Dec. 21, 1965 P. E. SCHNEDLER 3,224,847

PROTECTED METAL ARTICLES

Original Filed May 25, 1959

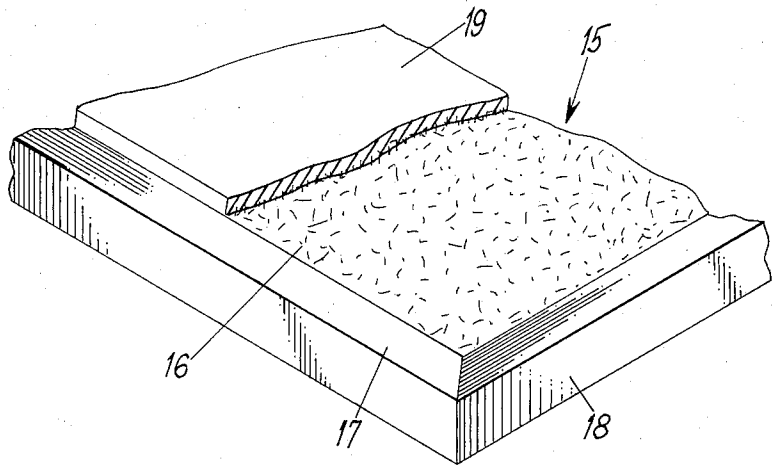


Fig.2

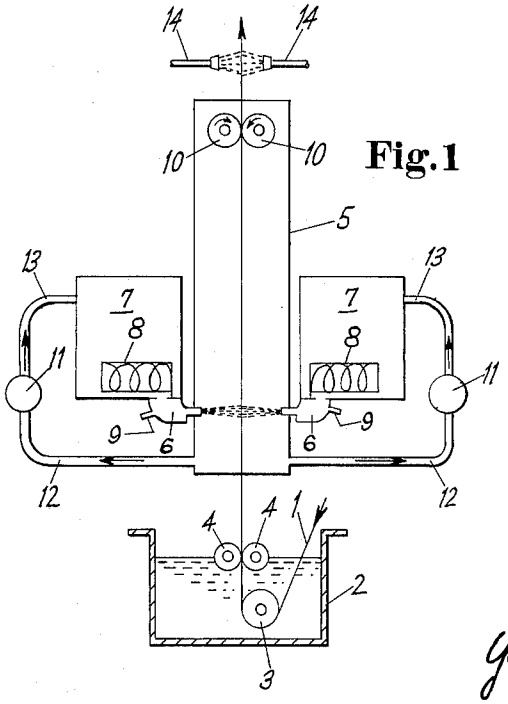


Fig.1

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PROTECTED METAL ARTICLES

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Original application May 25, 1959, Ser. No. 815,636, now Patent No. 3,155,530. Divided and this application Sept. 26, 1963, Ser. No. 311,884

3 Claims. (Cl. 29—195)

This invention has to do with protected metal articles, and is a division of copending application Serial No. 815,636, now Patent No. 3,155,530, filed May 25, 1959 and entitled Protected Metal Surface, Apparatus and Process of Producing Same. More particularly the instant invention relates to protected metallic strip, such as zinc coated steel strip, the coated surface of which is protected by a covering of fibrous material.

It has hitherto been proposed to protect a metal article such as a sheet or strip, coated with tin, zinc, aluminum, lead, or other similar metals or alloys having a lower melting point than steel, by means of a web of fibrous material pressed into the coating metal while the latter is in a fluid state. It has been variously proposed to bond a web of asbestos felt to a coated steel strip as an adjunct of the coating operation, i.e. the felt fed into contact with the strip as it emerges from the coating pot, either by assembling the coated sheet and the felt layer and placing the assembly in an oven to at least soften the coating, whereupon the felt is pressed into the softened coating so that when the coating cools the felt layer will be adhesively bonded to the coating, or by initially permitting the coating metal to solidify on the steel strip and thereafter rapidly heating the strip, as by induction or radiant heating, and immediately bringing the felt material into contact with the softened coating, whereupon the coating is permitted to solidify and bond to the fibrous layer.

All of the foregoing procedures have the disadvantage of relatively high cost, and some have the limitation of intermittent sheet operation. The resultant products have the disadvantage of very limited formability because of cracking of the fibrous layer and the separation of the fibrous layers when in tension.

A principal use of such fibrous covered sheets is in the manufacture of metal conduits, such as culverts and the like, wherein the fibrous layer serves as a base or bonding medium for an asphalt coating which waterproofs the structure and protects it against the corrosive action of water, acids and the like. A satisfactory asphalt to metal bond cannot be obtained, and it is for this reason that a fibrous layer is provided. However, with conventional fibrous layers applied in the ways characterized hereinbefore, unreliable saturating characteristics are encountered together with water leakage along the fibrous layer. These disadvantages, coupled with the limited formability of the fibrous web and its tendency to delaminate or separate into plies, very often lead to premature failure of the product.

In view of the foregoing, it is a principal object of the instant invention to provide an improved product which has lower cost, better asphalt saturation and water resistance, and superior formability, and which is capable of being continuously produced.

A further object of the instant invention is the provision of an improved metal coated article having a protective layer composed of discrete fibers or particles embedded in the coating metal to form a protective covering to which a saturant, such as asphalt, will readily bond.

The foregoing objectives together with others which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications,

are accomplished by that construction and arrangement of parts and by those procedures of which an exemplary embodiment shall now be described, reference being had to the accompanying drawing wherein:

FIGURE 1 is a diagrammatic view of an apparatus for practicing the instant invention.

FIGURE 2 is a fragmentary perspective view of a metallic strip treated in accordance with the invention.

Preferably, the application of the discrete fibers will be carried out as an adjunct of the coating operation, the steel strip being passed through the usual coating pot or other coating apparatus and then led immediately into a spraying chamber wherein flocking guns spray the fibers directly onto the unsolidified coating metal. Of course, if desired, a sheet or strip which has been previously coated, and on which the coating has solidified, could be reheated and the fibers sprayed into the softened coating.

Referring now to FIGURE 1 of the drawings, a strip of steel 1 will be led into the conventional coating pot 2 where it will pass around pot roll 3 and upwardly between exit rolls 4, all as will be readily understood by the skilled worker in the art, the passage of the strip through the coating pot serving to coat the surfaces of the strip with the desired amount of coating metal. The construction and arrangement of the coating pot does not constitute a limitation on the invention and consequently it may take any desired form consistent with the provision of a suitably coated strip.

Similarly, the coating metal itself does not constitute a limitation on the invention, and while molten zinc is probably the most commonly used coating metal, the instant invention is equally applicable to other metallic coatings, such as aluminum, tin, lead, and similar metals and alloys thereof.

Immediately upon emerging from the coating bath, the strip is continuously advanced into an elongated, preferably vertically disposed, spray chamber 5 having flocking spray guns 6 located near the bottom or entrance end thereof and positioned to cause the fibrous material to impinge upon the coated surface of the sheet. It will be understood, of course, that one or both sides of the strip may be sprayed, and that the number of nozzles employed may be varied as required to provide the desired coverage.

The fibrous material will be supplied to the spray guns 6 from one or more hoppers 7 preferably provided with screw-type conveyors 8 rotating inside the hoppers 7. The fibers will be propelled into the molten coating metal by air pressure supplied to the spray guns or nozzle 6 through conduits 9 connected to a suitable source of air under pressure (not shown).

The fibers themselves do not constitute a limitation on the invention, and while asbestos fibers of short length designated commercially as "6D" are preferred where the protected sheet is to be subsequently coated with asphalt, other fibrous materials, such as rock wool or glass wool may be employed, as may non-fibrous materials such as diatomaceous earths or other solid particles. The principal requisities of such fibers or particles are chemical inertness and the ability to be accelerated sufficiently to penetrate the surface of the molten coating metal.

For good adhesion it is necessary that the fibers or particles being embedded in the molten coating metal have sufficient mass and velocity so that their resultant momentum is sufficiently great to penetrate the surface film of the coating metal. If the particle or fiber mass is too small, velocity must be increased to a point where the molten metal is disturbed or event blown off by the air blast. Best results have been obtained with a dense, short-fibered material, such as the aforementioned "6D" asbestos fibers.

In an exemplary embodiment utilizing asbestos fibers of short length, highly satisfactory results have been obtained utilizing 100–200 p.s.i. air pressure with the spray nozzles positioned about 6″ from the surfaces of the strip. Where these conditions exist, it has been found that sufficient momentum is imparted to the fibrous particles to cause them to impinge upon the coating metal with such force that the metal oxide film on the surface is penetrated, thereby causing the fibers to be entrapped by the coating metal as it solidifies.

After being coated with fibers, the molten coating metal will be permitted to solidify, whereupon the strip is brought into contact with rotating brushes **10** located near the top or exit end of the chamber **5**, such brushes acting to remove excess fibers. Such surplus fibers are then removed from the spray chamber by means of one or more suction fans **11** having intake conduits **12** in communication with the lower end of the spray chamber, and outlet conduits **13** which serve to return the surplus fibers to the hoppers **7** for reuse.

As the coated strip emerges from the spray chamber **5**, and while it is still at a temperature of from 200°–500° F., depending on the nature of the coating metal, it is preferred to apply a fast-drying saturant, such as asphaltum paint thinned with naphtha, to permit the material to be subseqeuntly handled without sticking or loss of fibers. Other suitable saturants, such as the primers for various types of organic finishes, may be readily substituted for the asphaltum. In any event, the residual heat of the strip results in fast drying of the saturant. The application of such saturant is diagrammatically indicated by the spray nozzles **14**, although other types of applicators could be employed, such as coating rollers.

As should now be apparent, the resultant product is a fiber protected coated steel article, indicated generally at **15** in FIGURE 2, in which the individual fibers **16** are embedded in and entrapped by the coating metal **17** bonded to the metallic base strip **18**. By reason of the fact that the fibers or particles are discrete and individually secured to the coating, the resultant product can be readily formed, even at acute angles, without materially disrupting the protective layer so formed. The problem of delamination or separation of the plies of a fibrous web is eliminated; and the protruding fibers provide an excellent base for the subsequent application of asphalt or other coating materials. The apparatus is both simple and economical, as is the procedure itself, and material savings are effected both in time and labor.

It will be understood that subsequent to the application of the fibrous layer, the article may be coated with asphalt, pitch, tar or other coating material, seen at **19** in FIGURE 2, which firmly bonds to the fibrous layer and provided a protective surface coating for the article. Such asphalt or like coating may be applied either before or after the fabrication of the article.

It will be clear that numerous modifications may be made without departing from the spirit of the invention,

and consequently it is not intended that the invention be limited otherwise than as set forth in the claims which follow. In reading the claims, it is to be understood that the terms "fibers" and "fibrous material" as employed therein contemplate not only materials such as asbestos and the like which are truly fibrous in character, but also other types of particles, inclusive of such non-fibrous materials as diatomaceous earths, which may be utilized to provide a protective layer or covering for a coated steel strip or sheet.

Having thus fully described the invention, what is claimed as new and desired to be protected by Letters Patent is:

1. An article of manufacture comprising a metal base member having a lower-melting point metallic coating thereon, and a protective layer covering said metallic coating, said protective layer being composed of a multiplicity of individual particles, such as asbestos fibers, said particles being partially embedded in and individually anchored to the said metallic coating, said protective layer forming a rough and irregular surface capable of being penetrated by a non-metallic coating applied over said protective layer.

2. An article of manufacture having a ferrous metal base and a non-ferrous metallic surface covering said base, a protective covering for said metallic surface coating consisting of a multiplicity of individual short length fibers, such as asbestos fibers, each of which is partially embedded in and bonded to the said metallic surface coating, the said protective covering defining a bonding layer having an irregular surface capable of being penetrated by a non-metallic saturant.

3. A protected metal article comprising a ferrous metal base, a protective metallic coating on at least one surface of said ferrous base, a covering of fibrous material overlying and bonded to said protective metallic coating, said fibrous covering being composed of essentially short length fibers, such as asbestos fibers, said fibers being partially embedded in said protective metallic coating and individually bonded thereto to form a fibrous bonding layer having an essentially rough surface, and a protective coating of an asphaltic composition bonded to the rough surface of said fibrous bonding layer and secured thereby to said metal article.

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