Aug. 4, 1942. R. A. SHOAN 2,291,838

MATERIAL FOR WRAPPING PIPES AND FOR COVERING METALLIC SURFACES

Filed March 11, 1939

Fig. 1.

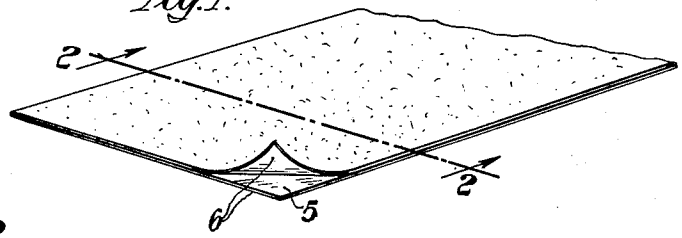


Fig. 2.

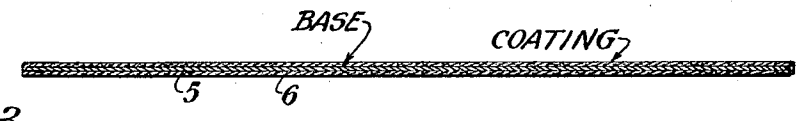


Fig. 3.

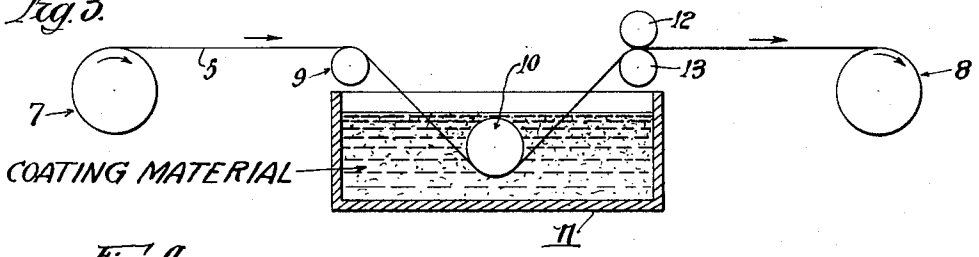


Fig. 4.

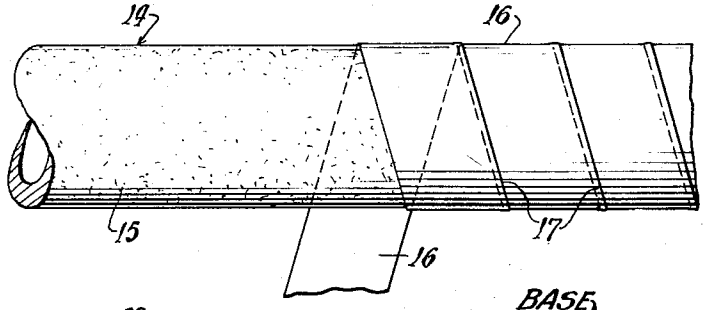


Fig. 5.

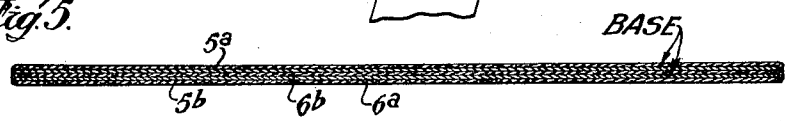
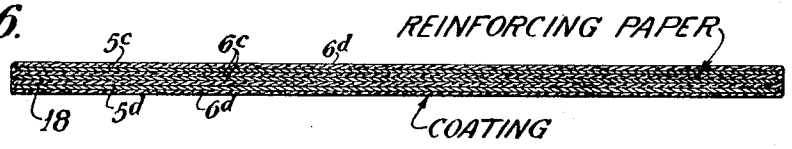


Fig. 6.



Inventor:
Raymond A. Shoan,
By: Arthur W. Nelson
Attorney.

Patented Aug. 4, 1942

2,291,838

UNITED STATES PATENT OFFICE

2,291,838

MATERIAL FOR WRAPPING PIPES AND FOR COVERING METALLIC SURFACES

Raymond A. Shoan, Chicago, Ill., assignor to Dearborn Chemical Company, Chicago, Ill., a corporation of Illinois

Application March 11, 1939, Serial No. 261,226

7 Claims. (Cl. 138—64)

This invention relates to improvements in material for wrapping pipes and for covering metallic surfaces for over and underground protection against corrosion and in the method of making such material and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The material of the present invention is in sheet or strip form for application either by hand or by machine, to the metal surface to be protected.

The electro chemical theory is now generally accepted as the one which best explains the rusting of iron and which is as follows: Iron, like all other elements has a definite inherent tendency to go into solution when placed in contact with water. Iron, however, can enter solution only by displacing some other element already in solution. In the ordinary case of iron immersed in water, hydrogen is the element plated out and it gathers on the surface of the iron in the form of a thin invisible film.

This presence of this film tends to obstruct the progress of the reaction by insulating, as it were, the metal from the solution. This interference may become so effective in natural waters as to stop corrosion altogether. Thus, the first stage of corrosion comes to a stop so quickly that no appreciable damage is done to the metal if the process goes no further.

In order that corrosion may proceed, the film of hydrogen must be removed. This may happen in two ways: either it may combine with oxygen in solution to form water or it may escape as a gaseous hydrogen.

Dissolved oxygen is usually present in water solutions and removes the hydrogen film by reacting with it to form water. The process is then free to continue, that is to say, more iron can go into solution, more hydrogen can plate out and the process can continue at a rate determined by the speed with which the oxygen removes the hydrogen. This is the second stage of corrosion and accounts for the continuance of the process in the great majority of cases.

In acids, the same reaction takes place, but the tendency for the hydrogen to plate out is much greater and so much of it gathers on the metal surface that it is forced off in the form of hydrogen gas bubbles. Corrosion therefore is proportionately more rapid in acid solutions than in natural waters.

Ordinarily, the iron which goes into solution is immediately thrown down as rust. After a time this rust, together with the insoluble material from the water may form a protective coating on the surface of the metal which interferes with the corrosion reaction by insulating the metal from the solution.

It will be apparent from the above that all materials have a tendency to dissolve to a certain extent when in the presence of an electrolyte. As iron goes into solution, some material is plated out on some part of the metal surface. The area where the iron continues to go into solution is considered the anodic area. The area where hydrogen or other material is plated out is known as the cathodic area. The rate at which corrosion progresses is dependent upon the electrical potential between these two areas.

Dissimilar metals when immersed in an electrolyte will, in many cases, form a wet battery with the production of noticeable current. By the same action, dissimilar metals in electric contact are an active cause of corrosion. It is possible, however, in the same piece of metal to have areas with different electrical potentials and these areas will result in the formation of an electric cell in the same manner as do dissimilar metals. The result is corrosion.

When the metal is in underground use, such as for pipe line use, soil action is also important and such action varies with the condition of the soil, as to its being wet or dry, as to its composition and, as to its pH value. Soil action tends to break down any protective coating that might be formed, thereby allowing corrosive elements in the soil to contact the metal and at the same time permitting the ground water to contact the metal of the pipe to provide the electrolyte whereby the above mentioned corrosive action is permitted. Thus, underground corrosion of iron or steel is due to electro chemical and to soil action.

Heretofore, in combating the rusting of pipes and other metallic surfaces, the primary consideration was the exclusion of moisture and oxygen from the exposed surface by the application of a film-like coating. Such coatings, however, were more or less permeable to moisture and gases and often had a tendency to dry and become brittle. The hardest or apparently most resistant coatings may not effectively retard the destructive action of corrosion, as many times they are easily and readily attacked or penetrated, allowing elements which promote corrosion to be carried to the surface of the metal. The reason that many coatings fail to protect such surfaces against the elements of corrosion is due to corrosive action taking place under the

applied coating and the inability of anything contained in the coating material to neutralize this action. Therefore it carries on to a point of breaking the bond between the coating and the metal.

When a protective coating is applied to a pipe for underground use, the coating is often covered by a wrapper of some kind which, while acting to increase resistance to corrosion, also acts as a protective shield for the material of the coating, against actions that occur in such underground use and which tend to break down said coating.

In wrapping or covering materials as heretofore made for this purpose, thickness of the same has been primarily relied upon to provide a mechanical shield for the protective coating, to minimize its permeability to moisture and to provide sufficient dielectric strength to help resist the action of soil currents on the pipe or other metallic surface upon which the material is employed. Wrapping material of this kind usually comes in rolls and such rolls are quite heavy and inconvenient to handle. Also, the length of such rolls, when used in pipe wrapping machines is limited by conditions imposed by the machine with the result that the rolls must be frequently renewed and this takes up considerable time and limits the wrapping operations.

One of the objects of the present invention is to provide a material in strip or sheet form for wrapping pipes and for covering metallic surfaces, which is impermeable to moisture, which has a high dielectric strength or electrical resistance to afford an efficient protection against rusting and which is also thinner, thereby increasing the footage per roll.

Another object of the invention is to provide material of this kind which when wrapped about a pipe or applied to a metallic surface is self-sealing at the overlap.

A further object of the invention is to provide a material of this kind which will not dry out and become brittle but which will retain its tough elastic nature and dielectric properties over an indefinite period of time.

The above mentioned objects of the invention, as well as others, together with the advantages thereof will more fully appear as the specification proceeds.

In the drawing:

Fig. 1 is a perspective view of a piece of the improved wrapping or covering material embodying the preferred form of the invention.

Fig. 2 is a transverse sectional view, on an enlarged scale, through the piece of material appearing in Fig. 1 and as taken on the line 2—2 thereof.

Fig. 3 is a diagrammatic view illustrating one manner of making the improved material.

Fig. 4 is a detail view in side elevation of a piece of pipe to which the improved material is being applied.

Fig. 5 is a view similar to Fig. 2 and illustrates a modified form of the invention which will be more fully referred to later.

Fig. 6 is a view similar to Figs. 2 and 5 and illustrates a further modified form of the invention and which will be more fully referred to later.

One form of the improved wrapping material, which is preferably produced in strip or sheet form, includes a base 5 and a coating 6 preferably on both sides and enclosing the edges of the base. The base is preferably constituted by a relatively thin, pliable imperforate sheet of cellulosic material selected from a group embodying a regenerated cellulose, a cellulose acetate and a cellulose nitrate. Material such as "Cellophane" (regenerated cellulose in sheet form) or "Kodapak" (cellulose acetate in sheet form) are both obtainable in strip and in sheet form, in the open market, and either one well serves the purpose of the base for the improved material. Such material, which has smooth surfaces on both sides is of considerable dielectric and tensile strength but it is not totally vapor or moisture proof.

The material for the coating is of a plastic or somewhat elastic nature made with a petrolatum base and is of a heavy grease or waxlike consistency. One form of satisfactory coating material is made from a petrolatum or mixture of petrolatums having an A. S. T. M. melting point of from about 140° to 175° F. and an A. S. T. M. penetration of from 30 to 45, using 100 grams at 77° F. for five seconds.

Another form of satisfactory coating material consisting of a mixture of a petrolatum having an A. S. T. M. melting point of from 125° to 160° F. and an A. S. T. M. penetration over 35 using 100 grams at 77° F. for 5 seconds, with paraffin wax having an A. S. T. M. melting point of from 140° to 160° F. and an A. S. T. M. penetration of 5 to 15 using 100 grams at 77° F. for five seconds.

A third satisfactory coating material consists of a mixture of a petrolatum having an A. S. T. M. melting point of from 125° to 160° F. and an A. S. T. M. penetration over 35 using 100 grams at 77° F. for 5 seconds, with a wax such as paraffin having an A. S. T. M. melting point of from 120° to 135° F. and having present a small amount of a material selected from the following group to cause a hardening of the product; rosin, carnauba wax, candelilla wax and montan wax. To any one of the examples above set forth, a chemical inhibitor may be added.

Any one of the above mentioned coating materials in film form, is vapor or moisture proof, remains permanently plastic, has a permanent wetting effect so that it will maintain contact with a metal surface for an indefinite period of time and has good dielectric properties. At the same time it may be thinned for application to the cellulosic sheet either by the use of heat or by the use of a hydrocarbon solvent such as kerosene, naptha or oleum spirits. After application, if solvents are employed, the same evaporate leaving a firm but elastic wax-like film. This film, which is highly resistant to moisture permeation, also has dielectric qualities and will retain its adhesiveness thereby providing a tight seal at the overlap when the finished material is wrapped about a pipe or laid as a covering upon a metallic surface. At the same time it permits separation between engaging surfaces of succeeding convolutions when the finished material is being unrolled or unwound from a supply roll such as that used in a pipe wrapping machine for example. When such a coating material includes a chemical inhibitor, it maintains the inhibitor in intimate contact with the surface being protected in those instances where the wrapper directly engages the metal.

One coating material which I find satisfactory for this purpose and which contains a chemical inhibitor is a proprietary product obtainable in the open market under the trade name of No-Ox-Id. It is a hydrocarbon base material

consisting of proportioned amounts of petroleum products and having incorporated therein certain chemicals for the purpose of inhibiting corrosion.

The coating may be applied to the cellulosic material in several different ways, after being rendered more liquid for application purposes, by the use of heat or by the addition of a solvent. It may be brushed on the base 5 or it may be applied by the tank method or it may be applied by the spray method. The tank method is diagrammetrically illustrated in Fig. 3. Under this method, a supply roll 7 of the cellulosic material 5 is provided and one end of the same is wound about a mandrel or the like of a rewind roll 8. The length of the material 5 between said rolls passes over a roll 9 and under a roll 10, at least a portion of which is disposed in a bath of coating material 6 in a tank 11. By reason of the length of material 5 passing through the bath of material 6, both sides thereof become coated and the coated strip then passes between a pair of rolls 12 and 13, which apply a pressure and an evening action thereon to produce the smooth surface coating of the finished material. These rolls may be adjustably mounted to determine the thickness or depth of the coating material on both sides of the cellulosic material. After the material leaves the rolls 12 and 13, it passes to the rewind roll 8.

While the coating produces an adhesiveness that makes the various convolutions snugly adhere to make a good solid roll, the same does not prevent the unwinding of the finished material from the roll 8 for application to a pipe or other metallic surface. As before mentioned, both surfaces of the cellulosic material are smooth and even. Thus in applying the coating as described herein, an intimate bond is afforded between the cellulosic material and the coating so that the coating is free from pin holes, air blisters and the like. In fact, it is most impossible to remove the coating from the cellulosic material without the use of solvents.

In Fig. 4 the pipe to be covered is shown at 14. If desired, but not necessarily so, the pipe may be treated with a priming coat 15 of paint or the said coat 15 may be of the same material or one analogous to that used for the coating on the wrapping material. Also said priming coat may be any one of the grades of the product "No-Ox-Id" before mentioned.

The finished wrapping material, which is indicated at 16 in Fig. 4 may be helically wound upon the pipe with the convolutions having a marginal overlap of the desired distance as indicated at 17. By reason of the adhesiveness before mentioned, the overlapped marginal parts are secured together with a tight sealing action that is proof against moisture penetration at this point.

As the cellulosic strip 5 has a high tensile and dielectric strength and as the coating has a high dielectric strength and is also impervious to vapor or moisture penetration, said coating adds its dielectric strength to that of the strip 5 and also acts to prevent the penetration of vapor or moisture through the cellulosic strip. The coating is of such nature as to prevent soil adhering to it and to prevent the resulting soil stress from rupturing the strip 5 whereby areas of the metal would be exposed to the electrolytic action before mentioned.

In certain soil, bacteria is present of a type which uses the carbon of petroleum products for partial sustenance. It is therefore important that such bacteria be at least kept from contact with that part of the petrolatum coating which is in engagement with the metal surface to be protected. The cellulosic material before referred to acts as a bacterial filter and therefore protects the coating engaged with the metal surface of the pipe from the action of that particular type of bacteria found underground and which use the carbon of the petrolatum in the coating for sustenance. Hence, the life and effectiveness of the protecting material is greatly prolonged.

In Fig. 5 a modified form of the improved material is illustrated, which is duplex in nature and whereby not only is the tensile strength greatly increased but the dielectric resistance as well as bacteria filtering action and impermeability to moisture and vapor penetration is likewise greatly increased. As shown in said Fig. 5, the base comprises two strips 5*a* and 5*b* respectively of cellulosic material that are spaced apart but are intimately united by a layer of adhesive 6*b*, said strips having elastic protective coating 6*a* on the opposed outer surfaces, the coating extending about and enclosing the edges of both strips. If desired, the adhesive layer 6*b* may be made of the same material as the coating 6*a* which in itself may be any one of the examples previously mentioned herein.

A further modified form of the improved material appears in Fig. 6. In this instance the base comprises two strips 5*c* and 5*d* of cellulosic material and an intermediate reenforcing strip of fibrous material 18, the said strips being spaced apart but intimately united by layers of adhesive 6*c*. The preferred form of fibrous material may be exemplified as by kraft paper or by asbestos paper. The strips 5*c*—5*d* have an elastic protective coating 6*d* on the opposed outer surface and which may enclose the edges of all of said strips. If desired, the adhesive layers 6*c* may be made of the same material as the coating 6*d* which in itself may be any of the examples previously mentioned herein. The construction shown in Fig. 6 not only further increases the tensile strength and the dielectric resistance of the material, but it gives a better bacteria filtering action, more impermeability to moisture and vapor penetration and a greater resistance to a tearing action at each lateral margin.

If desired, the material may be made in relatively wide strip form and then wound into rolls and thereafter cut into narrower rolls giving that width of material most convenient for application to the pipe either by hand or by machine. Under the condition last mentioned, the strip unwound from certain of the narrower rolls will not have coating material at the edges, other than that left by the cutters in cutting a wide roll into a number of narrower ones.

The improved material as a whole is of high dielectric strength. For example the laminated constructions shown in Figs. 5 and 6 which are generally preferred, each has several times the dielectric strength per unit of thickness, of typical wrappers heretofore used for corrosion protection work. Hence, it is possible to provide a wrapper which is of much less thickness and yet has the same dielectric strength of the much thicker wrappers heretofore used, to supply one of the same thickness and provide many times the dielectric strength heretofore available or to make a wrapper which is but a fraction of the

thickness and yet still has substantially greater dielectric strength.

The material therefore has many advantageous characteristics which make it an effective agent in preventing corrosion.

In describing the invention I have referred in detail to the construction of the material and to the constituents of the parts thereof, as well as to one method by which the material may be made, but this is to be considered only in the illustrative sense so that I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

By the term "sheeted cellulosic substance" in the following claims is meant, a thin pliable imperforate sheet of such substance as distinguished from a fabric of cellulosic strands made by weaving, knitting, knotting, netting or braiding.

I claim as my invention:

1. In combination with means providing a metallic surface, a covering adhered thereto and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength, consisting essentially of petrolatum and having an A. S. T. M. melting point of from 125° to 175° F. and an A. S. T. M. penetration of 30 to 45, using 100 grams at 77° F. for five seconds, said composition being adherently coated on both sides of the sheeted material and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

2. In combination with means providing a metallic surface, a covering adhered thereto and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength, consisting of a petrolatum having an A. S. T. M. melting point of from 140° to 175° F. and an A. S. T. M. penetration of 30 to 45, using 100 grams at 77° F. for five seconds, said composition being adherently coated on both sides of the sheeted material and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

3. In combination which means providing a metallic surface, a covering adhered thereto and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength consisting of a mixture of a petrolatum having an A. S. T. M. melting point of from 125° to 160° F. and an A. S. T. M. penetration over 35 using 100 grams at 77° F. for five seconds, with paraffin wax having an A. S. T. M. melting point from 140° to 160° F. and an A. S. T. M. penetration of 5 to 15, using 100 grams at 77° F. for five seconds, said composition being adherently coated on both sides of the sheeted material and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

4. In combination with means providing a metallic surface, a covering adhered thereto and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength consisting of a mixture of a petrolatum having an A. S. T. M. melting point of from 125° to 160° F. and an A. S. T. M. penetration over 35, using 100 grams at 77° F. for five seconds, with a paraffin wax having an A. S. T. M. melting point of from 120° to 135° F. and with a small amount amount of a wax selected from the group consisting of carnauba wax, candelilla wax and montan wax, said composition being adherently coated on both sides of the sheeted material and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

5. In combination with a metallic pipe, a covering adhered thereto and spirally wrapped thereon and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength consisting essentially of petrolatum and having an A. S. T. M. melting point of from 125° to 175° F. and an A. S. T. M. penetration of 30 to 45, using 100 grams at 77° F. for five seconds, said composition being adherently coated on both sides of the sheeted material and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

6. In combination with means providing a metallic surface, a covering adhered thereto and embodying a plurality of layers of relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, and a vapor and moisture proof, elastic coating composition having high dielectric strength consisting essentially of petrolatum and having an A. S. T. M. melting point of from 125° to 175° F. and an A. S. T. M. penetration of 30 to 45, using 100 grams at 77° F. for five seconds, said composition being adherently coated on both sides of the covering and uniting the layers thereof and being of sufficient tackyness to provide surfaces of the covering which are self sealing.

7. In combination with means providing a metallic surface, a covering adhered thereto and embodying a relatively thin, pliable, sheeted, non-fibrous material selected from the group consisting of regenerated cellulose and cellulose derivatives, a vapor and moisture proof, elastic coating composition having high dielectric strength, essentially of petrolatum and having an A. S. T. M. melting point of from 125° to 175° F. and an A. S. T. M. penetration of 30 to 45, using 100 grams at 77° F. for five seconds, and a reinforcing sheeting of fibrous cellulosic material adhesively united to the non-fibrous sheeting by said composition and both adherently coated by said composition to provide sufficient tackyness to produce surfaces of the covering which are self sealing.

RAYMOND A. SHOAN.