Jan. 26, 1965 W. B. GOLDSWORTHY 3,166,838

METHOD OF SECURING EXPANDED METAL TO THIN PLIABLE MATERIAL

Filed April 2, 1962 3 Sheets-Sheet 1

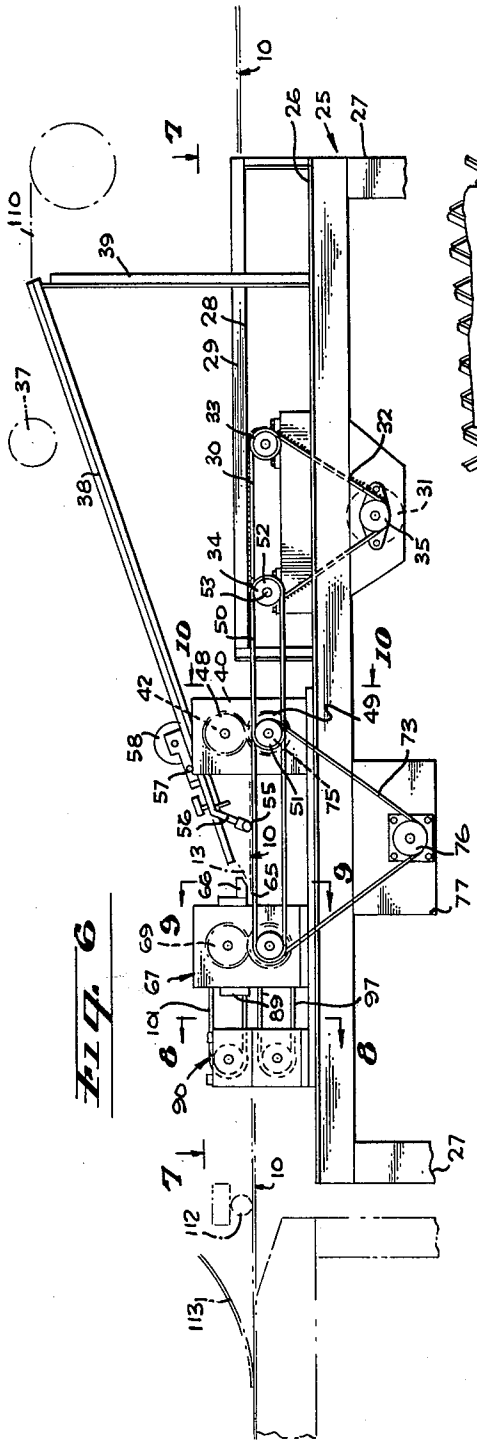


Fig. 6

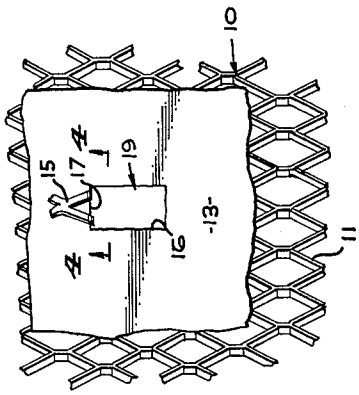


Fig. 2

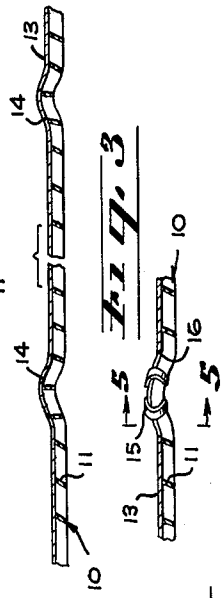


Fig. 3

Fig. 4

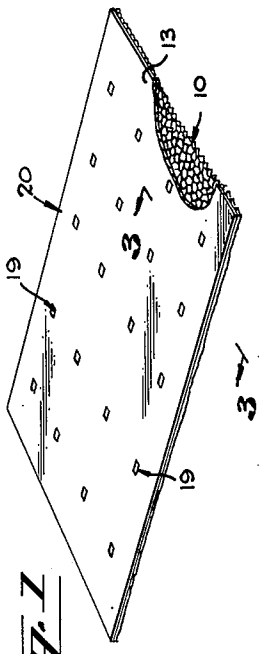


Fig. 7

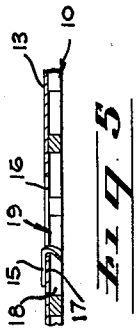


Fig. 5

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METHOD OF SECURING EXPANDED METAL TO THIN PLIABLE MATERIAL

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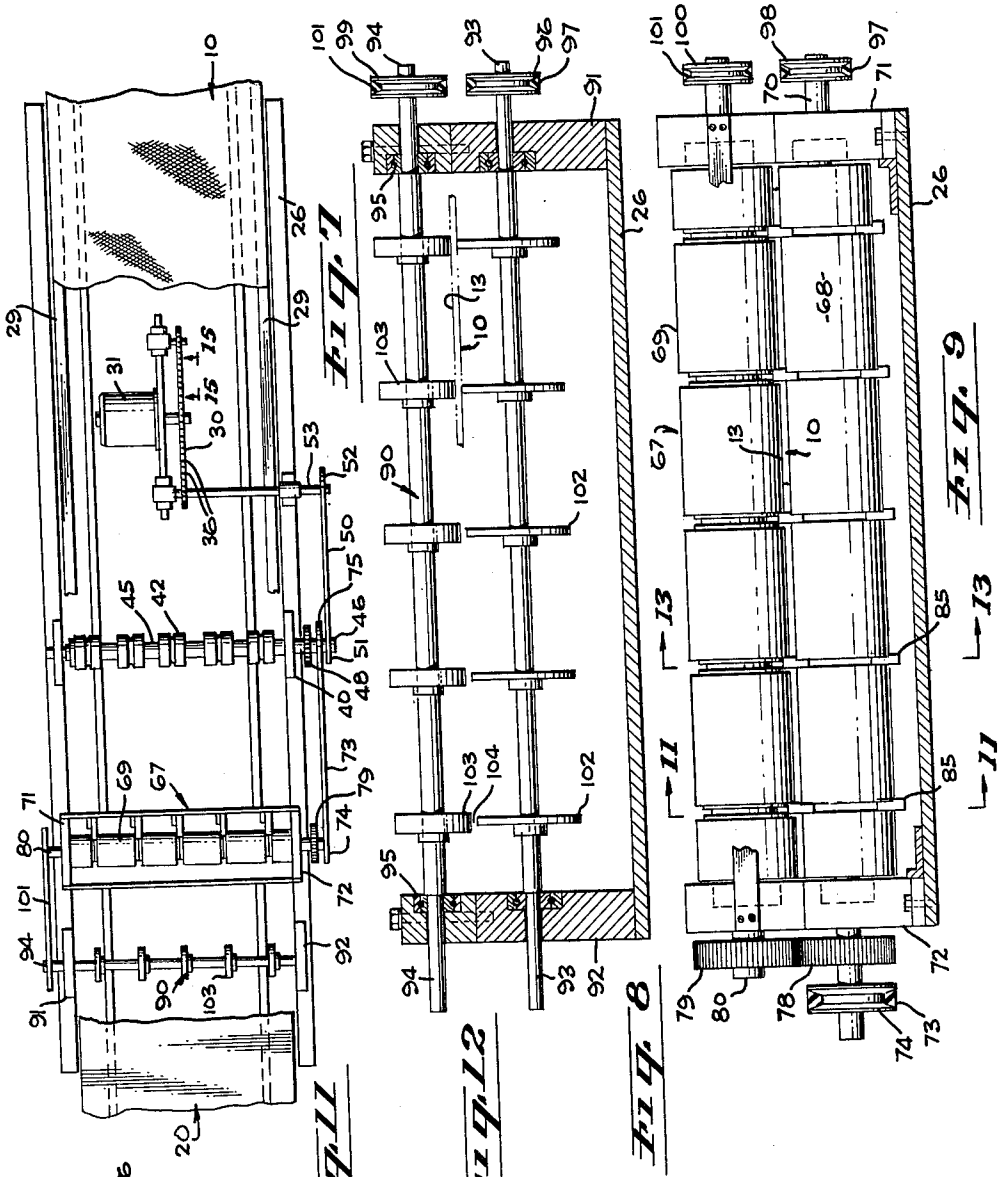


Fig. 1

Fig. 8

Fig. 9

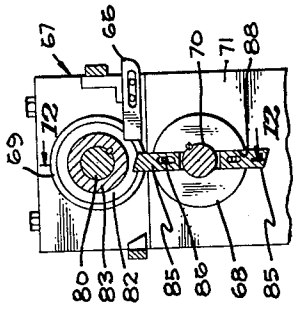


Fig. 11

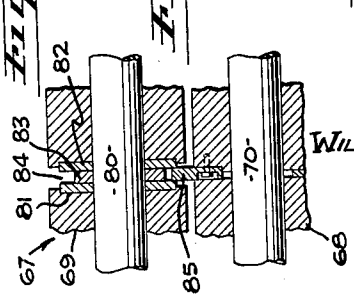


Fig. 12

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METHOD OF SECURING EXPANDED METAL TO THIN PLIABLE MATERIAL

Filed April 2, 1962 3 Sheets-Sheet 3

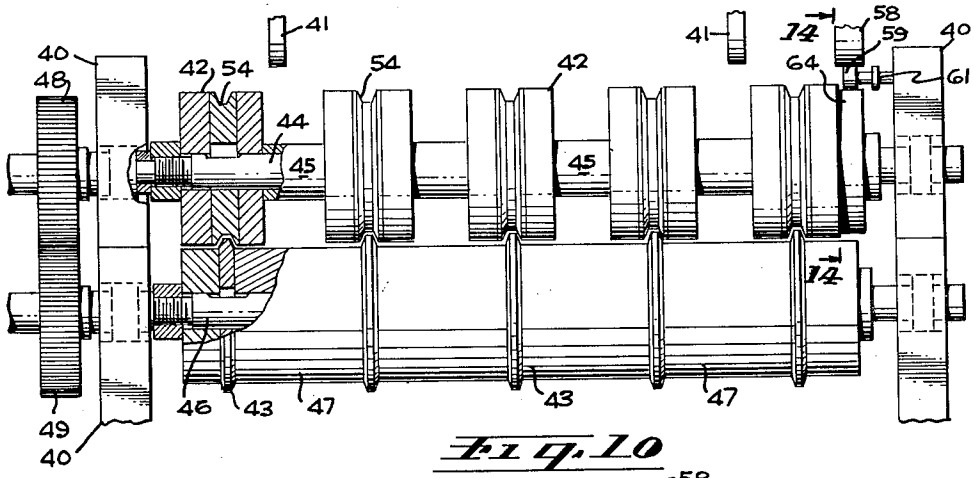


Fig. 10

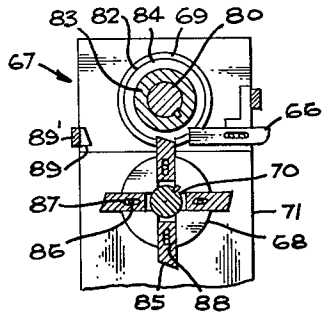


Fig. 13

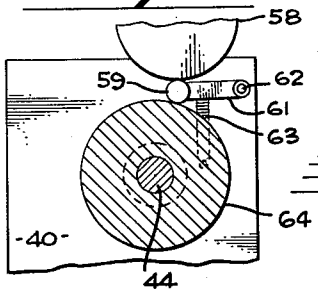


Fig. 14

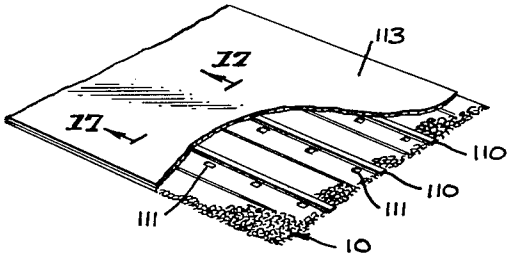


Fig. 16

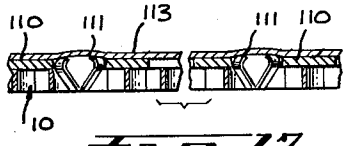


Fig. 17

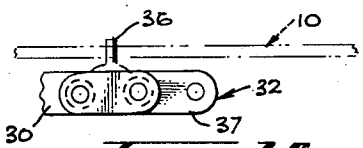


Fig. 15

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3,166,838
METHOD OF SECURING EXPANDED METAL TO THIN PLIABLE MATERIAL

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Filed Apr. 2, 1962, Ser. No. 184,111
4 Claims. (Cl. 29—432)

The invention relates to expanded metal both with respect to the product and the method of making the same and refers more particularly to expanded metal having a backing or coating of some kind so that the amount of plaster or other material which is applied thereto can be limited to an extent.

The most common expedient employed in recent years for application of the familiar stucco to a building wall is to nail over the area an expanse of expanded metal or expanded metal lath and to trowel the mortar over the expanded metal lath, pressing it through the holes, so that the mortar keys in place. Ordinarily, when a building wall is to be finished in this fashion, some form of paper, at times waterproof but sometimes merely insulating paper, is first tacked to the sheeting and then the expanded metal is nailed in place over the paper. On some occasions furring strips are applied to the surface and the expanded metal attached thereto but on other occasions where building codes permit the expanded metal may be nailed or tacked directly to the surface structure. This expedient has worked substantially satisfactorily in the past where troweling has been depended upon to apply the mortar. This has been true whether the mortar is conventional plaster or whether it is in the form of a cement mortar which ultimately sets up like concrete. By following this procedure, the craftsman has been able to determine the amount and depth of mortar applied to the expanded metal to a sufficient degree by controlling the pressure which is used to trowel the material into place.

More recently there has been considerable resort to spraying on mortar which has been prompted to a large degree by the success experienced by a spray-on process for concrete frequently identified as the "Gunite" process.

When spray-on techniques are employed for applying plaster, mortar and concrete as mentioned, the depth and quantity of the applied material cannot be as readily controlled partly because of the fact that the force of the spray tends to drive the material well behind the expanded metal, filling up areas behind the metal to an unnecessarily great degree. This is particularly true when the surface over which the expanded metal is applied is a rough surface or one full of cracks, voids and spaces of various kinds. The difficulty is especially prevalent where the expanded metal is fastened to furring strips under which circumstance the spray-on technique is virtually prohibitive.

It is therefore among the objects of the invention to provide a new and improved expanded metal sheet and method of making the same whereby there is fastened to the expanded metal a thin sheet of inexpensive material impervious to the penetration of mortar, plaster and grout, whereby the quantity of such material applied to the expanded metal is very definitely limited.

Another object of the invention is to provide a new and improved composite sheet of expanded metal and backing together with a method of making the same which incorporates a backing of such modest cost as to increase the over-all cost of the expanded metal and its application to a very minimum degree but at the same time provide a very substantial saving in the amount of material which is applied to it, especially by means such as spraying technique.

Still another object of the invention is to provide a new and improved composite expanded metal material incorporating expanded metal and a relatively impervious backing together with a method of making the same such that the composite material need not comprehend more than the materials themselves without need for the employment of auxiliary fastening means to connect the sheets together.

Still further among the objects of the invention is to provide a new and improved composite expanded metal material and method of making the same whereby a backing can be provided for the metal portion which is moisture-proof or, in any event, moisture-resistant, and fastened fairly snugly against the expanded metal portion so that even though the composite material be attached to a structure wherein there is no substantial backing for the expanded metal, a limited though sufficient quantity of mortar, plaster or grout can be applied thereto quickly and easily, either by hand troweling or by spraying and even in a considerably moist condition whereby to produce a dependable structure when hardened.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a typical composite sheet of expanded metal and appropriate backing.

FIGURE 2 is a fragmentary plan view of a section of the sheet of FIGURE 1.

FIGURE 3 is a fragmentary cross-sectional view taken on the line 3—3 of FIGURE 1.

FIGURE 4 is a fragmentary cross-sectional view taken on the line 4—4 of FIGURE 2.

FIGURE 5 is a fragmentary longitudinal sectional view taken on the line 5—5 of FIGURE 4.

FIGURE 6 is an elevational view partially diagrammatic of a typical machine capable of performing the method and producing the composite expanded metal product.

FIGURE 7 is a plan view taken on the line 7—7 of FIGURE 6.

FIGURE 8 is a cross-sectional view taken on the line 8—8 of FIGURE 6.

FIGURE 9 is a cross-sectional view taken on the line 9—9 of FIGURE 6.

FIGURE 10 is a cross-sectional view taken on the line 10—10 of FIGURE 6.

FIGURE 11 is a fragmentary longitudinal sectional view taken on the line 11—11 of FIGURE 9.

FIGURE 12 is a fragmentary cross-sectional view taken on the line 12—12 of FIGURE 11.

FIGURE 13 is a fragmentary longitudinal sectional view taken on the line 13—13 of FIGURE 9.

FIGURE 14 is a fragmentary longitudinal sectional view taken on the line 14—14 of FIGURE 10.

FIGURE 15 is a side elevational view of a portion of the mechanism for advancing the expanded metal to the process.

FIGURE 16 is a perspective view of a slightly modified composite sheet partially broken away to show the interior structure.

FIGURE 17 is a cross-sectional view taken on the line 17—17 of FIGURE 16.

In an embodiment of the invention chosen for the purpose of illustration, one form of the product as shown in FIGURES 1 through 5, inclusive, consists of a sheet 10 of expanded metal, often called expanded metal lath, of which the diamond-shaped pattern is exemplary only.

Cross-strips 11 which make up the diamond pattern are tilted slightly and give the sheet appreciable thickness as is evident from an examination of FIGURES 3, 4 and 5.

Attached to the sheet 10 of expanded metal is another sheet 13. Kraft paper or other paper forms for most purposes a very satisfactory sheet, although it is appreciated that the sheet 13 may be virtually any very thin gage, inexpensive, relatively impervious or imperforate material. Examples, include other forms of paper and certain types of synthetic plastic sheet material which has sufficient body to hold its shape and sufficient strength to enable attachment to the expanded metal.

An added expedient in some forms of expanded metal, and particularly where made necessary by local building codes under circumstances where no furring strips are used, consists of ridges 14 provided in the expanded metal at spaced intervals which, when applied against some supporting surface, serve to hold the expanded metal out away from the surface by a distance comparable to the height of the ridges.

In order to attach the sheet 13 to the sheet 10, tongues 15 are punched from the cross-strips 11 of the sheet 10, the punching serving to tear or puncture the sheet 13 forming apertures 16. The apertures 16 need not necessarily be defined by a clean-cut hole but may be merely a torn out hole, torn when the tongue 15 is punched out and driven through the sheet. The tongue, moreover, is bent over an edge 17 of the sheet 13, the tongue being forced into engagement with the edge 17 and pressed physically against adjacent portions 18 of cross-strips 11. Although the tongue 15 may be slightly ragged, as may also be the edge 17, the very roughness and raggedness will serve to provide a secure fastening means for attaching the sheet 13 at many points 19 over the area of the sheet 10 of expanded metal. In the chosen embodiment the points 20 lie upon the ridges 14, although it is appreciated that attachments of the same general nature throughout other portions of the sheet 10 may serve satisfactorily.

To provide a quick, inexpensive and effective method of constructing a composite sheet indicated generally by the reference character 20 which, as shown in FIGURES 1 through 5, inclusive, is made up of the two sheets 10 and 13, a machine may be provided for automatically attaching large sheets together. Although a variety of types of machinery may be employed, one typical of a satisfactory assembling machine is shown in the drawings consistings of a frame indicated generally by the reference character 25 having a bed 26 and supporting legs 27. At the right end of the bed is a table 28 having rails 29 at the sides for guiding the sheet 10 of expanded metal. The expanded metal may be hand fed, if desired, to the table where it may be picked up by a carrier 30 and advanced into the machine to the process which attaches the sheets together. To operate the carrier, and incidentally other portions of the machine, there is provided a motor 31 mounted beneath the bed 26 interconnected by a belt 32 with idler pulleys 33 and 34, the belt being driven by a pulley 35 of the motor. As here shown the carrier comprises a projection 36 supported upon links 37 which make up the belt 32. As the belt 32 is driven endlessly around the pulleys, the projection projects up through the diamond pattern of the sheet 10 and carries it forward from right to left into the machine to a location where the process starts.

The sheet 13 which may be paper can be stored upon a paper roll 37, if desired, or at some other convenient location and form such that the sheets can be fed manually or by other means to a paper feed 38 supported in a sloping arrangement by columns 39 at one end and by plates 40 at the other end. Gravity can be depended upon to draw the sheet 13 downwardly into the operation in the absence of a suitable feed means for that purpose. Rollers 41 may be employed for pressing the sheet 13 downwardly as it advances.

As the sheet 10 of expanded metal is fed to the operation, it is picked up by pairs of forming rolls 42 and 43. The forming rolls 42 comprise a plurality of rolls keyed to and spaced axially upon a shaft 44, the rolls being properly spaced by spacing sleeves 45. Similarly, the forming rolls 43 are carried by and axially spaced along a shaft 46, spacing between the rolls 43 being determined by spacing sleeves 47. The shafts 44 and 46 are driven at the same rates of speed, being interconnected by means of gears 48 and 49. The drive is accomplished by means of a belt 50 extending from the shaft 46 and a suitable pulley 51 thereon to a pulley 52 on a shaft 53 which also serves to mount the belt 32.

As shown the forming rolls 42 have annular recesses 54 therein and the forming rolls 43 have a wedge-shaped annular contour which meshes with the recess 54 in each instance. As the forming rolls 42 and 43 roll in counter-rotation to each other in engagement with the sheet 10 of expanded metal, these rolls serve to form the ridges 14 heretofore described as well as to grip the sheet and to advance it through the process, after it becomes disengaged from the projections 36.

In the product formed by the process and machinery herein described, it is desirable to have the paper about one inch shorter than the expanded metal lath. Therefore, it becomes necessary to provide a means of indexing the paper so that a margin is provided between the edge of the lath and the edge of the paper at each end. The lath itself must also be indexed to make this possible. The index is arranged so that the first punched holes always fall at the same distance from the edge of the expanded metal which enters the operation. Spacing is accomplished by having the belt 32 upon which is mounted the projection 36 geared to the perforating roll so that it always starts the sheet of expanded metal through the machine in proper timing with the punch position on the perforated rolls. Proper indexing provides a one-half inch space at each end between the edge of the expanded metal and the edge of the paper.

Paper feeding accordingly must be indexed to start at the right point with respect to the expanded metal. To accomplish this, when the leading edge of the expanded metal emerging from the forming rolls engages a cam follower roll 55 on a downwardly extending pivoted arm 56, pivoting about a point 57, the thickness of the metal is sufficient to raise the cam follower so as to in turn force a roller 58 into engagement with a running idler 59, thereby providing friction drive to conventional rubber disc drive rolls 41 in engagement with the paper which, prior to this pivotal motion, has been restrained along its feeding edge by upwardly extending stops of conventional character (not shown). The same pivotal motion through a conventional mechanism, likewise not shown, may be employed to retract the stops at the same instant as the rubber drive rolls are advanced. The paper is thus fed into position upon the expanded metal at the proper moment for correct indexing. As shown, the idler 59 is mounted upon an arm 61 pivoted at a point 62 and normally drawn by a spring 63 into engagement with a cylindrical drive surface 64.

As the sheet of expanded metal is advanced by the means just described, a sheet 13 of paper or other flexible material is likewise advanced down the paper feed 38 by the paper rollers 41 until the expanded metal and paper meet at a point 65, as shown to the left of the mid-portion of FIGURE 6. When the sheets of expanded metal are manually fed one sheet at a time, the sheets 13 of flexible material may also be fed one at a time rather than from a roll like the roll 37 under which circumstances some form of cut-off would need to be automatically supplied. A guide 66 serves to impress the sheet 13 downwardly into engagement with the sheet 10 and in particular in engagement wtih the peaks of the ridges 14.

The next step which is undertaken by a set 67 of punching rollers serves to punch out the tongues 15 extending

them through punched out apertures 16 is in the sheet 13 to a position where they can be subsequently bent over to the form previously described. The set 67 of punching rollers are located immediately to the left of the point 65, as shown in FIGURE 6.

The set of punching rollers consists of a lower roller 68 and an upper roller 69. The relationship of these rollers is shown to good advantage in FIGURES 9, 11, 12 and 13. The roller 68 is carried by a shaft 70 having suitable bearing mounts in brackets 71 and 72. A belt 73 in engagement with a pulley 74 on the shaft 70 passes over a pulley 75 on the shaft 46 from which power is taken. An idler pulley 76 may be provided mounted upon a bracket 77 beneath the bed 26. Gears 78 and 79 intermeshing as shown create a counterrotation in the shaft 70 and a shaft 80, the shaft 80 serving to mount the upper roller 69.

On the shaft 80 discs 81 and 82 on opposite sides of a spacer 83 create a space 84 for reception of teeth 85 on the shaft 70. In the chosen embodiment there are four teeth spaced circumferentially at equal distances around the shaft and fastened by means of adjusting screws 86 in a well-known fashion so that the teeth can be adjusted outwardly or inwardly, as may be desired, to produce longer or shorter tongues 15, there being provided suitable adjusting slots 87 for reception of the screws. A recess 88 in the lower roll 68 accommodates the teeth.

As the sheets 10 and 13 together are passed to the set 67 comprising the rollers 68 and 69 at each of the respective locations extending across the machine, the teeth 85 at longitudinally spaced intervals will punch out tongues 15. Although, as shown in the drawings, the tongues 15 are punched from that portion of the expanded metal identified as comprising ridges 14, it will be understood that the tongues, if desired, may be punched from other portions of the expanded metal, even though ridges may also be provided, and particularly for expanded metal where there may be an absence of ridges. The same practice may also follow where, instead of the ridges as shown, raised portions may be substituted in the form of dimples.

When the tongues 15 are punched out of the expanded metal, the tongue in each instance is punched through the sheet 13 making a hole in the sheet as the result of the combined effect of the tongue being driven through the sheet by action of one of the teeth 85 which also is long enough to penetrate the sheet 13. When the two sheets leave the set 67 of punch-out rollers, the tongues 15 stick outwardly relative to the sheets and must subsequently be bent over to the positions shown in FIGURES 2, 4 and 5.

When first punched out the tongues extend forwardly and upwardly at an obtuse angle relative to the expanded metal. To bend the tongues backwardly past a 90 degree angle prior to passing through the succeeding bending operation, the tabs engage triangular wedge blocks 89, as shown in FIGURE 13, the blocks being mounted successively upon a crossbar 89' at the location shown in FIGURE 6, namely, on the exit side of the perforating roll. The subsequent bending over is accomplished by a set 90 of rollers which are located immediately to the left of the set 67 of rollers as shown in FIGURES 6 and 7. The form and relationship of the rollers of the set 90 are shown in FIGURE 8. Brackets 91 and 92 on opposite sides of the bed 26 support a lower shaft 93 and an upper shaft 94 on suitable conventional bearings 95. A pulley 96 at one end of the shaft 93 over which is reeved a belt 97 may be driven from the shaft 70 by virtue of having the belt engage a pulley 98 thereon.

In a similar fashion the shaft 94 having a pulley 99 thereon may be driven from the shaft 80 having a pulley 100 thereon through a belt 101.

On the shaft 93 is a series of axially spaced rollers 102, the spacing of which conforms with the spacing of the pulleys 68 and teeth 85 and also the spacing of the ridges

14. Matching the rollers 102 is a set of similarly spaced rollers 103 on the shaft 94. The circumferences of the rollers 103 are spaced from the circumferences of the rollers 102 forming spaces 104 as indicated on FIGURE 8, the spacing being determined by the thickness of the sheet 10 of expanded metal. As the tongues 15 bent to the new position and accompanied by the sheets 10 and 13 pass beneath the rollers 103 and over the rollers 102, the rollers roll the tongues 15 to the bent position shown in FIGURES 2, 4 and 5. Although there may be some irregularity in the bending over process due in part to irregularity in the punching-out process in the first instance, the irregularity is in fact beneficial. When the tongues are roughly bent into position the irregularity serves to enhance the grip of the tongue and its ragged edge upon a sheet 13 so as to more firmly fasten it in place. During the rolling down or bending over process, the rollers 102 back up the portion of the expanded metal immediately adjacent the punched-out tongue, as the tongue is forced against the sheet 13, pressing it into engagement with the sheet 10.

Moreover, due in part to the fact that the sheet 13 is engaged at many points simultaneously throughout its expanse, the sheet is held reasonably taut and under mild tension so that it remains spread out flat. After being attached it is firmly held in engagement with the sheet 10 so that the composite sheet consisting of two sheets attached together in this fashion can be easily handled upon being taken from the machine and stacked and tied for shipment.

On those occasions where there is need for a degree of waterproofing, a compound sheet like that illustrated in FIGURES 16 and 17 is preferred. In this instance there is applied to the sheet 10 of expanded metal a series of strips 110 which may be attached at ridges 14 or spaced as desired across the sheet 10 in these instances where no ridges are provided. In the chosen embodiment the sheet 10 is shown as one without ridges and accordingly the strips lie flush with respect to the surface of the expanded metal. In this instance the strips are fastened by employment of tongues 111 which are punched out and bent over in precisely the same manner as has been described in connection with the tongues 15. Expanded metal is fed to the machine in the same fashion but instead of a large sheet like the sheet 13 being applied to the paper feed 38, the strips 110 are supplied instead. The strips are spaced to the extent shown by suitable guiding means and are aligned with the spacing of the rollers of the set 67 and the rollers of the set 90. In this instance, of course, the forming rollers 42 and 43 are dispensed with.

As the expanded metal having the strips 110 attached thereto as shown and described passes from the set 90 of rollers, a glue roll 112 located in alignment with each pair of rollers 102, 103 applies a line of glue to the strip 110. As a matter of preference the glue roll may be offset laterally slightly with respect to the bent-over tongues 111 so that the glue strip will be continuous and uninterrupted by the punched-out holes. After the glue line has been applied to each of the strips, a waterproof sheet 113 co-extensive with the expanded metal is applied and pressed against the glue lines until the glue has set. No extra pressure is needed inasmuch as the pressure exerted as the composite strips thus formed are stacked one upon the other may be depended upon to exert sufficient pressure so that the gluing attachment will be accomplished throughout the entire area. By applying an imperforate waterproof sheet in this fashion to the strips 110, the composite sheet thus formed takes advantage of the simple, inexpensive, attaching expedient heretofore described and in addition provides an imperforate sheet, thus making the composite sheet completely imperforate to whatever degree is achieved by the waterproof character of the sheet 113. The additional expense is little more than the very modest cost of the strips 110

and the time consumed in applying the sheet 113 after the glue lines have been traced.

In view of the need for low cost in providing expanded metal for spray-on techniques, the simple expedient herein described of applying paper or other material attached directly to the expanded metal, either simply, as in the first form, or as an imperforate waterproof backing in the second form, satisfies the need in the form shown. Only a modest amount of sprayed on material will be sufficient to adequately coat the expanded metal without prospect of undue accumulation of surplus mortar behind the expanded metal. The material not only is productive of a great saving in avoiding waste as indicated, but also is of considerable help in maintaining a very improved, smooth finish on the surface by reason of the fact that there is no unbalanced accumulation of extra material upon the expanded metal.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having thus described the invention what is claimed as new in support of Letters Patent is:

1. A method of forming a layer of expanded metal material and a layer of relatively thin pliable material into a composite sheet of material for attachment to a support for application of plastic material in mortar-like condition comprising laying said respective layers of expanded metal material and pliable material one upon the other, passing said layers of material in a continuous line of travel in a selected direction toward a final destination, puncturing said layer of expanded metal material during movement thereof in said selected direction at each of a plurality of points to produce a tongue of said expanded metal material at each point, driving said tongue of expanded metal material at each point through said layer of pliable material whereby to puncture said layer of pliable material severing a tab of said pliable material at the side of a hole toward said final destination, then bending each respective tongue of expanded metal material in a direction counter to said selected direction to a location over an adjacent unpunctured area of said layer of pliable material and an adjacent unpunctured area of expanded metal material during travel of said layers in said selected direction, and forcing said unpunctured area of said pliable material into engagement with said expanded metal material.

2. A method of forming from a layer of expanded metal material and a layer of relatively thin pliable material into a composite sheet of material for attachment to a support for application of plastic material in mortar-like condition comprising passing said layers of material in a continous line of travel in a selected direction toward a final destination, rolling a series of spaced parallel ridges in said expanded metal material, laying said layer respectively of expanded metal material and pliable material one upon the other, tearing a plurality of cross-strips of said layer of expanded metal material at each of a plurality of points along the respective ridges and producing thereby a tongue of said expanded metal material at each point having ragged ends, driving said tongue of expanded metal material at each point through said layer of pliable material whereby to puncture said layer of pliable material at the location of the respective tongue of expanded metal material, then bending each respective tongue of expanded metal material to a location over an adjacent unpunctured area of said pliable material and an adjacent unpunctured area of expanded metal material, and forcing said unpunctured area of said pliable material into engagement with said expanded metal material.

3. A method of forming from a layer of expanded metal material and layers of relatively thin pliable material into a composite sheet of material for attachment to a support for application of plastic material in mortar-like condition comprising laying said layers of expanded metal material and pliable material respectively one upon the other, passing said layers of material in a continuous line of travel in a selected direction, breaking a plurality of cross strips of said layer of expanded metal material during travel thereof at each of a plurality of points to produce a multiple edged tongue of said expanded metal material at each point and driving said tongue of expanded metal material at each point through one of said layers of pliable material whereby to puncture said one layer of pliable material with the respective tongue of expanded metal material then while said layers of material continue to travel bending each respective tongue of expanded metal material at an angle counter to said selected direction and overlying an adjacent unpunctured area of said one layer of pliable material and an adjacent unpunctured area of the expanded metal material, and forcing said unpunctured area of said pliable material into engagement with said expanded metal material, and then in a separate operation fastening an imperforate layer of said pliable material to said punctured layer of pliable material.

4. A method of forming a layer of expanded metal material and a layer of relatively thin pliable material into a composite sheet of material for attachment to a support for application of a plastic material in mortar-like condition comprising laying said respective layers of material one upon the other, passing said layers of material in a continuous line of travel in a selected direction toward a final destination, while said layers of material are traveling breaking a plurality of cross-strips of said layer of expanded metal material at each of a plurality of points to produce a tongue of said expanded metal material at each point attached to said layer of material at one edge only of a hole opened therethrough and driving said tongue of expanded metal material at each point through said layer of pliable material, also while said layers of material are traveling, bending each tongue of said expanded metal material from an initial bent out position to an angular position facing counter to the selected direction of travel, then during travel of said layers of material, pressing each tongue into engagement with a portion of said layer of pliable material immediately adjacent the tongue and into engagement with a portion of the expanded metal material immediately beneath said portion of said pliable material whereby to anchor pliable material to said expanded metal material.

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