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METAL REINFORCED SHEATHING SHEET AND METHOD OF MAKING SAME

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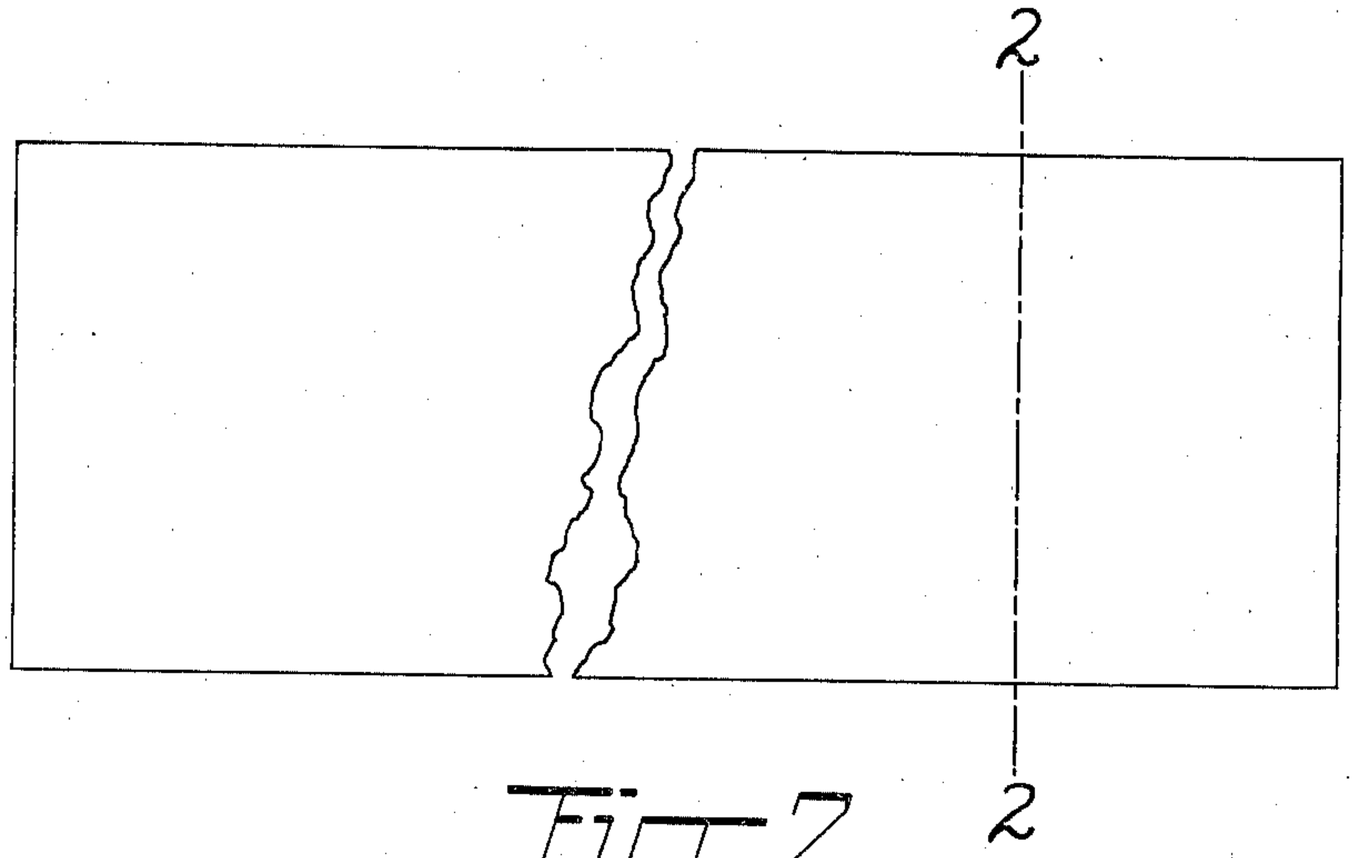


Fig. 2.

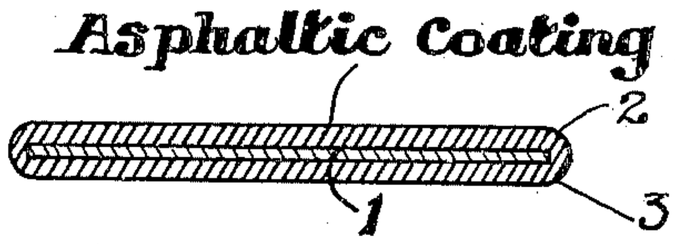


Fig. 1

INVENTORS:
Joseph T. Lawrence
Leon Hartman
By W. H. Swearton
Their ATTORNEY.

BY

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## METAL REINFORCED SHEATHING SHEET AND METHOD OF MAKING SAME

Joseph T. Lawrence, Jersey City, N. J., and Leon Hartman, New York, N. Y., assignors to Mitchell-Rand Manufacturing Company, New York, N. Y., a corporation of New York

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7 Claims. (Cl. 91—70)

This invention relates to the production of a reinforced, flexible bituminous or asphaltic sheet which is waterproof, acid and alkali-resistant and especially adapted as a sheathing for spandrel beams, as a lining for automobiles, linoleum or wood flooring, refrigerators and shipping containers, as a wrapping for pipes and cylinders, as a replacement of felt in built-up roofing, as a shield for high frequency radio currents, besides having other advantages hereinafter set forth.

In the accompanying drawing in which we have illustrated a preferred embodiment of our invention—

Figure 1 is a plan view of a reinforced bituminous sheet embodying our invention; and

Figure 2 is a transverse section on the line 2—2 of Figure 1.

Referring to the drawing and the construction shown therein, the reference numeral 1 designates a reinforcing element comprising preferably a metallic sheet, such as copper, zinc or the like, and the reference numerals 2 and 3 represent layers of a bituminous or asphaltic coating of uniform thickness applied to the opposite sides thereof in the manner hereinafter described.

In the preparation of our improved product we first prepare a bath of a suitable coating compound for example a mixture of gilsonite and thermolized tung oil preferably in equal proportions. These ingredients are introduced into a direct fired kettle and heated in such a manner to gradually raise the temperature of the mixture to 550° F., at which point there will be noticeable ebullition and frothing. The heating of the mixture is then discontinued and the mixture subjected to vigorous stirring until the frothing subsides at which time the reaction compound will be in a placid liquid state and will have attained a temperature of about 600° F. due to the exothermic reaction developed therein. The kettle is then covered, allowed to cool until viscous and temperature of compound approximates 350° F. whereupon a thin sheet of copper, preferably electrolytic copper of 2 to 7 ozs. per square foot, (electro-sheet copper) is slowly passed through said viscous bath wherein it will become embedded in a coating of the mixture. The resultant product comprising the copper sheet hermetically sealed within the aforesaid bituminous compound is removed from the bath and the surplus coating is allowed to drain off. The temperature and viscosity of the coating compound in the kettle is preferably such that the finished product when cool will have a coating of approximately $\frac{1}{32}$'' thick on each side thereof which will effectively serve as an effective seal against the penetration of moisture or air to the copper sheet.

The method of manufacture as hereinbefore described results in the embedded copper sheet being annealed under ideal conditions, since such sheet while subjected to an annealing temperature is effectively protected by the coating within which it is embedded against oxidation. Likewise, due to the heat insulation characteristics of the coating, the heated metal sheet cools very gradually as is essential in successful annealing operations.

Our improved product will flex readily without fracture of the external coating and as a matter of fact is even more flexible than was the original sheet of metal prior to its being processed in the manner above described due to the fact that the embedded metal sheet has been annealed under ideal conditions during the coating operation. Furthermore, due to the reinforcing action of the metal and the imperviousness of the same to moisture, our product is much tougher and less susceptible to shearing stresses, besides being more waterproof than the coating compound, per se, if the latter is formed into sheets while retaining its characteristics of being alkali- and acid-resistant. Again, due to the reciprocal reinforcing action of the external bituminous coating on the embedded metal sheets of our improved product, it is possible to employ extremely thin metal sheets, which if used alone would crumple during the ordinary handling thereof without any danger of the embedded metal sheet crumpling in use under the conditions to which the product is subjected.

The aforesaid coating compound employed when cold possesses the following characteristics:—

| | Degrees Fahrenheit |
|---|---|
| Melting point (Ball & Ring) | 140 to 160 |
| Specific gravity at 60° F | 1.0111 |
| Viscosity at 350° F | 3.75 to 5.25 |
| Penetration | 28 to 35 |
| 32/200/60 | 10 to 20 |
| 77/100/5 | 40 to 50 |
| 115/50/5 | 110 to 120 |

Due to the flexibility and inelasticity of the product, the same can be conveniently marketed in roll form, for example rolls containing 24 ft. of a strip 30'' wide which are advantageous dimensions for many commercial purposes. Moreover it is desirable that the thickness of the coat-

ing should be such that the finished sheet weighs not less than 6 oz. per sq. ft. in excess of the actual weight of the metal sheet employed.

The bituminous coating compound employed is desirably prepared from bitumens either natural, residual or oxidized; vegetable, animal or mineral oils, either raw or treated; and vegetable, animal or mineral pitches. Whatever mixture of bitumens, pitches or oils is employed, the same should be so proportioned and treated that the resultant coating when cool is waterproof, alkali- and acid-resistant and will posses the following characteristics:

| | Degrees Fahrenheit |
|---|---|
| Melting point (Ball & Ring) | between 130 and 200 |
| Penetration: 77/100/5 | between 20 and 50 |

Other examples of highly suitable coating compositions which may be employed in lieu of the aforesaid gilsonite-tung oil coating are included in the following:

(1) *Asphalt—pitch—oil mixture*

| | Per cent |
|---|---|
| Oxidized Trinidad asphalt | 50 |
| Tung oil (thermolized) | 25 |
| Stearin pitch (cotton-seed oil pitch) | 25 |

(2) *Pitch—oil mixture*

| | Per cent |
|---|---|
| Hardwood pitch | 65 |
| Castor oil (blown) | 35 |

Upon a comparison of a strip 3'' x 6'' in dimensions of untreated electrolytic copper with a strip of similar size of the same copper which has been subjected to the treatment herein described but from which the coating had been removed with a cold solvent, it will be found that if both strips are supported in such a manner that 5'' of each strip projects beyond the edge of the support and a similar weight is attached to the free ends of each of the strips, that then the treated copper strip will be deflected approximately twice as much as the untreated strip and when the weights are removed, the untreated strip will resume approximately its original position while the treated strip, being substantially inelastic, will return but partially to its original position.

Our improved sheathing has no attraction for metal thieves owing to the fact that the coating cannot be removed therefrom without deleteriously affecting the metal, except at prohibitive expense, and consequently the theft of the same is unprofitable.

Among the additional advantages of our improved sheathing product are its unusual flexibility as compared with bare sheets of metal corresponding in thickness to the metal reinforcing element in our sheathing, its unusually long life, due to the protection afforded to the metal reinforcing element by the impervious and non-corrosive coating thereon and also the fact that the joints between overlapped strips thereof can be readily sealed merely by heating the coating to soften the same or by moistening the surfaces to be lapped with a suitable solvent of the coating and then manually or otherwise pressing the overlapped surfaces together. Since the coating is semi-plastic under prevailing weather conditions in all climates, the sheathing can be nailed to a supporting surface and owing to the self-sealing nature of the coating the nail holes will be permanently sealed, notwithstanding the expansion and contraction of the sheathing under changing temperature conditions.

While we prefer to employ virgin electro-deposited copper or zinc sheets, we may also employ sheets of steel, wrought iron, aluminum, brass or of other metals or alloys thereof since as the reinforcing metal sheet is fully protected against corrosion in use, it is not essential that a relatively non-corrosive metal of the order of copper or zinc be employed. Of course in those cases where steel or iron sheets are employed as the reinforcing element of our improved sheathing, the same should be of extremely thin gauge to admit of the convenient flexing of the sheathing when applying the same to the structure to be protected thereby.

Among the other oils and asphalts that are especially suitable for the production of our improved bituminous coating are oils and asphalts of the order of whale and menhaden oils, pine tar oil and Bermudez asphalt (oxidized).

In choosing the particular bituminous coating compound for use in the production of our improved product, care should be exercised that the same be free from acids or other ingredients corrosive to copper, as otherwise a copper sheet coated therewith will soon become porous due to the solvent action of such corrosive ingredients thereon. This is especially important because of the relatively high temperature employed in the treatment, at which temperature the corrosive action of any such ingredient becomes accentuated. Among the pitches which contain such corrosive ingredients that should be removed if the same is to be employed in our method of treatment are the various coal tar pitches.

Our improved product peculiarly lends itself for use as membraneous waterproofing and as a substitute for weather-proof sheathing paper or metal lining behind clapboards, shingles and stucco, for which latter purpose it is ideally suited because of its high index of heat and cold insulation, also as a water-stop and termite stop for foundations and otherwise for water-proofing and damp-proofing purposes generally.

It is important at the time the metal sheet is passed through the bath that the temperature of the same should not exceed the point at which the coating compound will be highly viscous and sufficiently so that a substantial layer of the coating compound will adhere to the metal sheet during the passage through the bath, preferably a coating layer on each side of such sheet approximating about $\frac{1}{32}$'' in thickness. At the same time the bath must be sufficiently hot, at least several hundred degrees Fahrenheit, to insure intimate adhesive union between the coating compound and the metal, as otherwise if the bath is not sufficiently hot, the coating compound will not firmly adhere to the metal and can be readily peeled or scaled off therefrom.

Various changes in the proportions and ingredients and temperatures prevailing during the manufacture of both the coating and our improved sheathing may be made without departing from our invention as embraced within the scope of the appended claims.

Having thus described our invention, what we claim and desire to obtain by United States Letters Patent is:

1. Metal reinforced sheathing comprising a highly flexible sheet of metal selected from the group of non-ferrous metals consisting of copper, zinc and aluminum, which are of a gauge of the order of not exceeding about 7 oz. per sq. ft. and which sheet has a tough, firmly adhering coating covering both sides thereof, said coating compris-

ing essentially a member of a group of bituminous compounds consisting of asphaltum and hard wood pitch and containing a minor proportion of an oil and being also characterized by its substantial freedom from inert mineral filler, as well as being waterproof, semi-plastic, alkali- and acid-resistant and of a melting point between 130° F. and 200° F.

2. Metal reinforced sheathing comprising a highly flexible, substantially inelastic sheet of annealed metal selected from the group of non-ferrous metals consisting of copper, zinc and aluminum, which are of a gauge of the order of not exceeding about 7 oz. per sq. ft. and which sheet has a tough, firmly adhering coating covering both sides thereof, said coating comprising essentially a member of a group of bituminous compounds consisting of asphaltum and hard wood pitch and containing a minor proportion of an oil and being also characterized by its substantial freedom from inert mineral filler, as well as being waterproof, semi-plastic, alkali- and acid-resistant and of a melting point between 130° F. and 200° F.

3. Metal reinforced sheathing comprising a highly flexible and substantially inelastic sheet of annealed copper of a gauge of the order of not exceeding about 7 oz. per sq. ft. and which sheet has a tough, firmly adhering coating covering both sides thereof, said coating comprising essentially a member of a group of bituminous compounds consisting of asphaltum and hard wood pitch and containing a minor proportion of an oil and being also characterized by its substantial freedom from inert mineral filler, as well as being waterproof, semi-plastic, alkali- and acid-resistant and of a melting point between 130° F. and 200° F.

4. The method of making metal reinforced sheathing, which comprises causing the passage of a sheet of a metal, selected from a group of non-ferrous metals consisting of copper, zinc and aluminum, which sheet when isolated is relatively elastic and resists taking a permanent set upon the distortion thereof, through a coating bath heated to a temperature at least approximating the annealing point of the metal being treated, and which bath consists principally of a melted substantially neutral bituminous compound selected from the group consisting of an asphaltum and a hard wood pitch that is alkali- and acid-resistant, also waterproof, and which compound is substantially free from inert mineral filler, and of a melting point between 130° F. and 200° F., maintaining said metal sheet in said bath for a sufficient time to effect the substantial annealing thereof, then removing the resultant coated sheet from the bath, draining off the surplus coating and permitting the coated sheet to cool.

5. The method of making metal reinforced sheathing, which comprises causing the passage of an electro-deposited, unannealed, virgin copper metal sheet through a coating bath, heated to a temperature at least approximating the annealing point of copper, that is alkali- and acid-resistant, also waterproof, substantially free from added mineral matter and of a melting point between 130° F. and 200° F. and which bath consists principally of a melted, substantially neutral asphaltum compound and a minor proportion of a mineral oil, maintaining said metal sheet in said bath for a sufficient time to effect the substantial annealing thereof, then removing the resultant coated sheet from the bath, draining off the surplus coating and permitting the coated sheet to cool.

6. Metal reinforced sheathing comprising a highly flexible and substantially inelastic sheet of annealed copper of a gauge of the order of not exceeding about 7 oz. per sq. ft. and which sheet has a tough, firmly adhering coating covering both sides thereof, said coating comprising stearin pitch, mineral oil and a member of a group of bituminous compounds consisting of asphaltum and hard wood pitch, said coating being also characterized by its substantial freedom from inert mineral filler, as well as being waterproof, semi-plastic, alkali and acid-resistant and of a melting point between 130° F. and 200° F.

7. The method of making metal reinforced sheathing, which comprises causing the passage of an electro-deposited, unannealed, virgin copper metal sheet through a coating bath heated to a temperature at least approximating the annealing point of copper, that is alkali- and acid-resistant, also waterproof, substantially free from added mineral matter and of a melting point between 130° F. and 200° F. and which bath consists principally of a melted, substantially neutral asphaltum compound and a minor proportion of stearin pitch and a minor proportion of a mineral oil, maintaining said metal sheet in said bath for a sufficient time to effect the substantial annealing thereof, then removing the resultant coated sheet from the bath, draining off the surplus coating and permitting the coated sheet to cool.

JOSEPH T. LAWRENCE.
LEON HARTMAN.