July 14, 1936. H. VON FORSTER 2,047,655

MATERIAL FOR AND METHOD OF COVERING OBJECTS

Filed Dec. 12, 1934 2 Sheets-Sheet 1

Fig. 1.

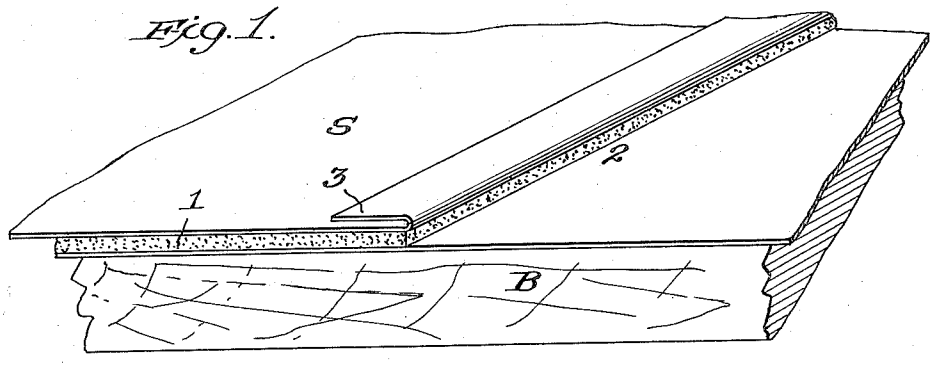


Fig. 2.

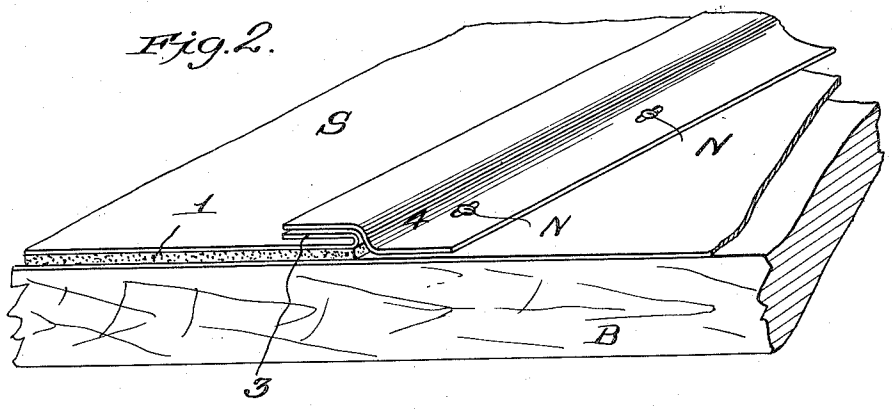
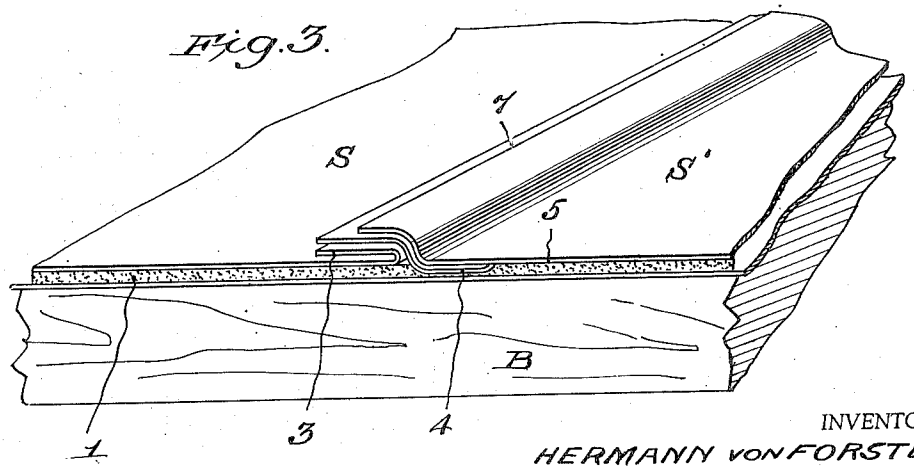


Fig. 3.



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Fig. 4.

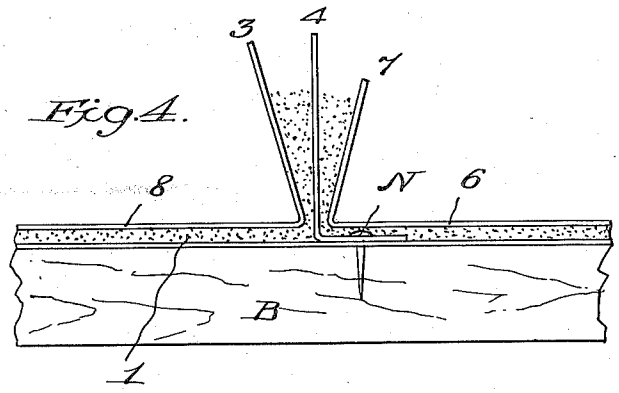


Fig. 6.

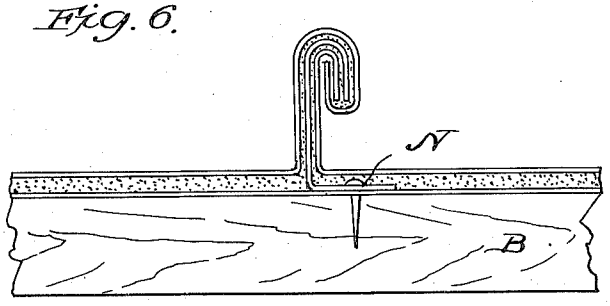
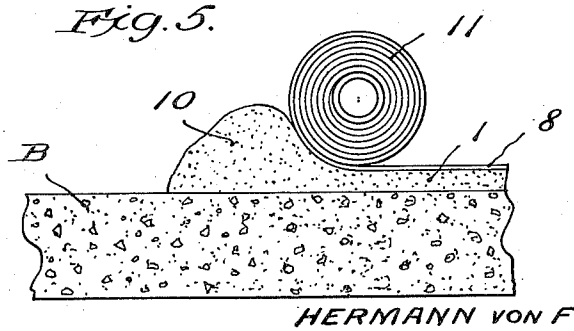


Fig. 5.



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UNITED STATES PATENT OFFICE

2,047,655

MATERIAL FOR AND METHOD OF COVERING OBJECTS

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Application December 12, 1934, Serial No. 757,126
In Germany September 5, 1930

4 Claims. (Cl. 108—6)

The present invention relates to a material and method for covering roofs, walls and the like by means of foil-like, flexible, long and non-corrosive metal sheets and, more particularly, to a material and method for installing roofings of the described type which are permanently attached to the base by means of a permanently plastic cementing mass intermediate to the metal sheet and the base.

Heretofore, the installation of roofing materials has been effected in such manner that first the base of wood-work or concrete or the like has been covered by a thin layer of the hot plastic cementing mass and thereafter the metal sheets supplied in rolls similar to rolls of wall paper have been spread out on the plastic mass and cemented thereto. The longitudinal edges of the adjoining sheets have been joined to each other by means of folding. The operation of folding was rather troublesome because the edges of the adjoining sheets had to be bent up and, consequently, a longitudinal margin had to be left uncoated by the cementing mass. Furthermore, the cementing mass when spread all over the base in a thin layer usually not exceeding a few millimeters in thickness cooled off rather quickly due especially to the good heat conductivity of the metal sheet. In view of the quick cooling, the adhesion of the mass to the bright metallic surface was considerably diminished. A further disadvantage was that there was danger that in time some moisture might enter the structure through the capillaries of the folds or through the holes of the retaining strips generally nailed to the base, even though the metal sheets were perfectly impermeable. Although attempts have been made to remedy the aforesaid disadvantages, no proposal, as far as I am aware, has been wholly practical, successful and satisfactory.

I discovered that the foregoing disadvantages can be eliminated in a remarkably simple way by providing the edges of the metal sheets with a bend of appropriate form and by arranging the retaining strips within the folds itself and filling out the intervals in the fold with the same plastic mass which is used for cementing the metal sheets to the base. I have also found that the adhesion of the metal sheets to the base is improved if the cementing mass is not spread out in a thin layer on the base before putting on the sheets, but a substantial amount or mound of the hot cementing mass is poured out directly in front of the roll of sheet metal and then pushing the roll into the mound and causing the hot plastic mass to spread out ahead of the roll.

It is an object of the present invention to facilitate the installation of roofings of the type herein described.

It is another object of the present invention to provide an improved foil-like flexible metallic roofing material in rolls similar to rolls of wall paper which can be easily installed and joined to other sheets of the same type by means of folding.

It is a further object of the invention to provide a method of joining adjacent sheets of the material and fastening same to the base in a simple and efficient manner.

The invention also contemplates a method of putting on the plastic cementing mass between the metal sheet and the base.

Other objects and advantages of the invention will become apparent from the following description and the accompanying drawings in which:—

Fig. 1 is a perspective view, somewhat fragmentary, of a roofing material embodying the principles of the invention;

Fig. 2 is a similar view of a sheet of roofing material and of a retaining strip for fastening same to the base;

Fig. 3 depicts perspectively two adjacent sheets of the roofing material which are joined to each other by means of folding and are attached to the base by means of a retaining strip and a thin layer of an adhesive plastic mass;

Fig. 4 is a cross section of a roofing similar to the one shown in Fig. 3 and made in the plane of that drawing; and

Fig. 5 illustrates the manner in which the plastic cementing mass is introduced between the metal sheet and the base.

Fig. 6 shows the roofing illustrated in Fig. 4 after the edge of the adjoining sheets are folded together to make a joint.

Referring now more particularly to Fig. 1, a wooden base is designated by the reference character B which is to be covered by the metal sheets. Upon base B is a thin layer 1 of an adhesive permanently plastic mass which bonds a metal sheet S thereto. An edge 3 of the metal sheets is bent back upwards before installing the sheet. I prefer to pre-bend the longitudinal edges of the metal sheets at the plant where the sheets are manufactured and before they are rolled upon or formed into rolls or drums. I found that no flaws are formed when putting the pre-bent sheets on drums and the like provided the proportion of the thickness of the sheet to the diameter of the drum is selected properly even though the sheet near its edges will be of double thickness. For

example, copper sheets of 0.1 or 0.2 millimeter in thickness can be wound up and off drums of 400 millimeters in diameter without producing flaws, wrinkles or other deformations on the bent over edges of the sheets. Generally speaking the thickness of the sheets used may vary between 0.5 and 0.1 millimeter or less and, of course, the diameter of the drum is preferably adapted to the sheet thickness.

The advantages of my invention can easily be appreciated when it is considered that with metal sheets of such type when applying the cementing mass it is not necessary to leave out a strip on the base as strip 2 in Fig. 1 but the complete surface may be covered with the plastic cementing mass and the sheet of metal is applied as shown in the drawings. The adjoining sheet is applied in a similar manner so that its bent edge comes close to that of the first sheet. After the sheets are applied, the bent back edges of both sheets are bent upwards vertically and are joined to each other by means of folding.

The adhesion provided by the permanently plastic cementing mass is sufficient to secure the metal sheet to the base. In some cases, however, I prefer to provide additional protection of the sheet by arranging a retaining strip to the base by means of nails, pins or the like. The arrangement of the retaining strip can be seen from Figs. 2 and 3, showing the retaining strip and the two adjoining sheets in progressive phases of the assembly. In Fig. 2, one of the sheets S has its edges 3 bent back and is secured to the base B by means of the plastic mass 1. Hereafter retaining strip 4 is laid flat on top of the edge of sheet S and fastened to the base B, for example, by means of nails N as indicated in the drawings. After this, the sheet S' is laid with its edge covering the retaining strip in its full width and cemented to the base as indicated in Fig. 3. I found that if edges 3 and 7 of the sheets S and S' and the free edge of the retaining strip 4 are folded together, in time some moisture might enter the capillaries of the fold and under certain conditions might even reach the base. To eliminate this possibility of leakage, I prefer to bend the edges 3 and 7 and the free edge of the retaining strip 4 vertically upwards as shown in Fig. 4, fill out the intervals with the plastic cementing mass, and then firmly unite them by means of folding. The advantages of this procedure are obvious. The retaining strip is placed inside of the fold and the holes in the same are not exposed to the influence of rain or water. At the same time the fold itself is completely covered and coated with the plastic mass. In this manner, even the slight chance of some moisture entering the capillaries of the fold is completely eliminated and a perfectly impermeable roofing is provided.

I have also found that it is of paramount importance that the cementing plastic mass should be hot and easily pliable at the moment the metal sheet is attached thereto. Previous to my invention this could not be accomplished because the plastic mass has been first spread out on the base in a thin layer of only 2 or 3 millimeters in thickness and then the sheets have been put on the base thus prepared. This prior procedure had the disadvantage that the plastic cementing mass due to its thinness and large surface cooled very rapidly, especially due to the great heat conductivity of the metal sheets employed, so that the sheets did not adhere well to the plastic cementing mass. According to the principles of my invention, this difficulty is easily overcome in a surprisingly simple way. As may be seen from Fig. 5, I pour out a substantial amount of the hot cementing mass next to roll 11 of the metal sheet 8 instead of spreading out the cementing mass on the surface or base to be covered, so that due to its great consistency it will form an accumulation or mound 10 which presses against the full width of the roll of the metal sheet. The roll of metal sheet is then rolled into this hot, plastic mound whereby the individual parts or particles of the cementing mass will be rolled along and will be rubbed against the surface of the metal and by the pressure of the roll and will be securely cemented thereto. Of course, the cementing mass adheres very well to the non-metallic base and when due to the progress of the roll these adhering parts or particles are pushed ahead, the accumulation of the hot, cementing mass before the roll will be maintained. It is this constant accumulation of the cementing mass in front of the roll that has the greatest importance for the present invention. The uppermost parts or particles of the cementing mass adhere to the metallic surface and these adhering parts or particles take up some more of the mass when the metal sheet is wound off from the roll. In this manner, the bright surface of the metal will be uniformly and completely covered by the cementing mass. I found by experiment that when the hot cementing mass is simply spread out in a thin and uniform layer as this has been in general practice heretofore and the metal sheet is then applied thereto, only 30 to 60% of the metallic surface is actually cemented to the base, whereas according to the principles of the present invention a perfect, substantially 100% union of the metal with the base is obtained. I also found that it is preferable to use a plastic cementing layer of approximately 1½ to 2½ millimeters in thickness.

In addition, my invention provides other important advantages. It is easily understood that a substantial accumulation or mound of the hot plastic mass will keep its high temperature much longer than a thin layer of the same mass. Due to its great heat capacity, the cementing mass will heat up the metal sheet quite considerably during the cementing process. The metal sheet will expand and after cooling off and contracting, it will lay smooth and under some tension due to the fact that the adhesion of a well cemented sheet to the base is very considerable. Seasonal and daily changes in temperature cannot cause deformations of the metal sheet, because a renewed expansion of the sheet due to an increase in temperature will merely reduce the inner tensions within the sheet.

The process of the present invention is of especial advantage if very thin sheets of metal approximately 0.1 to 0.2 millimeter (0.004 to 0.008 inches) in thickness are preferred for covering or insulating structural surfaces, although thicknesses up to about 0.5 mm. or even somewhat greater (0.6 mm.) may be used. In general thicknesses greater than the 0.0005 inch and less than 0.010 inch may be used. The amount of heat stored in the accumulation or mound of the cementing mass is capable of increasing the temperature of such thin sheets very considerably.

The invention provides a method of covering an object with a corrosion-proof, flexible and foldable metal in the form of a sheet of foil thickness and of sufficient mechanical strength to be handled without a supporting backing and

to withstand the mechanical stresses to which it is subjected in normal use but of less thickness and mechanical strength than is required of sheet metal roofing applied without adhesive attachment to the understructure and of securing the sheet directly to said surface by means of a hot mound of adhesive material. In carrying this invention into practice, it is contemplated to use a metal having such inherent flexibility and an adhesive having such inherent plasticity as to be capable of relative movement under differential thermal expansion and contraction without separation from the surface or from the metal covering.

Perfectly smooth covering surfaces of metal can thus be obtained also on irregular bases having cracks, bumps or holes. The principle of the invention can be applied with success also to greatly inclined or even perpendicular surfaces. In such cases, I prefer to start from the lowest part of the surface and to move the roll of metal sheet upwards into the substantial accumulation or mound of the cementing mass poured out before the roll, whereby the same advantages are realized as in the case of level or slightly inclined surfaces. Of course the coverings made according to the principles of the invention may be also used as insulating layers inserted or embedded in structures, for example tunnels and the like, to waterproof them against ground water or moisture.

In the present specification, I have described the preferred embodiments of my invention but it is readily understood that many variations and modifications are possible and will suggest themselves to those skilled in the art without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:—

1. The method of covering structural surfaces with sheets of non-corrosive metal of foil-like thickness and of accentuated length which comprises positioning a roll of metal sheet on a base to be covered, pouring a hot cementing mass on said base immediately in front of and next to said roll of metal sheet said mass having a very substantial volume and a relatively small cooling surface, rolling said roll of metal sheet into said hot cementing mass at the same time unwinding the sheet therefrom, pushing the portion of the cementing mass not retained between the metal sheet and the base ahead of the roll in the form of a substantial mound of considerable heat capacity adapted to heat the unwinding sheet to preferred cementing temperatures, and continuing said operation until the full length of the base is covered.

2. The method of covering structural surfaces with non-corrosive, foldable metal sheets of foil-like thickness which comprises folding backwards the side edges of a metal sheet of accentuated length to form a folded double marginal portion, rolling up said sheet to provide a roll having the said doubled marginal portion towards the inside, positioning said roll on a base to be covered, pouring a hot and plastic cementing mass on said base immediately in front of and next to said roll of metal sheet said mass having a very substantial volume and a relatively small cooling surface, rolling said roll of metal sheet into said hot cementing mass at the same time unwinding the sheet therefrom, pushing the portion of the cementing mass not retained between the metal sheet and the base ahead of the roll in the form of a substantial mound of considerable heat capacity adapted to heat the unwinding metal sheet to preferred cementing temperatures, and continuing this operation until the full length of the sheet is firmly and uniformly cemented to the base with the exception of the folded marginal portion which may be easily bent upwards for the purpose of making a joint.

3. The method of covering structural surfaces with non-corrosive metal sheets of foil-like thickness which comprises folding backwards the side edges of a metal sheet of accentuated length to form a folded double marginal portion, rolling up said sheet to provide a roll having the said doubled marginal portion towards the inside, positioning said roll on a base to be covered, pouring a hot and plastic cementing mass on said base immediately in front of and next to said roll of metal sheet, said mass having a very substantial volume and a relatively small cooling surface, rolling said roll of metal sheet into said hot cementing mass at the same time unwinding the sheet therefrom, pushing the portion of the cementing mass not retained between the metal sheet and the base ahead of the roll in the form of a substantial mound of considerable heat capacity adapted to heat the unwinding sheet to preferred cementing temperatures, continuing this operation until the full length of the sheet is firmly and uniformly cemented to the base with the exception of the folded marginal portion, bending said uncemented, folded marginal portion of said sheet vertically upwards, and forming a joint with the corresponding edge of another adjacent sheet prepared and laid on said base in similar manner.

4. The method of covering structural surfaces with non-corrosive metal sheets of foil-like thickness which comprises folding backwards the side edges of a metal sheet of accentuated length to form a folded double marginal portion, rolling up said sheet to provide a roll, positioning said roll on a base to be covered, pouring a hot and plastic cementing mass on said base immediately in front of and next to said roll of metal sheet said mass having a very substantial volume and a relatively small cooling surface, rolling said roll of metal sheet into said hot cementing mass at the same time unwinding the sheet therefrom, pushing the portion of the cementing mass not retained between the metal sheet and the base ahead of the roll in the form of a substantial mound of considerable heat capacity adapted to heat the unwinding sheet to preferred cementing temperatures, continuing this operation until the full length of the sheet is firmly and uniformly cemented to the base, preparing and laying another sheet adjacent to the first sheet in the same manner, bending up the uncemented, folded marginal portion of said sheets, placing a retaining strip between said sheets one edge of said retaining strip being rigidly fastened to the base the other edge of said retaining strip being bent upwards and arranged between the bent up edges of the covering sheets, filling the gaps between all three side edges with a permanently plastic cementing mass and joining said edges together by means of folding.

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