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PARTING AGENT FOR SPRAYED METAL SHELLS AND METHOD FOR MAKING SUCH SHELLS

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6 Claims. (Cl. 22—193)

This invention relates to a parting agent for sprayed metal shells and to the method for making such shells and more particularly to a composition adapted to be applied to a pattern or form for use in making sprayed metal shells and to the method for making such shells whereby tight adherence between the pattern and the sprayed metal shell is assured while at the same time enabling their ready separation.

While it has been known that the metal spray technique may be used to build up a metal shell upon a pattern formed of such materials as wood or plaster of Paris, such methods have been generally limited to the use of such low melting temperature metals as zinc and tin by reason of the natural tendency of the sprayed metal to contract away from the pattern surfaces where the metals are of the higher melting point variety such as copper, bronze, brass, steel, nickel, and their various alloys. The use of such metals as zinc and tin is undesirable in that they are generally unsatisfactory as electrode materials where the sprayed metal shell is to be used as an electrode in such operations as electrical discharge machining. Similarly, these materials are generally unsatisfactory for use as a wear face on a plastic backed stamping die by reason of their poor wear resistant qualities.

Accordingly, it is an object of my invention to provide a composition suitable for coating a pattern or form to enable the use of relatively high melting point metals in forming sprayed metal shells.

It is a further object of my invention to provide a method for forming sprayed metal shells whereby the surface of the pattern or form is prepared to assure tight adherence between the pattern and the sprayed metal shell while enabling their ready separation.

In order to maintain fidelity of reproduction of the contour of the pattern over a wide range of complexity, I have found it to be essential that the sprayed metal adhere closely thereto. It is also necessary that upon completion, the sprayed metal shell must be easily parted from the pattern without damage. Obviously, these two generally conflicting requirements must be reconciled to enable successful metal spraying.

As a result of extensive investigation I have found that both low temperature metals such as zinc and tin and high temperature metals such as copper, steel, nickel and chromium, including their alloys, may be successfully sprayed to obtain both tight adherence and ready removal from the pattern. More specifically, I have found that a liquid mixture comprising polyvinyl alcohol, a fine grain powder such as silica flour, powdered graphite or powdered copper, and sufficient thinner, such materials, i.e., methylethyl ketone and ethyl alcohol being well known in the art, result in a coating composition which may be either brushed, sprayed or otherwise applied to the pattern surface to enable tight adherence and easy removal of the sprayed metal shell. I have also found that the powder material should have a maximum coarseness of about 200 mesh size while having no practical limit on the degree of fineness.

I prefer to use a mixture consisting of about 50% polyvinyl alcohol, about 25% silica flour (200 mesh size) and about 25% by weight ethyl alcohol, such a mixture being highly effective for the purpose intended while being

made up of the least expensive ingredients, all proportions being set forth herein and in the claims as percent by weight. Such a mixture has been found suitable for forming both a relatively complex contoured copper shell for use as an electrode in electrical discharge machining and a complex contoured steel shell for use as a plastic backed stamping die. In each case the sprayed metal was found to be tightly adherent while the final metal shell was easily removed from the pattern.

It has been found that the desired results may be obtained regardless of whether the pattern is formed of such widely different materials as wood, clay, plaster of Paris, or metal. The range of compositions found to be best suited for the treatment or conditioning of the pattern surface is as follows:

	Percent
Polyvinyl alcohol	18–55
Silica flour	20–60
Ethyl alcohol	15–30

Another composition found to be well suited to forming sprayed metal shells comprises about 36% polyvinyl alcohol, about 43% silica flour and about 21% ethyl alcohol.

As pointed out above, the new process of my invention is based on the application of metal to the desired pattern by the spray metal technique well known in the art. The electrode materials are fed into a specially designed "gun" in wire, rod or powder form where they are heated to the melting point by an oxyacetylene burner or other similar device. The molten metal is sprayed under air pressure as a mist of fine particles and a suitable or desired thickness of sprayed metal shell is built up on the pattern by repeated passes of the gun. However, in order to preclude blistering, peeling or cracking of the shell during the build up operation and in order to enable the easy removal of the final shell, I have found it necessary to coat, as by spraying after cleaning, the surface of the pattern with the compositions of my invention, the resulting process being entirely effective for the purposes described.

Having described my invention in terms of its preferred embodiments, various modifications will be apparent to those skilled in the art as covered by the claims which follow.

What is claimed is:

1. A parting composition for coating the surface of a pattern to be metal sprayed for building up a shell tightly adherent to and easily removed from the pattern consisting essentially of a mixture of about 18 to 55% polyvinyl alcohol, about 20 to 60% silica flour and about 15–30% thinner, said silica flour having a maximum coarseness of about 200 mesh size.

2. In a method of making a sprayed metal shell, the steps of applying the parting agent set forth in claim 1 to the surface of the pattern the contour of which is to be duplicated, depositing on the coated surface sprayed metal to the desired thickness, and removing the resulting metal shell from the pattern without damage.

3. A parting composition for coating the surface of a pattern to be metal sprayed for building up a shell tightly adherent to and easily removed from the pattern consisting essentially of a mixture of about 50% polyvinyl alcohol, about 25% silica flour, and about 25% alcohol, said silica flour having a maximum coarseness of about 200 mesh size.

4. In a method of making a sprayed metal shell, the steps of applying the parting agent set forth in claim 3 to the surface of the pattern the contour of which is to be duplicated, depositing on the coated surface sprayed metal to the desired thickness, and removing the resulting metal shell from the pattern without damage.

5. A parting composition for coating the surface of a pattern to be metal sprayed for building up a shell tightly

adherent to and easily removed from the pattern consisting essentially of a mixture of about 36% polyvinyl alcohol, about 43% silica flour, and about 21% ethyl alcohol, said silica flour having a maximu mcoarseness of about 200 mesh size.

6. In a method of making a sprayed metal shell, the steps of applying the parting agent set forth in claim 5 to the surface of the pattern, the contour of which is to be duplicated, depositing on the coated surface sprayed metal to the desired thickneess, and removing the resulting metal shell from the pattern without damage.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,077,647 February 19, 1963

Alfred E. Kugler

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 62, for "25% alcohol" read -- 25% ethyl alcohol --; column 3, line 4, for "maximu mcoarseness" read -- maximum coarseness --; line 10, for "thickneess" read -- thickness --; column 4, line 4, for "2,421,373 Cozza ------ June 30, 1947" read -- 2,421,373 Cozza ------ June 3, 1947 --.

Signed and sealed this 10th day of September 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents