April 16, 1963 E. J. GUTMAN 3,085,895

COMPOSITE WOODEN FOUNDRY PATTERN

Original Filed Oct. 14, 1957 2 Sheets-Sheet 1

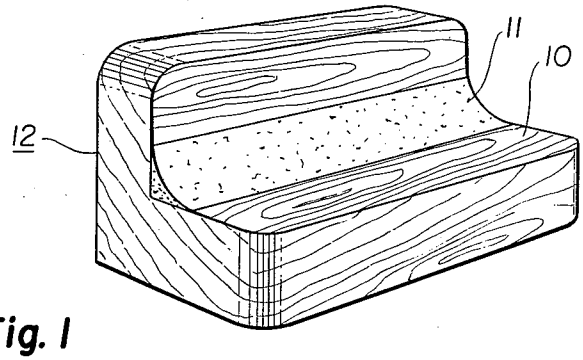


Fig. 1

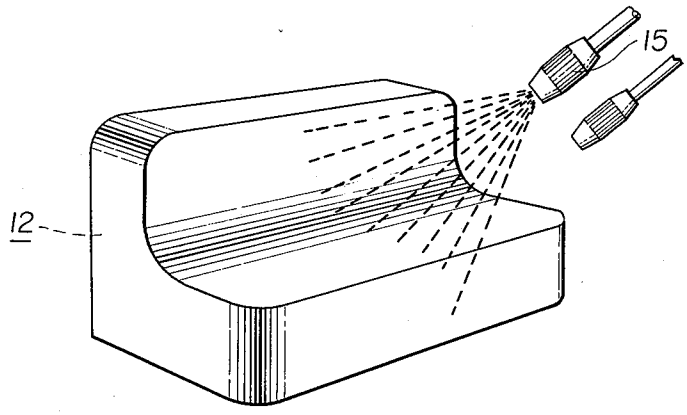


Fig. 2

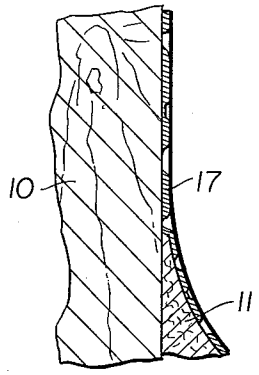


Fig. 3

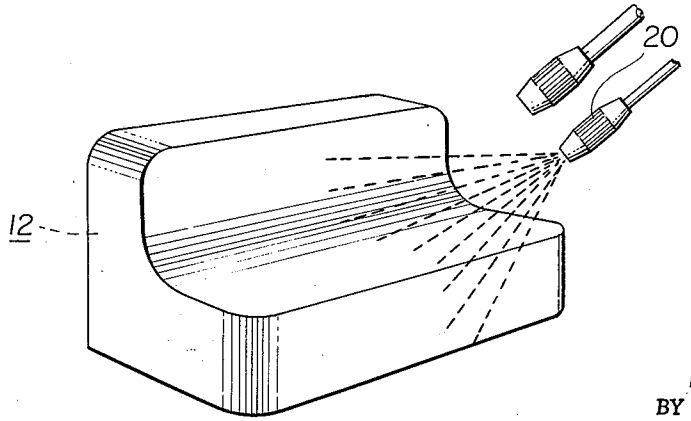


Fig. 4

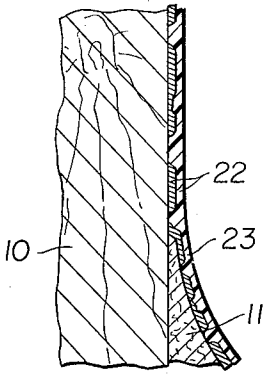


Fig. 5

INVENTOR.
EDWARD J. GUTMAN
BY Pyle & Fisher
ATTORNEYS

April 16, 1963 E. J. GUTMAN 3,085,895

COMPOSITE WOODEN FOUNDRY PATTERN

Original Filed Oct. 14, 1957 2 Sheets-Sheet 2

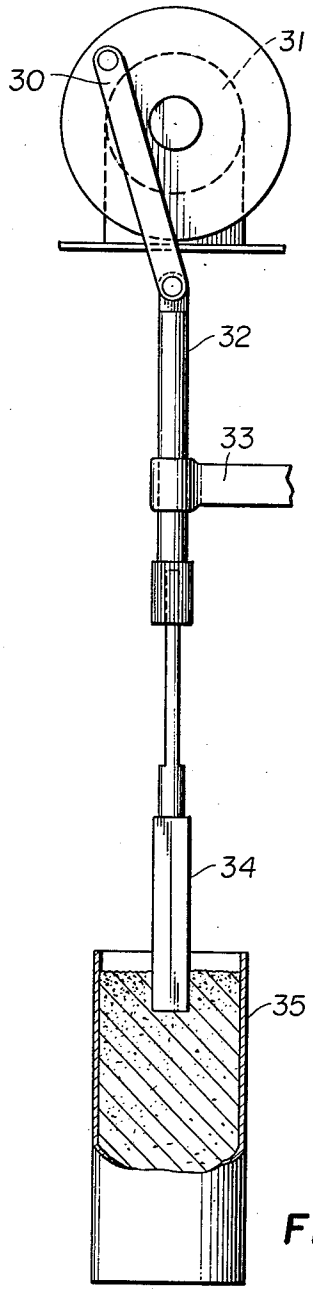


Fig. 6

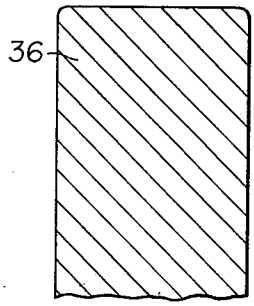


Fig. 7

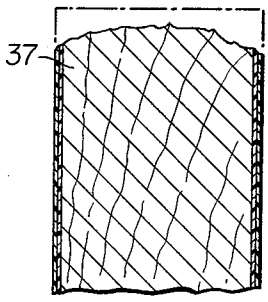


Fig. 8

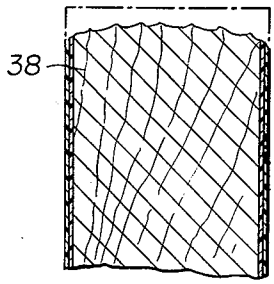


Fig. 9

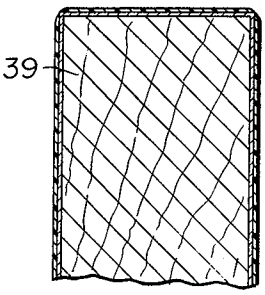


Fig. 10

INVENTOR.
EDWARD J. GUTMAN
BY
Pyle & Fisher
ATTORNEYS

United States Patent Office

3,085,895

Patented Apr. 16, 1963

3,085,895

COMPOSITE WOODEN FOUNDRY PATTERN

Edward J. Gutman, 4738 Lexington Ave., Cleveland, Ohio

Continuation of application Ser. No. 689,819, Oct. 14, 1957. This application May 24, 1961, Ser. No. 114,281

3 Claims. (Cl. 117—5.1)

This invention relates in general to the foundry pattern art, and relates more specifically to the surface preparation of composite wooden patterns to provide a vastly improved abrasion and moisture resistant surface.

This is a continuation of my application Serial No. 689,819, filed October 14, 1957, for Metalized Coating, now abandoned in favor of this application.

Wooden foundry patterns are as old as the foundry art. Among other attributes, they are relatively easy to form and are light in weight. However, even with the best of woods, such patterns are relatively short lived because of rapid abrasion by the foundry sand and also absorption of moisture.

Metal patterns, of course, are a natural solution to abrasion resistance. But metal, even aluminum, is quite heavy to be handled manually all day. Further, such metal patterns are quite expensive to make.

Because a metal surface is expected to be a good abrasive resistant surface and because wood is easy to form and light in weight, it would appear that a metal coated surface on a wooden core by the well-known sprayed metal technique would be the logical solution to the problem. It is not!

Further, wooden patterns have long been protected by paint—usually a black lacquer—to provide moisture resistance, but not enough to measure. Paint and the newer resin plastics are not far removed. Such plastic coatings have not given enough protection to make them outstanding as foundry pattern coatings.

This inventon resides principally in the discovery that sprayed metal bound by plastic resin polymerized in situ will produce an abrasive and moisture resistance coating having a useful life far beyond any reasonable expectation.

The object of this invention, therefore, is to provide a wood member with a skin coating of a combination of alternate layers of a sprayed metal bound by plastic, having in combination, a useful life approximate to an equivalent member of metal.

Another object of this invention is to provide a wooden foundry pattern having a skin surface of porous sprayed-on aluminum with the surface irregularities thereof filled with a phenolic resin.

These listed objects will outline the invention, but other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a raw wood and leather pattern for foundry sand casting practice;

FIGURE 2 is a schematic illustration of the application of a sprayed aluminum coating to the raw pattern;

FIGURE 3 is a fragmentary section through the fillet area of the metal coated pattern;

FIGURE 4 is a schematic illustration of the application of a plastic resin coating to the sprayed metal coat;

FIGURE 5 is a fragmentary section through the fillet area of the pattern having the sprayed metal and resin combined coating in two alternate layers;

FIGURE 6 is a side view of a test machine set up to repeatedly ram test patterns into a sand bucket;

FIGURE 7 is a side view of the tip end of an aluminum test piece after testing in the apparatus of FIGURE 6;

FIGURE 8 is a side view of the tip end of a plastic resin coated test piece after testing in the apparatus of FIGURE 6;

FIGURE 9 is a side view of the tip end of a black lacquer coated test piece after testing in the apparatus of FIGURE 6; and,

FIGURE 10 is a side view of the tip end of a test piece with alternate sprayed aluminum and phenolic resin layers after testing in the apparatus of FIGURE 6.

Now that the discovery constituting the basis of this invention has been made and fully evaluated, its application in practical foundry use is dependent only upon the careful manipulation and combination of known techniques.

The spraying of metal to provide a metal coating upon surfaces is now old and well-known. Under present practice, metalizing guns are employed in a very scientific metalizing system for the spraying of many different types of metal. The guns of these spraying systems, according to one well-known manufacturer, are turbine driven by the gases employed to heat and project the molten spray. In the drawings illustrating this invention, a nozzle **15** has been illustrated as a nozzle projecting a spray of molten metal. The nozzle **15** is fanciful to a degree although it is a caricature of a readily available commercial metalizing spray gun. Basically, such spray devices comprise an automatic feed device which feeds a wire of the desired metal through an orifice where a high temperature flame is maintained. The rate of metal feed and the intensity of the flame are relatively adjusted to produce the desired melting action and the desired degree of heating of the molten metal, while projecting the molten droplets of metal as a mist spray onto a target area. In the present inventive practice, aluminum is the preferred metal for this purpose. One manufacturer of metalizing spray guns reports that a sprayed layer of zinc .003 inch thick, followed by a 1/32 inch thick layer of copper, which required hand finishing, increased life expectancy as much as eight times. This increase is small in comparison to the present invention, which uses a much thinner metal coating.

Referring now to FIGURE 1, an actual pattern piece is illustrated as it was developed for foundry use. The reference character **12** indicates a composite pattern consisting of a wooden basic pattern **10** having a leather fillet piece **11**.

The composite pattern **12** is brought to substantially the dimensions required for a finished foundry pattern because the protective coating which is later provided is of extreme thinness. Whenever the coating must be built to greater thicknesses by repeated layers of metal and resin, then allowance must be made in the dimension of the raw pattern.

In FIGURE 2 of the drawings, the composite pattern **12** is illustrated as being spray coated with metal by the metal spray head **15** formerly described. Those now familiar with the spray coating of metal will understand the operation and use of such equipment for the uniform application of a metal coating upon the basic composite pattern **12**.

The FIGURE 3 is a fragmentary cross sectional portion of the pattern in the fillet area, greatly enlarged, to show the layer of aluminum **17** which now forms the surface of the pattern. Although it is impractical to show in a drawing of this size, if the bond area between the metal coating **17** and the wood or leather surfaces were enlarged by a photomicrograph technique, it would be seen that the metal has actually entered the pores of the wood and the leather and thereby has bonded itself to the composite pattern with a very tenacious grasp.

In the FIGURE 4 the composite pattern **12** is illustrated as now being coated with a plastic resin by means of a spray nozzle **20**. Actually, the resin coating will more likely be applied by a brushing technique, but for the purposes of illustration, a spray technique has been shown.

The FIGURE 5 illustrates the combined coating of sprayed metal with a plastic resin coating applied to the sprayed metal. Once again, in the dimensions available in an illustrative drawing, it is not feasible to show the filling of the pores of sprayed metal with resin. Sprayed metal is a porous material. There is ample opportunity for a flowable resin to get into the crevices and pores of the metal and bind all of the metal particles together with a resilient bond. The coating is very thin over the surface of metal. The object is to fill the metal rather than to cover the metal.

The selection of the plastic resin will be largely at the discretion of the operator. It has been found that the metal coating may be enhanced and the combined coating will provide the desired effects with variations of plastic material. Both phenolic and epoxy resins have been employed with good success. Even shellac and varnish will be useful to a certain extent. However, a phenolic resin has been found to be the outstandingly successful material, both from the standpoint of a single laminate of one metal coating and one plastic resin fill, and for a multiple laminate construction. The chemical composition and method of making the preferred resin is disclosed in U.S. Patent No. 1,854,600, dated April 19, 1932. Hereafter, when reference is made to plastic spray, it will refer to a material capable of polymerizing; or copolymerizing into a long chain molecule, and the finished product will indicate a long chain formed in situ. The epoxy resin tends to burn when a metal coating is attempted over the previously applied resin surface. Similar burning is experienced with other burnable resins such as the shellac and varnish mentioned. However, the phenolic resin appears to merely soften a bit whenever the second metal spray is applied and therefore permits a better bond of the new metal with the old laminate.

It is required, however, to bind all the metal and resin as a cooperating unit, and therefore the invention contemplates a polymerization in situ. Thus, not a layer of resin on a layer of metal, but a combined layer of metal and resin provides one smooth surface.

Accordingly, the preferred embodiment of the invention is incorporated with sprayed aluminum metal and a phenolic resin.

The FIGURE 5 is a section through such an aluminum and phenolic coating showing the composite structure **22** which consists of the aluminum coating **17** and the resin filler **23**.

To illustrate the phenomenal results which have been obtained by the discovery of this invention, reference is made to the FIGURES 6 through 10. The FIGURE 6 is a side elevation of a testing machine employed to determine the qualities of various surface finishes. This machine consists of a drive eccentric **30** operated by a motor **31**. An articulated plunger **32** operating in a guide **33** is employed to drive a test piece **34** repeatedly into a sand bucket **35**. Therefore, the test piece may be rammed into the sand a uniform depth and a counter applied to the mechanism to determine the number of plunges to which the test piece has been subjected.

In the FIGURE 7 a conventional aluminum alloy test piece **36** is illustrated after test. This piece **36** has been made from an aluminum alloy widely used for foundry patterns. The side view of the end of the test piece **36** indicates substantially no wear. The only wear is a slight rounding of the corners. This piece has been subjected to 2000 plunges into foundry sand contained in the bucket **35**.

In FIGURE 8 a test piece **37** illustrates a like side view of the end of a wooden test piece after having been coated with two coats of plastic phenolic resin. This test piece **37** was plunged into the bucket **35** 1000 times to produce the extreme erosion shown.

In FIGURE 9 the test piece **38** is a wooden piece coated with conventional procedure of one coat of shellac and one coat of lacquer. This test piece was rammed 1000 times into the sand bucket **35** to produce the extreme erosion shown in the FIGURE 9. The dotted outline illustrates the original outline of the test piece before the erosion test.

The test piece **39** shown in FIGURE 10 was made according to the principles of this invention. The test piece **39** is the identical same wood base material cut in the same manner as the test pieces **37** and **38**. However, the test piece **39** was first spray coated with aluminum and thereafter a very light application of phenolic resin is made to fill the metal pores. This particular piece was plunged into the bucket **35** 2000 times, or exactly the same number of times as the test piece **36** made of solid metal. Note that the corners of the test piece **39** are worn not much more, if at all, than the solid metal piece. This illustrates the phenomenal increase in wear resistance with the combination of sprayed metal and phenolic resin and is a considerably greater increase in resistance over anything which might be expected from a combination of the results obtained in test pieces **37** and **38**. The results are not accumulative, but they are spectacularly excessive over an acumulated life. Such results are entirely unexplainable, but are exactly reproduceable.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A wooden foundry pattern having the advantages of wood with the life of aluminum, comprising in combination, a wooden base pattern, said pattern having a porous surface, an irregular metal coating over said surface, said coating of metal comprising a multitude of tiny specks of metal laid down upon one another and penetrating the porous surface, and a tough resinous plastic which has been polymerized in situ filling the irregularities of said metal coating and binding the metal and plastic into one smooth surface coating.

2. A wooden foundry pattern having the advantages of wood with the life of aluminum comprising in combination, a wooden base pattern, said pattern having a porous surface, and a protective exterior surface consisting of alternate layers of sprayed aluminum and plastic resin which has been polymerized in situ locked to the wood surface and in the pores thereof.

3. A wooden foundry pattern having the advantages of wood with the life of aluminum, comprising in combination, a wooden base pattern, said pattern having a porous surface, an irregular sprayed metal coating over said pattern, and a plastic resin which has been polymerized in situ filling the irregularities of said metal coating and binding the metal and resin into one smooth surface coating.

References Cited in the file of this patent

UNITED STATES PATENTS

1,688,127	Meurer	Oct. 16, 1928
2,280,864	Stossel	Apr. 28, 1942
2,280,866	Stossel	Apr. 28, 1942