

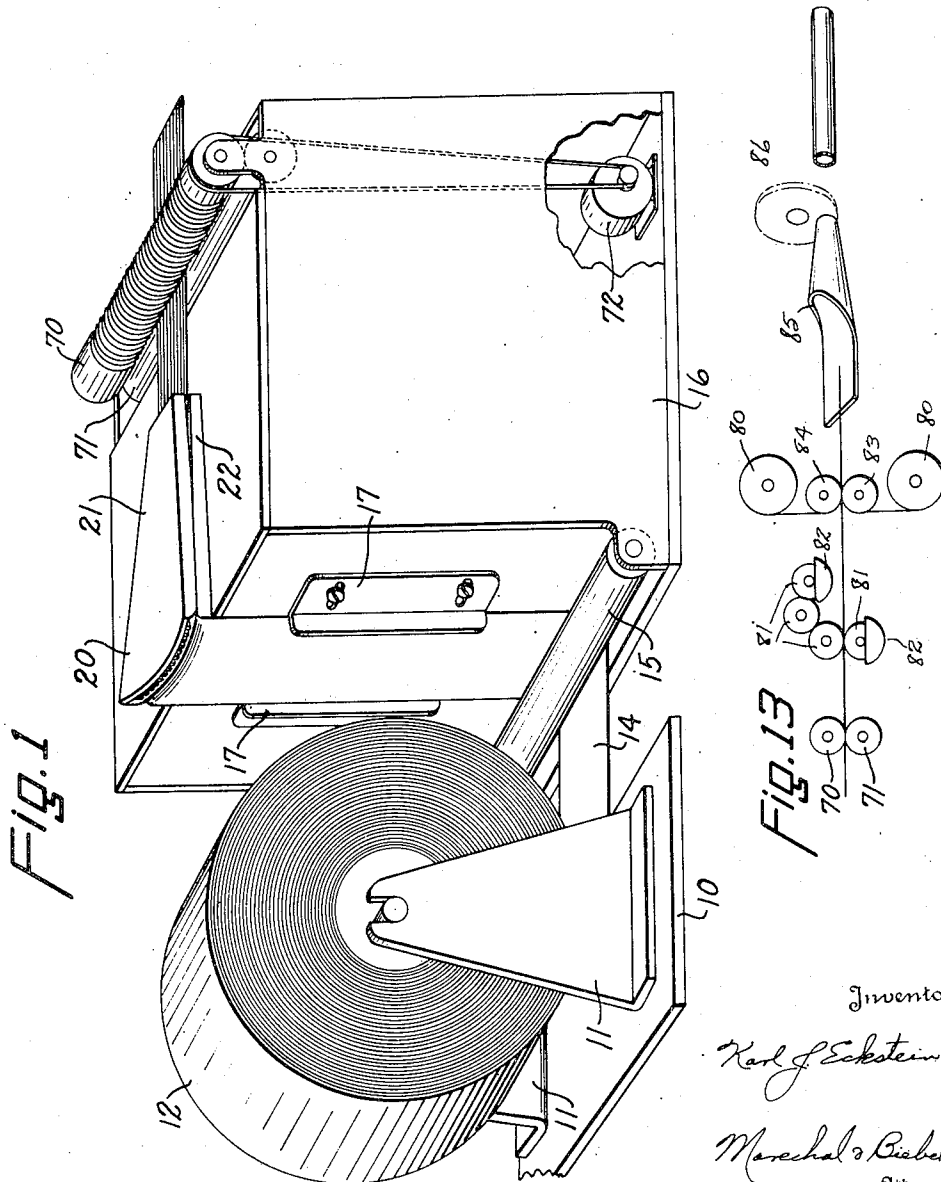
Jan. 10, 1950

K. J. ECKSTEIN
CONTINUOUS CORRUGATING MECHANISM

2,494,431

Filed June 28, 1945

5 Sheets-Sheet 1



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CONTINUOUS CORRUGATING MECHANISM

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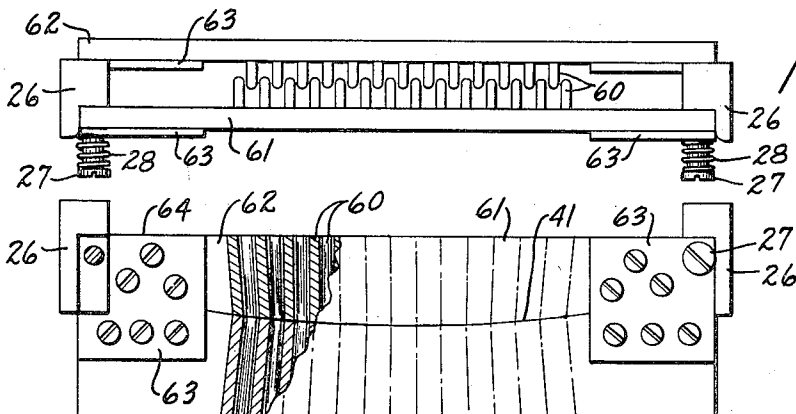


Fig. 4

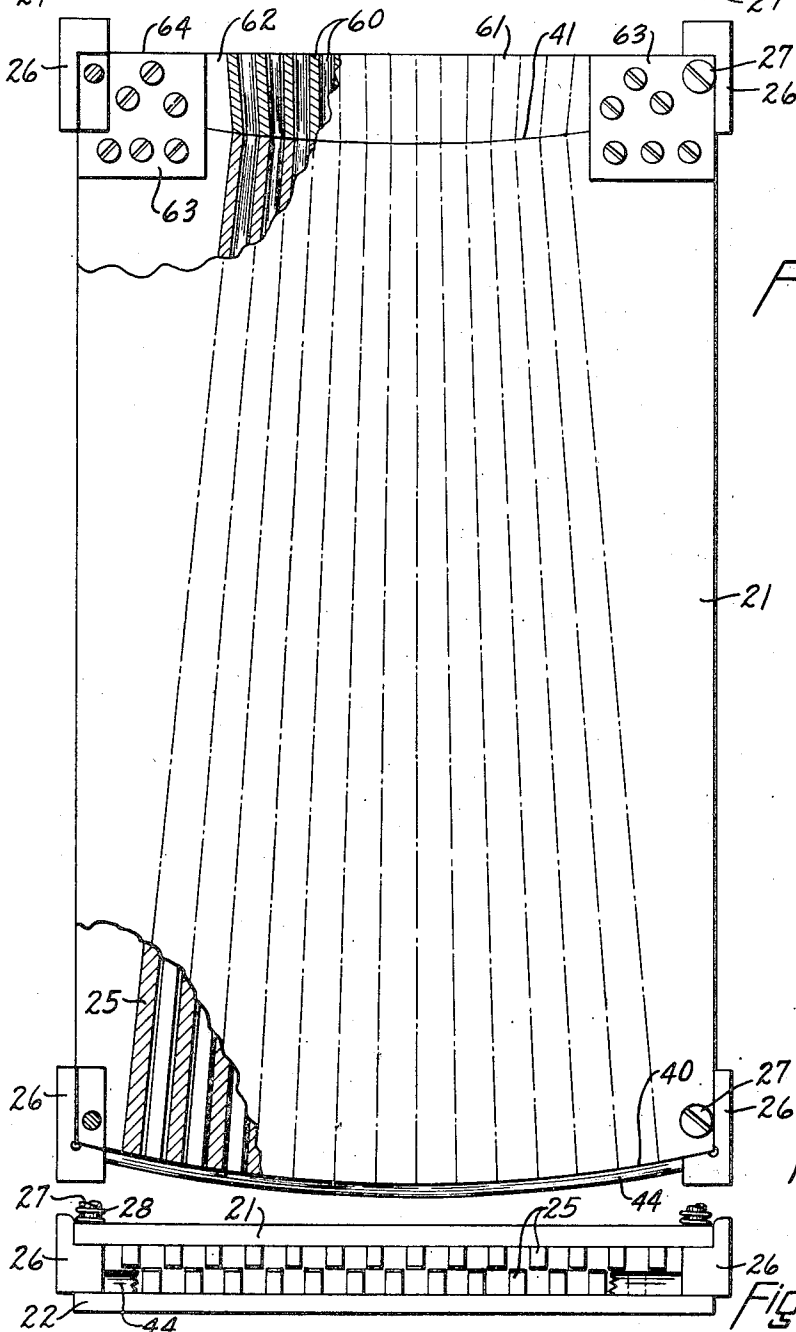


Fig. 2

Fig. 3

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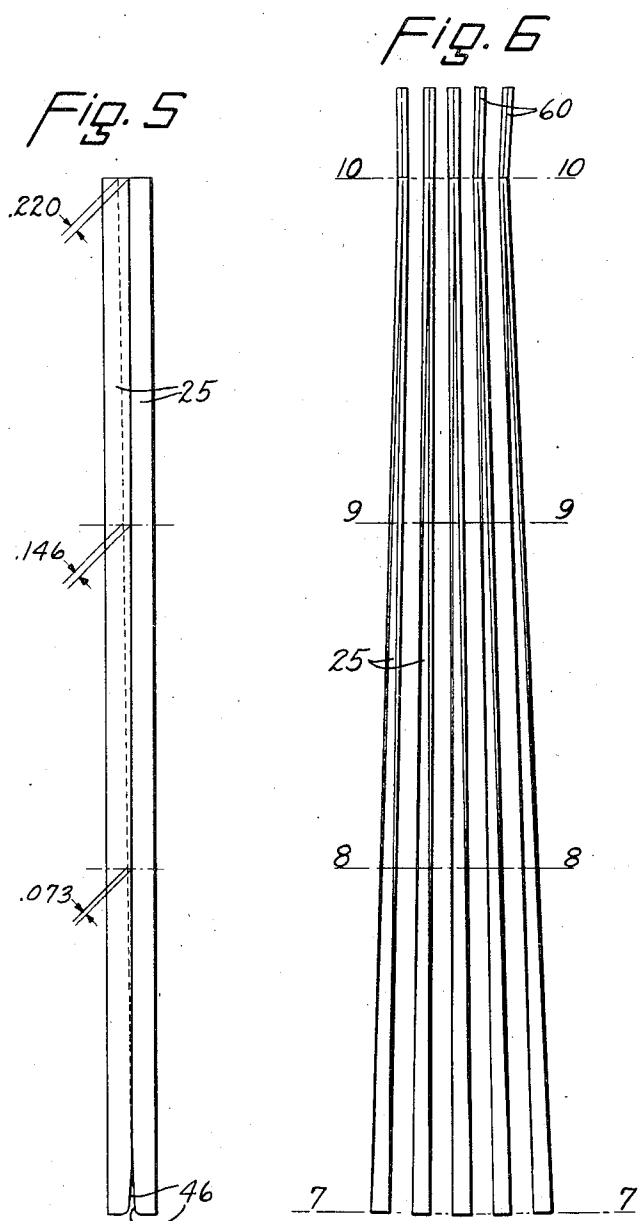
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5 Sheets-Sheet 3



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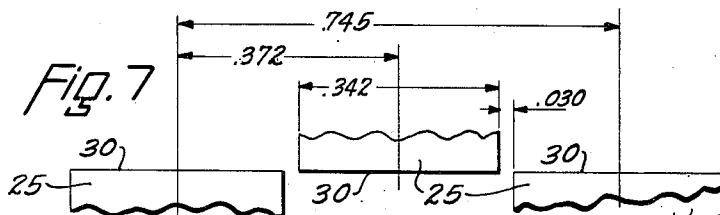
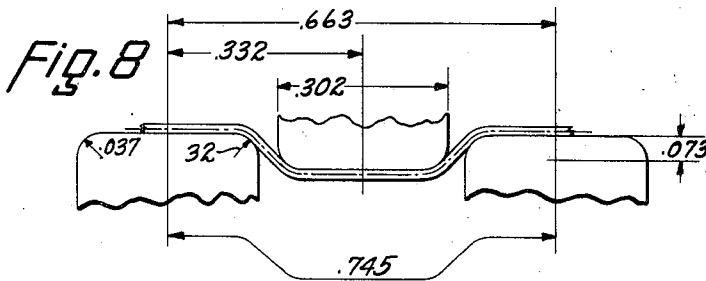
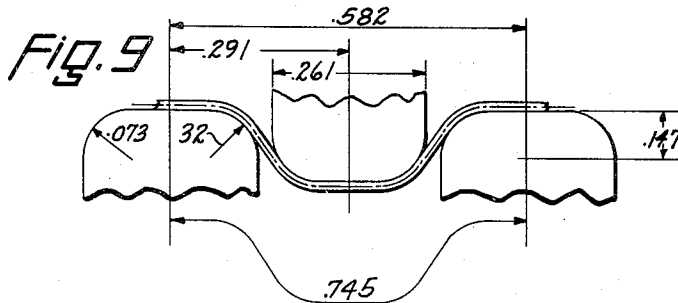
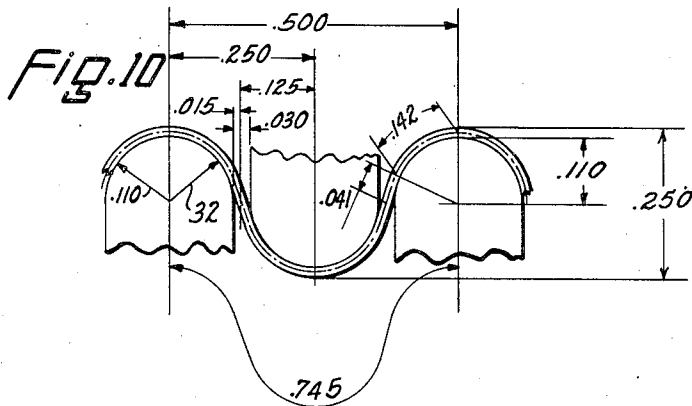
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CONTINUOUS CORRUGATING MECHANISM

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Application June 28, 1945, Serial No. 602,109

15 Claims. (Cl. 154—30)

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This invention relates to the continuous corrugation of material in web or strip form.

It is the principal object of the invention to provide a mechanism for corrugating a web of paper or other material lengthwise of the web and with the web or strip passing between stationary interfitting guides which are so arranged that as the web passes therethrough its travel is correlated with the shape and arrangement of the guides so that smooth and uniform corrugations are produced without stressing or rupturing the web.

It is also an object to construct such a mechanism so that the distance between adjacent guides of a set in the path actually traversed by the web remains the same throughout the entire passage of the web between the guides, thus avoiding lateral stresses in the web and making it possible to pass the web through the guides easily and without objectionable friction such as to tend toward rupture of the web.

It is also an object to provide such a mechanism in which the guiding fingers are arranged to facilitate the feeding of the web material therethrough and in such a manner that the web is supplied without danger of tearing either while being threaded into, in its passage through, or as it is discharged from the device.

It is a further object to provide a mechanism in which the converging corrugating guides are of progressively changing shape so that the path established for the web remains the same in width between each pair of guides throughout the longitudinal extent thereof to assure smooth passage of the web therethrough with low friction.

It is a further object to provide a process of continuously corrugating material in web or strip form in which the corrugations are continuously developed lengthwise of the direction of travel of the web as the web passes between guide elements and in correlated relation with such travel avoiding disruptive lateral movement between the web and the guide elements crosswise of the direction of travel.

It is also an object to provide a continuous corrugating mechanism having main and auxiliary sets of interfitting guides between which the web of paper is continuously passed to produce longitudinal corrugations, the guides of the main set converging while those of the auxiliary set, located at the discharge end of the mechanism, are arranged in diverging relation providing for discharge of the corrugated web substantially smoothly and without bulges.

It is a still further object to provide mechanism for continuously corrugating material in web or strip form, which is then continuously formed into desired shape such as flat or tubular, or the like, in which form it may be cut off into suitable lengths.

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It is a further object to so control the supply and delivery of the material to and from the guide that smooth and uniform corrugation is obtained with a minimum of friction and the formation of bulges or the like is avoided.

Other objects and advantages will be apparent from the following description, the accompanying drawings, and the appended claims.

Referring to the drawings—

Fig. 1 is a view in perspective with certain parts being broken away showing the continuous corrugating of web material in accordance with the present invention;

Fig. 2 is a plan view with certain parts being broken away showing the fan shaped corrugating guides;

Fig. 3 is an end elevational view of the entering end of the mechanism shown in Fig. 2 with a part of the guide structure being broken away;

Fig. 4 is an end elevational view of the discharge end of the mechanism;

Fig. 5 is a longitudinal schematic view showing the progressively increasing interfitting relationship of two adjacent guides of opposed sets.

Fig. 6 is a plan view of the upper or working surface of one set of main guides and the corresponding auxiliary guides at the discharge end;

Figs. 7 to 10 inclusive are cross sectional views on the respective corresponding lines 7—7 to 10—10, inclusive, of Fig. 6, on a larger scale and showing the details of the path of travel of the web throughout the longitudinal extent of the guides;

Fig. 11 is a perspective view showing the relationship of cooperating guides of opposed sets and looking toward the entering end thereof.

Fig. 12 is a diagrammatic view on an enlarged scale illustrating the procedure for shaping the entering ends of the guides to facilitate introduction of the web thereinto; and

Fig. 13 is a diagrammatic view indicating the application of a liner to the corrugated web and preparatory to the formation of the corrugating sheet into tubular or other desired form.

In the production of corrugated material, the ordinary procedure is to run the sheet of material through corrugating rolls which operate in the nature of gear teeth and which thus provide corrugations running transverse of the length of the web. Not only is this process relatively slow, but it limits the length of the corrugated body which can be formed to the width of a paper web, or the axial length of the corrugating rolls, whichever is smaller.

In accordance with the present invention a web of material is successfully corrugated in a continuous manner, and with the corrugations running lengthwise of the web. There is no limitation upon the length of the corrugated sheet which may be produced, and its width may

be made adequate for all ordinary purposes. The operation is performed at relatively high speed and in a smooth and uniform manner which does not disrupt or weaken the body of the fibrous material, providing for the production of a continuously corrugated strip which can be subsequently formed into any desired shape.

The invention is useful for the production of all types of corrugated materials such as corrugated paper and paper board and particularly for the making of such material for coverings for cylindrical or tubular objects, either for the purpose of shipping protection, or for purposes of heat insulation or other protection while in use. The article to be thus covered need not be circular in cross section but may have flat or irregular sides, the product of the present invention with the lengthwise extending corrugations being readily adaptable and affording good protection regardless of the particular shape of the article.

It is highly important in the production of such product that the entire path of travel of the material through the corrugating mechanism be predetermined and controlled and that such mechanism provide for the passage of the web through the mechanism in substantially straight lines and without lateral or transverse movement away from those lines at any time. It will be readily understood that if the passage of the web is such as to result in lateral forces being developed which tend to distort the partially formed corrugating grooves, there will be a resulting tendency to stretch and even tear the sheet, causing additional frictional drag and requiring the application of greater force to draw the sheet through the mechanism, further increasing the possibility of damage thereto.

In prior mechanism for continuous corrugating, the use of corrugating guides in various arrangements have been proposed, some of which resulted in a proper spacing at the entering end, or at the discharge end, but in none of which was the entire path of travel properly controlled so that at no point in the travel of the web through the mechanism would there be any application of force laterally to disrupt the partially formed corrugations. As an example, careful analysis has shown that the use of guides of uniform cross section throughout and of progressively increasing interfitted relationship may be made to provide the proper spacing at the entering end and at the discharge end, but fail to provide such spacing at intermediate points with the result that the material does not progress properly therethrough and undue friction and tearing of the sheet result.

In accordance with the present invention the web is passed between two similar sets of stationary fan shaped interfitted guides which are arranged in lines converging toward a common center substantially beyond the ends of the guides. The guides are of progressively decreasing width and increasing depth from their entering toward their discharge ends and are mounted with their supporting bases substantially parallel thus establishing a progressively increasing interfitted relationship. The opposed or working surface of the guides are defined by flat surfaces, and the edges of those surfaces are defined by arcs of progressively and continuously increasing radius. At the entering ends the arcs are of substantially zero radius and a sharp edge is thus provided, the flat sur-

face covering the entire working surface. The radius increases uniformly down to the discharge end at which point it becomes equal to half the thickness of the guide and hence the two arcs meet, forming a full semicircle around the working end of the finger, the flat surface of the guide being uniformly reduced and finally terminating at such end point. Careful test of the guides constructed and operating in this manner, confirmed by detailed mathematical analysis of the actual length of the web path, has shown that this path remains uniform throughout the length of the guides and provides for longitudinal travel of the web therethrough substantially free of lateral motion relative to the guides, thus providing for a highly accurate operating condition substantially free of undue friction.

Furthermore the guides at their entering ends terminate in a convex arc which is struck from approximately the same center as that toward which the guides converge, and at the discharge ends they terminate in a concave arc also struck from approximately the same center. It is further found that it is advantageous to introduce the web into the guides from a substantial angle to the direction of its travel therethrough, and a curved surface is therefore preferably provided over which the web is passed from an angle of approximately 90° to the direction of its travel through the guides.

It has further been found that it is advantageous to provide auxiliary sets of guides at the discharge end of the main set in order to assure delivery of the corrugated web in straight lines of travel and substantially eliminating any tendency toward bulging at this point. These auxiliary guides may be relatively short, and are preferably of the same cross section as that of the main sets at the discharge end, being also arranged with a uniform amount of interfitted relationship. Instead however of converging as do the main guides, they have a relatively small diverging action which facilitates the delivery of the web in a condition where it travels forwardly in straight lines and in a common plane. Preferably they are arranged to be received in the concave arc of the discharge ends of the main sets, and diverge outwardly to the extent that the distance between adjacent auxiliary guides at their discharge ends measured in a plane transverse to the direction of travel of the web is approximately the same as the distance between the ends of adjacent guides of the main sets measured along the concave arc at their discharge ends.

Suitable mechanism is provided for drawing the web through the corrugating mechanism, and for holding the formed corrugations in proper shape and relation until the application thereto of liners or other material which will permanently retain the corrugated form. Stationary forming mechanism and cutting and slitting knives may also be provided to form the corrugated product into desired shape.

Referring to the drawing which discloses a preferred embodiment of the invention, the mechanism comprises a suitable support 10 carrying standards 11 upon which a roll 12 of the paper material to be corrugated is mounted. As shown this may comprise a roll of paper, and if desired mechanism may be provided for facilitating the changing of rolls to assure the supply of a continuous web from one roll to the next.

The web 14 from roll 12 passes under a suitable guide roll 15 carried on housing 16 and

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between lateral guides 17 conveniently supported on the housing and engaging the side edges of the web to assure its delivery to the corrugating mechanism in proper relation thereto, such guides being adjustable to provide for the handling of webs of different widths as desired. The corrugating mechanism is shown generally at 20 and is mounted upon the housing 16, comprising two similar sets of stationary fan-shaped guides, including an upper set 21 and a lower set 22. These guides may be made of suitable material which can be properly formed and which will not have excessive wear under the action of the web material in passing therethrough, suitable materials for this purpose being metal, glass, plastic compositions, or the like.

The guides comprise a plurality of elongated fingers or guides 25 which are arranged in sets upon the supporting plates 21 and 22 respectively. Suitable corner pieces 26 having right angular notches therein provide for receiving the two supporting plates and maintaining them in proper spaced relation to each other. The assembly is effected by means of bolts 27 under the heads of which springs 28 are received to provide a yielding action allowing the plates to separate in case of any obstruction occurring to thus prevent damage thereto. It will be understood that the base plates 21 and 22 are thus normally held in substantial parallelism with each other.

Referring first to the main sets of guides 25, these guides are in the shape of elongated fingers of predetermined shape and contour throughout their extent. The depth of the guides is not uniform, but as shown in Fig. 5 continuously increases from the entering end to the discharge end thereof. Both sets of guides have a similar increase in depth and thus a progressively increasing interfitting relationship is developed as shown by this Fig. 5. Also the width of the guides transversely of the direction of travel of the web progressively decreases toward the discharge end, the projection of the sides of the guides also meeting at the common point of convergence. Such width at the entering end is equal to half the developed length of one corrugation minus only a small clearance between adjacent guides while at the discharge end the width is the same as the internal diameter of the corrugation itself. The guide is laterally symmetrical on opposite sides of its longitudinal center line at all cross sections throughout its length.

The opposed or working surfaces 30 of the two sets of guides have flat surfaces with the flat surfaces extending substantially throughout the longitudinal extent thereof. The side edges of such surfaces are defined by arcs 32, the radius of which progressively increases from approximately zero at the entering ends to the end point at the discharge ends where the two arcs meet, forming a finger which is semicircular in cross section. The flat surface 30 thus becomes progressively smaller and finally terminates at the discharge end.

As will be evident from Figs. 2 and 6, the guides of both upper and lower sets are arranged in lines which converge from their entering to their discharge ends. The center lines of each of these guides if projected would meet at a common point substantially beyond the discharge ends of the guides, a distance beyond the discharge ends of the guides approximately double the length of the guides themselves having been found to give satisfactory results.

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Also as will be clear the guides at their entering ends terminate in a convex arc 40, and at their discharge ends in a concave arc 41, both of which are struck from approximately the common point of convergence above referred to.

To facilitate the passage of the web into the entering ends of the guides at an angle to its path of travel therethrough, a curved piece 44, substantially a quarter round in cross section, is arranged along the arc 40 and the web is passed over this surface from either above or below the plane of the guides themselves depending upon the most convenient relationship. As shown this angle is a substantial one, preferably about 90°.

As shown in Figs. 3 and 7, the two plates 21 and 22 are normally mounted so that the upper or working surfaces of the guides at their entering ends lie in approximately the same plane and adjacent guides are relatively closely spaced as there shown, such spacing preferably being somewhat larger than and about twice the thickness of the web of material in the case of paper. Since the web of material to be corrugated has appreciable thickness, it is desirable to relieve the surface of the guides sufficiently to permit of the introduction of the web thereto. For this purpose the entering ends of the guides are beveled as shown at 46 to provide a sufficient space between the two sets of guides to provide for receiving the web therebetween.

The method of forming this bevel 46 may be determined by reference to the schematic arrangement shown in Fig. 12 where the interfitting relationship of upper and lower guide elements 25 has been represented on a magnified scale. In this view the solid line 47 represents the upper surface of the lower guide and the broken line 48 represents the lower surface of the upper guide. It will be seen that these two lines when extended back to the right hand or entering end meet at a common point 49. The interfitting relation has been exaggerated to better illustrate the procedure involved in forming the bevel. The thickness of the paper is shown at 50, this being the thickness which it is necessary to provide for receiving between the guides. It will be understood that the paper is actually corrugated at the discharge ends of the fingers but in Fig. 12 is represented by parallel lines 50 on opposite sides of a center line for purposes of analysis. By projecting lines 51 in parallel relation toward the right hand side of the diagram it will be seen that two triangular sections 51 and 52 are formed, where these projected lines intersect lines 47 and 48, these being indicated by cross hatching. It is these cross-hatched areas 52 and 51 at the entering ends of the respective upper and lower fingers which are removed to provide the bevel 46 at the entering ends of the fingers for receiving the web of material, the web then passing between the remainder of the fingers as already described.

The auxiliary sets of guides are shown at 60, and are preferably mounted in similar manner upon upper and lower plates 61 and 62 respectively, the same spacing blocks 26 serving to support the same in proper relation to each other. Blocks 63 suitably bolted to the main and auxiliary sets of guides provide for retaining the same in proper fixed relation to each other, as will be clearly apparent from Fig. 2, the two sets of auxiliary guides 60 are in substantial alignment at their entering ends with the discharge ends of both sets of guides 25, and are arranged in the form of an arc corresponding to and fitting within the concave arc 41. At their discharge ends they terminate in a com-

mon transverse plane 64. The guides 60 are of the same cross section throughout, i. e., the same as that of the discharge ends of the main set of guides, and are supported in substantially parallel relation with each other and are of the same depth so that they have a uniform interfitting relationship.

Also as shown in Fig. 2 guides 60 are arranged to diverge a small amount. They are so arranged that the distance between adjacent guides of each set measured in the straight line of plane 64 is the same as the distance between the guides 60 at their entering ends measured along the arcuate path 41. This has been found to improve the discharge action of the corrugating mechanism and to effect delivery of the corrugated web in a smooth and uniform manner overcoming the tendency to form a bulge as the web leaves the guides.

In threading the web the two sets of guides are separated after loosening bolts 27, to provide for receiving the web therebetween. The web is slowly drawn through and the guides then brought together and proper pressure established by springs 28.

In order to draw the web through the corrugating mechanism a pair of rollers 70, 71, at least one of which is grooved as shown at 70, are arranged to be driven by a suitable power source 72 and to engage opposite sides of the corrugated web. The rolls thus provide the tractive force and also provide for retaining the web in the formed corrugated shape pending further manipulation.

If desired the corrugated web may be passed through a stationary former which has sloping funnel shaped sides providing for curving the web into continuous tubular form as it moves thereinto; thereafter a cut-off knife may be operated to cut the formed body into suitable lengths.

Preferably the operation is carried out as indicated diagrammatically in Fig. 13 in which upper and lower rolls of liner material 80 are applied to opposite sides of the corrugated web, adhesive applying rolls 81 being utilized for applying adhesive from reservoirs 82 to the ribs of the corrugations on opposite sides of the web. A pair of rolls 83, 84 effect the application of the liners under proper pressure, following which the web passes into the former 85 where it is continuously formed into the desired shape and cut into suitable lengths by cut-off knife 86. It will be understood that liner webs may be applied to only one side of the corrugated web, and further that one or more corrugated webs and one or more liner webs may be associated with each other to form a composite body as desired for particular purposes.

In order further to show an application of the principles of the invention, the following specific example is given showing the manner of constructing a mechanism in accordance with the present invention for producing corrugated paper of a particular depth of corrugation. It is assumed that it is desired to corrugate a web of paper having a thickness of .015" and to produce corrugations having a total depth of .250", as measured from the top of one corrugation to the bottom of an adjacent corrugation, or a distance between adjacent corrugated ribs of .500", as shown in Fig. 10. Thus the internal diameter of each finished corrugation is .250" minus twice the thickness of the web, or .220". For this purpose the fan shaped guides 25 may have a length of 18", and may be arranged in lines which converge toward a common point approximately $54\frac{3}{4}$ " from the arc 40 and approxi-

mately $36\frac{3}{4}$ " from arc 41. It is preferred to make the length of the guides between about two to three times the width of the corrugated web and in general to so arrange the length and the number of corrugating guides that the outermost guides make angles with the center line of the set of not more than about $7\frac{1}{2}$ degrees.

The flat surfaces of the fingers 25 have a width of .3425" at their entering ends and the arcs 32 are practically zero or non-existent. The spacing between the adjacent guides of opposed sets remains the same throughout, namely .030". As shown in Fig. 7 this provides a spacing at the entering end between centers of adjacent guides of a set of approximately .745".

At the intermediate zone shown in Fig. 8 the radius of the arc 32 has increased from approximately zero to .037". From Fig. 5 it will be seen that there is an overlapping or interfitting relationship of .073", that being twice the radius of arc 32 at this point. While the direct distance between the centers of adjacent guides of a set is now reduced to .663", careful determination of the distance in the path of the web will show that it remains .745".

At the section line 9—9, the radius 32 has increased to .073" and the interfitting relation to .146". Again while the direct distance between centers of adjacent guides has been reduced to .582", the developed distance in the path of the web remains accurately .745".

At the discharge end of the guides 25, as shown by section line 10—10, the radius 32 has now increased to .110" and forms a complete semicircle as shown in Fig. 10. From Fig. 8 it will be seen that at this point the interfitting relation has also increased to the same value. This gives a diameter of .220", which with two thicknesses of web material upon opposite sides, each having a thickness of .015", provides the final desired corrugated depth of .250". Also as will be clear the direct distance between the centers of adjacent guides is the desired amount of .500" but the developed distance in the path of the web remains .745". Similar analysis made at any point throughout the length will show that the same relationship is present.

From the above it will be clear that the guides in this form provide for the formation of a web of the desired depth of corrugation, and further that the path traversed by the web at all points throughout the length of the guides remains the same, thus eliminating lateral travel and maintaining friction at a low and unobjectionable level.

The auxiliary guides 60 may have a length of approximately $1\frac{1}{2}$ ", the spacing between their centers at the discharge side thereof being accurately .500", the same as the distance measured along arc 41. The shortest distance between the centers of adjacent fingers 25 of a set at the discharge ends thereof measures .498" and thus guides 60 diverge to the extent of .002".

It will be understood that the above detailed measurements are representative of only one condition of size of corrugation, thickness of web, etc., and that these factors may vary as desired within the teachings of the invention to obtain the desired highly satisfactory results.

The above invention therefore provides a highly successful mechanism for continuous corrugation of web material, overcoming the inherent defects in prior devices of this character and providing for smooth and continuous passage of the material through the mechanism without ex-

cessive friction, tearing, or disrupting of the web at any point in its passage. It is capable of high speeds, up to about 2500 feet per minute, and beyond, and represents an economical and highly advantageous procedure for producing corrugated material and resulting products therefrom.

While the method and form of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of similar fan-shaped interfitting guides, the guides of one set being formed to interfit in progressively increasing relation with those of the other set, the lateral spacing of said guides and the peripheral surfaces thereof in contact with said web progressively varying longitudinally of said mechanism in correlated relation with the interfitting relation of said guides and the thickness of the material being corrugated to maintain the developed lateral distance between the centers of adjacent guides of a set substantially constant throughout the longitudinal extent of said guides.

2. Continuous corrugating mechanism of the character described for corrugating a web of material comprising two sets of fan-shaped interfitting guides, said guides being arranged in lines converging toward a common center substantially beyond the discharge end thereof, the guides of one set interfitting in progressively increasing amount with those of the other set, each of said guides having a progressively varying surface for contact with the web, said surface varying continuously in lateral extent throughout the length thereof in correlated relation with the interfitting of the guides to provide a web path of uniform developed width between the centers of adjacent guides of a set throughout the longitudinal extent thereof, and means for passing a web of material through said device to be continuously corrugated thereby.

3. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, each of said guides having a surface adapted to contact said web, the guides of one set being formed to interfit in progressively increasing relation with those of the other set, the spacing of said guides and the peripheral contour of said web-contacting surfaces thereof continuously varying longitudinally of said mechanism in correlated relation with the interfitting relation of said guides and the thickness of the material being corrugated such that the developed lateral distance between the centers of adjacent guides of a set in the path traversed by the web remains constant throughout the longitudinal extent thereof, and means for feeding a web of material to the entering end of said guides at an angle to the path of travel of the web there-through.

4. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, each of said guides having a surface adapted to contact said web, the guides of one set being formed to interfit in progressively increasing relation with those of the other set, the spacing of said guides and the peripheral con-

tour of said web-contacting surfaces thereof continuously varying longitudinally of said mechanism in correlated relation with the interfitting relation and the thickness of the material being corrugated such that the developed lateral distance between the centers of adjacent guides of a set in the path traversed by the web remains constant throughout the longitudinal extent thereof, means for feeding a web of material to the entering end of said guides at an angle to the path of travel of the web therethrough, and adjustable means for guiding the web laterally as it is fed into said mechanism.

5. Continuous corrugating mechanism of the character described for corrugating a web of material comprising two sets of fan-shaped interfitting guides, said guides being arranged in lines converging toward a common center substantially beyond the discharge end thereof, the guides having a progressively decreasing width from the entering to the discharge ends thereof, the guides of one set being formed to interfit in progressively increasing amount with those of the other set, the peripheral surface of the guides in contact with the web varying continuously throughout the length thereof in correlated relation with the interfitting of the guides providing a web path of uniform developed width between the centers of adjacent guides of a set, the ends of said guides at the entering end thereof terminating in an arcuate path.

6. Continuous corrugating mechanism of the character described for corrugating a web of material comprising two sets of fan-shaped interfitting guides, said guides being arranged in lines converging toward a common center substantially beyond the discharge end thereof, the guides of one set being formed to interfit in progressively increasing amount with those of the other set, the peripheral surface of each guide in contact with the web being formed to vary continuously in lateral extent throughout the length thereof in correlated relation with the interfitting of the guides and providing a web path of uniform developed width between the centers of adjacent guides of a set throughout the longitudinal extent thereof, the ends of said guides at the entering end thereof terminating in an arcuate path having its center substantially at said point of convergence, and means for feeding a web of material into the entering ends of said guides from an angle of approximately 90° to the path of travel of the web through said device.

7. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, the guides of one set being formed to interfit in progressively increasing relation with those of the other set from the entering to the discharge ends thereof, each of said guides having a surface adapted to contact said web, the lateral spacing of said guides and the peripheral contour of said web-contacting surfaces thereof continuously varying longitudinally of said mechanism in correlated relation with the interfitting relation of said guides and the thickness of the material being corrugated such that the developed lateral distance between centers of adjacent guides of a set in the path of the web remains constant throughout the longitudinal extent thereof, said guides having the marginal edges thereof in contact with the web curved about an arc of progressively increasing radius from the entering to the discharge end thereof.

8. Continuous corrugating mechanism of the

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character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, the guides of one set being formed to interfit in progressively increasing relation with those of the other set from the entering to the discharge ends thereof, each of said guides having a surface adapted to contact said web, the lateral spacing of said guides and the peripheral contour of said web-contacting surfaces thereof continuously varying longitudinally of said mechanism in correlated relation with the interfitting relation of said guides and the thickness of the material being corrugated such that the developed lateral distance between centers of adjacent guides of a set in the path of the web remains constant throughout the longitudinal extent thereof, said guides being of substantially uniform transverse thickness, the marginal edges of said guides in contact with the web being curved about a radius progressively increasing from a minimum at the entering end of said device to a maximum at the discharge end forming a substantially semi-circularly curved guide surface in contact with the web material at said discharge end.

9. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, the guides of each set being of progressively increasing depth from the entering to the discharge end thereof, means for mounting said sets in opposed relation with the guides of one set interfitting in progressively increasing relation with those of the other set, said sets being so mounted that the projections of the working surfaces of the guides of opposite sets lie in approximately the same plane at the entering ends thereof, the entering ends of said guides being relieved to provide for the introduction of the web of material thereinto.

10. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped progressively interfitting guides, the guides of each set being formed with material-engaging surfaces having a peripheral contour defined at their side edges by arcs of progressively increasing radius from the entering to the discharge ends thereof.

11. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped progressively interfitting guides, the guides of each set being formed with material-engaging surfaces having a peripheral contour defined at their side edges by arcs of progressively increasing radius from the entering to the discharge ends thereof, said arcs at the discharge ends of said guides forming a substantially complete semi-circle defining the cross section of each guide.

12. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, said guides being arranged in converging lines, and auxiliary sets of guides located respectively at the discharge ends of said two sets of guides and in relative alignment therewith, said auxiliary guides being arranged in lines diverging outwardly toward the discharge end thereof.

13. Continuous corrugating mechanism of the character described for corrugating a web of ma-

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terial which comprises two sets of fan-shaped interfitting guides, said guides being arranged in lines converging toward a common center substantially beyond the discharge end thereof, said guides terminating in an arc struck from the approximately said common center, and auxiliary sets of guides located respectively at the discharge ends of said two sets of guides and in relative alignment therewith, said auxiliary guides being arranged in lines diverging outwardly toward the discharge ends thereof, and terminating in a plane transverse to the direction of travel of the web.

14. Continuous corrugating mechanism of the character described for corrugating a web of material which comprises two sets of fan-shaped interfitting guides, said guides being arranged in lines converging toward a common center substantially beyond the discharge end thereof, said guides terminating in an arc struck from approximately said common center, and auxiliary sets of guides located respectively at the discharge ends of said two sets of guides and in relative alignment therewith, said auxiliary guides being arranged in lines diverging outwardly toward the discharge ends thereof and terminating in a plane transverse to the direction of travel of the web, the distance between the discharge ends of adjacent auxiliary guides measured in said transverse plane being substantially the same as the distance between the discharge ends of adjacent guides of said two sets measured on said arc.

15. In an apparatus for corrugating having stationary forming means associated therewith for receiving the corrugated web and continuously forming the same into tubular shape, the combination of continuous corrugating mechanism of the character described which comprises two sets of fan-shaped interfitting guides, the guides of one set being formed to interfit in progressively increasing relation with those of the other set, each of said guides having a surface adapted to contact said web, the spacing of said guides and the peripheral contour of said web-contacting surfaces thereof progressively varying longitudinally of said mechanism in correlated relation with the interfitting relation of said guides and the thickness of the material being corrugated such that the developed lateral distance between the centers of adjacent guides of a set in the path of the web remains constant throughout the longitudinal extent thereof, and means for passing a web of material through said device to be continuously corrugated thereby.

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