May 10, 1927. 1,628,259

A. MAUSER

PROCESS AND APPARATUS FOR INCREASING THE STRENGTH OF ARTICLES

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Fig. 7.

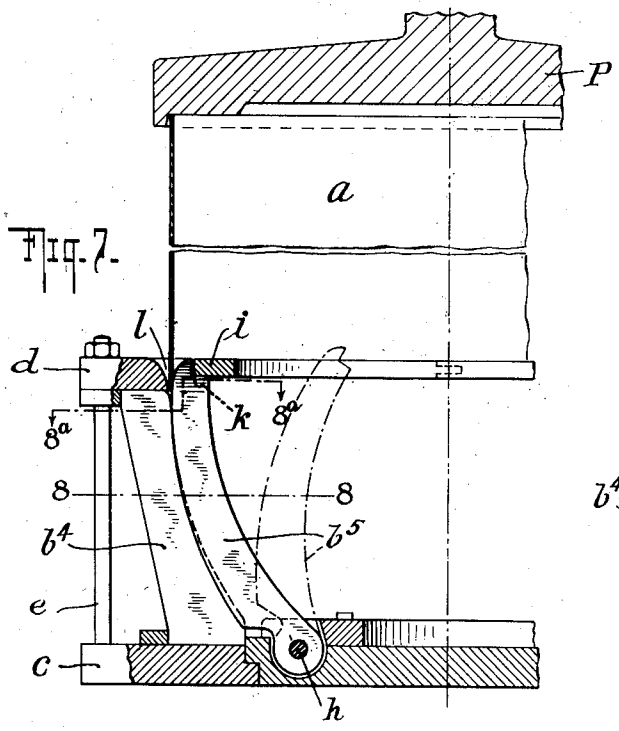


Fig. 8.

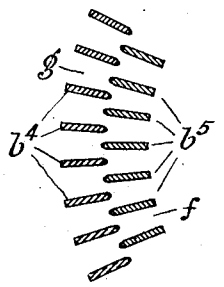


Fig. 9.

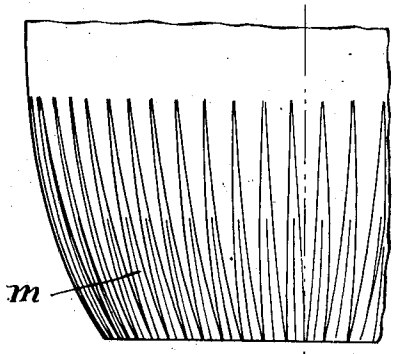


Fig. 8a.

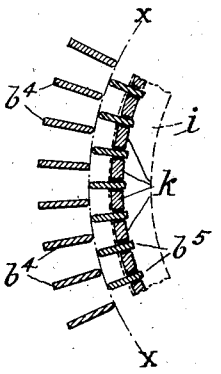
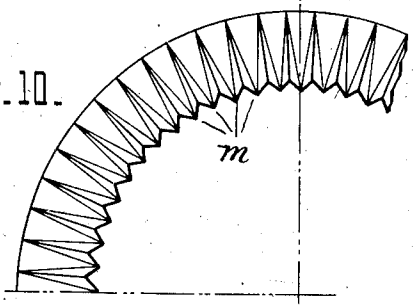


Fig. 10.



WITNESS

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UNITED STATES PATENT OFFICE.

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PROCESS AND APPARATUS FOR INCREASING THE STRENGTH OF ARTICLES.

Application filed November 6, 1924, Serial No. 748,031, and in Germany September 20, 1924.

My invention relates to articles made of sheet metal or similar material of a thickness enabling the article to be corrugated for the purpose of strengthening it. The invention is applicable to plate-like articles as well as to tubular ones. The object of my invention is to corrugate such articles in a simple and effective manner, while preventing material changes in either the thickness or surface length of the material and the distortion and irregular results which accompany the procedures hitherto employed for corrugating operations. The objectionable lack of uniformity in the individual products of the processes employed heretofore, and the distortion of certain portions of the material, were due largely to the fact that prior to my invention at least one of the instrumentalities or sets thereof used for producing the corrugations were mounted for movement transversely to the plane of the blank during the corrugating action and the pressure upon the blank was not equally distributed.

In my present invention, both surfaces of the article or blank are engaged by corrugation-producing elements which are held stationarily in planes extending transversely to the faces of the blank during the corrugating action although they may be moved longitudinally of the blank, and the said elements are so constructed and arranged that the pressure is equally distributed over a large area of the blank.

Three ways of carrying out the invention are illustrated, as examples, by the accompanying drawings, in which Fig. 1 is a fragmentary face view of a plate prior to its treatment according to this invention; Fig. 2 is an edge view of said plate in conjunction with a diagrammatic representation of the corrugating mechanism, at the entrance end of such mechanism; Fig. 3 is a side view of such mechanism; Fig. 4 is a view similar to Fig. 2, but showing the plate and corrugating mechanism at the outlet end of such mechanism; Fig. 5 is a fragmentary face view of the finished corrugated plate; Fig. 6 is a diagrammatic representation of a mechanism for corrugating a tubular body, and also indicates both the original and the final shape of said body; Fig. 7 is a partial sectional elevation, in an axial plane, of another form of mechanism for corrugating tubular bodies; Fig. 8 and Fig. 8^a are partial cross-sections on lines 8—8 and 8^a—8^a respectively of Fig. 7; Fig. 9 is a partial side elevation of a corrugated article such as may be produced with the aid of the mechanism shown in Figs. 7 and 8; Fig. 10 is a partial plan view corresponding to Fig. 9.

In Figs. 1 and 2, a designates a plate of sheet metal or other material which it is desired to strengthen or stiffen by means of longitudinal corrugations. The plate, which in its original condition is smooth and flat or substantially so, is introduced between the upper ends of two opposing sets, b, b', of stationary ribs or corrugating elements which converge from the inlet end of the apparatus (shown at the top) to the outlet end (shown at the bottom). The corrugating ribs or elements of one set out of line with those of the other set, that is, the ribs b alternate with the ribs b'. At the entrance end, the opposing edges of the ribs of the two sets are shown as spaced sufficiently to provide a narrow channel to allow the plate a to be inserted between them freely. At the outlet end, however, the opposing edges of the ribs b, b', overlap, as shown clearly in Fig. 4, and it will be understood from Fig. 3 that there is a gradual transition from the relative arrangement of the ribs illustrated by Fig. 2, to that shown in Fig. 4, so that the forcing of the plate a (downwardly) between the said ribs, toward the outlet of the mechanism will not only reduce the width of the plate, but at the same time form therein corrugations which, from being very shallow at first increase in depth as the outlet is approached. Evidently it is immaterial whether the plate is moved downward while the corrugating elements are stationary, or these elements are moved upward while the plate is stationary, or downward movement of the plate is combined with an upward movement of the corrugating mechanism. A comparison of Figs. 2 and 4 will also show that in this specific construction the ribs b, b', taper lengthwise, being wedge-shaped, with their upper ends narrower than their lower ends. This gives the ribs greater width and strength toward the outlet of the apparatus, where the corrugating effect is greatest. It will be clear that by giving the ribs b, b', a suitable shape or cross section and altering their radial depth and their ar-

ing to Figs. 6 to 10 are originally of cylindrical shape and therefore of circular cross-section, it will be understood that tubular articles of other cross-sections (for instance oval or angular) may be corrugated according to the same principle, the arrangement of the inner and outer corrugating members being varied accordingly. Tubular blanks corrugated according to this invention are intended particularly for use as the bodies of barrels and like containers.

It will be obvious that provision may be made for the radial adjustment (in or out) of the outer and inner blades b^2, b^4, and b^3, b^5, respectively, thereby enabling the same apparatus to be used for corrugating tubular blanks of different diameters. If it is desired to vary the depth of the corrugations, this may be done by making the backing ring i of different outer diameter.

Should it be desired to contract the end of the tubular blank to a lesser extent than would result from forcing it completely to the lower end of the apparatus as described above, the press P may be stopped when the desired result has been obtained.

Whether dealing with tubular blanks or others (for instance plates, as in Figs. 1 to 5) my invention is not restricted to corrugating the entire surface of the blank at the same time, as in the specific embodiments shown. It will be obvious that by removing some of the corrugating elements only a portion of the blank would be treated, thereby enabling certain portions of the blank to be corrugated, while other portions are left uncorrugated or plain, thus producing different effects or designs in the finished article.

It will be noted that in all embodiments of my invention described above, the blank is fashioned between two opposing sets of corrugating members which are held stationarily with respect to each other during the corrugating action and as these members are positively held in position, the articles thus produced will be absolutely uniform, that is, there will be no objectionable variation either in the outer dimensions of the finished articles or in the number or depth of the corrugations. Furthermore, as the pressure of the corrugating members is exerted gradually upon the blank as it is passed between said members and is uniformly distributed along the entire length of the corrugating members, no material distortion of the thickness or length of the material occurs. While I have described the corrugating action as being produced by moving the blank longitudinally of the pressure producing elements, it will be understood that a longitudinal movement of either the elements alone or both the blank and the elements is the full equivalent of the movement of the blank alone, the principle of operation being the same.

Various modifications may be made without departing from the nature of my invention as set forth in the claims.

I claim:

1. The process of corrugating a blank of bendable material to form a container having a corrugated end portion, the diameter of which increases progressively from the end towards the mid-length of said container which consists in exerting pressure upon opposite sides of said blank along a plurality of spaced line contacts only, by means of pressure producing instrumentalities distributed along spaced longitudinally extending converging lines inclined laterally to the sides of said blank in overlapping staggered relationship, and producing relative longitudinal movement between said blank and the pressure producing instrumentalities, while preventing movement of the pressure producing instrumentalities relatively to each other during the corrugating action to form progressively and simultaneously in said blank a plurality of longitudinally extending corrugations of gradually increasing depth by a combined longitudinal and transverse folding of the material.

2. The process of corrugating a blank of bendable material which consists in exerting pressure upon opposite sides of said blank along a plurality of spaced line contacts only, by means of pressure producing instrumentalities distributed along spaced longitudinally extending converging lines inclined laterally to the sides of said blank in overlapping staggered relationship, producing relative longitudinal movement between said blank and the pressure producing instrumentalities, while preventing movement of the pressure producing instrumentalities transversely of said blank to form simultaneously therein a plurality of longitudinally extending corrugations of gradually increasing depth, and continuing said movement to subject the entire length of said blank to said pressure to form the final product into longitudinally extending corrugations of uniform depth.

3. The process of corrugating a tubular blank of bendable material which consists in subjecting opposite sides of said blank to pressure exerted with a substantially equally distributed pressure by means of pressure producing instrumentalities along spaced longitudinally extending converging lines inclined laterally to the sides of said blank in overlapping staggered relationship and producing relative longitudinal movement between said blank and the pressure exerting instrumentalities, while preventing movement between the pressure producing instrumentalities relatively to each other during the corrugating action.

4. The method of subjecting a blank of bendable material to the corrugating action

of two sets of elements arranged in alternating overlapping relationship to contact with the opposite sides of the blank and having substantially a line contact only with said blank characterized by arranging the elements of one set to converge towards the elements of the other set and passing said blank between said sets of elements by producing relative longitudinal movement between said blank and elements while preventing relative movement between said elements, the corrugating action being produced entirely by said elements and said relative movement.

5. A corrugating apparatus comprising a plurality of pressure members arranged in two sets to exert a substantially equally distributed pressure with substantially a line contact only upon opposite sides of a blank of bendable material along longitudinally extending lines inclined transversely to the sides of said blank when said blank is forced longitudinally between said elements, the active edges of the members of the same set being closer at one end thereof than at the other end, and the active edges of the elements of one set overlapping those of the other set in staggered relationship to an extent which increases towards said end.

6. A corrugating apparatus comprising a plurality of pressure members, arranged in alternation to form inner and outer annular opposed sets to engage the opposite sides of a tubular blank, along spaced longitudinally extending lines, the members of each set converging laterally towards each other and arranged in progressively overlapping staggered relationship with the members of the other set from the entrance to the delivery end of said apparatus to exert a corrugating action upon the blank when relative longitudinal movement is produced between said blank and pressure members, and supports to hold said pressure members against movement relatively to each other during the corrugating action.

7. A corrugating apparatus comprising a plurality of pressure members arranged in alternation to form inner and outer annular opposed sets to engage the opposite sides of a tubular blank along spaced longitudinally extending curved lines, the members of each set converging laterally towards each other and arranged in progressively overlapping staggered relationship with the members of the other set from the entrance to the delivery end of said apparatus to exert a corrugating action upon the blank when relative longitudinal movement is produced between said blank and pressure members and supports to hold said pressure members against movement relatively to each other druing the corrugating action, one of said supports being removable to permit one of said sets of members to be released to permit removal of said blank from said apparatus.

8. A corrugating apparatus comprising longitudinal corrugating elements arranged in two sets spaced from each other so that they may engage the blank along spaced lines on opposite sides, the members of one set forming an inner annular set, while the members of the other set form an outer annular set, the members of one set being stationary, while those of the other set are pivoted to swing toward and from said stationary members, and means for positively holding said pivoted members against movement in their active or working position.

9. A corrugating apparatus comprising longitudinal corrugating elements arranged in two sets spaced from each other so that they may engage the blank along spaced lines on opposite sides, the members of one set forming an inner annular set, while the members of the other set form an outer annular set, the members of one set being stationary, while those of the other set are pivoted to swing toward and from said stationary members, and a movable locking member arranged to engage and arrest all of said pivoted members and hold them positively against movement in their active or working position.

10. The process of corrugating a blank of bendable material which consists in producing relative longitudinal movement between said blank and a plurality of pressure producing instrumentalities, arranged along a plurality of spaced, longitudinally extending, converging, lines, inclined laterally to the sides of said blank upon opposite sides thereof in gradually overlapping, staggered relationship, while preventing movement between said instrumentalities relatively to each other during the corrugating action, and maintaining said blank free from any transversely exerted pressure or clamping effects except such produced by said instrumentalities, whereby the corrugating action is performed entirely by a combined transverse and longitudinal folding of the material produced by pressure exerted, with substantially a line contact only, along a plurality of spaced longitudinally extending lines by said instrumentalities.

In testimony whereof I have hereunto set my hand.

ALFONS MAUSER.

May 10, 1927. 1,628,260

J. H. MAXIM

POWER TRANSMISSION UNIT

Filed Oct. 27, 1926 2 Sheets-Sheet 1

Fig. 3.

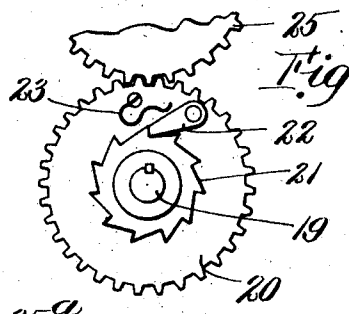


Fig. 1.

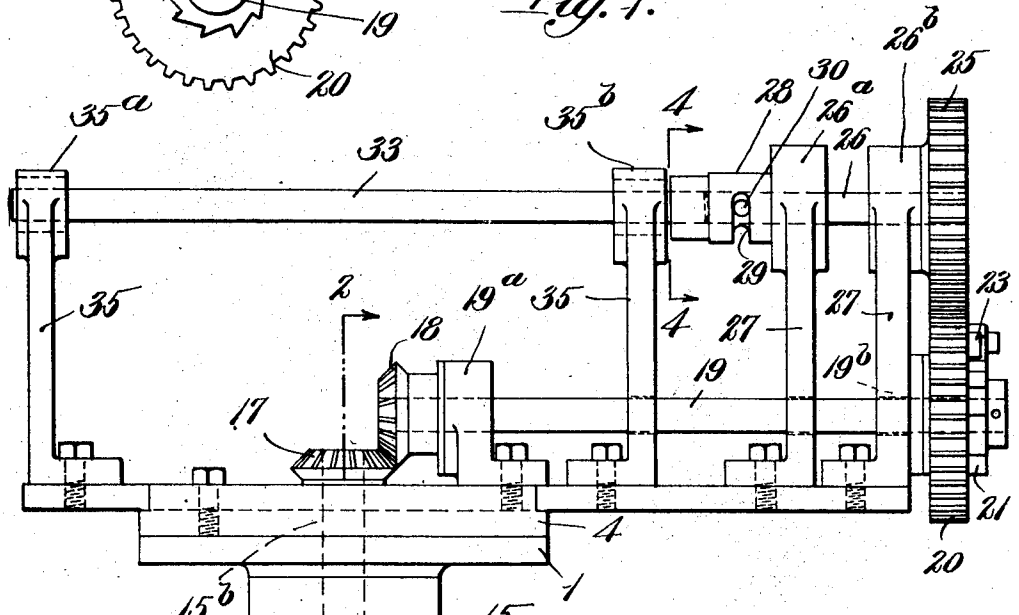
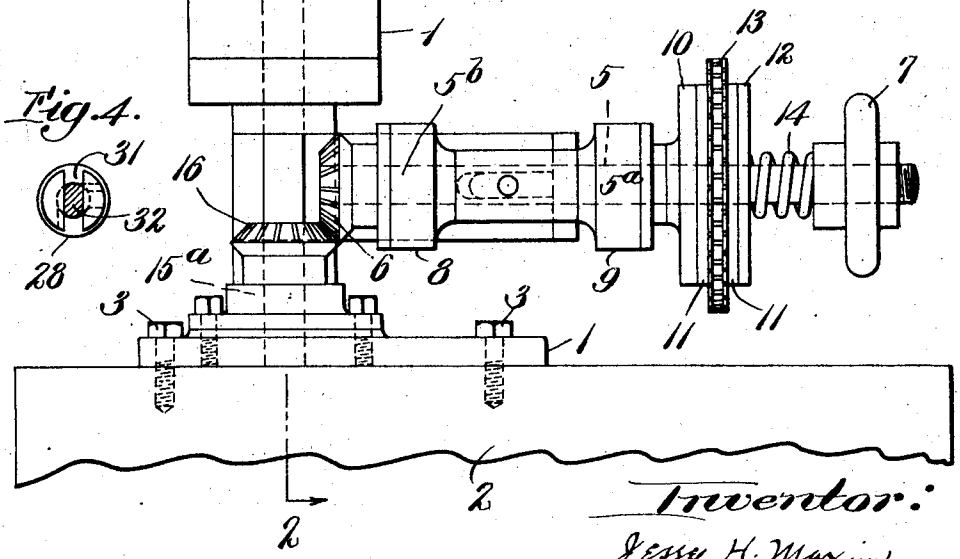


Fig. 4.



Inventor:
Jesse H. Maxim
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Atty.