June 8, 1943. H. C. KOCH 2,321,396

METHOD OF AND APPARATUS FOR MANUFACTURING BUILDING COVERING SHEET MATERIAL

Filed Aug. 5, 1939

3 Sheets-Sheet 1

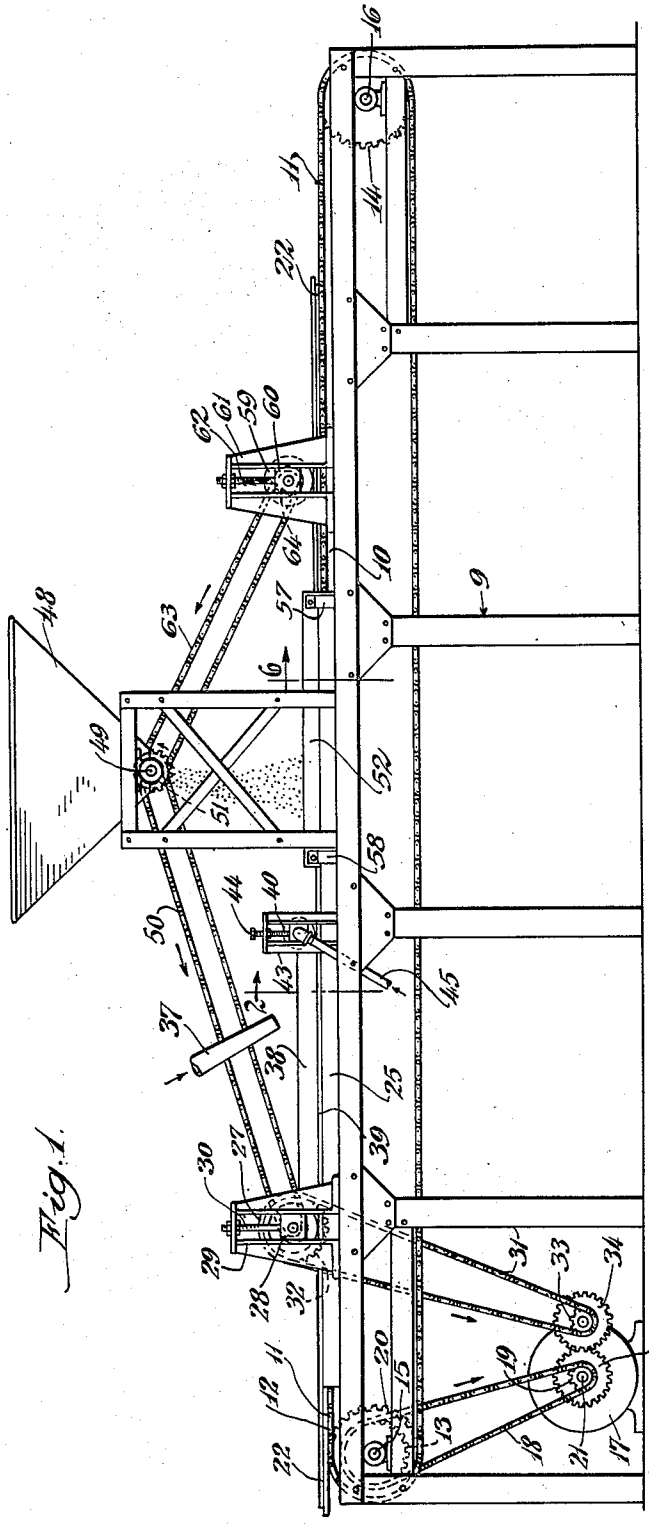

Fig. 1.

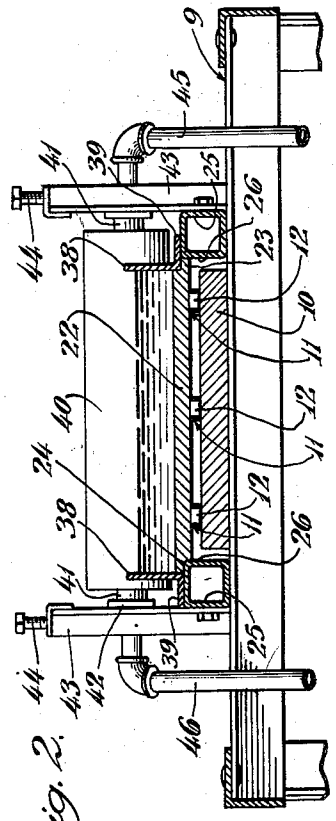

Fig. 2.

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3 Sheets-Sheet 2

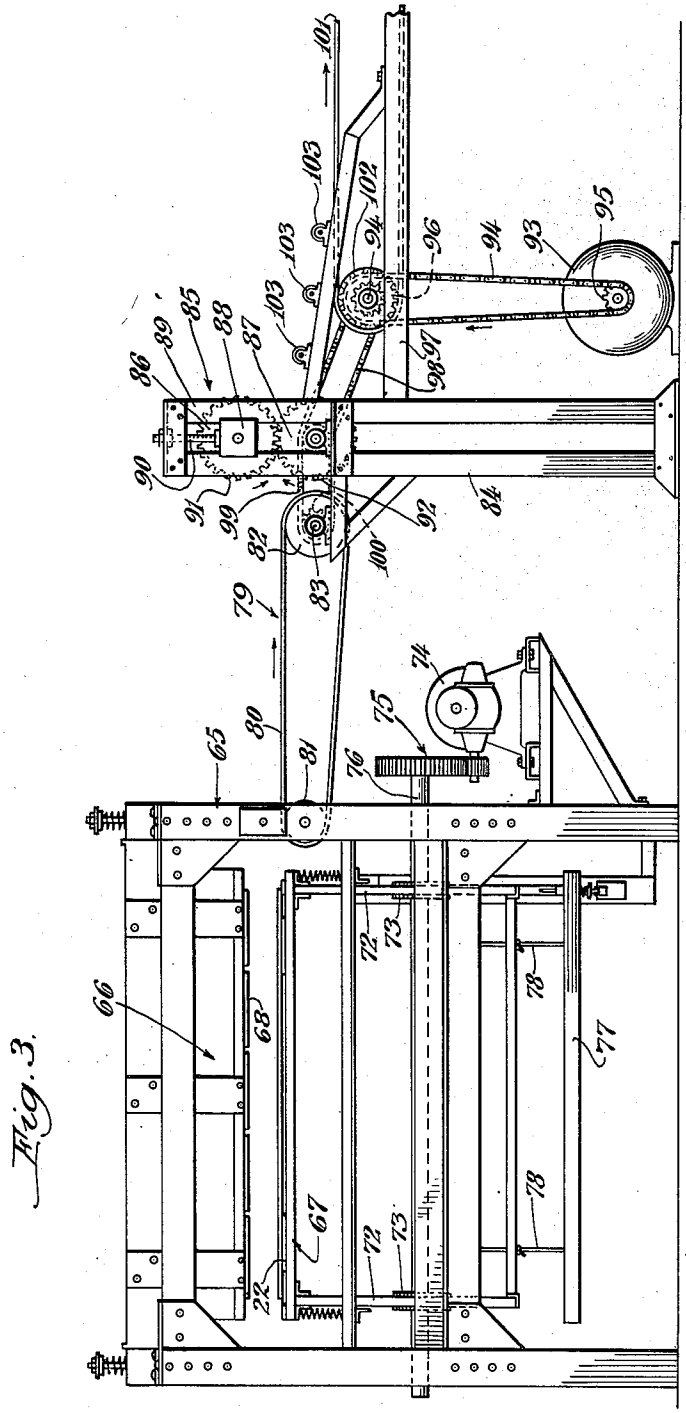

Fig. 3.

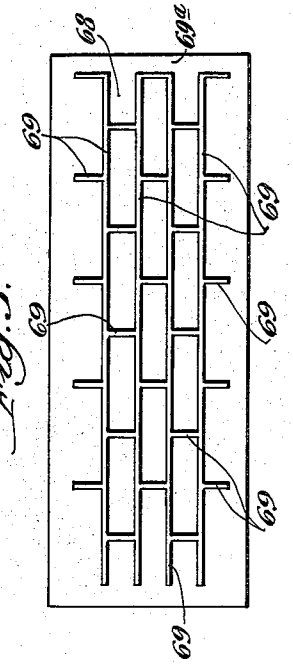

Fig. 5.

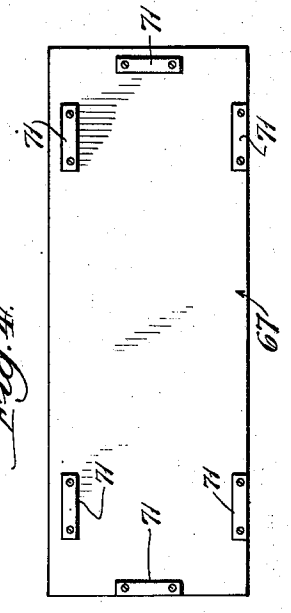

Fig. 4.

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3 Sheets-Sheet 3

Fig. 6.

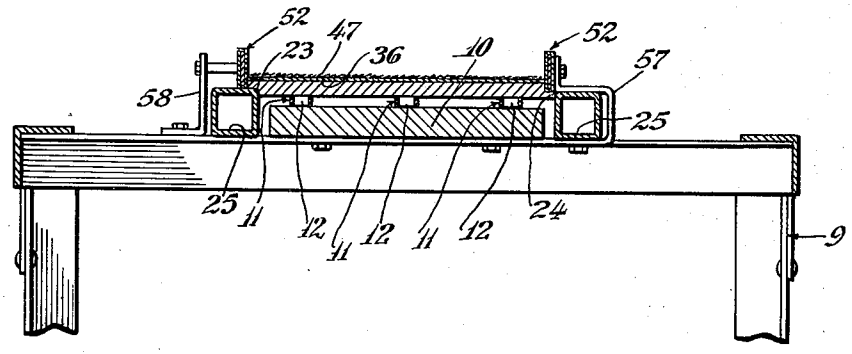


Fig. 7.

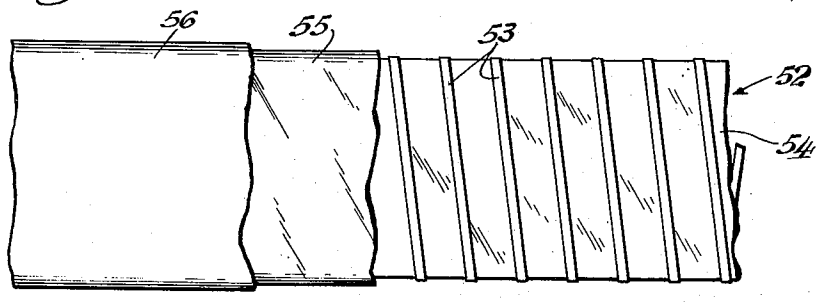
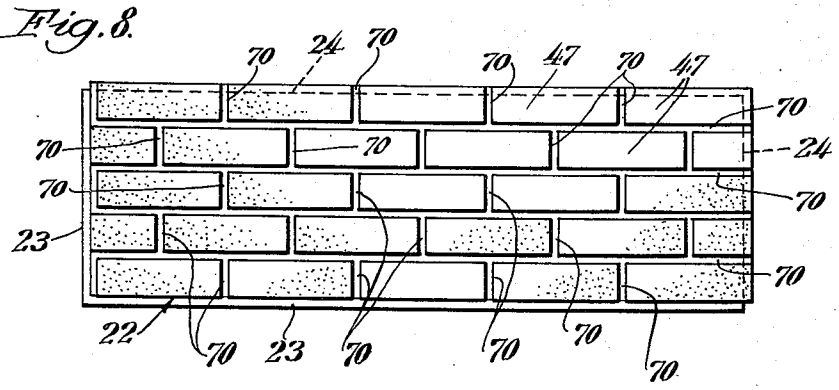


Fig. 8.



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UNITED STATES PATENT OFFICE

2,321,396

METHOD OF AND APPARATUS FOR MANUFACTURING BUILDING COVERING SHEET MATERIAL

Henry C. Koch, Chicago, Ill., assignor to Abbott Coburn, Chicago, Ill.

Application August 5, 1939, Serial No. 288,678

3 Claims. (Cl. 117—65)

My invention relates to the production of sheet building covering material comprising base sheets coated with an adhesive, as for example and more particularly asphalt, with a covering of grit, as for example crushed slate, adhered to the adhesive coating and exposed at the outer surface of the sheet material. Such sheet material is commonly provided by applying the adhesive in hot condition to the base sheet, dropping the grit upon the adhesive, rolling the grit into the adhesive and then removing the excess grit, the face of the resultant sheet material being completely covered by the grit.

The invention relates more particularly, though not exclusively as to certain of the features thereof, to the production of such material bearing designs produced by pressing the grit along lines corresponding with the design to be produced, into the adhesive for full embedment therein; and especially, though not exclusively as to certain features thereof, to the production of matched sheets which when applied to a surface to be covered cooperate with each other to produce a surface wherein the design is continuous and unbroken. An instance of such matched sheets is those commonly provided for covering the sides of buildings and bearing a design simulating the built-up brick or tile structure wherein the bricks or tile are arranged in courses, with the bricks or tile of adjacent courses disposed in staggered relation.

My primary object, generally stated, is to provide improvements in the method of, and apparatus for, producing building covering sheet material whereby a highly satisfactory product may be produced economically.

Certain of my more specific objects are:

To provide for the forcing of the adhesive coating applied to the sheet material, into the longitudinal edges thereof.

To provide for the maintaining of the longitudinal edges of the sheet material clear of the grit applied to the material particularly for the purpose of producing material with such smooth and sharply defined longitudinal edges that such edges of adjacent sheets of the material when the sheets are applied to use in grouped condition, will fit closely together.

To provide for such accurate positioning of the designs on the sheets of the material that the designs on adjacent sheets, when applied to a structure to be covered, will accurately match and present a continuous and unbroken design; and

To provide for the production of grit-coated sheet material presenting designs in which the lines delineating the design produced will be sharp and the grit coated surface flat, as desired.

Referring to the accompanying drawings:

Figure 1 is a view in side elevation of apparatus for applying adhesive coating and thereafter a grit coating to the sheet material embodying my invention and by the use of which certain of the phases of my novel method may be practiced.

Figure 2 is an enlarged sectional view taken at the line 2 on Fig. 1 and viewed in the direction of the arrow.

Figure 3 is a view in side elevation of apparatus for embossing the grit-coated sheet material and rolling down the grit, embodying my invention and by which certain of the features of my novel method may be practiced; this apparatus being suitable for use in connection with the apparatus shown in Figs. 1 and 2 for practicing certain features of my novel method.

Figure 4 is a plan view of the support for the sheet material during the embossing operation.

Figure 5 is a bottom plan view of the die of the embossing apparatus for producing a design on the sheet material simulating a built-up brick structure as above referred to.

Figure 6 is a section taken at the line 6 on Fig. 1 and viewed in the direction of the arrow.

Figure 7 is an enlarged fragmentary side view of one of the strip heaters forming parts of the apparatus of Figs. 1 and 2; and

Figure 8, a face view of a grit-coated sheet produced on the apparatuses of the preceding figures.

Referring to the particular apparatus shown, one section thereof is provided to receive the sheet material forming the base of the finished grit-coated sheets and which may be, and preferably is, preliminarily water-proofed as by saturating it in any suitable water-proofing material, and apply to a face thereof a coating of a suitable adhesive, such as for example that above mentioned, and thereupon apply a grit coating to the adhesive coating, followed by the rolling down of the grit to adhere it to the adhesive coating and produce a smooth grit surface entirely covering the face of the sheet material.

The other section of the apparatus is provided to emboss on the grit covered side of the sheet material such design as it may be desired to present, such as for example a design simulating a built-up brick structure as above referred to, which is the design which the particular die shown is adapted to produce.

Referring to the first-referred-to section of the apparatus it comprises as shown, a framework 9 having a bed 10 extending lengthwise thereof

and along the upper surface of which the upper reach of a conveyor 11 for the sheet material to be operated on extends. The conveyor 11, which extends lengthwise of the apparatus, is shown as formed of three separate chains 12 engaging sprockets 13 and 14 on shafts 15 and 16 journaled, respectively, in opposite ends of the framework 9. A motor shown at 17 drives the conveyor 11 in the direction of the arrow in Fig. 1 by means of an endless chain 18 engaging sprockets 19 and 20 on the motor shaft 21 and on the shaft 15, respectively.

The conveyor 11 is provided to receive the base sheet material, preferably waterproofed as stated, and convey it along the apparatus, the material being preferably provided in the form of sheets 22 each of a size corresponding with the size of the sheets in finished condition and having their surrounding edges undercut and flanged as shown at 23 and 24, respectively, to form shiplap joints between adjacent ones of the sheets when grouped together in applying them to use.

Extending along the framework 9 longitudinally thereof at opposite sides of the bed 10 from points adjacent the entering end of the apparatus toward its opposite end, are parallel bars 25, shown as of rectangular shape in cross section and having straight inner vertical sides 26 which extend above the top surface of the conveyor 11 and form guides for the sheets 22 in their travel along the apparatus.

Located at the entering end of the apparatus is a presser roll 27 which extends transversely of the apparatus and above the conveyor 11, this roll serving to press the sheets 22 against the conveyor 11, as the sheets move into engagement with this roll.

The roll 27, which is shown as adjustable up and down at its journal blocks in vertical guides, as by adjusting screws, these parts at one end of the roll being shown at 28, 29 and 30, respectively, is driven from the motor 17 at substantially the same peripheral speed as the conveyor 11, as by means of a sprocket chain 31 engaging a sprocket 32 on the roll and a sprocket 33 driven by gear mechanism operated by the motor 17 and comprising meshing gears 34 and 35, the gear 34 being rigid with the sprocket 33 and the gear 35 being driven by the motor 17.

To the rear of the roll 27 are means for applying to the upper surfaces of the sheets 22 to produce thereon a uniform coating 36 covering the full areas of their upper surfaces, adhesive material, such as for example asphalt as commonly used for this purpose in the manufacture of grit-coated sheet material. The means shown for this purpose comprise a suitable source (not shown) of the fluid adhesive from which leads a spout 37 through which the adhesive discharges upon the sheets 22; these means also comprising parallel upstanding plates 38 shown as of angle shape in cross section with their horizontal flanges 39 projecting laterally outward as shown, mounted on the bars 25 to extend lengthwise thereof and against which the longitudinal side edges of the upper portions of the sheets 22, bear (Fig. 2); and a dam 40 at the rear ends of the plates 38 for insuring the production on the sheet 22 of the uniform coating 36 of adhesive of the desired thickness, the dam 40 being shown as in the form of a roller extending transversely of the apparatus and fitting at its periphery in arcuate recesses in the rear ends of the plates 38. The plates 38 are similarly recessed at their front ends to receive the periphery of the roll 27.

In the arrangement shown the roll 27 not only serves to press the sheets 22 against the conveyor 11 stated, but also serves to form a closure for the front end of the space to which the adhesive is supplied as stated, should the adhesive flow to this point.

The roller 40, provided in the illustrated apparatus as of hollow form, is journaled at trunnions 41 thereon in blocks 42 mounted in vertical guides 43 on the framework 9 and adjustable vertically therein by adjusting screws 44 to regulate the thickness of the adhesive layer on the sheets 22 as they pass beyond the adhesive applying means.

It is intended that the roller 40 be maintained heated to the desired degree to insure the production of such uniform coating on the sheets, this being effected in the construction shown by connecting the roller trunnions 41 with non-rotatable pipes 45 and 46 through one of which a heating fluid, such as for example steam, is supplied to the roller 40 and through the other of which the heating fluid discharges.

To the rear of the adhesive applying means are means for covering the adhesive coating 36, with a substantially uniform layer of grit represented at 47, as the sheet travels beneath it, these means comprising an elevated hopper 48 for the grit provided with any suitable means for controlling the flow of the grit to the adhesive-coated sheets beneath it, such as for example a rotary feed device as is well known in the art, the shaft of the feeder device being represented at 49 and shown as driven by a sprocket chain 50 connected to a sprocket 51 on the shaft 49 and a sprocket on the roll 27, respectively.

In the rear of, and closely adjacent to, the dam 40, are what I chose to term strip-heaters shown at 52, which are provided at opposite sides of the apparatus to extend longitudinally thereof and substantially flush at their lower edges with the upper surfaces of the bars 25, and in such position that the upper portions of the opposite longitudinal edges of the sheets 22, as they travel beyond the adhesive-applying means and along the grit-applying means, engage these plates as shown in Fig. 6 and move in rubbing contact therewith.

The strip heaters 52 extend above the upper surfaces of the sheets 22 and thus, with the sheets, form, in effect, a channel in which the grit is disposed by the grit-applying means above referred to.

It may be here stated that the strip heaters 52, maintained at the desired temperature, are provided primarily to cause, by the heating of the adhesive on the sheets 22 adjacent the side edges thereof, the forcing of portions of the adhesive into the body of the sheets at their side edges, to enhance the waterproofing thereof and also to cause these side edges to be sharply defined and smooth; and furthermore, to confine the grit between the longitudinal edges of the sheets and thus prevent the grit from contacting the longitudinal edge portions of the sheets.

The heaters 52 for the sheet edges may be of any desirable construction, those shown being each formed of a coil 53 of electric resistance wire and inner and outer sheets 54 and 55 of mica for current insulating purposes, and an outer sheathing 56 of metal, the heaters 52 being secured in place on the framework 9 as by brackets represented at 57 and 58. In use, as will be understood, the coils 53 would be inter-

posed in any suitable electric circuit, or circuits (not shown), for maintaining the sheathing 56 at the desired temperature.

Located rearwardly of the strip heaters 52 are the means for rolling the grit into the adhesive coating 36 to cause the surface of the sheets to present the desired even solid coating of grit, these means comprising a roll 59 extending transversely of the apparatus above the bed 10 and journaled at its ends in journal blocks vertically adjustable in guides on the framework (the block and guide for one end of the roll 59 being shown at 60 and 61, respectively), as by adjusting screws one of which is shown at 62; the roll 59 being driven as by a sprocket chain 63 engaging a sprocket 64 on the roll 59 and a sprocket on the rotary feeder device 49, respectively.

As will be understood, the sheets 22 are applied in succession to the conveyor 11 at the entering end of the apparatus, with the undercut end edges 24 of each sheet interfitted with the flanged end 23 of the adjacent sheet and in such condition travel through the apparatus for operation thereon by the several means referred to; such of the grit as may not become anchored to the adhesive coating 36 during the grit-rolling operation, being removed from the sheets in any desirable way.

The adhesive supplied to the sheets through the spout 37, in the travel of the sheets from the adhesive-applying means past the grit-applying means and beneath the roll 59 remains sufficiently hot to permit the grit to be rolled into the adhesive coating 36 sufficiently to effect the desired anchorage of the grit to the adhesive coating upon the cooling of the adhesive by the atmosphere to atmospheric temperature.

The adhesive grit coated sheets 22 discharge along the outgoing end of the conveyor with their adjacent ends adhered together by the adhesive, but with sufficient retained heat in the adhesive at the joints between the sheets as to permit the sheets to be readily separated by the operator using, if desired, any suitable tool to clear the adjacent joint surfaces of any of the adhesive thereon.

Referring now to the part of the apparatus by which the embossing of the sheets is effected, the apparatus shown is of the same construction, except for the shape of the die proper, as that shown in my application for United States Letters Patent Serial No. 288,677, filed August 5, 1939, concurrently herewith and therefore reference need be made to only those features of the construction which are material to the invention of the present application.

Generally stated, the embossing apparatus, according to the particular construction shown, comprises framework 65 having thereon a die element represented generally at 66, and presenting a heated die proper hereinafter referred to, a vertically movable support 67 for the sheets applied thereto in succession, mounted below the die element 66, for vertical movement in a path normal to the surface on which the sheet is supported and to the plane of the hereinbefore referred to die proper 68 of the die element, and means for raising the support 67 to force the sheet to be embossed against the die proper 68 to effect the embossing operation and lowering the support 67 to position the embossed sheet for withdrawal from the apparatus.

The particular illustrated form of die proper 68 is provided with longitudinal and transverse dieribs 69 depending from a plate 69a heated to the desired temperature in any suitable way, as for example by electric resistance elements, to produce on the grit coating 47 of the sheet which is to be exposed to view when applied to use, a design simulating a built-up wall structure as above referred to, by subjecting the grit coating 47 to a pressing action along lines conforming to the mortar lines of such a wall, which embeds the grit in the adhesive coating 36 along these lines, represented at 70, delineating the design by black lines contrasting with the color of the grit; the design being so disposed on the sheets that the sheets will properly match when assembled together on the surfaces to be covered and present an unbroken continuous design.

The sheet-supporting member 67 is provided on its upper surface at its ends and sides with positioning bars 71 so disposed that the sheet 22 applied thereto will snugly fit into the space outlined by these positioning bars to insure the accurate positioning, relative to the die proper 68, of each sheet applied to the sheet-supporting member 67, with the result that the positioning of the design on all of the sheets 22 is identical, insuring the proper matching of the sheets when grouped together in use.

The sheet-supporting member 67 of this construction is provided at each of its four corners with a depending rack bar, the two at one side thereof being shown at 72, which mesh with four gears, the two gears for the two bars shown being indicated at 73, these four gears being connected together to rotate simultaneously to actuate the sheet-supporting member 67. A motor 74, geared through gear mechanism 75 to a shaft 76 on which the gears at one side of the apparatus engaging the adjacent rack bars are secured, operates to reciprocate the sheet-support 67, the latter being counterbalanced by a weight 77 carried by cables 78 supported between their ends on pulleys (not shown) on the frame and connected with the support 67.

At the rear of the embossing apparatus is a conveyor 79 which extends lengthwise thereof and is shown as in the form of a belt 80 supported at one end on a pulley 81 journaled on the framework 65 and a pulley 82 on a shaft 83 journaled in the frame 84 of a roll stand represented generally at 85; this conveyor, which is driven as hereinafter described, being provided to receive the embossed sheets and deliver them to the rolls of the stand 85.

The roll stand 85 is provided to further roll down the grit coating 47 and particularly to roll down such portions of the coating on the sheets as may have become upwardly bulged or displaced in the embossing operation.

As shown, the roll stand comprises an upper roll 86 and a lower roll 87 to receive the grit-coated embossed sheets between them, the lower roll 87 being shown as journaled in stationary bearings on the frame 84 and the upper roller 86 being mounted at its ends in journaling blocks vertically movable in guides on the frame 84 and adjustable through the medium of adjusting screws, these parts at one side of the apparatus being shown at 88, 89 and 90, respectively; the rolls 86 and 87 being connected together to simultaneously rotate in opposite directions by means of intermeshing gears 91 and 92 on the rolls 86 and 87, respectively.

The conveyor 80 and the rolls 86 and 87 are shown as operated by a motor represented at 93 through the medium of a sprocket chain 94 con-

nected with sprockets 95 and 96 on the shaft of the motor 93 and on a shaft 94 journaled on a bracket frame 97 connected with the frame 84; a sprocket chain 98 engaging a sprocket fixed on the shaft 94 and a sprocket connected with the roll 87; and sprocket chain 99 engaging a sprocket on the roll 87 and a sprocket 100 on the shaft 83.

To the rear of the roll stand 85 is an endless conveyor belt 101 supported on rolls one only of which is shown at 102, for conveying the finished grit-coated sheets away from the apparatus. The roll 102 is carried by the shaft 94 and is thus driven by the motor 93 to drive the conveyor belt 101.

To guide the sheets as they issue from the roll stand 85, to the conveyor 101, rolls represented at 103 and supported on the bracket 97 are provided between the roll stand 85 and the conveyor 101.

As will be understood from the foregoing the grit-coated sheets 22, separated by the operator as they issue from the apparatus shown in Fig. 1, are separately applied in succession to the embossing apparatus wherein they are individually embossed and from which they are removed for passage through the roll stand 85 in which the finished rolling of the sheets is effected.

The feature of introducing the grit-coated sheets one at a time into the embossing apparatus wherein they are embossed and particularly by the relative movement of the sheet support and embossing die in a plane normal to the surface upon which the sheet is supported, each sheet being accurately positioned in the same place in the embossing apparatus, is of especial importance, particularly in producing matched sheets, as the possibility of producing the design on the sheets in misplaced position, is reduced to the minimum.

It has been found in practice that, by employing embossing apparatus of the kind disclosed in which the sheet-support and the die are relatively movable in a path normal to the support for the sheets, the upward local bulging or tearing of the coatings on the base portions of the sheets adjacent the depressed lines produced to form the design, is so slight that the sheets may may be further rolled, as for example in the roll stand 85 as above described, without producing disfigurement of the design-lines on the sheets whereby the design is caused to be sharply defined in the finished sheets and the grit-coatings thereon to be in the desired flat condition.

The term "side edge surfaces" in the appended claims means the edge surfaces at an angle to the sides of the sheet material (90° as shown) which edges extend parallel with the line of travel of the sheet material.

While I have illustrated and described certain particular apparatus embodying my invention and have illustrated and described certain particular apparatus for practicing my improved method I do not wish to be understood as intending to limit the invention thereto as the apparatus shown may be variously modified and altered and the invention may be embodied in other forms of structure and my improved method practiced by other apparatus without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent is:

1. The method of producing embossed adhesive coated sheet material which comprises embossing the sheet material by pressure exerted over the desired area of the sheet material only in a direction normal to the sheets to produce the desired design, and thereafter subjecting the sheet material to pressure for pressing down such portions of the coatings on the sheet material as may have been displaced outwardly beyond the level of the coated face of the sheet material in the embossing operation.

2. The combination with embossing apparatus comprising members between which sheet material coated with an adhesive is pressed, one of said members being a die and said members being relatively movable in a direction normal to the surface of the other of said members against which the sheet material bears, of means for pressing down such portions of the coatings on the sheet material as may have been displaced outwardly beyond the level of the coated face of the sheet material in the embossing operation.

3. The combination with embossing apparatus comprising members between which sheet material coated with an adhesive is pressed, one of said members being a die and said members being relatively movable in a direction normal to the surface of the other of said members against which the sheet material bears, of roller means for pressing down such portions of the coatings on the sheet material as may have been displaced outwardly beyond the level of the coated face of the sheet material in the embossing operation.

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