July 9, 1940. H. C. KARCHER 2,206,962

METHOD OF MAKING INSULATION AND LIKE STRUCTURES

Original Filed Dec. 1, 1937 2 Sheets-Sheet 1

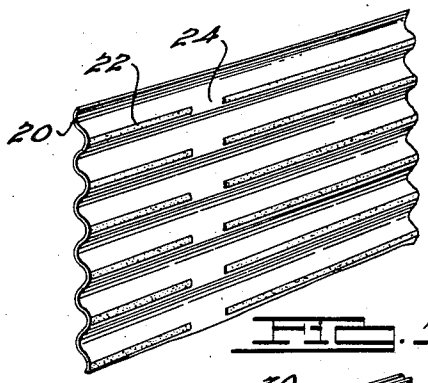


FIG. 1.

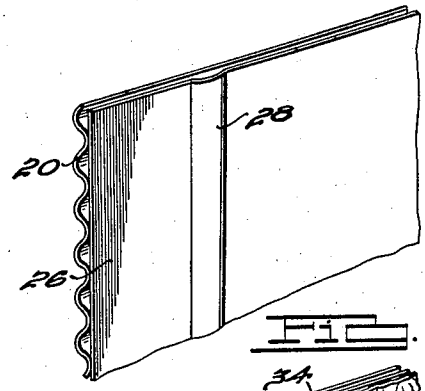


FIG. 2.

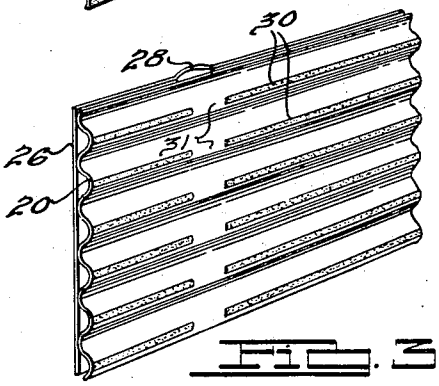


FIG. 3.

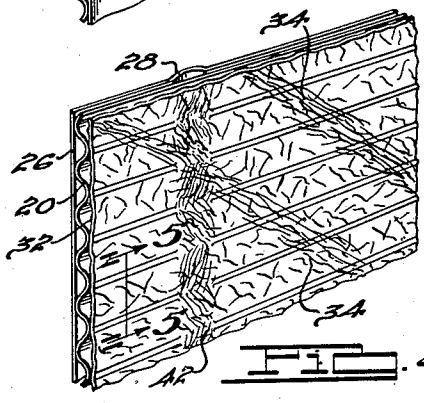


FIG. 4.

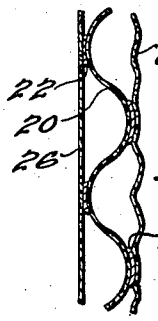


FIG. 5.

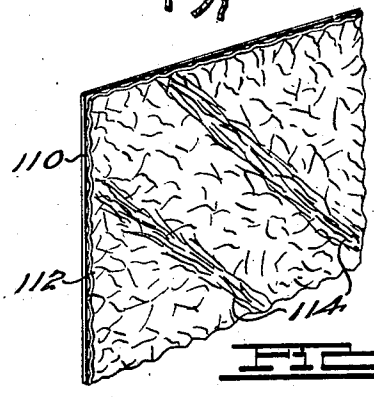


FIG. 13.

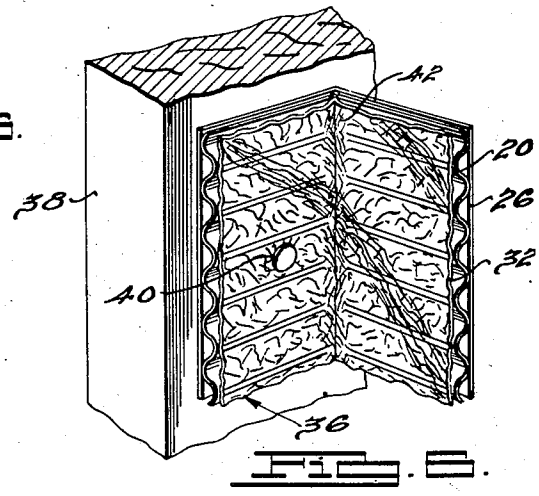


FIG. 6.

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METHOD OF MAKING INSULATION AND LIKE STRUCTURES

Original Filed Dec. 1, 1937 2 Sheets-Sheet 2

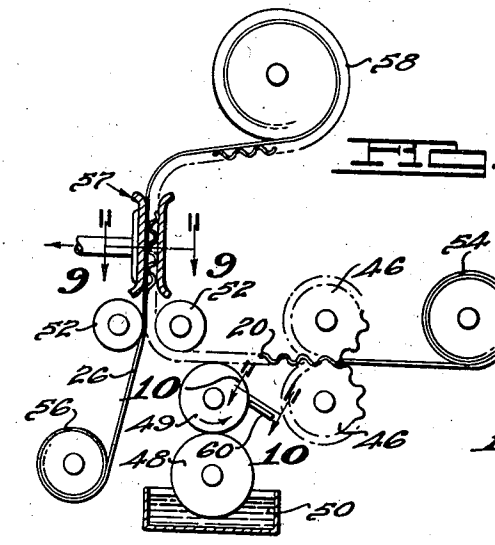


FIG. 7.

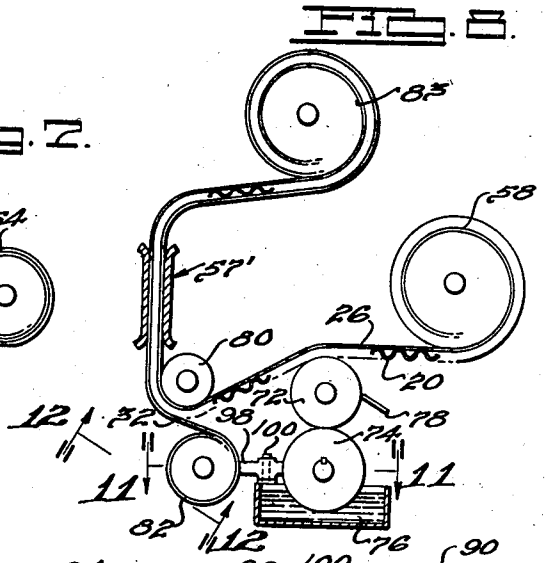


FIG. 8.

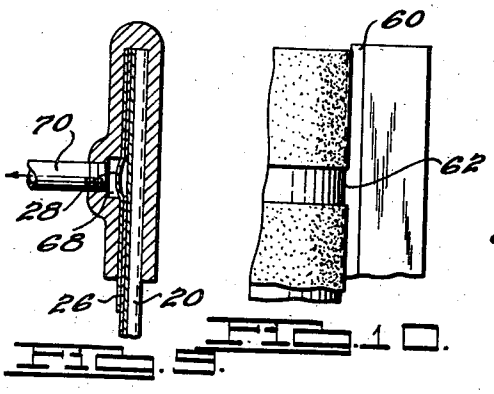


FIG. 9.

FIG. 10.

FIG. 11.

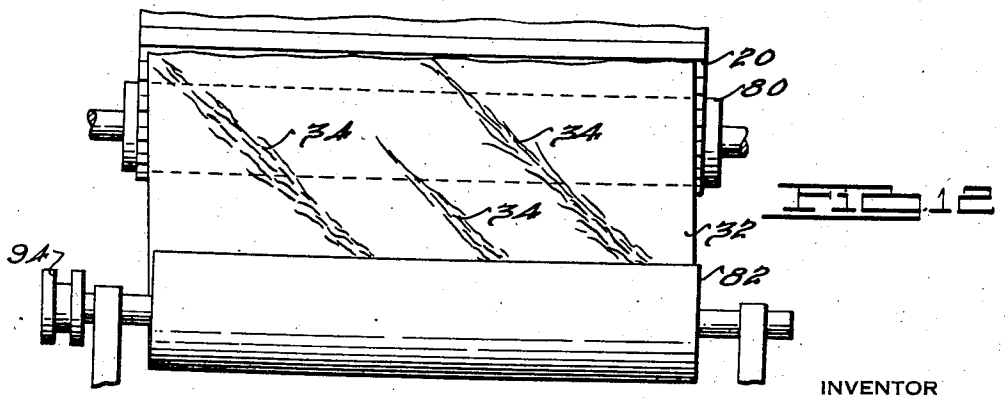


FIG. 12.

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UNITED STATES PATENT OFFICE

2,206,962

METHOD OF MAKING INSULATION AND LIKE STRUCTURES

Harry C. Karcher, Dearborn, Mich., assignor to Aluminum Aircell Insulation Company, Detroit, Mich., a corporation of Michigan

Original application December 1, 1937, Serial No. 177,627. Divided and this application December 30, 1938, Serial No. 248,565

6 Claims. (Cl. 154—28)

This invention relates primarily to the manufacture of structures at least partially formed from paper or similar sheet material, and while the invention is primarily concerned with the manufacture of such a structure adapted for use as heat insulation, certain features of the products capable of being produced by the present invention are capable of broader use and, accordingly, the invention is not to be understood as being solely restricted to the manufacture of heat insulating material.

The present application is a division of my copending application for Letters Patent of the United States for improvements in Insulation and like structures, filed December 1, 1937, and serially numbered 177,627.

Objects of the invention include the provision of a novel means and method of providing gathers or the like in a sheet of material to be secured as the covering to a sheet of corrugated or other paper or like material; to provide a novel means and method of applying a covering to a corrugated sheet whereby an excess of area will be provided in the covering to permit expansive and contractive movements of the corrugated sheet without subjecting the covering to undue strains; and to provide a method of applying a planular sheet of material to the face of a sheet of corrugated material whereby an excess of the cover material will be provided between the corrugations of the corrugated sheet.

The above being among the objects of the present invention, the same consists in certain novel steps of operation to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

The accompanying drawings illustrate suitable apparatus for carrying out the present invention and products resulting therefrom, like numerals referring to like parts throughout the several different views.

Figure 1 is a fragmentary perspective view of a piece of corrugated paper or like material showing the interrupted lines of adhesive applied thereto;

Fig. 2 is a view of the corrugated sheet shown in Fig. 1 to which a sheet-like covering or single face has been applied, the covering being provided with an excess of material over the areas in which the adhesive has been omitted;

Fig. 3 is a perspective view of the assembly shown in Fig. 2 looking from the opposite side and showing lines of adhesive applied to such side corrugated sheet for the reception of a covering on such side;

Fig. 4 is a view similar to Fig. 3 showing an additional covering member applied to the construction shown in Fig. 3 to make it into a double face structure;

Fig. 5 is an enlarged, fragmentary, transverse sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary perspective view illustrating a piece of material such as shown in Fig. 4 bent along an unadhered area between the first covering member and the corrugated sheet so as to form an edge flange shown nailed to a wooden member which may be a house frame stud, rafter or other suitable object;

Fig. 7 is a more or less diagrammatic view illustrating apparatus by means of which corrugated paper or like material such as shown in Fig. 1 may be provided with a single face or covering such as shown in Fig. 2;

Fig. 8 is a view similar to Fig. 7 but illustrating further apparatus by means of which material such as shown in Fig. 2 may be provided with a second face or covering such as shown in Fig. 4;

Fig. 9 is an enlarged fragmentary transverse sectional view taken on the line 9—9 of Fig. 7, and illustrating one type of mechanism that may be employed for insuring an excess of material in a covering member over the unadhered area between it and the corrugated sheet member;

Fig. 10 is an enlarged fragmentary view taken on the line 10—10 of Fig. 7 and illustrating the apparatus employed for applying adhesive to the corrugated sheet shown in Fig. 1 so as to leave certain areas of the paper free of the adhesive;

Fig. 11 is an enlarged fragmentary view taken on the line 11—11 of Fig. 8 and illustrating the mechanism employed for oscillating one of the sheet material rolls so as to provide a gather in the material as it is applied to the corrugated sheet;

Fig. 12 is an enlarged fragmentary view taken on the line 12—12 of Fig. 8 and further illustrating the manner of providing the gathers in the sheet material; and,

Fig. 13 (Sheet 1) is a fragmentary perspective view of a solid sheet of paper to which a covering of sheet material has been applied so as to provide gathers in the sheet material.

In order to properly understand the present invention it is first necessary to understand the various types of structures which are intended to be produced thereby. Accordingly such structures will be first described.

Referring to Fig. 1 a piece of corrugated material is indicated at 20 in the condition it assumes immediately before receiving a substantially planular sheet covering or single face on one side thereof. The corrugated sheet 20 may and in most cases will be paper, although it is to be understood that it may be formed of any suitable non-metallic or fibrous material. For the sake of simplicity in the following description it will be referred to as being formed from paper but it will be understood that such reference is in a descriptive and not in a limiting sense. For the purpose of applying such single face or covering the high points of the corrugation on the side of the sheet 20 that is to receive the single face covering is provided with lines of adhesive 22 in accordance with conventional practice. However, in accordance with the present invention and contrary to conventional practice the lines 22 of adhesive are not continuous over the full length of the corrugations but are interrupted at intervals as at 24. Preferably, and particularly where the feature of the present invention is employed to provide a line of fold in the corrugated paper transversely of the length of the corrugations, areas 24 which are devoid of adhesive are preferably arranged in line across the corrugations of the sheet. Where it is later desired to bend the material along a line perpendicular to the corrugations in the sheet 20 the line or lines of areas 24 devoid of adhesive will extend in such direction, and when the line of bend is to be at an angle to the length of the corrugation and also to a line perpendicular thereto the lines of areas 24 will be directed accordingly. Where the unadhered areas are provided simply for the purpose of permitting a yielding between the covering and the corrugated board or paper, to compensate for variations of dimensions of these parts in service, then the unadhered areas 24 may be located at random as will be readily apparent. For the purposes of the present description, however, it will be assumed that it is desired to provide for bending of the finished product about a line extending perpendicular to the length of the corrugations in the sheet 20 and where any different arrangement is desired the changes required in the following explanation of the process and apparatus will be apparent to those skilled in the art.

Referring now to Fig. 2 a covering 26 is shown applied to the corrugated paper 20 illustrated in Fig. 1 to form a single face structure. The cover 26 will usually be a substantially flat paper sheet of the character commonly employed in connection with corrugated paper board, although it will be understood that in the broad aspects of the present invention the covering 26 may be formed of any suitable material such as paper, metallic foil, or other suitable substance or material. In accordance with the present invention, the covering 26 is so applied to the corrugated paper 20 that an excess of material in the cover 26 is provided over each line of cooperating areas 24 which are devoid of adhesive so as to form a gather or so-called loop 28. Such a gather or loop 28 is particularly desirable where it is desired to fold the corrugated paper board constituting the final product about the unadhered line below the loop 28 so as to provide, for instance, a flange. Such flange will ordinarily extend away from the nearest side of the assembly as illustrated in Fig. 2, as in such case it will be apparent that the excess material in the loop 28 will readily permit such folding without subjecting the covering 26 along the line of fold to an excessive tensile stress. The last mentioned arrangement is particularly useful in place of the conventional folding scores provided in corrugated paper board to define a line of fold therein transversely of the corrugation. It has been found that the absence of adhesive over the areas 24 will so weaken the strength of the board transversely of the corrugations over this area that upon compressive stress being applied to the paper board in the direction of the corrugation the board easily bends along this line. This weakness occurs not only because the corrugations are not reinforced by the cover along this line, but also because the corrugations are stiffened by the adhesive which is lacking along this line. Particularly where the loops or gathers 28 are provided this bending as before mentioned does not subject the covering to excessive tensile stresses as in the case of conventional structures employing the usual scores, with the result that the final product is stronger than when equivalent bends are made by the conventional method. The above described feature also has this advantage over corrugated paper board with a score to provide a line of bend, that it remains constantly effective, while scores are liable to become obliterated where formed in sheets that are stored away in flat condition for relatively long periods of time.

It is to be understood that in accordance with one phase of the present invention the areas 24 devoid of adhesive forming unadhered areas between the cover and the corrugated paper occur at more or less frequent intervals over the length of the corrugation and that in some cases at least it is preferable that the covering be looped as at 28 over each of these areas. This last is particularly true where the covering 26 is of a material or substance that has a materially different temperature co-efficient of expansion than the corrugated sheet, or where it is of such character that its expansive and contractive movements under the influence of variations in moisture content are materially different from that of the material from which the corrugated paper 20 is made, the loops in such case permitting movement of one member relative to the other without subjecting either to dangerous stresses.

The corrugated paper 20 with the covering 26 adhered thereto as illustrated in Fig. 2 may in many cases form a completed article of manufacture and be employed in the form shown in accordance with conventional practice. This is particularly true where the assembly is to be used for packing or like purposes although its use is not limited to packing purposes. In most cases, however, a second covering will be applied to the corrugated paper 20 on the side thereof opposite the cover 26 so as to form a double face structure.

In applying this second covering the high points of the corrugations of the paper 20 on the side thereof opposite the cover 26 are provided with lines 30 of adhesive as illustrated in Fig. 3. This adhesive may be applied in identically the same manner as illustrated in Fig. 1, that is, so as to leave areas 31 devoid of adhesive in line with, but on the opposite side of the corrugated sheet from the areas 24, this alignment occurring particularly where the line is to be employed as a line of fold or bending in the final product, and a second covering identical to the covering 26 and formed from the same material as the covering 26, or some other suitable material, may be applied in identically the same manner. This second covering may be applied so as to provide the

loops 28 if desired, or it may be applied in completely flat condition with that portion overlying the areas equivalent to the areas 24, simply remaining unadhered to the corrugated paper. However, a covering may be applied to the corrugated paper 20 so as to get the equivalent of the non-adhered and loop construction previously described in an entirely different manner and for the purpose of illustration the second covering is applied to the assembly shown in Fig. 2 in this further novel manner, in addition to the provision of the non-adherent areas 31, to illustrate the same.

The second covering which is shown applied is illustrated in Fig. 4 at 32 and it will be noted that the surface of this covering is more or less crinkled over its entire area. In addition to such crinkling it is further provided with gather lines 34 which extend angularly with respect to the length of the corrugations in the paper 20. The crinkled relation of the covering 32 is best brought out in Fig. 5 and the nature of the gather line 34 will best be understood during explanation of the method of providing them in the covering 32 which will later follow. It is sufficient to note at the present time that the crinkles in the covering 32 have the effect of providing an excess of the material in the covering 32 both longitudinally of and transversely of the corrugations in the paper 20, the effect in this respect between corrugations for instance being similar to that which might be obtained by providing a sag in the covering 30 between the high points of adjacent corrugations in the corrugated paper 20. This excess material in the covering 32 serves the same purpose as the loops 28 in the covering 26 but in addition serve to act in two directions perpendicular to each other, whereas the loops 28 act in one direction only. Likewise the angularly disposed gathers 34 provide excess material capable of permitting the covering 32 to give both in the direction of the corrugations in the paper 20 and in a direction perpendicular thereto, these gathers having an effect similar to the loops 28 where the loops are disposed angularly with respect to the length of the corrugations in the paper 20 and also to a line perpendicular thereto.

The crinkles and the gathers 34 may be used independently of one another to obtain substantially the same ultimate effect, that is an excess of material in the covering 32 permitting variations in expansion and contraction of the sheet 20 and covering 32 in all directions without subjecting either the corrugated sheet 20 or the covering 32 to undue or unusual stresses. However, inasmuch as by the preferred method of applying the covering 32 both the crinkles and the gathers 34 will result in the covering 32, it will ordinarily be preferable to use both in combination, either with or without the unadhered areas 24 and/or 31.

The structure shown in Fig. 4 when the covering 26 is formed from paper and the covering 32 is formed from bright metallic foil is particularly adapted for heat insulation purposes in buildings and particularly residential buildings of the frame or brick veneer type. In such case the material is preferably made up in strips of a width approximately four inches wider than the spacing between the studs, joists, rafters and the like between which the material is to be located, and at least two lines of unadhered areas 24, and preferably cooperating loops 28, together with corresponding unadhered areas 31, are provided, one located approximately two inches in from one edge of the strip and the other located a corresponding distance inwardly from the opposite edge of the strip. That portion of the strip outwardly of each of these loops is then bent at right angles to the main body portion of the strip, in either direction, to form a flange such as the flange indicated generally at 36 in Fig. 6. Where the strip is being applied between studs, such as the studs 38 in Fig. 6, a flange 36 is then applied against a side face of the stud and is secured thereto as by nails 40, or other suitable fastening devices, it being understood that the corresponding flange formed at the opposite side of the strip of material is likewise flanged and secured to the opposed face of the next adjacent stud 38. Preferably the flanges 36 are so secured to the studs 38 that the main body portion of the strip is located intermediate the outer and inner faces of the studs somewhat in the manner illustrated in Fig. 6, thus separating the air space between adjacent studs and between the inner and outer sheathings of the building secured by the studs into two separate spaces. Also it is preferable, but not essential, that the foil face be positioned toward the inside of the building or the like. This not only separates the air between the studs into two separate bodies, but also insures the bright aluminum covering 32, as assumed in this case, as being bounded solely by air on its exposed face, which is conducive to optimum heat insulation performance thereof. The bending of the material to form such flanges causes the foil facing the crinkle along the line of bending as indicated at 42 in Figs. 4 and 6.

In manufacturing a product of the type disclosed in Fig. 2 in accordance with the present invention apparatus of the character diagrammatically illustrated in Fig. 7 may be employed. This apparatus includes a pair of cooperating corrugating rolls 46, a pair of cooperating glue rolls 48 and 49, respectively, the lower one of which extends into a bath 50 of suitable adhesive, and a pair of cooperating rolls 52. A roll 54 of paper of suitable character and width required in the corrugated paper 20 is suitably mounted so that paper thereon may be withdrawn and passed between the corrugating rolls 46 which act to corrugate the paper in a conventional manner to form the corrugated paper 20. The corrugated paper 20 from the rolls 46 passes over the upper roll 49 which applies adhesive to the high points of the corrugations on the corresponding side of the corrugated paper 20, and the corrugated paper 20 is then led over one of the rolls 52 which may or may not have a corrugated face. A roll 56 of the required character and width for the covering 26 and of the desired material for the cover 26, in this case considered to be paper, is suitably mounted and the paper therefrom is passed with the corrugated paper coming over the glue rolls between the rollers 52. The rollers 52 may, if desired, be employed to press the paper from the roll 56 into contact with the high points of the corrugated paper which has just received adhesive from the roll 49, but ordinarily a pressing mechanism indicated generally at 57 will be employed for this purpose and the rollers 52 employed simply to properly guide the corrugated paper 20 and covering thereinto. The corrugated paper and the one sheet of covering thus applied after leaving the rolls 52 or pressing mechanism 57 is then wound up into a suitable roll 58. As thus far described the construction is conventional.

As is well understood in the art, adhesive

picked up by the roller 48 which is driven at a uniform peripheral speed with the roller 49 and usually at the same speed as the paper that is delivered from the corrugating rolls 46, discharges adhesive upon the roll 49 and the roll 49 in rotating applies it to the corrugated paper. In order to predetermine the thickness of the coating of adhesive applied to the corrugated paper a scraper 60 is provided in conjunction with either of the rolls 48 and 49 but preferably the roll 49 so as to limit the thickness of the adhesive coating beyond the scraper 60 in the direction of rotation of the roller 49 which may be carried up into contact with the corrugated paper.

In accordance with the present invention, in order to provide the areas 24 devoid of adhesive the scraper 60, as best illustrated in Fig. 10, at intervals over its length corresponding to the intervals between the desired areas 24, is provided with a corresponding number of projections 62 each of the same width as the desired length of the areas 24 measured along the lines of corrugations in the paper 20, and which projections contact the surface of the roll 49 so as to remove all of the adhesive therefrom over their width. Consequently the adhesive which is finally carried up into contact and transferred to the corrugated paper is interrupted axially of the cylinder 49 at each location where the areas 24 are desired to be located. Where this scraper construction, or any other construction capable of effecting the same result in the application of the adhesive to the corrugations is employed, it will, of course, be apparent that the covering delivered from the roll 56 will be adhered to the high points of the corrugations on the corresponding side of the corrugated paper at separated intervals over the length of the corrugations.

In many cases where the character of the adhesive is such as to wet the corrugated paper, the mere act of securing the covering paper from the roll 56 thereto will, when the assembly is dried, have the effect of producing the loops 28 due to drying out and consequent contraction of the corrugated paper lengthwise of the corrugations. Where the character of the adhesive is not such as to effect this result, or in cases where more positive means are desired to provide the gathers or loops 28, suitable means may be provided for this purpose. While any suitable means may be provided for this purpose in the broader aspects of the invention the pressing device 57 may be readily modified to effect this result. As best indicated in Figs. 7 and 9, the device 57 constitutes a slotted member disposed on the discharge side of the rolls 52 and through which the corrugated paper with its covering from the roll 56 is passed on the way to the roll 58, the width of the slot being such as to press the paper 20 and covering 26 together. The member 66 at intervals corresponding to the desired spacing longitudinally of the corrugations between the areas 24 is provided internally on that face opposing the covering 26 from the roll 56 with a groove 68 extending in the direction of movement of the paper therethrough. Each groove 68 is connected by means of a pipe or tube 70 with a suitable source of suction so that as the paper passes therethrough it will draw the covering 26 away from the corrugated paper 20 and into such groove over the area 24 as illustrated in Fig. 9 to form a loop 28.

Where the covering 26 is formed of paper the adhesive 50 may be of any of the usual types of adhesive employed for this purpose and of which the most commonly employed is sodium silicate. Sodium silicate will usually be employed but in some instances it may be preferable to employ a non-drying or resilient type of adhesive of a suitable character a number of different types of which are now found on the open market. The use of the non-drying adhesive is particularly advantageous in connection with metallic foils because the latter are usually resistant to the adhesive effects of a drying type of adhesive, and additionally in extreme cases of contraction or expansion of either the corrugated sheet 20 or of the coating 26 the non-drying adhesive may yield sufficiently to prevent rupturing of the foil which might otherwise occur.

The method of applying the facing or covering 26 forms the subject-matter of my co-pending application for Letters Patent of the United States for improvements in Method of making insulation and like structures, filed December 9, 1939, Serial No. 308,342, the same being a division of the present application.

As previously mentioned the corrugated paper may be provided with a covering or facing on both sides applied thereto in the same manner as the covering 26 as above described. On the other hand both sides of the paper 20 may be provided with a covering such as 32, but for the purpose of illustrating both in the present instance it is assumed that the covering or facing 26 is applied to one side of the paper 20 and the covering or facing 32 applied to the other.

In applying the covering 32 apparatus of the general type shown more or less diagrammatically in Fig. 8 is preferably employed. Referring to Fig. 8 it will be noted that the roll 58 has been transposed to serve as the feeding roll in this case, the corrugated paper 20 with the covering 26 applied thereto being fed over a pair of adhesive rolls 72 and 74 so as to apply adhesive to the uncovered face of the paper 20. The lower roll 74 projects into a bath 76 of suitable adhesive and, as previously mentioned, where the covering 32 is of metal foil this bath may be either sodium silicate or of a suitable non-drying nature. Likewise a scraper 78 cooperates with the roll 72 to limit the thickness of the coating of adhesive to be transferred to the high points of the corrugations on the exposed face of the corrugated paper being unrolled from the roll 58, and such scraper will preferably be substantially identical to the scraper 60 previously described particularly where it is desired to provide a line of adhesive to be applied to the high points of the cooperating corrugations of the paper 20 in this case as illustrated at 30 in Fig. 3. The corrugated paper with the covering 26 thereon and provided with the adhesive as above described is then led under a roller 80 and in passing under the roller the covering 32 is applied thereto from a roll 82. The corrugated paper 20 with the two coverings 26 and 32 applied thereto is then led up between the opposed faces of the pressing device 57', corresponding with the device 57 previously described, except that no grooves equivalent to the grooves 68 are assumed employed in this case, which presses the covering 32 against the opposed corrugations of the paper 20 and the assembly is then led to the roller 83 upon which it is wound.

It will be noted that in applying the covering 32 to the corrugated paper 20 it is applied thereto at a point where the corrugated paper 20 is bent around the roll 80. Consequently where the central line of thickness of the corrugated

paper 20 remains at the same length, when the paper is straightened out there will be an excess in the length of the covering 32 on the corrugated paper which thus provides for an expansion of the corrugated paper in a direction perpendicular to the length of the corrugations without placing the covering 32 under tension in this direction. However, as previously described in order to additionally provide against the possibility of variations of dimensions of both the corrugated paper 20 and of the covering 32, particularly where the covering 32 is formed of metallic foil, from subjecting these parts to undue stresses, means are provided in accordance with the present invention for crinkling the surface of the covering 32 and providing the gather lines 34 therein. Briefly this is accomplished by axially reciprocating the roll 82, or moving the sheet delivered therefrom in a corresponding direction, during the withdrawal of the covering 32 therefrom and its application to the corrugated paper 20. The effect of this axial reciprocation of the roll 82 or its equivalent is particularly brought out in Fig. 12 wherein it will be noted that in the position of the parts shown the roll 82 has been reciprocated to the right of its transversely aligned position with the roll 80 and that this movement of the roll 82 to the right has caused the gather lines 34 to appear in the covering 32, these gather lines 34 being angularly disposed with respect to both the axis of the roll 82 and the direction of movement of the covering 32 therefrom. The particular angle of the gathers 34 will, of course, depend upon the amount and rate of the reciprocatory movements of the roll 82 as well as the distance between the axes of the rolls 80 and 82. As will also be understood the lines of gather 34 will extend in one angular direction during movement of the roll 82 axially in one direction and will extend in the opposite angular direction when the axial movement of the roll 82 is reversed. These gather lines 34 will be appreciated as being composed of ripples or corrugations in the covering 32 occurring as a result of the tendency to warp the covering 32 in the plane of its thickness. Additionally it will be found that the lines of gather 34 will occur usually in spaced groups in the manner illustrated in Fig. 12 and it will also be found that a certain amount of crinkling of the covering 32 will occur between the various gather groups during the formation of the gather groups 34 and particularly upon reversal of the reciprocatory movement of the roll 82. The rolling of the final product onto the roll 83 will have the effect of shortening this face of the product, and increase the amount of slack material in this face, the tendency of which is also to produce a certain amount of additional crinkling of the material particularly when formed from metallic foil.

Although any suitable means may be employed for effecting axial reciprocation of the roll 82 or effect an equivalent movement of the sheet delivered from the roll 82 to the sheet of corrugated paper, and even manual means may be employed to obtain the desired effect with satisfactory results, in Fig. 11 one suitable means of reciprocating the roll 82 is shown by way of illustratin. This means comprises a member 90 fixed to the shaft of the roll 74 and provided with a peripheral cam track 92 in its surface, the cam track 92 being circumferentially continuous and providing consecutively oppositely angularly offset portions. The corresponding end of the shaft of the roll 82 is provided with a member 94 fixed thereto and this member is peripherally provided with a circumferential circular groove 96. A doubled arm lever 98 is mounted midway between its ends upon a fixed vertically extending pin 100 and one end of the lever 98 is received in the cam groove 92 and the opposite end in the groove 96. As will be appreciated, rotation of the member 90 will cause oscillatory movement of the double armed lever 98 the opposite end of which engaging in the groove 96 of the member 94 will automatically effect reciprocatory axial movement of the roll 82 and the covering 26 carried thereby.

As previously mentioned there may be instances within the broader principles of the present invention where it is desired to apply a coating particularly of metallic foil, such as bright aluminum foil, to the surface of a solid sheet of paper or paper board, or other flat sheet-like material and it will readily be appreciated that in the event such material is of a relatively stiff character and relatively unyielding it is important that some means be provided to eliminate the danger of rupturing the foil upon variations in the dimensions of the foil due to temperature changes or variations in the dimensions of the sheet due to changes in moisture content. It will be readily understood that in such cases if the foil is of the character of the covering 32 previously described, that is either crinkled or provided with the lines of gather 34 or both, in the manner above described or in any other suitable way, the desired result will be obtained. Such a sheet or board of paper or like material is illustrated in Fig. 13 at 110, the metallic foil covering at 112, and the covering 112 is of crinkled formation and provided with lines of gather 114 similar to the lines of gather 34 previously described. It will be appreciated without further explanation that the covering 112 may be applied to the paper 110 in substantially the same manner as illustrated and described in connection with Figs. 8, 11 and 12.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In the manufacture of corrugated paper board or the like, the steps of applying an adhesive to a face of a corrugated sheet, applying a sheet of substantially planular material to said face of said corrugated sheet, and shifting said last mentioned sheet transversely of the direction of its movement onto said corrugated paper during its application thereto whereby to provide gathers in said last mentioned sheet.

2. In the manufacture of corrugated paper board or the like, the steps of applying an adhesive to a face of a corrugated sheet, applying a sheet of substantially planular material to said face of said corrugated sheet, and repeatedly and reversely shifting said last mentioned sheet transversely of the direction of its movement onto said corrugated paper during its application thereto whereby to provide gathers in said last mentioned sheet.

3. In the application of a planular-like covering to a sheet of corrugated paper, the steps of operation to provide gathers in the surface of said planular sheet comprising repeatedly reversely shifting said planular sheet transversely

of the length of corrugations in said corrugated sheet during its application thereto.

4. In the manufacture of corrugated paper board and structures of like construction, the method of forming gathers in the surface of a planular sheet during its application to a corrugated sheet comprising the step of acting upon the planular sheet tending to warp it in its own plane, first in one direction and then in the opposite direction, during its application to said corrugated sheet.

5. In the manufacture of composite paper board or the like, in combination, the steps of withdrawing sheet material from two separate rolls of material, applying adhesive to one surface of at least one of said strips, bringing said strips into contact with each other and with the surface supplied with said adhesive opposed to a surface of the other strips, and simultaneously shifting one of said sheets in the plane of its width and transversely of its direction of movement during its application to the other of said sheets whereby to provide gathers in the last mentioned sheet appearing as such in the finished product.

6. In the manufacture of composite paper board or the like, in combination, the steps of withdrawing sheet material from two separate rolls of material, applying adhesive to one surface of at least one of said strips, bringing said strips into contact with each other and with the surface supplied with said adhesive opposed to a surface of the other strips, and reciprocating one of said rolls axially during the last mentioned operation whereby to produce alternately angularly disposed gathers in the surface of the strip delivered therefrom during application thereof to the other of said strips.

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