

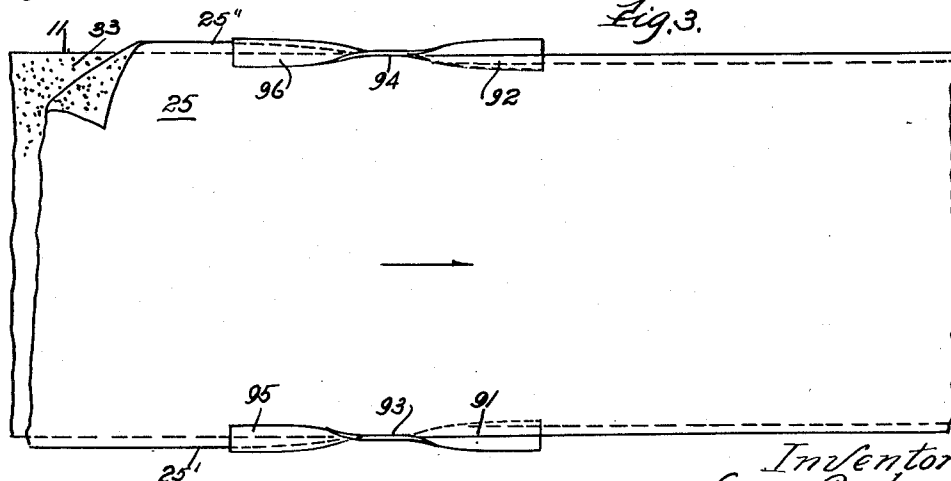
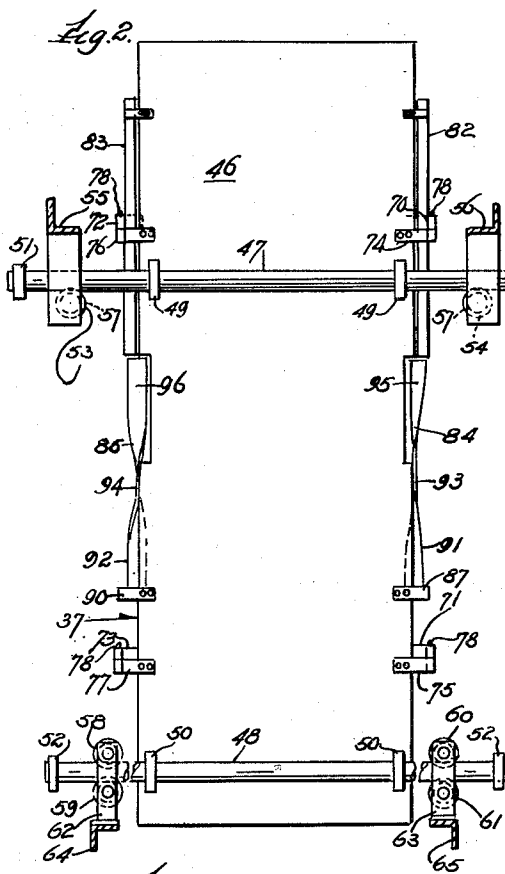
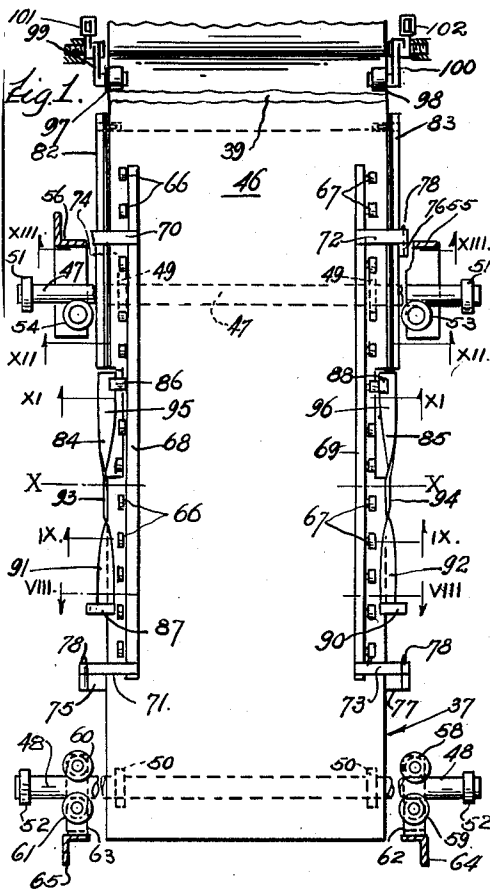
Feb. 19, 1957

G. BECKMAN ET AL
METHOD AND APPARATUS FOR FLANGING METALLIC
AND ASPHALTIC SHEET MATERIALS

2,781,818

Filed Jan. 2, 1953

4 Sheets-Sheet 1



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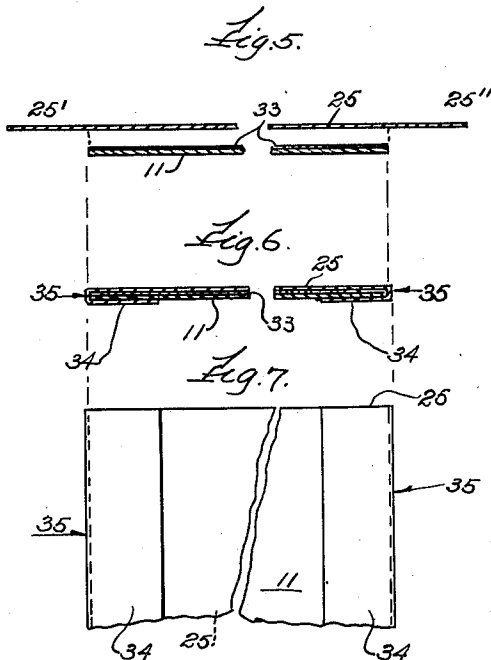
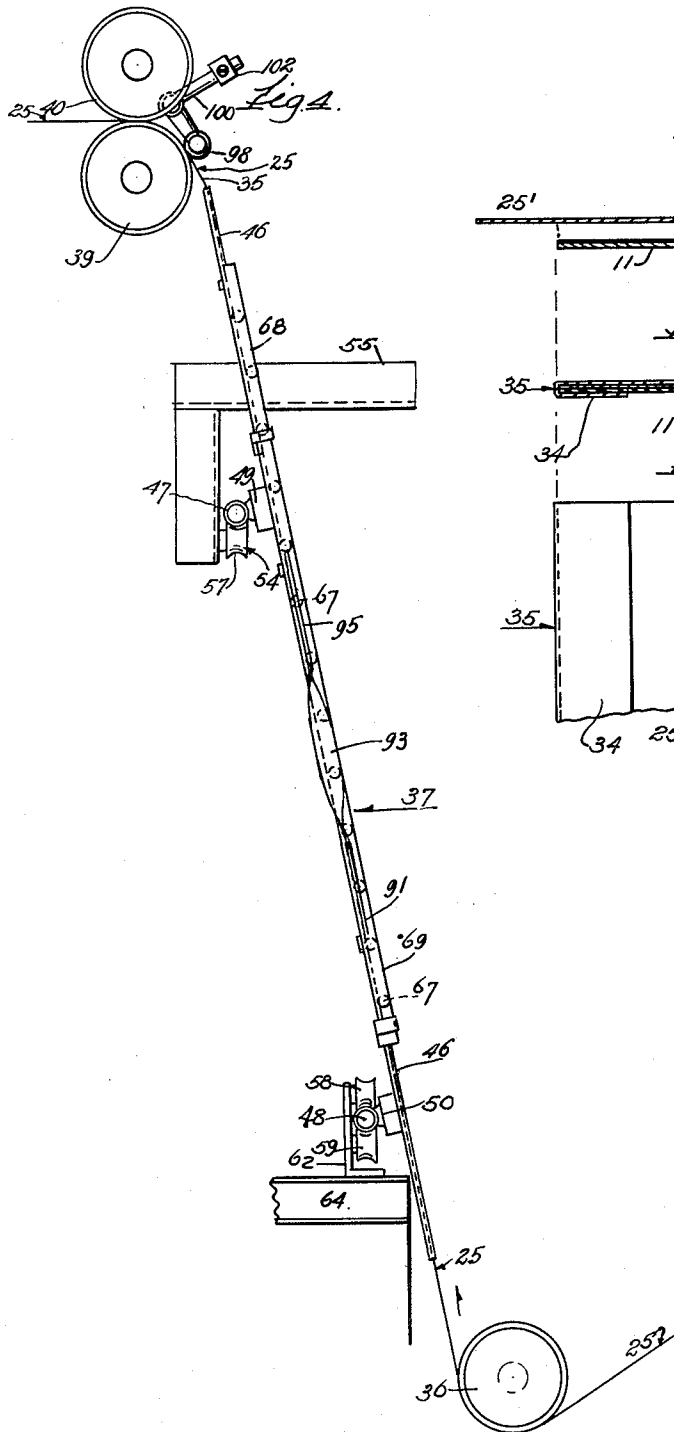
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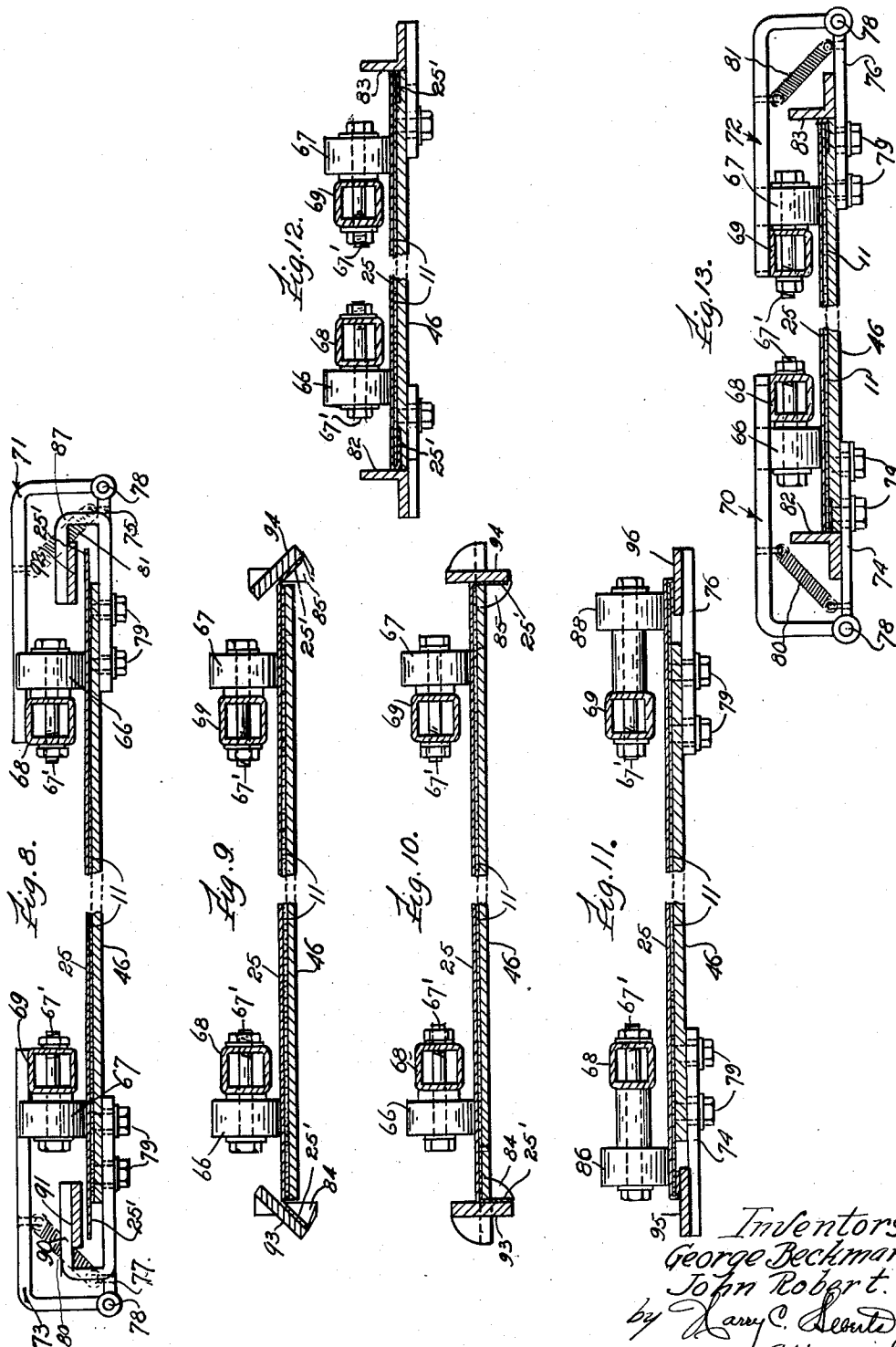
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Feb. 19, 1957 **G. BECKMAN ET AL** **2,781,818**
METHOD AND APPARATUS FOR FLANGING METALLIC
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Filed Jan. 2, 1953 **4 Sheets-Sheet 4**

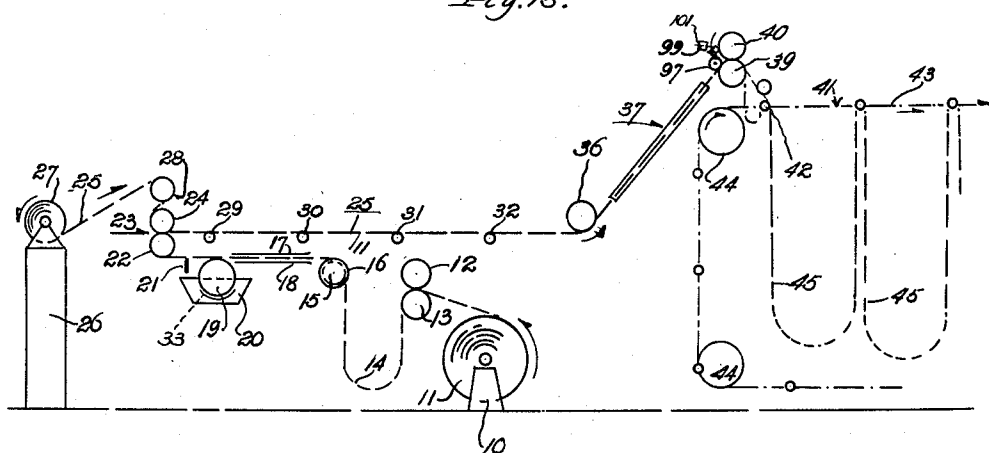
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4 Sheets-Sheet 4

Fig. 15.



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METHOD AND APPARATUS FOR FLANGING METALLIC AND ASPHALTIC SHEET MATERIALS

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Application January 2, 1953, Serial No. 329,356

10 Claims. (Cl. 154—1.8)

This invention relates to a method of and apparatus for forming composite sheets or rolls of flexible metallic and asphaltic materials as well as to the product resulting therefrom, although certain features thereof may be used with equal advantage for other purposes.

It contemplates more especially an improved continuous method and apparatus for forming laminating sheets or rolls from metallic and asphaltic materials to provide an improved building material for roofing, siding, insulating and other structural purposes.

It is generally known that thin sheets of bright metallic materials such as aluminum have a high thermally reflective characteristic, but that such materials do not resist conduction or transmission of heat or cold, so that the combination of thin metallic sheets such as aluminum with a sheet material that has insulating properties, and resists conduction as well as transmission of heat or cold, constitutes a desirable combination for roof sheeting, building siding and underflooring where there are no basements and moisture-laden cold air has ready access. Furthermore, metallic sheeting, such as aluminum, even in a very thin gage, possesses the desired tensile strength and the thermally reflective properties which combine with the insulating properties of asphaltic sheet materials, such as saturated roofing felt, to give protective body thereto and resist the thermal transmission and conduction of heat and cold. The lamination of such sheets of material in the continuity of production operations is comparatively difficult because of the substantial differences in their tensile strength, coefficient of expansion and contraction and their respective resistances to bending and deformation.

Resort to an adhesive alone to retain these different sheets in laminated association is not considered entirely satisfactory, so that the problem has been solved by flanging the metallic sheet around the asphaltic material so that a permanently tacky adhesive can be utilized to preclude the creasing or rupture of the highly flexible sheeting materials. To accomplish the lamination of such sheeting material in the continuity of production operations has required special processing and mechanical expediency in view of the delicate nature of these materials from the standpoint of their differences in tensile strength, coefficient of expansion and contraction and their delicate character from the standpoint of possessing little or no resistance to deformation while the sheets are under processing for association with each other.

One object of the present invention is to provide an improved continuous process of continuously laminating metallic and asphaltic material to provide a composite sheet having a protected flange edge or edges.

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Another object is to provide an improved method of adhesively joining thin metallic sheet material with asphaltic sheets to form a composite building material for roofing, building siding, and other structural purposes.

Still another object is to provide an improved apparatus for continuously processing metallic and asphaltic sheets into a laminated building material possessing better qualities than each provides independently.

A further object is to provide an improved laminated composite sheet of thin metallic material, such as aluminum, and asphaltic material such as saturated felt, joined by permanently tacky adhesive and having a protective flanged edge or edges.

A still further object is to provide an improved apparatus for self-aligning sheets to be laminated together for adhesive as well as flanged joinder in a continuity of operations.

Still a further object is to provide improved, more effective and less intricate edge folding means capable of flanging sheets together responsive to the continuous linear movement thereof.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

In the drawings:

Figure 1 is a front view in elevation of an aligning flanging device embodying features of the present invention.

Figure 2 is a rear view in elevation of the device shown in Figure 1.

Figure 3 is a plan view of the sheets of material that are being brought together and flanged relative to each other as they are linearly displaced through the self-aligning and flanging or edging device shown in Figures 1 and 2.

Figure 4 is a side view in elevation of the flanging or edging device shown in Figures 1 and 2.

Figure 5 is a fragmentary sectional view in elevation of the component sheets shown in spaced relation just prior to their adhesion and flanging preparatory to entering the edging device shown in Figures 1, 2 and 4.

Figure 6 is a fragmentary sectional view in elevation of the composite sheets after they have passed through the edging device shown in Figures 1, 2 and 4.

Figure 7 is a fragmentary rear plan view of the laminated sheets shown in Figure 6 after having passed through the edging or flanging device.

Figure 8 is a sectional view in elevation taken substantially along line VIII—VIII of Figure 1.

Figure 9 is a sectional view in elevation taken substantially along line IX—IX of Figure 1.

Figure 10 is a sectional view in elevation taken substantially along line X—X of Figure 1.

Figure 11 is a sectional view in elevation taken substantially along line XI—XI of Figure 1.

Figure 12 is a sectional view in elevation taken substantially along line XII—XII of Figure 1.

Figure 13 is a sectional view in elevation taken substantially along line XIII—XIII of Figure 1.

Figure 14 is an enlarged end view in elevation of the edging or flanging guide shown assembled in Figures 1 and 2.

Figure 15 is a diagrammatical view in elevation of the entire apparatus utilized for continuously laminating

metallic and asphaltic sheets into a composite building material.

The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the invention, but is merely illustrative thereof. There may be considerable variations and adaptations of all or part of the teachings depending upon the dictates of commercial practice.

The method is exemplified by a description of the structure and functional features possessed by the resulting product. The present embodiment comprises an unwinding stand 10 which carries a full roll of saturated felt 11 (Figure 15) of the type commonly used as roofing paper. The roofing paper is saturated with asphaltic material to render such impervious to moisture and to impart a body thereto without eliminating the flexible character of the coarse paper. The saturated felt may be of any desired weight and in practice may vary from what is normally termed ten pound to thirty pound felt, depending upon the dictates of commercial practice.

The roll of felt 11 is threaded through a pair of pull rolls 12—13 which are journaled on their hubs for support in vertically aligned relation on the frame structure (not shown) of a processing machine that is of any suitable or standard construction, insofar as providing vertically aligned and intergeared rollers 12—13 which are driven at a pre-determined rate of speed for synchronized operation with other rollers in a manner to be hereinafter described. The pull rolls 12—13 are driven at a rate of speed to provide a loop 14 forwardly thereof for support on a spaced stationary roll or pipe 15 having flanged edges 16 to guide the loop 14 of the sheet material 11 thereover. To this end, the stationary flange roller or pipe 15 is spaced forwardly and somewhat upwardly relative to the vertically aligned pull rollers 12—13.

Positioned forwardly of the stationary flange roller 15 is a vertically spaced pair of flanged guides 17—18, which are horizontally spaced to provide confronting pairs to receive the edges of the sheet material 11 as it is threaded therethrough for guidance to and over the top cylindrical surface of an adhesive applicator roller 19. The adhesive applicator roller 19 is journaled in the frame of the machine (not shown) so that the lower portion thereof is disposed in a trough or vessel 20. The trough or vessel 20 contains adhesive in order to provide a thin uniform layer over the cylindrical surface of the roller 19 as it is power rotated with or against the linear movement of the sheet 11 thereof. The speed of the roller 19 is adjusted to the travel or linear movement of the sheet 11 thereover, and its direction of rotation may be in unison with or against the travel of the sheet 11 depending on the desired adhesive film thickness. The relative speed between the power driven roller 19 and the linear travel of the sheet 11 may be increased or decreased depending on the dictates of commercial practice. The adhesive in the trough or vessel 20 is preferably of the permanently tacky type such as asphaltic coating glue, plastic adhesive or the like, depending upon the dictates of commercial practice. Disposed forwardly and above the trough or vessel 20 is a stationary scraper 21, which is adjustably supported for contact with the underside of the sheet 11 as it passes beyond the adhesive applicator roller 19 to insure a uniform layer of adhesive of any desired thickness.

From the scraper 21, the sheet 11 is threaded over the lowermost roller 22 for contact with the peripheral surface thereof to comprise one of the rollers of a three stack roller unit 23. Another roller 24 of the three stack unit 23 is disposed above and at vertical alignment with the roller 22, so that the sheet 11 can be re-threaded over the latter and below the upper roller 24 to effect contact with the nip of the rollers 22—23 and to meet the thin sheet, such as aluminum, 25 that is threaded from an

unwinding stand 26 which supports a roll of thin metallic sheet material 27, preferably though not essentially aluminum foil sheets of .020 to .040. The thickness is not critical and will vary within a wide range depending upon the uses and dictates of commercial practice. The aluminum sheet 25 is threaded over the uppermost roller 28 of the three stack roller unit 23, but in this instance the uppermost roller 28 is vertically spaced from the roller 24 so that the aluminum sheet 25 may be threaded over the uppermost roller 28 and around the roller 24 for passage between it and its contacting lowermost roller 22 for disposition over and in contact with the asphaltic sheet 11, so that both sheets 11—25 can be displaced horizontally and backwardly over a plurality of supporting idler rollers 29—30—31—32, which may vary in number and in spacing to meet the particular requirements of any machine or installation.

It is to be noted that the aluminum sheet 25 is appreciably wider than the vertical sheet 11 (Figure 5) by a distance equivalent to the thickness of the sheet 11 and the adhesive 33 that is applied thereto by the applicator roller 19 and controlled by the scraper 21 plus the extent of the underlapped portions 34 of the edging flanges or flanges 35 (Figure 6). It will be apparent, therefore, that at this step in the process, the composite sheets 11—25 are brought in adhesive superposed relation by reason of pressure exerted between the rollers 22—24 comprising part of the vertical three stack roller unit 23 and the laminated sheet with its over-hinged superposed aluminum sheet 25, thereafter passing under an idler roller 36 which is journaled on the frame of the machine (not shown) so that its lower surface is in line with the upper surface of the idler rollers 29—30—31—32. It should be observed that the rollers 22—24 are intergeared and power driven in timed relation to the rollers 12—13, so that there is a displacement at the same linear speed of the vertical sheet 11 and the metallic sheet 25.

The superposed metallic sheet 25 must be sufficiently wider than the saturated felt or roofing sheet 11 to provide an underlap 34 of any desired width such as but not limited to three-quarters of one inch on one edge or on both edges, and this underlap in conjunction with the flanged edge or edges 35 is provided in the laminated sheets 11—25 by pulling them through a flanging device 37 to be presently described. The flanging or edging device 37 is disposed between the idler roller or drum 36 and a power driven roller 39 which is confronted by a superposed roller 40 journaled thereover for contact therewith through the urge of gravity. The sheets are threaded between the rollers 39—40 which are mounted on the frame or adjacent frame of a machine which may be built in units should commercial practice so dictate; however, the frame portions upon which the rollers 39—40 are journaled may comprise an accumulator looper 41 of any suitable or standard construction, which in the trade is normally referred to as a festoon looper. The laminated sheets, after being pulled through the self-aligning flanger or edger 37 which is to be presently described, traverse a plurality of over-spaced rods 42 which are journaled on an endless chain 43 defining an endless rectangular track by means of corner sprockets 44 which are power driven in timed relation with the power driving pulley 39, so that the laminated sheets would be looped thereover as at 45 in a manner well known in the art.

Preparatory to being linearly displaced over the power driven roller 39 and into the accumulator looper 41, the self-aligning flanging and edging device 37 folds or otherwise turns over the overlapping edge portions of the metallic sheet 25 (Figure 5) to embrace the underside of the asphaltic sheet material 11 to the extent of the underlap 34 (Figure 6) to define the flanged edge or edges 35 thereon. The flanging device 37 comprises, in this instance, a substantially rectangular plate 46 (Figures 1 and 2) which is disposed along an inclined plane (Figure 15) for movable support by means of spaced shafts

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47—48 attached to the underside of the plate 46 by means of a plurality of brackets 49—50 respectively. The mounting shafts 47—48 project beyond the side edges of the rectangular plate 46 and terminate in circular collars 51—52 at their respective extremities to serve as limit stops therefor. The plate 46 is mounted for free lateral movement on ball-bearing mounted rollers 53—54 journaled on brackets 55—56 fixed to the frame of the machine (not shown) to support the uppermost shaft 47 with its plate 46. To this end, the rollers 53—54 have a peripheral groove 57 therein. As a complement the shaft 47 is disposed thereunder to serve as a rolling support therefor.

The lower shaft 48 is disposed between confronting pairs of ball-bearing mounted rollers 58—59 and 60—61 mounted in upstanding brackets 62—63 fixed to the channels 64—65 comprising part of a frame to laterally and movably support the shaft 48, thereby rendering the plate 46 movable laterally to the left or right by a slight exertion of force created by the outside edges of the laminated sheet 11—25 as it passes over the plate 46 between the rollers 36 and 39—40. The laminated sheet 11—25 will cause the free floating plate 46 to align therewith and thus insure minimum resistance and uniform flanging or edging as will presently appear.

The laminated sheet 11—25 is confined to the surface of the plate 46 by means of two series of linearly spaced rollers 66—67, which are journaled by means of stub shafts anchored at one extremity to the elongated channels 68—69 disposed at the proper distance from the plate 46 by means of angular-shaped brackets 70—71 and 72—73 comprising the movable part of hinge supports 74—75 and 76—77 which have pintles or hinge pins 78 extending therethrough (Figures 1 and 13). The hinge plates 74—75 and 76—77 are attached to the rectangular plate 46 by means of stub fasteners such as the threaded studs 79 (Figures 11 and 13). Stub springs 80—81 are anchored between the channel 68—69 and the hinge plate 74—76 in order to normally urge the rollers 66—67 in contact with the sheets 11—25 for support on the rectangular plate 46. Elongated angular members 82—83 are fixed to the side edges of the plate 46 proximate to the upper end thereof to retain the flanged laminated sheets in alignment with the plate 46 as the upward and forward traverse thereof continues.

Beneath the angular guides 82—83, there is mounted edge turning means in the form of a fully twisted pair of plates 84—85 which are fixed by means of brackets 86—87 and 88—90 to the plate 46 along both edges thereof to present a lower flat surfaced portion 91—92 in spaced parallelism with the plate 46, thereby facilitating the entry of the metal sheet end overlaps 25'—25" (Figures 5 and 8) thereunder for traverse therealong and gradual turning or folding thereunder by means of a pair of 180° helically twisted central portions 93—94 provided on the parallel disposed flange fold plates 84—85. There are oppositely disposed flat portions 95—96 that present the final fold-over to the overlaps 25'—25" that become the underlaps 34 (Figure 6) and thus fully cover and enclose the side edges of the asphaltic sheet 11. As the laminated sheet 11—25 emerges from the plate 46 over the top end thereof, a pair of rollers 97—98 that are journaled on arms 99—100, are pivotally mounted on the frame portion (not shown) to gravitate downwardly against the edge or folded flange surfaces which are supported on the power driven roller 39 (Figure 4) to impart the final set to the edge flanges 35 and to provide a smooth surface thereon.

With this arrangement of parts, the laminated sheets 11—25 are edge flanged responsive to the displacement thereof upwardly along and over the rectangular plate 46 as it is displaced to and along the accumulator looper 41 from which it is wound into rolls of predetermined length and then cut or severed so that the rolls would be uniform and contain the desired footage. This operation con-

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tinues with all of the parts operating in synchronism and with the sheets 11—25 being fed from the unwinder reels 10—26.

It may be desirable from an appearance as well as a practical standpoint to provide fine embossings over the top surface of the aluminum sheet 27, thereby concealing any imperfections in the thin metallic sheet surface as well as to produce a more effective jointer between the sheets 11—27. To this end, one of the rollers such as the roller 40 which confronts the power driven roller 39 may be provided with an embossed surface to impress a complementary embossing on the aluminum sheet 27. This embossing will be sufficiently deep to provide increased surface contact with the adhesive disposed between the metallic and fibrous sheet materials. In fact, the embossing may somewhat indent the fibrous material 11 in order to insure an effective binder therebetween; however, this is preferable, though not essential, in the manufacture of the composite sheet material.

It should be observed that any suitable dusting substances may be provided on the surface of the sheet that is not covered with adhesive in order to provide for a clean finished composite sheet and to insure the proper feeding thereof through the various rollers described herein.

While we have illustrated and described a preferred embodiment of this invention, it must be understood that the invention is capable of considerable variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

We claim:

1. A method of forming continuously metallic and fibrous laminations into a composite sheet which consists in linearly displacing thin metallic and fibrous sheet materials from separate rolls to a common path, applying coating materials to at least one of the confronting surfaces of said materials prior to reaching their common path of traverse preparatory to effecting contact therebetween, then bringing said metallic and fibrous materials together under pressure while in motion along said common path, then turning overlapping parallel edges of said metallic sheet material around and under the edge regions of said fibrous sheet material while in motion to define protecting edge flanges, retaining in alignment the formed protecting turned edge flanges with the overlapping unturned parallel edges of the metallic sheet material in the region of the conversion from unturned to turned edge sheet material, and then rolling said combined sheets into rolls of uniform length for convenient handling and storage.

2. A method of continuously forming metallic and fibrous laminations into a composite sheet which consists in linearly displacing thin metallic and fibrous sheet materials from separate rolls to a common path, applying a permanently tacky coating adhesive to at least one of the confronting surfaces of said materials prior to reaching their common path, then effecting contact between said confronting sheets under pressure and at elevated temperatures during the linear displacement of said sheets in unison along said common path, then turning overlapping parallel edges on said metallic sheet material around and under the edge regions of said fibrous sheet material while in motion to define protecting edge flanges, retaining in alignment the formed protecting turned edge flanges with the overlapping unturned parallel edges of the metallic sheet material in the region of the conversion from unturned to turned edge sheet material, and then rolling said combined sheets into rolls of uniform length for convenient handling and storage.

3. In an apparatus for continuously flanging sheet materials in a continuity of displacement therethrough under tension, the combination with a plate for guiding a con-

tinuous sheet of material therethrough and therealong in a predetermined path, of elongated sheet guide and edge turning means on said plate spaced to substantially conform with and to the width of the sheet that is continuously displaced along said plate, and yieldable means on said plate for retaining the edges of the sheet along the path of travel in said plate, means on said plate for effecting the alignment of the unturned laminated sheet with the turned portion thereof responsive to turning the flange during the continuous forward traverse of the laminated sheet including a shaft extending crosswise above the plate and from which the plate is suspended, rollers mounting the plate for free lateral displacement whereby the plate and shaft are laterally displaced in alignment with the sheets upon the development of force between the sheets and the said sheet guide, and means to maintain the laminated sheet under tension in its travel through the flanging and turn-under device.

4. In an apparatus for flanging sheet materials in a continuity of displacement therethrough under tension, the combination with a plate for guiding a continuous sheet of material therethrough along a predetermined path, of fixed elongated sheet guide and edge turning means on said plate spaced to substantially conform with and to the width of the sheet that is continuously displaced along said plate, means on said plate for yieldably retaining the edges of the sheet along the path of travel in said plate, means on said plate for effecting the alignment of the laminated sheet during the flanging thereof, and means comprising side guides in the path of the turned edge portion to align the unturned edges of the laminated sheet immediately prior of the initial turning operation, means to maintain the laminated sheet under tension in its travel through the flanging and turn-under device, and means for movably mounting said plate to laterally float to insure self-alignment with the sheet.

5. In an apparatus for flanging sheet materials in a continuity of displacement therethrough under tension, the combination with a plate for guiding a continuous sheet of laminated materials consisting of a base sheet of fibrous material and a thin formable metallic material adhesively joined to the base sheet and overlapping the edges of said base sheet therethrough along a predetermined path, of fixed elongated and gradually twisted guide and edge turning plates on each side of said plate and spaced to conform with the width of the base sheet that is continuously displaced along said plate, spring mounted roller means on both sides of said plate for yieldably guiding and retaining the edges of the sheet along the path of travel in said plate, said guide and edge turning plates serving to inwardly flange the overlapping edges of said formable metallic sheet around the edges of the base sheet, cross-rails fixedly mounted to support said plate proximate to the ends thereof, and rollers mounted on said plate to frictionally engage said cross-rails to movably support said frame for self-alignment of the continuous laminated sheet which is displaced under tension therethrough.

6. In an apparatus for flanging sheet materials in a continuity of displacement therethrough under tension, the combination with a plate for guiding a continuous sheet of laminated materials consisting of a base sheet of fibrous material and a thin formable metallic material adhesively joined to the base sheet and overlapping the edges of said base sheet therethrough along a predetermined path, of fixed elongated and gradually twisted guide and edge turning plates on each side of said plate and spaced to conform with the width of said base sheet that is continuously displaced along said plate, spring mounted roller means on both sides of said plate, said spring mounted roller means including elongated rigid means on each side of said plate to gang support said rollers for multiple application against said plate with the continuous sheet therebetween for yieldably guiding and

retaining the edges of the sheet along the path of travel in said plate, said guide and edge turning plates serving to inwardly flange the over-lapping edges of said formable metallic sheet around the edges of the base sheet, cross-rails fixedly mounted to support said plate proximate to the ends thereof, and rollers mounted on said plate to frictionally engage said cross-rails to movably support said frame for self-alignment of the continuous sheet which is displaced under tension therethrough.

7. A method of continuously forming a composite sheet of thin formable metallic material and a comparatively thick flexible insulating sheet material which comprises the unreeling of said respective sheets from separate rolls at substantially the same linear speed so that the metallic sheet has an over-lapping edge in relation to the other sheet, applying an adhesive to the confronting surface of the flexible insulating sheet material prior to their displacement in contact with each other, pressing said sheets together during the linear movement thereof in unison, and then flanging the overlapping edge of said metallic sheet to said insulating sheet edge to insure their composite association with a protective edge.

8. A method of continuously forming a composite sheet of thin formable metallic material and a comparatively thick flexible insulating sheet material which comprises the unreeling of said respective sheets from separate rolls at substantially the same linear speed so that the metallic sheet has an overlapping edge in relation to the other sheet, applying an adhesive to the surface of the flexible insulating sheet material which is to confront the formable metallic material, bringing said sheets together for contact during the movement thereof in unison, pressing said sheets together during the linear movement thereof in unison, then flanging the overlapping edge of said metallic sheet to said insulating sheet edge to insure their composite association with a protective edge, and then smoothing the flanged edge by applying pressure over the flanged area of said sheet edge while being linearly displaced in its travel.

9. A method of continuously forming a composite sheet of thin metallic material and a comparatively thicker sheet of asphalt saturated felt by unreeling a wider metallic sheet in superposed relation with a narrower asphalt saturated felt to present overlapping metallic edges, interposing a permanently tack adhesive between said sheets during the linear displacement of said sheets under pressure to effect their adhesion, then turning overlapping parallel edges of the metallic sheet material around and under the edge regions of the thicker sheet of asphalt saturated felt to define protecting edge flanges with the overlapping edges of the thin metallic material before being turned over and under the edges of the asphalt saturated felt, then smoothing the flanged edges while being linearly displaced in its travel, and then rolling said composite sheet into rolls of uniform length.

10. A method of forming a composite sheet of thin metallic material and a comparatively thicker sheet of asphalt saturated felt by unreeling a metallic sheet in superposed relation with an asphalt saturated felt sheet to present an overlapping metallic edge, interposing a permanently tacky adhesive between said sheets during the linear displacement of said sheets between rollers to effect their adhesion, then turning the overlapping parallel edge of the thin metallic material around and under the edge region of the thicker sheet of asphaltic saturated felt to define a protecting edge flange, retaining in alignment said protecting edge flange and the opposite edge of the saturated felt with the unturned overlapping parallel edge of said metallic material and the opposite edge of the saturated felt, smoothing the flanged area of said sheet edge while it is being linearly displaced in its travel, and then rolling said composite sheet into rolls of uniform length.

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