesive property and is employed primarily for the heat reaction property afforded to the molding sand and to the surface of the casting by the heat of such casting while cooling in the sand core or mold whose parts may be joined by my said paste. This heat reaction evidences the property unexpected of adhesives of maintaining sufficient adhesive strength to hold the core parts in their fixed positions until the casting formed by the core has cooled sufficiently to become non-fluid. Thereafter the adhesive property is destroyed by the constituents of my core paste being combusted by the protracted heat of the cooling casting. The

products of said combustion form a protective film between the surface of the casting and the surfaces of the mold and core, which film prevents the sand or other components of the mold or core from adhering to or becoming imbedded in the surface of the casting. Said products also permeate the mold or core and render the constituents readily separable from the casting and from each other and enables the core sand to be reusable for the making of other cores without regranulation or other similar labor.

With molds and/or cores made in accordance with either of my aforesaid co-pending applications by having their cemented portions joined together with core paste of the prior art, and where a usable casting results therefrom, the portions of such castings made in contact with the joint or joints formed by the core paste of the prior art, are substantially harder than the other portions of the casting and/or have embedded therein or adhering thereto a scale. Such portions of the casting at, and adjacent to, the exterior edges of the mold and/or core portions cemented together with the core paste of the prior art are substantially harder than the other portions of the casting due to the more rapid cooling of the metal at such points. This more rapid cooling changes the characteristic of the metal at such points and sets up stresses therein and between such hardened and the adjoining normal metal. This results in castings highly unsatisfactory for many normal and practically all exacting conditions. Where such surfaces are required to be machined the cutting tool or tools are forced to cut, for instance, continuously in alternating areas of normally soft metal as well as through intermediate areas of substantially harder or unduly hard metal, which with or without the said scale, are associated with said harder metal, creates undue strains upon the cutting tools and/or upon the machine which are desirable to avoid in efficient economical production. This is but one typical of the many substantial advantages attained by the use of my present invention.

Reference may be had to my aforesaid co-pending applications in any respects that may be desired for a fuller discussion and/or understanding of the ingredients of my said core paste and/or the action or reaction arising from their contact with the material to be cast in the mold and/or core cemented with my core paste.

The term "rubber-like substance" will be understood by those skilled in the art of metal casting and foundry practice as any substance or mixture which affords in or on the mold or core substantially the same action or reaction to the heat of cast metal as is afforded when my mold or core paste or adhesive has a rubber content.



The invention herein described may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon or therefor.

Having now so fully described my invention that others skilled in the art may therefrom make and use the same, what I claim and desire to secure by Letters Patent is:

1. The method of joining together separate portions of a mold or core for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, including the step of placing between such portions a substance containing rubber adapted to be juxtaposed to and subjected to disintegration by the heat of the cast metal.

2. The method of joining together separate portions of a mold or core for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, including the step of placing between such portions a plastic derivative of rubber adapted to be juxtaposed to and subjected to disintegration by the heat of the cast metal.

3. The method of joining together separate portions of a mold or core for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, including the steps of placing between such portions a substance containing rubber and vulcanizing the same before using such mold or core, said rubber being adapted to be juxtaposed to and subjected to disintegration by the heat of the cast metal.

4. The method of joining together separate portions of a mold or core for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, including the steps of placing between such portions a plastic derivative of rubber and vulcanizing the same before using such mold or core, said rubber being adapted to be juxtaposed to and subjected to disintegration by the heat of the cast metal.

5. A core paste for cores for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, said paste containing rubber.

6. A core paste for cores for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, said paste containing a heat-plastic selected from the class comprising substantially rubber and rubber components adapted to maintain adhesiveness until the casting has become non-fluid and to be combusted by the protracted heat of the cooling casting, which combustion renders the core component reusable for the making of further cores.

7. A core paste for cores for the making of castings of molten steel, iron, brass, aluminum and the like high melting point metals, said paste containing a plastic derivative

of rubber adapted to be subjected to disintegration by the heat of the cast metal.

8. A core paste for cores for the making of castings of molten steel, brass, aluminum and the like high melting point metals, said paste containing rubber and a vulcanizing accelerant, said rubber being adapted to be subjected to disintegration by the heat of the cast metal.

9. A core paste for cores for the making of castings of molten steel, brass, aluminum and the like high melting point metals, said paste containing a plastic derivative of rubber and a drying accelerant, said rubber being adapted to be subjected to disintegration by the heat of the cast metal.

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