

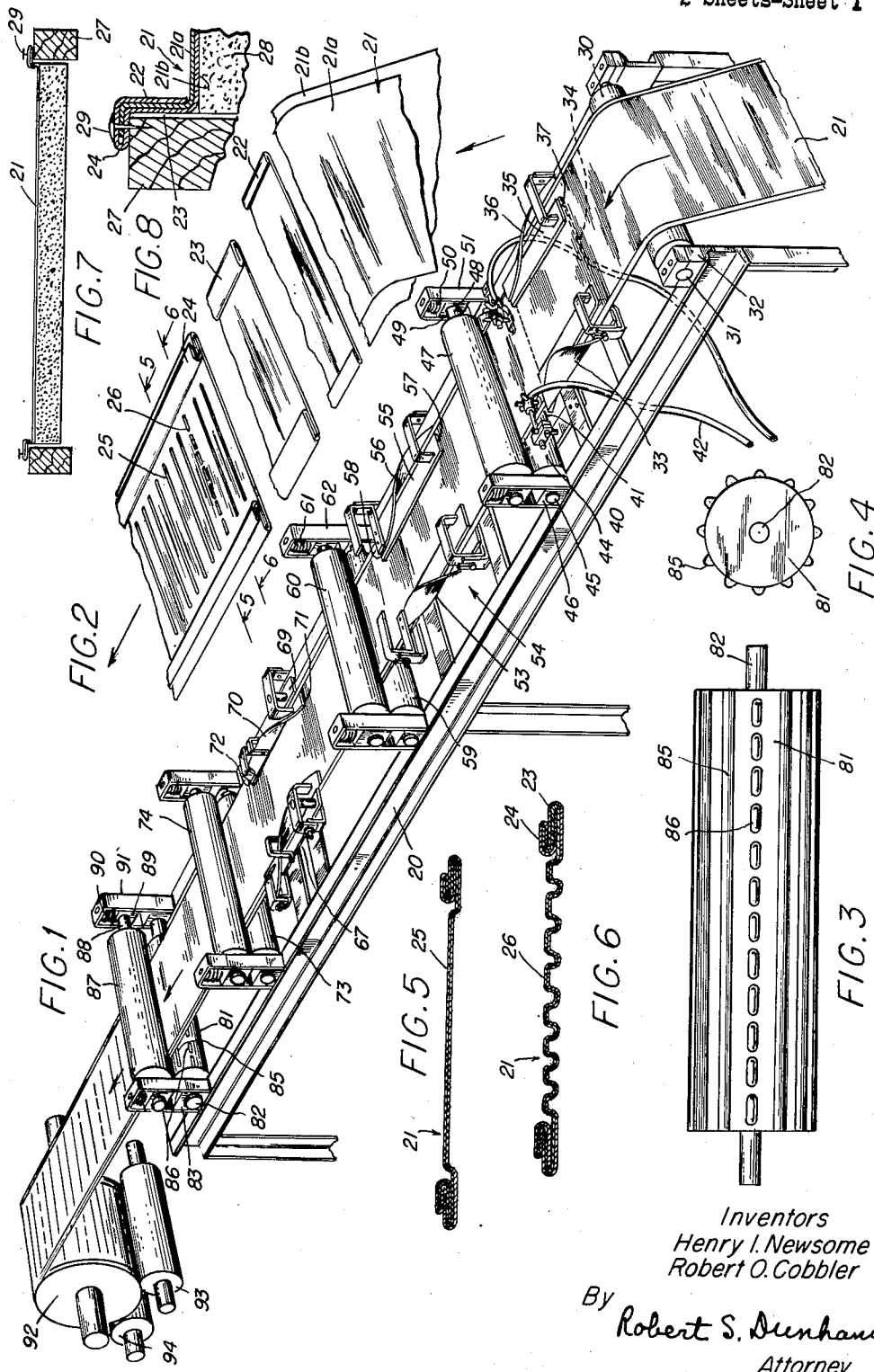
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H. I. NEWSOME ET AL
 APPARATUS AND METHOD FOR THE MANUFACTURE OF FOIL-PAPER
 LAMINATES AND CORRESPONDING PRODUCT

3,012,603

Filed Feb. 19, 1959

2 Sheets-Sheet 1



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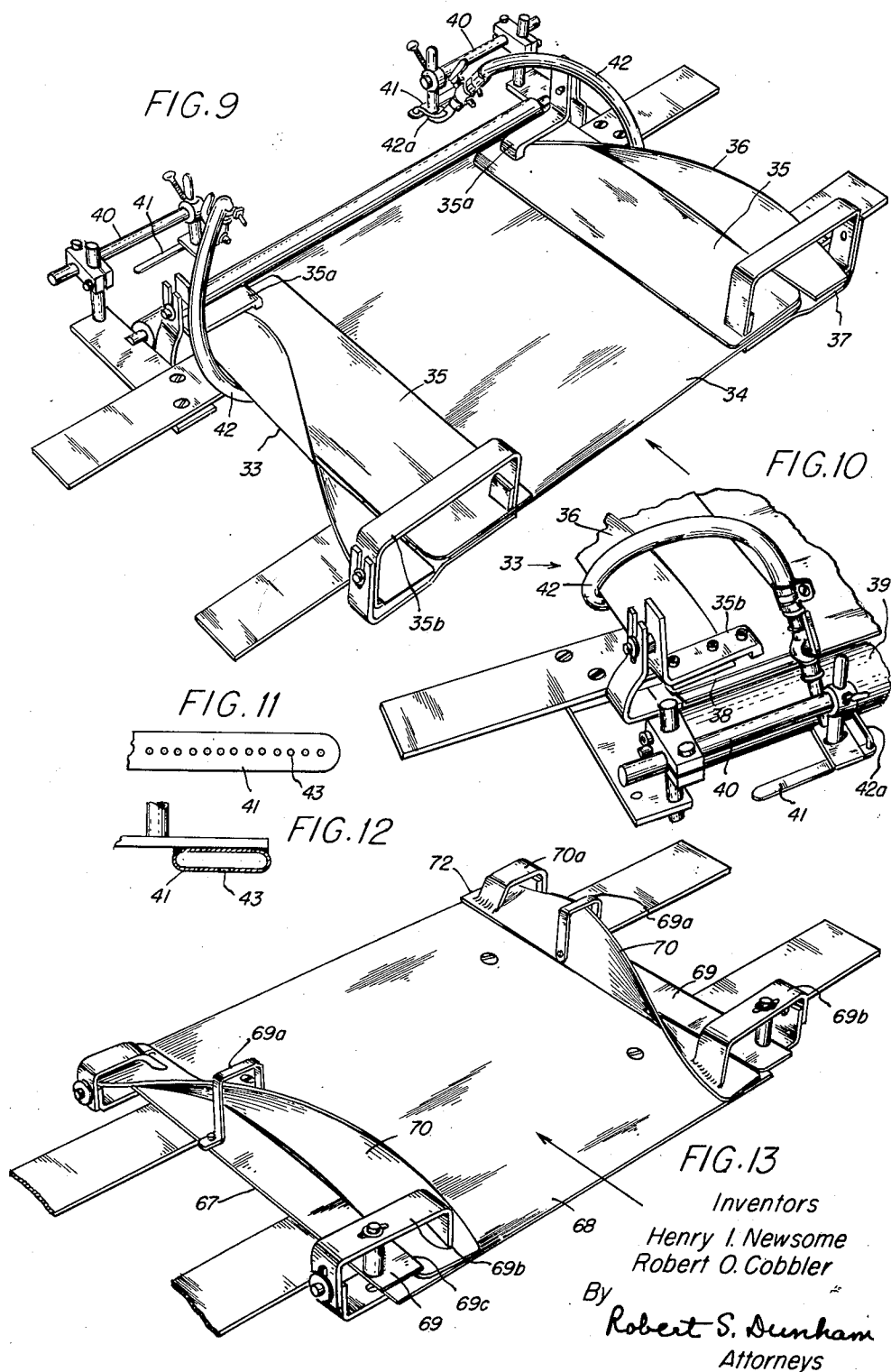
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APPARATUS AND METHOD FOR THE MANUFACTURE OF FOIL-PAPER LAMINATES AND CORRESPONDING PRODUCT

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13 Claims. (Cl. 154-44)

This invention relates to the manufacture of structures of foil-paper lamination and the like, particularly for the production of foil-paper laminates, conveniently in the form of a continuous web or strip, having special folded, embossed or similar configuration, adapting the material for special uses requiring such shape and construction. A particular feature of the invention is directed to novel means and methods for pleating or successively folding selected portions, such as side portions, of a web of material of the nature of foil-paper laminates, and also for otherwise providing special shapes or configurations, more or less permanently embodied in the sheet material.

In a more specific sense, the invention is concerned with the manufacture of foil-paper insulating structure in strip or web form, as adapted for use in buildings, with or without associated cellular or like insulating material. A presently common type of structural insulation, for instance as employed between the joists, studs, or rafters of frame buildings, comprises elongated, thick, matted bodies of rock wool, glass wool or similar fibrous composition, attached to coextensive sheet material consisting of a foil-paper laminate. Such composite structures, usually marketed in rolls of a continuing web many feet long, are designed to be cut off in appropriate lengths by the user, and secured in place by nailing or tacking the side portions of the laminate to neighboring studs, rafters or the like, so that the thick bat or mat of cellular or fibrous insulation is recessed between the structural members in conventional manner. The foil lamination, usually disposed with its foil side opposite to the rock or glass wool material (i.e. the paper layer being between the latter and the foil) not only contributes the reflective insulating qualities of the metal foil, e.g. aluminum foil, but also affords a moisture barrier, for greater lasting qualities of the cellular insulation and thus for avoidance of problems incidental to condensation which might otherwise occur in the wall cavities filled by such insulation.

Heretofore a common arrangement for materials of this type has been to provide a single creased fold of the foil-paper laminate, as to a portion along each edge that projects beyond the body of cellular material, so that such folded-over portion of the web lies on the outer or foil side of the composite body. Then this overlying portion is unfolded to a 90° angle and tacked to the opposing inner faces of the pair of studs, rafters and the like, between which the insulation is seated. It is now desired to provide insulating means of the described character, arranged so that the outer edge portions of the laminate are of double thickness and are pre-shaped for nailing to the outermost or exposed faces of the studs or rafters, i.e. the coplanar faces at right angles to the opposed, facing side surfaces. Such arrangement is stronger, is considerably easier to install, and avoids damage to the material as sometimes occurs in the nailing or tacking operation where the latter must be accomplished essentially in a narrow region reached by a hammer or implement swung across the face of the foil.

Accordingly, an important object of the invention is to provide novel means and methods for producing longitudinal folds along the sides of a web or sheet of material such as foil-paper laminate, and particularly for producing

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a folded construction of the character described above, as by providing, at each edge, a first inward fold of a side portion, with the resulting doubled layer again folded inwardly over the adjacent remaining or standing part of the material, and with a part of the thus-doubled flap folded outwardly to achieve a second flap overlying the first double flap. Other objects are to afford improved apparatus and procedure for effectuating such folds, especially in a continuous manner with respect to a traveling web of the material so as to yield a product having the desired folded configuration in a single, continuing passage of the sheet. Still other objects are the provision of new folding means and operations, to impart desired folded and creased shapes along the edge of traveling sheet material, with desired effectiveness and with minimum hazard of tearing or otherwise injuring the material.

A further object is to provide a novel structure of foil-paper laminate, particularly to be used for or to be embodied in insulating material, in buildings and the like, whereby the material is stiffened or strengthened so as to be less susceptible or sagging, wrinkling or otherwise becoming disordered in the course of use. Further objects are the provision of improved means and methods for shaping or modifying the foil-paper laminate to achieve the improved structure, as just described.

Still further objects are the provision of improved folding and shaping instrumentalities and methods, for converting materials of the character defined into desired folded or otherwise shaped articles, preferably in a rapid and continuous manner.

To these and other ends, important features of the invention comprise the provision of means establishing a path for travel of a continuing web of material, e.g. a foil-paper laminate, from a source of supply to a take-up reel or the like, together with means disposed along the path for performing predetermined folding and other operations in succession on the traveling material. More particularly, to achieve the successive folds along edge portions as defined above, the apparatus includes three pairs of folding means, the first being structure which inwardly bends an outer portion of the passing material at each side, the second being adapted to achieve a further fold of the previously folded portion, over an adjacent part of the main body of material, and the third means comprising structure engaging the last-completed double flap and folding a part of it outwardly. The folding instrumentalities include creasing means, as in the nature of pressure roller means, effective on the turned and folded portions of material respectively in immediate association with each folding stage. The successive folding and creasing devices are so arranged and functioning that their operation is effected by drawing the material past them, i.e. advantageously by the continuing operation of winding the web on the take-up reel or the like, disposed beyond the train of folding instrumentalities at the end of the defined path of travel.

In accordance with another and important feature of the invention, means are provided for imparting, in the manner of embossing, a predetermined, repeated shape to the traveling foil-paper laminate, specifically transverse corrugations in the area lying across the material and between the folded edge portions. A specially effective instrumentality for so shaping the traveling web comprises a pair of rollers arranged intermediate the edge folding means and the take-up reel, including a rigid corrugating roller and a resilient pressure roller coacting to indent the traveling web with successive corrugations or raised portions that extend across the material, the folded thickness of the side portions preventing corrugating action in these, and the inherent extensibility and slack of the unfolded main body of laminate, permitting effective corrugation there. Pursuant to a still further

feature of invention, the corrugations are spaced, lengthwise of the web by predetermined distances to afford linear measuring means integrally embodied in the material, with selected corrugations, at longer distances, constituted to have a distinctive shape or appearance, for example as representing a dotted line or bead, for special convenience of measurement.

The improved methods of the invention include the steps of continuously advancing the web of material, while successively turning and creasing the edge portions into correspondingly successive folds and preferably also imparting transverse corrugations, as described above, in the material, such operations being performed by moving the web in a continuous manner and in each instance progressively bending a side portion through an angle of 180° into the desired folded relation.

Further features and details of the invention will be described hereinbelow, especially in connection with the accompanying drawings which show a presently preferred example of the apparatus and of the ultimate product and its progress through successive stages.

Referring to the drawings:

FIG. 1 is a perspective view of an embodiment of the complete machine, with some simplification of structure;

FIG. 2 is a perspective, somewhat schematic, view of the material, with successive segments showing correspondingly successive stages in the folding and shaping operations;

FIG. 3 is an enlarged elevational view of the corrugating roller of FIG. 1;

FIG. 4 is an end view of the roller of FIG. 3;

FIGS. 5 and 6 are transverse sections of the completed web of material showing the corrugations respectively effected by certain specific ribs of the roller of FIG. 3, these being sections on lines 5—5 and 6—6 respectively of FIG. 2;

FIG. 7 is a transverse sectional view of a complete body of thermal insulation including the sheet material of FIG. 2, shown in place between studs or the like in a building;

FIG. 8 is an enlarged fragmentary view of the attachment of the insulating material to a stud, all in transverse section, similar to FIG. 7;

FIG. 9 is an enlarged perspective view of the folding means and associated instrumentalities at the first folding station of FIG. 1;

FIG. 10 is a further enlarged, fragmentary view, from an opposite direction, showing certain gluing means of the first folding devices;

FIG. 11 is an enlarged view of the bottom side of a gluing element in FIG. 10;

FIG. 12 is a greatly enlarged, sectional view of the gluing element; and

FIG. 13 is an enlarged perspective view of the third folding instrumentalities in FIG. 1.

In its illustrated embodiment, the invention is adapted to impart three folds to each side of a strip or web 21 of foil-paper laminate to facilitate attachment of the laminate to the parallel rafters, joists or studs of a roof, floor or wall construction for purposes of insulation, viz. a primary inward fold 22, glued for permanence, to provide a double thickness of the laminate at the points of attachment; a secondary inward fold 23 and a tertiary outward fold 24 of the inner portion of the secondary fold, both designed to open partially to abut the surfaces of the adjacent joist or stud. The invention as illustrated is further adapted to impress transverse corrugations 25, 26 on the central portion of the folded laminate, for increased strength and ease of measurement, the spacing of these corrugations corresponding to convenient units of length and divisions thereof.

The apparatus as shown in the drawings includes a horizontally elongated frame, generally designated 20, supporting a series of plow folds and transverse rollers disposed on the frame in succession along a horizontal path through which the laminate web 21 is continuously

advanced (e.g. from right to left in FIG. 1) to a rewind spool or reel 92 rotated by a pair of trunnion rollers 93, 94 whereon the rewind spool rests, these trunnion rollers being driven by suitable means (not illustrated), i.e. so as to provide the desired continuous advance of the laminate web.

At the end of the frame most distant from the rewind spool, a steel guide roller 30 is mounted, adapted to rotate about a horizontal axis transverse to the path of the web and having axial extensions 31 at either end journaled in blocks 32 rigidly attached to the frame; the continuous web of laminate 21 is advanced from a spool or other suitable source (not shown) over this roller into the aforementioned horizontal path. Mounted on the frame 20 behind the guide roller (with respect to the direction of the advancing laminate web), i.e. so as to receive the horizontally directed web therefrom, is a steel plow fold 33, shown in detail in FIGS. 9 and 10. This plow fold includes a horizontal supporting plate 34, disposed along and slightly below the path of the web, and a pair of horizontal guard plates 35 suspended by brackets 35a, 35b, over the supporting plate and slightly above the path of the web, with their long axes directed parallel to the path of the web. The supporting plate and guard plates are so dimensioned that the sides of the entering web extend beyond their respective outer edges a certain predetermined distance. Also included in the plow fold structure is a pair of folding flanges 36 respectively mounted outside the guard plates, having leading edges 37 respectively outside and co-planar with the supporting plate, and being thence curved upwardly and inwardly (i.e. toward the path of the web) about axes parallel to the path of the web, so that their trailing edges 38 are respectively above and substantially parallel with the trailing edges of the guard plates. These flanges 36 are adapted to guide the side portions of the web, which pass above their leading edges, progressively upwardly and inwardly while the central portion of the web is held down by the guard plates 35, folding these side portions inwardly over the guard plates to effect the primary inward folds 22 of the web sides simultaneously; i.e. as the web emerges from the plow fold 33 its central portion is beneath the guard plates 35 while its side portions (now folded 180°) are above the guard plates and beneath the trailing edges of the flanges 36.

Directly behind the plow fold 33 a steel guide roller 39 is mounted, transverse to the path of the web; over this roller the emerging web passes. Also mounted behind the plow fold 33 are two glue feet 41, shown in detail from the underside in FIG. 11, suspended by brackets 40 from a location above the web, and extending horizontally from points respectively inward of the primary folds 22 of the web toward the web sides, i.e. transverse to the path of the web; each glue foot is so disposed that the inner faces of the folded portion of the adjacent web side will pass respectively above and beneath it. These glue feet are flattened, hollow members as shown in FIG. 12, into which glue is pumped under low pressure through feed tubes 42 and connecting tubes 42a, the glue being transmitted to the folds through a series of apertures 43 (FIG. 11) on the lower surfaces of the glue feet, spaced along the long axes thereof.

Behind the glue feet are mounted a pair of steel pressure rollers 44, 47, substantially longer than the width of the web, and adapted to rotate about horizontal axes transverse to the path of the web and parallel to each other in a vertical plane. The lower roller 44 has axial extensions 45 journaled in bearing blocks 46 rigidly attached to the frame 20; the upper roller 47 has axial extensions 48 journaled in bearing blocks 49 respectively urged downward by compression springs 50 within inverted-U frames 51 attached to the frame 20, the blocks 49 being adapted to slide vertically within these U-frames 51. The upper roller 47 is strongly biased by the springs

50 toward the lower roller 44, i.e. to apply pressure to the web as it passes between the rollers and thereby to crease the primary folds 22 and insure good adhesion of the folds by the glue.

Next in the path of the web along the frame 20 a second plow fold 53 is mounted, substantially similar in structure and function to the plow fold 33. It includes a supporting plate 54 and a pair of guard plates 55 disposed in the same manner with relation to each other and to the sides of the web as supporting plate 34 and guard plates 35, i.e. they are so disposed that the web passes above the supporting plate and beneath the guard plates, the folded sides of the entering web extending a certain predetermined distance, e.g. the width of the primary fold 22, beyond the respective outer edges of the supporting and guard plates. Also included in the plow fold structure, as before, are a pair of folding flanges 56 mounted respectively outside the guard plates with leading edges 57 respectively outside and coplanar with the supporting plate 54, being thence curved upwardly and inwardly along axes parallel to the path of the web so that their trailing edges 58 are respectively above and substantially parallel with the trailing edges of the guard plates; these flanges are adapted to simultaneously guide the folded sides of the web, which pass over their leading edges, progressively upward and inward against the guard plates to produce the secondary inward folds 23 of the web sides, in the same manner as plow fold 33 imparts the primary inward folds 22 thereto. There is, however, no gluing structure associated with this plow fold 53.

Directly behind the plow fold 53 is a pair of pressure rollers 59, 60 exactly analogous in character and disposition to pressure rollers 44, 47; i.e., rollers 59, 60 are adapted to rotate about horizontal axes transverse to the path of the web and parallel to each other in a vertical plane, the upper roller 60 being biased as before, by compression springs 61 mounted within inverted-U frames 62, toward the lower roller 59, so as to exert pressure on the web as it passes between the rollers and thereby to crease the secondary folds 23.

The path of the advancing web passes next through a third steel plow fold 67 mounted on the frame 20, and illustrated in detail in FIG. 13. The plow fold 67 includes a horizontal supporting plate 68, disposed along and slightly beneath the path of the web with outer edges substantially coextensive with the outer edges of the entering web; and a pair of horizontal guard plates 69 suspended by bracket structures 69a, 69b, over the supporting plate, above and parallel to the path of the web, so disposed that the outer, creased side edges of the web pass directly beneath them, while the inner portions of the secondary folds 23 of the web sides extend respectively a certain predetermined distance inward of the inner edges 69c of the guard plates. A pair of folding flanges 70 are also included in the plow fold structure 67, mounted (by brackets 69b, 70a) inward of and partly above the guard plates, and having leading edges 71 respectively inward of the guard plates and in a horizontal plane between the plane of the guard plates and the supporting plate 68, i.e. so that the inward portions of the secondary folds 23 of the web sides (corresponding to the outer portions of the primary folds 22) pass respectively above these leading edges 71; the flanges 70 are thence curved upwardly and outwardly along axes parallel to the web path so that their trailing edges 72 are above and substantially parallel with the trailing edges of the guard plates. Thus the flanges are adapted to guide the inner portions of the secondary folds 23 of the web progressively upward and outward, folding these portions against the guard plates (against their edges 69c), i.e. over the respective outer portions of the secondary folds, thereby simultaneously producing the tertiary folds 24 of the web.

A third pair of spring-biased pressure rollers 73, 74

is disposed behind the plow fold 67 in a manner exactly analogous to that of pressure rollers 59, 60, the function of these rollers being likewise analogous to that of rollers 59, 60, i.e. to crease the tertiary folds 24 of the web sides.

Behind these rollers is disposed a further pair of rollers 81, 87, substantially longer than the width of the web, and adapted to rotate about horizontal axes transverse to the web path and parallel to each other in a vertical plane. The lower roller 81, illustrated in detail in FIGS. 3 and 4, is composed of steel, and has axial extensions 82 journaled in blocks 83 rigidly attached to the frame 20. The circumference of this roller corresponds to some convenient unit of length, e.g. one foot; the roller bears a series of longitudinal ribs 85 disposed on its surface in spaced circumferential relation, the distances between them corresponding to convenient divisions of the aforementioned unit of length, e.g. for a roller of one-foot circumference the ribs may be spaced one inch apart. One of these ribs 86 is of different design from the others, e.g. comprising a longitudinal series of raised dots or dashes.

The upper roller 87 is composed of a resilient substance, such as moderately soft rubber, and has a smooth cylindrical surface. It is carried on a shaft that has axial extensions 88 journaled in bearing blocks 89 which are urged downward by compression springs 90 within inverted-U frames 91 rigidly attached to the frame 20, the blocks being vertically slidable within the inverted-U frames. The springs 90 bias the upper roller 87 toward the lower roller 81, i.e. to exert pressure on the laminate web as it passes between the rollers and thus to cause the raised ribs of roller 81, whose rotation is effected by advancement of the web over it, to emboss a corrugated pattern on the web, composed of transverse ribs 25 (FIG. 5) in the aforementioned spaced relation, and rows of dots or dashes 26 (FIG. 6) occurring sequentially with the ribs 25 at distances corresponding to the circumference of the roller 81, e.g. every twelve inches. The embossed pattern thereby indicates units of length and divisions thereof, as exemplified above, on the laminate.

The path of the web from these rollers 81, 87 extends to the friction-rotated rewind spool or roll 92 beyond the end of the frame 20, whereon the folded and corrugated web is rolled.

From the foregoing description of the apparatus its operation, and the performance of the process, should be largely self-explanatory. After a web or strip of foil-paper laminate from a spool or other source has been threaded through the machine to the rewind spool 92, driving power applied to the trunnion rollers 93, 94 rotates the rewind spool to advance the web 21 continuously over guide roller 30 into and along a horizontal path along the frame 20. The web enters the plow fold 33, passing over supporting plate 34 and beneath guide plates 35; its side edges, i.e. the portions extending outwardly of the supporting plate and guard plates, passing over leading edges 37 of folding flanges 36, are advanced simultaneously and progressively against the upward and inward curves of these flanges and are thus guided upwardly and inwardly over the longitudinal edges of the guard plates 35 (while the guard plates hold down the central portion of the web) to form the primary folds 22. Emerging from the plow fold, the web passes over guide roller 39; then as the folds pass glue feet 41, glue fed into the glue feet at low pressure through tubes 42 is applied through the apertures 43 in the glue feet to the web surface within the folds. The folds are creased and their respective facing surfaces pressed together, to insure good adhesion by the glue, by passage of the web between pressure rollers 44, 47.

Thence the web is advanced to the second plow fold 53, where it passes above the supporting plate 54 and beneath guard plates 55; the folded sides of the web, pass-

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ing over the leading edges 57 of flanges 56, are advanced simultaneously and progressively against the upward and inward curves of these flanges, thus being bent inward over the longitudinal edges of the guard plates 55 to form the secondary folds 23. As the web emerges from this plow fold 53, pressure rollers 59, 60, between which the web passes, exert pressure on it to crease the secondary folds.

The web next enters the third plow fold 67, passing above the supporting plate 68 with its outer side portions beneath the guard plates 69; the inward portions of the secondary folds 23 pass over the leading edges 71 of the flanges 70, and are advanced simultaneously and progressively against their upward and outward curves, being thereby bent outward over the guard plates (which hold down the outer portions of the secondary folds 23) to form the tertiary outer folds 24. Emerging from the plow fold the web passes between pressure rollers 73, 74 which crease the tertiary folds.

Leaving these pressure rollers, the web passes between the further pair of rollers 81, 87; the advancing web rotates the ribbed roller 81, and the pressure of the spring-biased upper roller 87 against the lower roller forces the raised ribs of the lower roller into the web, embossing a permanent transverse corrugation on the central portion of the web, which is sufficiently slack or yieldable to permit and facilitate such impression, while the thickness of the folded sides prevents any embossing or at least any permanent or lasting embossing of such folded parts. Thus the web is strengthened or stiffened by corrugation in its central region and at the same time its subsequent linear measurement (as for cutting off desired lengths to be used) is facilitated by the spacing of the pattern which marks out units of length, e.g. inches and feet, on it.

From the corrugating roller the web advances to the rewind spool, where it is rolled up as the trunnion rollers turn the spool. The thicker edge portions of the folded and corrugated web, resting on the trunnion rollers, prevent the pressure of the rewind spool (and the roll of laminate building up thereon) against the trunnion rollers from flattening the transverse corrugations in the central portion of the web.

In use, the folded and corrugated foil-paper laminate with its paper side preferably attached to or otherwise associated with a longitudinally coextensive bat of fibrous or cellular insulating material 28 (FIGS. 7 and 8) is cut into pieces of convenient length, with the corrugated pattern used as a guide for measurement of the length of the insulating strips to be cut, and placed, for example between studs 27 of a wall with the foil side exposed, i.e. away from the outer wall. As apparent, the folded edge portions of the laminate extend sidewise beyond the bat 28, which is dimensioned to fit a standard spacing of studs, joists or the like. In the described use of the product, the secondary and tertiary folds 23 and 24 along the sides of the laminate are partially unfolded, so that the secondary folds 23 are at right angles to the surface of the central portion of the laminate 21, and the tertiary folds 24 are again at right angles to the secondary folds, i.e. in a plane parallel to the central portion of the laminate. The outer surfaces of the secondary folds 23 then abut the facing sides of the studs (or joists) 27, while the inner surfaces of the tertiary folds abut the coplanar outer faces of the studs, and may be conveniently attached thereto with nails 29, driven through the primary fold 22 into the outer faces of the studs.

Thus it will be seen that the attachment of strips of insulation to walls or other parts of buildings is rendered particularly facile with this prefolded laminate of the studs, joists or rafters, so that there is no need to swing a hammer across the face of the laminate in the restricted space between the structural members. At the same time the primary folds 22 of the laminate, made permanent by the gluing effected by the apparatus described above, afford a double thickness of the portion of laminate which

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is to be nailed, with attendant increase of strength and resistance to tearing; further strength and stiffness is added to the laminate as a whole by means of the transverse corrugated pattern, which makes the material more rigid and reduces or eliminates sagging after it is nailed in place, and which also provides a ready means for determining a desired length of the laminate strip.

While the foil-paper laminate can have its foil and paper layers fully coextensive, or partially coextensive in some other way, the specific material 21, as illustrated, has an economical arrangement whereby its aluminum foil layer 21a is a little narrower, crosswise of the web, than the paper layer 21b, the difference at each side being exactly the width of the primary fold 22 so that the first-folded flap is a flap of paper alone. Likewise while the folding or pleating and other steps in FIG. 1 can be performed with either side of the material 21 on top, the operation is advantageously performed with the foil side uppermost, so that the flaps of the completed 180° folds 22, 23, 24 all have a paper side exposed, for greater durability and convenience in the described ultimate use of the product.

Although the foregoing description delineates a presently preferred embodiment of the invention, it is to be understood that the invention is not limited to the specific devices, procedures and products herein disclosed but may be embodied in other forms without departure from its spirit.

We claim:

1. Apparatus for producing longitudinal folds along the sides of a web of sheet material, comprising means providing a path for travel of a continuing web of the sheet material from a supply thereof, means engaging the material at the end of the path for continuously advancing the web along the path and three pairs of folding means disposed in succession along the path for engaging side portions of the advancing web, the folding means of each pair being respectively disposed at opposite sides of the path and comprising a longitudinal folding edge and an adjacent bending surface helically extending through 180° for guiding and turning a side portion of the advancing material over said edge into a predetermined folded configuration, each folding means of the first pair being shaped to fold a side strip of the web inwardly across the web to produce a doubled portion of web, each folding means of the second pair being shaped to fold said doubled portion inwardly across a further part of the web to produce a three-layer structure along the web, and each folding means of the third pair being shaped to fold a part of the first-mentioned doubled portion, which constitutes two layers of said three-layer structure, outwardly of the web across an adjacent part of said doubled portion, whereby each side of the web material is overlaid with a doubled structure which has a reversely folded configuration.

2. Apparatus for producing longitudinal folds along the sides of a web of sheet material, comprising means providing a path for travel of a continuing web of said material from a supply thereof, means engaging the material at the end of the path for continuously advancing the web along the path, and three pairs of folding means spaced along the path for engaging respectively opposite side portions of the advancing web, each folding means comprising longitudinal edge means and coacting helically shaped flange means for folding the material over the edge means, each folding means of the first pair being shaped to fold a side strip of the web inwardly across the web to produce a doubled portion of web, each folding means of the second pair being shaped to fold said doubled portion inwardly across a further part of the web, to produce a three-layer structure along the web, and each folding means of the third pair being shaped to fold a part of the first-mentioned double portion, which constitutes two layers of said three-layer structure, outwardly of the web across an adjacent part of said doubled portion, whereby each

side of the web of material is overlaid with a doubled structure which has a reversely folded configuration.

3. Apparatus as defined in claim 2, which includes means positioned in the path of the web of material between the first and second pairs of folding means and disposed to extend into the folds produced by the first pair of folding means, between the plies thereof, for dispensing adhesive material within said fold, and a pair of compression rollers, disposed across the path of the web of material beyond said adhesive-dispensing means, for engaging the folded portions of the web to crease the folds and compress the aforesaid plies thereof into mutual adherence by the applied adhesive.

4. Apparatus for converting a web of sheet material into stiffened web material having a folded configuration along its sides, comprising means providing a path for travel of a continuing web of said material from a supply thereof, means for continuously advancing the web along the path, folding means along opposite sides of the path and engaging opposite side portions of the web for folding said portions along lines longitudinal of the web, said folding means being adapted successively to fold a side strip of the web inwardly across the web to produce a double portion of web, then to fold said double portion inwardly across a further portion of the web to produce a three layer structure and to fold the top two layers of said three layer structure outwardly of the web across an adjacent part of said three layer structure whereby each side of the web of material is overlaid with a reversely folded two layer structure on top of a three layer structure, and means at a locality of the aforesaid path beyond the folding means in the direction of travel of the web, for transversely corrugating the web, to stiffen same intermediate the folded portions.

5. Apparatus for converting a web of sheet material into stiffened web material adapted for attachment to other structure along its sides, comprising means providing a path for travel of a continuing web of said material from a supply thereof, means for continuously advancing the web along the path, folding means along opposite sides of the path and comprising elongated curved structures shaped for progressively engaging side portions of the advancing web and progressively bending said portions into a predetermined folded configuration longitudinally of the web, to provide fold-reinforced structure along the sides of the web arranged for flatwise attachment to other structure which is not coplanar with the web, said folding means being adapted successively to fold a side strip of the web inwardly across the web to produce a two layer portion of web, then to fold said two layer portion inwardly across a further portion of the web to produce a three layer structure and to fold the top two layers of said three layer structure outwardly of the web across an adjacent portion of said three layer structure whereby each side of the web material is overlaid with a reversely folded double layer structure on top of a three layer structure and means at a locality of the aforesaid path beyond the folding means in the direction of travel of the web, for transversely corrugating the web, to stiffen same intermediate the folded portions.

6. Apparatus as defined in claim 5, wherein the last-mentioned means comprises a pair of rolls extending across the web and engaging said web under pressure between them, one of said rolls being of rigid structure and having axial corrugating ribs spaced around its circumference, and the other of said rolls being of resilient structure for coaction with the ribbed roll to impress the corrugations transversely of the web.

7. Apparatus for converting a web of sheet material into stiffened web material, comprising means providing a path for travel of a continuing web of said material from a supply thereof, means for continuously advancing the web along the path, folding means along opposite sides of the path for folding opposite side portions of the web along lines extending longitudinally of the web, said fold-

ing means being adapted successively to fold a side strip of the web inwardly across the web to produce a double portion of web, then to fold said double portion inwardly across a further portion of the web to produce a three layer structure and to fold the top two layers of said three layer structure outwardly of the web across an adjacent part of said three layer structure whereby each side of the web of material is overlaid with a reversely folded two layer structure on top of a three layer structure and means in the aforesaid path for transversely corrugating the web, to stiffen same intermediate the folded portions, said last-mentioned means comprising a pair of rolls extending across the web and engaging said web under pressure between them, one of said rolls being of rigid structure and having axial corrugating ribs spaced around its circumference, and the other of said rolls being of resilient structure for coaction with the ribbed roll to impress the corrugations transversely of the web.

8. Apparatus as defined in claim 7, wherein one of said corrugating ribs has a distinctive pattern differing from other ribs that are disposed in immediate succession to said distinctive rib around said rigid roll, to produce an array of corrugations in the web wherein one out of every predetermined number of said corrugations is characterized by said pattern.

9. Apparatus for producing a longitudinal fold along a web of sheet material, comprising means providing a path for travel of a continuing web of said material, folding means in said path comprising longitudinal edge structure overlying the web of material along a locality spaced inwardly of a side edge of the web and folding flange means providing a folding surface disposed along said structure and extending helically in the direction of travel of the web from a position beside the edge structure and beneath a portion of the material through 180° to a position overlying said longitudinal edge structure for turning said portion over the edge structure, said portion of material to be folded over the edge structure being an inner part of a previously inwardly folded flap of the material extending lengthwise of the web, said edge structure being disposed to face inwardly of the web along a line defining the outer longitudinal boundary of said part of the flap, and said folding flange means having its said folding surface extending helically from a position inside the edge structure and between said part of the flap and the underlying material of the web to the position overlying the edge structure to produce a fold of said inner part of the flap outwardly of the web over an outer part of the flap.

10. A method of producing longitudinal folds along the sides of a web of sheet material, comprising drawing a continuing web of said material from a supply thereof along an elongated path by applying advancing force to the web at the end of said path, subjecting opposite side portions of the advancing web to a plurality of folding operations creating successive longitudinal folds, each of said folding operations comprising progressively bending the advancing web material through an arc of 180° around a longitudinal line while engaging the web along said line to define the line of fold, the first folding operation of the aforesaid plurality of folding operations comprising bending an outermost side portion of the web back into a flatwise folded relation to the inwardly adjacent web portion, and wherein a further folding operation of the aforesaid plurality of folding operations comprises bending the double-layer structure provided by the first folding operation back over the in-turned original edge of the web against a further inner portion of the web to provide a three-layer structure, and wherein a subsequent folding operation of the aforesaid plurality of folding operations comprises an inner part of the double, overlaid structure outwardly against another part of said last-mentioned structure to provide an outwardly turned fold along the side of the web.

11. A method of producing an elongated insulating structure comprising drawing a continuous web of sheet

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material comprising foil-paper laminate from a supply thereof along an elongated path by applying advancing forces to the web at the end of said path, subjecting opposite side portions of the advancing web to three folding operations creating successive longitudinal folds, the first two of said folding operations comprising progressively bending the advancing web material inwardly through an arc of 180° around a longitudinal line while engaging the web along said line to define the line of fold and the third said folding operation comprising progressively bending the top two layers of the three layer structure produced by said first two folding operations outwardly of the web across an adjacent portion of said three layer structure whereby each side of the web material is overlaid with a reversely folded double layer structure on top of a three layer structure and attaching insulating material to said web of sheet material substantially coextensive with the central portion thereof intermediate said folded portions.

12. A method as defined in claim 10, which includes transversely corrugating the web at a locality in its path of travel beyond the folding operations, by engaging the web with successive transverse indenting elements, spaced to effect transverse corrugations at predetermined successive distances along the web.

13. A method of producing an elongated insulating structure comprising drawing a continuous web of foil-paper laminate from a supply thereof along an elongated path, subjecting opposite side portions of the advancing web to three folding operations creating successive longitudinal folds, the first two of said folding operations comprising progressively bending the advancing web material inwardly through an arc of 180° around a longitudinal line while engaging the web along said line to define the line of fold, and the third said folding operation comprising progressively bending the top two layers of the resulting three layer structure produced by said first two folding operations outwardly of the web across an adjacent portion of said three layer structure whereby each side of the web material is overlaid with a two layer structure which has a reversely folded configuration transversely corrugating the web at a locality in its path of travel beyond the folding operations by engaging the web with successive transverse indenting elements spaced to effect transverse corrugations at predetermined successive distances along the web and subsequently attached insulating material to the paper side of the resulting corrugated laminate.

14. As a new product, an elongated sheet of foil-paper laminate having folded portions along its opposite sides comprising folds along longitudinal lines, said folds comprising an inwardly folded three layer structure having an outwardly folded two layer structure on top thereof

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and having an array of transverse corrugations substantially throughout its central portion between the folded portions.

15. The product defined in claim 14, wherein said transverse corrugations are spaced at a uniform, measured distance from each other along the sheet, and wherein a predetermined one out of each of a predetermined number of said corrugations, in succession, has a distinctive pattern different from all others of said number.

16. The product defined in claim 14, wherein said transverse corrugations are spaced one inch apart along the sheet and wherein every twelfth corrugation has a distinctive pattern different from all the other corrugations.

17. An insulating structure comprising an elongated sheet of foil-paper laminate having folded portions along its opposite sides, said folded portions extending along longitudinal lines of said laminate comprising on each side a primary inward fold, a secondary fold formed by folding said primary fold inwardly and a tertiary fold formed by folding a portion of said secondary fold outwardly, said laminate having an array of transverse corrugations along the central portion of said sheet between said folded portions and insulating material substantially coextensive with said central portion attached to the paper side of said foil-paper laminate.

18. An insulating structure in accordance with claim 17 wherein said transverse corrugations are spaced at a uniform, measured distance from each other along the central portion of said foil-paper laminate and wherein a predetermined one out of each of a predetermined number of said corrugations, in succession, has a distinctive pattern different from all others of said number.

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