

## UNITED STATES PATENT OFFICE

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COMPOUND FOR PREPARING MOLDS FOR METAL CASTINGS

No Drawing.

Application filed October 7, 1929. Serial No. 398,095.

The principal objects of this invention are to produce metal castings of a superior quality with smooth, clearly defined surfaces which will be extremely accurate reproductions of the patterns, and which will be uniform in texture.

A further and very important object is to enable the use of coarser and cheaper core and mold materials, thereby effecting a reduction in the cost of molding the casting, and the prevention of injury to machine tools from encountering embedded mold materials.

A still further object is to enable the production of cores and molds which will reduce the danger of tearing or cracking of the casting during shrinkage.

An additional important object is to enable the reinforcement of frangible cores and molds made with insoluble bonds such as clay.

The principal feature of the invention consists in applying to a mold or core surface, a composite fluid material which readily permeates the body of the mold or core and deposits upon the surface thereof a soft, compressible, bonded substance presenting a uniformly smooth surface which will result in the production of smooth, clean castings, the liquid vehicle of the coating being adapted to partially disintegrate soluble bonds of the mold or core materials, and to reinforce insoluble bonds.

A further and important feature consists in providing a liquid compound, having the above properties, which is non-explosive and non-combustible while being applied.

In the art of molding and casting metals, many different forms of coatings for the surface of the core or mold have been proposed, but many of these, while producing a smooth exterior to start with, are hygroscopic, are easily chipped or broken, and resist the escape of gases which cause defects in the castings. In some instances such hardening of the core surfaces also has the detrimental effect of increasing the tendency of castings to fracture during the shrinkage period. Further, such excessive protection of surfaces keeps them from burning and renders destruction and removal of the cores and molds difficult.

In carrying the present invention into effect, a composite fluid substance is produced mainly of carbon tetrachloride and a soft powdery substance such as ground talc, together with a small quantity of a soluble binder, such as linseed oil or rubber.

Carbon tetrachloride is non-inflammable and it may be diluted with a hydrocarbon such as gasoline or with coal oil to approximately 25% without becoming inflammable or explosive. It may also be diluted with other soluble fluids such as carbon bisulphid, propyl alcohol or formaldehyde in various combinations and the use of the term "hydrocarbon" in the claims is to be construed as including the above named dilutents or mediums capable of imparting a solvent property to the carbon tetrachloride compound in proportion to the quantity used. The diluted carbon tetrachloride is preferably mixed nineteen parts thereof with one part of a soluble binder for the filler material.

In this solution is placed a quantity of fine powdered material such as talc, soapstone, graphite or plumbago, silica, silica-flour, mica, flour of mica or in certain cases other material such as bronze, tin or aluminum powder may be found desirable. The above filler mediums may be classified generally as "inert" fillers and the use of the term inert in the claims in defining the filler medium may be construed to include any one or combination of the above fillers and while talc is desirable as the filler agent the invention is not restricted to its use.

A sufficient quantity of such powdered filler material is incorporated into the liquid so that when assisted in suspension by agitation, they will, with the rapid absorption of the liquid by the core or mold dipped into the fluid, form a coating of the character described. This coating is deposited by filtration of the liquid so as to close all the surface irregularities, leaving a smooth substance containing a sufficient amount of binder to hold it securely. It will be readily understood that the quantity of powdered material will be varied in accordance with the ability to maintain it in suspension in the liquid carrier and in relation to the de-

sired thickness of the surface coating, and since the fluid-suspending medium is highly volatile and light the agitation of the compound serves to maintain the powdered inert fillers in uniform suspension throughout the mass. It is to be noted that carbon tetrachloride alone is practically a non-solvent of the core binder but when combined with hydrocarbon solvents such as gasoline, kerosene, coal oil or propyl-alcohol, the solubility is greatly enhanced and the eventual disintegration of the core body after pouring the metal a very accurate control of the solvent action is effected by combining the solvent and relatively non-solvent components in such proportions as to obtain the desired results. While carbon-tetrachloride alone has no appreciable solvent action its presence in the compound is very important as a carrying agent for the filler materials so that when a dry core or mold is dipped in the compound the light, highly volatile carbon tetrachloride content will be rapidly absorbed into the core body carrying with it the solvent content and the powdered filler materials suspended therein, so that the filler materials will be rapidly deposited on the outer surface and particles of the core. A true filtration action is thus involved and the depth of the coating of filler materials will be determined mainly by the length of time it is submerged in the compound and the proportion of filler used.

It will thus be seen that the carbon tetrachloride being highly volatile and quickly absorbed into the core will on exposure of the treated core to the atmosphere rapidly evaporate leaving the core ready for use in a very short space of time.

The coating when first deposited is preferably of a soft nature, but will harden through the action of the binder material therein in relation to the time it is exposed to air. The chemical characteristics of the liquid vehicle is such as to attack the soluble binders of the core or mold material which are commonly used and a partial disintegration of these binders commences immediately upon application of the liquid compound.

The surface coating applied by filtration as described and which contains a binder material, offsets the initial weakening of the soluble binders of the core and mold materials, and prevents rapid disintegration of the mold surfaces during pouring of the metal. The subsequent application of heat through the pouring of the metal completes the disintegration of the binder commenced by the solvent action of the liquid vehicle.

The initial solvent action of the liquid vehicle in such cases somewhat increases the porosity of the cores and molds below the surface coating and assists the ready escape of gases produced during the pouring of the metal. Gas produced by the burning of the binder of

the surface filler material will pass readily through the surface coating of the powdered talc, or other substance, and through the body of the core or mold to regular outlets.

In some instances cores or molds are produced with insoluble binders and when such are used the compound fluid which contains a binder material permeates the core or mold and acts to strengthen both the surface and body of the cores and molds.

The use of this surface treating method does not destroy the binder but adds a further binder and in addition deposits a soft, smooth exterior coating. Such application of a core binder by infiltration of the liquid vehicle into the core or mold produces a binder of a very delicate nature readily disintegrated during the subsequent application of heat.

The application of this surface treatment to cores and molds can be very accurately controlled so as to enable any degree of surface protection required, by varying the thickness of the coating applied and also by varying its density and the proportion of binder material.

All filler material binders soluble in the liquid vehicle, are non-hygroscopic in character, consequently the cores and molds so treated when stored are immune to absorption of moisture which would otherwise render them unfit for use.

The present process produces a surface the hardening characteristics of which may be regulated so that if desired they may be kept soft for an extended period. Use of such a surfacing permits the filling of misfit core prints with a soft plug which is very valuable in preventing the formation of fins on castings.

The compound herein described preferably dries upon the surface but does not harden quickly due to the peculiar qualities of the vehicle described, which gives quick penetration and though such surface dries readily, enough binder is preferably used so that it does not powder and will not wash off in the pouring of the metal but remains more or less plastic.

In the treatment of cores and molds having insoluble binders, the use of filler material binders in this process may be directed to increase the strength of the body of the mold or core as well as the outer surfaces.

In some instances it may be found desirable to apply a thin coating of tin to the inside of castings and to accomplish this result, the tin may be placed in the solution in finely powdered or even colloidal form and be deposited upon the core so that when the metal is poured it will fuse on to the surface thereof.

Many variations in the application of the method of treatment herein described may be made, so long as the principal feature con-

sists in applying a surface coating of the character described, to the cores or molds by filtration of a liquid substance which will be readily absorbed into the core or mold leaving a fine powdered bonded substance as an outer coating and will partially disintegrate soluble bonds and reinforce insoluble bonds in the core or mold.

What I claim as my invention is:

10 1. Compound for treating dry sand cores and molds comprising a compound containing carbon-tetrachloride and a finely powdered inert filler material suspended therein by agitation to be applied directly to the dry  
15 cores or molds or by dipping the latter thereinto.

2. Compound for treating dry sand cores and molds as claimed in claim 1 in which the carbon-tetrachloride is diluted by the application thereto of gasoline.

20 3. A compound for preparing dry sand cores and molds for casting, comprising a mixture containing carbon-tetrachloride, finely powdered inert filler material, and a  
25 binder for acting on said powdered material, said compound to be applied directly to the dry cores or molds or by dipping the latter thereinto.

30 4. A compound for preparing dry sand cores and molds as claimed in claim 3 in which the binder for acting on the filler material comprises a quantity of linseed oil.

35 5. A compound for treating dry sand cores and molds in preparation for casting comprising a mixture composed of carbon-tetrachloride having incorporated therewith a hydrocarbon bond solvent, a finely powdered inert filler material, and a binder for said  
40 filler material, the said compound being maintained in agitation during use to retain the filler material in suspension.

45 6. A compound for preparing dry sand cores and molds for casting, comprising a mixture composed mainly of carbon-tetrachloride and a finely powdered talc to be applied directly to the dry core or mold or by dipping the latter thereinto.

50 7. A compound for preparing dry sand cores and molds for casting, comprising a mixture containing carbon-tetrachloride diluted with a hydrocarbon acting as a bond solvent for the core and having a finely powdered inert filler material held in suspension therein by agitation, the said compound  
55 to be applied directly to the dry core or mold or by dipping the latter thereinto.

60 8. A compound for preparing dry sand cores and molds for casting comprising, a carbon-tetrachloride hydrocarbon mixture in approximately nineteen parts, the hydrocarbon content being a bond solvent of the core, a soluble binder approximately one part, and a finely powdered inert filler substance held in suspension therein, the said  
65 compound to be applied directly to the dry

core or mold or by dipping the latter thereinto.

9. A compound for preparing dry sand cores and molds for metal casting, comprising a fluid composed of carbon-tetrachloride in approximately nine parts to act as a carrier, a hydrocarbon approximately one part to act as a bond solvent, and an inert finely powdered insoluble filler suspended therein to form a coating for the core or mold surfaces, the said compound being applied directly to the dry core or mold or by dipping the latter thereinto.

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