

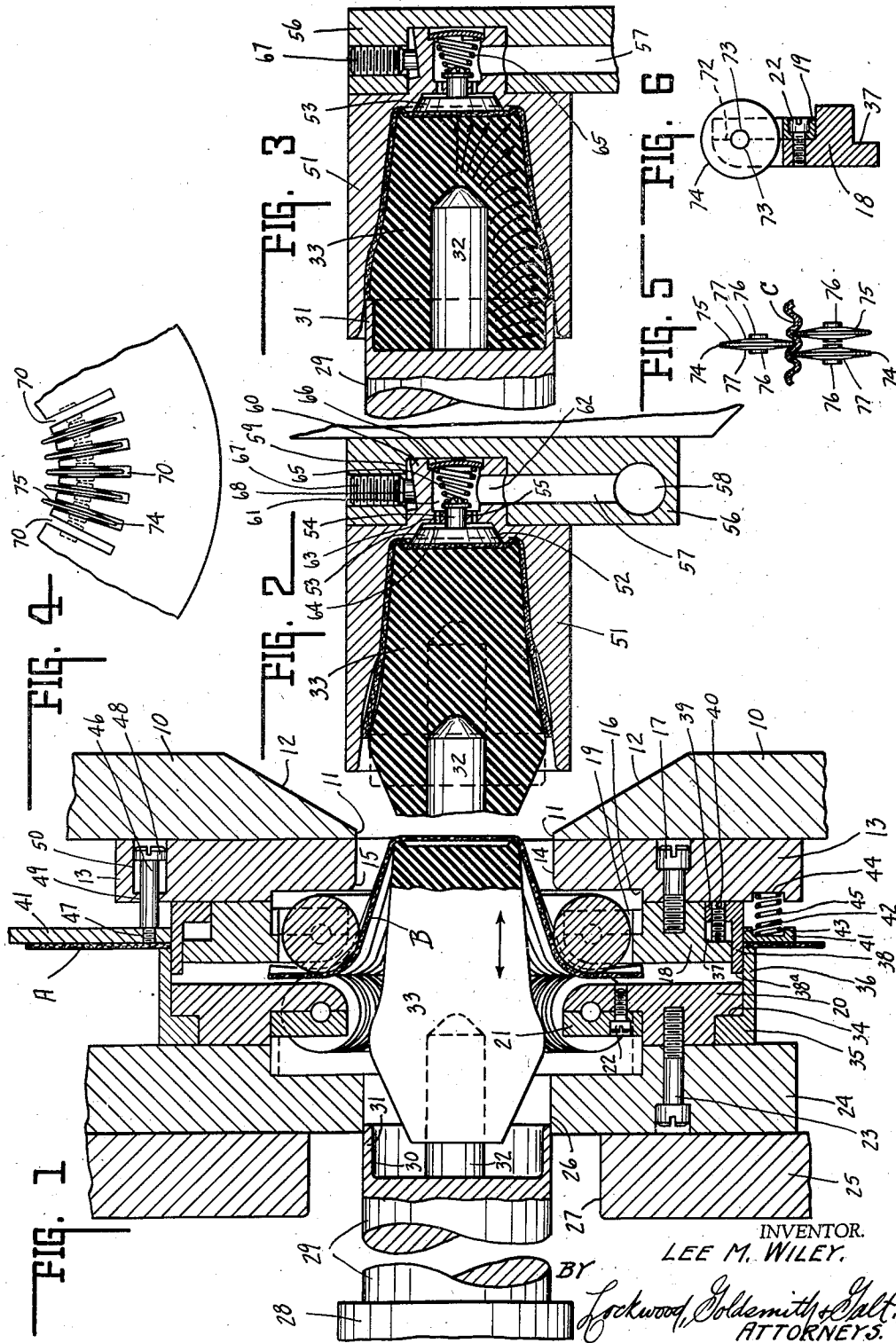
Sept. 29, 1942.

L. M. WILEY

2,296,889

PROCESS OF AND APPARATUS FOR FORMING SEAMLESS FIBER STOCK CONTAINERS

Filed May 13, 1940



INVENTOR.
LEE M. WILEY.

BY
Lockwood, Goldsmith & Galt.
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,296,889

PROCESS OF AND APPARATUS FOR
FORMING SEAMLESS FIBER STOCK
CONTAINERS

Lee M. Wiley, Marion, Ind.

Application May 13, 1940, Serial No. 334,823

11 Claims. (Cl. 93—60)

This invention relates to fluting arrangement for forming a fluted wall container blank from a flat blank and subsequently compressing the flutes into side wall formation simultaneously with initial container form formation.

This invention is an improvement upon the processes and similar forms of apparatus described and claimed in the copending applications, Serial No. 288,343, filed August 4, 1939, and entitled, "Sheet pulp container forming process and apparatus therefor," and Serial No. 316,742, filed February 1, 1940, and entitled "Sheet pulp container forming process and apparatus therefor," and is a continuation in part application of the aforesaid applications.

The chief object of the present invention is to preventing the cutting of the sheet stock in the prefluting and initial dishing operation and to reduce the friction between the sheet stock and deforming parts to permit stock drawing with a minimum of friction and which permits deeper containers to be drawn, containers to be drawn from different blank thicknesses and different thickness containers to be drawn from the same blank thickness and at a much lower tool cost.

The chief feature of the invention consists in the elimination of sharp edges in the fluting arrangement in the earlier disclosed application and the elimination of hand finishing of flutes in the later disclosed application, and utilizing in lieu thereof a pair of confronting peripheral series of creasing wheels or discs, the wheels of both series partially overlapping and interfitting.

Other objects and features will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawing and the following description and claims:

In the drawing,

Fig. 1 is a central sectional view through the invention, parts being shown in a position wherein the blank is but partially drawn from flat sheet form, and but partially dished.

Fig. 2 is a similar view of the cooperating dies for initial container formation immediately prior to such formation.

Fig. 3 is a similar view of the cooperating dies in the initial container formation forming position.

Fig. 4 is a plan view of a portion of one creasing wheel ring arrangement.

Fig. 5 is an elevational view of a portion of the two cooperating creasing wheel arrangements with the creased or fluted stock therebetween.

Fig. 6 is a radial sectional view through one wheel arrangement support.

In Fig. 1 of the drawing, 10 indicates the bed plate or base portion of a container forming machine, such as is more fully illustrated and described and claimed broadly in the two before mentioned applications. This support 10 includes an aperture 11 relieved as at 12. Suitably mounted on the plate 10 is a die supporting plate 13 having a central aperture 14 registering with aperture 11 and relieved as at 15. The face opposite the base is relieved as at 16 for clearance purposes.

Carried by the plate 13 as indicated at 17 is a gathering die supporting plate 18 which with its mating ring 19 suitably supports a fluting arrangement to which reference will be had hereinafter. The gathering plate and its retaining ring 19 are suitably secured together, as otherwise illustrated in Fig. 1, and to which reference now will be had.

Confronting gathering plate 18 is the gathering plate 20 provided with the retaining ring 21, the two being suitably secured together as indicated at 22. This gathering ring structure 18—19 is the die portion and the gathering ring structure 20—21 is the punch structure. The latter is suitably secured as at 23 to the punch plate 24 and the latter is carried by and moved with the ram plate 25.

The plate 24 is apertured as at 26 and positioned in the aperture 27 of the ram plate is a ram or plunger 28 having a reduced portion 29 which is recessed as at 30 to form a tubular portion 31 that is slidably supported in aperture 26 of plate 24.

Projecting centrally and forwardly from the recess 30 is a stem 32 and upon the same is mounted the expansible drawing and sizing punch 33. The gathering plate 20 is suitably relieved as at 34 and interposed in the channel thus formed between the plate 20 and the plate 24 is the portion 35 of the blanking ring or punch 36, the bolts 23 rigidly securing the latter and the two plates 20 and 24 together.

In like manner, the gathering plate 18 is recessed as at 37 and the blanking ring die 38 includes the inwardly directed flange portion 39 seatable in the recessed portion 37 of the gathering plate structure 18. Set screw means 40 adjusts the position of this blanking ring die.

There also is provided a stripper plate 41 which is apertured at 42 so as to be slidable on the blanking die 38. The stripper plate is recessed as at 43 and the adjacent face of the die plate

13 is correspondingly recessed as at 44 and seated in said confronting recess is the spring 45 which normally constrains the stripper plate away from the die plate 13 and toward the respective rams.

Separating movement of said stripper plate relative to the die plate 13 is limited by the bolt 46 secured to the stripper plate as at 47 and having the head portion 48, the body portion of the bolt being slidably supported in the opening 49, the latter being enlarged as at 50 to form a bore to receive the head of the aforesaid bolt structure. Any suitable number of stripping plate retainers and travel limit arrangements as well as springs 45 may be provided, as desired or required.

In Fig. 1, the letter A indicates the strip of prime pulp sheet and the letter B the blank cut therefrom by the movement of the blanking ring punch 36 into engagement with the sheet A and then the shearing of said sheet by further movement of the blanking ring punch toward the right, the sheet being maintained in intimate contact with this blanking ring by means of the stripper plate and the blank cut therefrom initially bearing on the face 38a of the blanking ring die.

After this movement has occurred, the ram 28 continues advancing toward the right so that the plunger 33 engages the central portion of the blank and draws the blank through the two confronting interfitted gathering or fluting arrangements, and the position of the parts as illustrated in Fig. 1 corresponds to the position when the sheet is but partially dished and almost entirely fluted. The advancing movement of the expansible plunger is continued until it draws the blank through the fluting arrangements and frees the same therefrom and transports the partially formed fluted blank into the receiver die 51. It will be apparent, therefore, that the fluted blank and the expansible plunger project through the apertures 14 and 11 in order to effect this receiver die reception.

The receiver mold may be of parted character, and the like, and includes a central aperture 52 controlled by a frusto conical combination relief valve and ejector 53 carried by a stem 54 slidably supported as at 55 in the receiver mounting plate 56 carried by the turret structure, not shown, but described in the copending applications.

This receiver mounting plate includes a passage 57 that communicates with a compressed air supply duct 58 and the former is enlarged to form a well arrangement 59 that seats the stem portion 50 of the receiver mold arrangement, the latter including a chamber 61 provided with a passage 62 communicating with passage 57 and provided with a plurality of ports 63 communicating with the chamber 61 controlled by the valve 53. A spring 65 normally constrains the valve and ejector to open valve and ejecting position. The chamber is closed by the disc 66.

The receiver is locked to the receiver supporting plate, as indicated at 67 and 68, this being of taper lock character, so as to insure rigidity of mounting and retention of the receiver mold on the receiver plate. When the fluted container is nested in the receiver mold, as shown in Fig. 2, by the expansible plunger, it will be noted valve 53 is closed and forms a portion of the bottom of the receiver mold.

The final position the expansible mold takes and the final form it assumes in the particular embodiment of the invention selected herein, is

shown in Fig. 3. After this formation has occurred, ram 28 is retracted and the expansible mold assumes the position shown in Fig. 2 while the container retains the position shown in Fig. 3. Continued retraction of the plunger 23 then withdraws the plunger to the position shown in Fig. 1 and further retraction fully withdraws the plunger 33 from the vicinity of the gathering plate structure carried by the ram plate 25 and simultaneously with part of this retraction movement, the ram plate is moved toward the left until there is a complete clearance between the two blanking rings and all other more remotely separated parts. When sufficient clearance occurs between the two blanking rings, the sheet A is fed so as to register a portion of the sheet sufficient for forming a blank.

In the withdrawal movement it will be apparent the stripper plate moves toward the right under the influence of its spring constraint so that the sheet A is freed from the relatively stationary blanking die and thus the sheet A may be fed to provide a new blank. The operation of blanking, drawing the blank through the fluting or creasing arrangements, and drawing the blank into dished form and ejecting the dished and fluted blank from gathering arrangements and positioning the same in the receiver die, is then repeated.

For a more detailed and comprehensive description of the aforesaid mechanism, process and the like, reference is had to each of the two before mentioned applications. The specific improvement in the present instance is shown most clearly in Figs. 1 and 4 to 6, inclusive, to which reference now will be had.

Since the two gathering plate structures are substantially similar but not identical, as will be perfectly obvious from the following description, reference will be had more particularly to Figs. 4 to 6, inclusive. In these figures, it will be noted that 13 indicates the gathering plate die and 19 the retaining ring, the gathering die, as stated, being relieved as at 37. The inner periphery of this ring is slotted as indicated at 70 and these slots are radially directed with reference to the ring center when a cylindrical or circular sectioned wall formation is to be formed in the sheet blank. The ring construction as shown clearly in Fig. 6 is parted as at 72 and in each of the two confronting faces of members 18 and 19 and in the slotted portions thereof, there are provided grooves 73, which register with each other and form circular bearings or the circular channel 73.

Mounted in each radial slot 70 is a creasing wheel or disc having the rounded periphery 74, the flaring side portions 75 and the oppositely directed hub portions 76. Between the hub portion and the flaring side is a flat face 77 and it is this flat face, cooperating with the sides of the slot 70, that maintains the creasing disc in predetermined position or rather in radial alignment.

As shown clearly in Figs. 1 and 5, the discs of the two creasing wheel arrangements are alternated so that the wheels of one arrangement are interposed between adjacent wheels or the other arrangement and the wheels overlap to the desired degree. The shape of these wheels at their overlapping portions and the amount of overlap determines the character of the flute formed in the blank as it is drawn through the creasing wheel arrangements by the expansible die in its advance toward the receiver mold. The grooves

formed in the blank B are indicated by the letter C in Fig. 5.

It will be apparent that all the wheels are identical and that all that is necessary when desired to change the creasing wheel arrangements, is to provide wheels of different confronting character.

It also will be obvious by the employment of ring spacers, or the like, the amount of overlap may be varied. It also will be noted that the number of flutes to be formed in the blank may be readily changed by substituting other members 18, 19, 20 and 21, for those illustrated.

The wheel arrangements permit a blank to be drawn through the creasing arrangements with the minimum amount of friction and permit the blank to be drawn through the creasing arrangements without danger of cutting, which might occur with the form of the broad invention disclosed in the first mentioned application.

The present form of the invention provides a creasing arrangement which has the advantages over the creasing arrangement disclosed in the second mentioned application in that friction is reduced to a minimum and more particularly hand finishing and smoothing of the creasing dies are eliminated. Furthermore, due to the reduction in friction, there is less wear on the present invention incident to the blank passing therethrough and thus longer life is obtained therefrom.

Furthermore, by reason of the fact that the entire periphery of a wheel is a creasing surface, the wear thereof is not localized but is distributed and, therefore, localized wear common to both forms of the basic invention disclosed in the two co-pending applications is eliminated. The result, therefore, is that the blank may be drawn through the creasing arrangements more rapidly, more efficiently and with less danger of variation in or fracture or tearing, cutting, or the like, of the blank.

The life of the present invention, therefore, is many fold times that of either of the two before mentioned forms of creasing arrangements disclosed in said applications.

As previously pointed out, the present creasing arrangements are of such form that the same may be more cheaply fabricated, may be more easily adjusted for flute variation and may be readily substituted either entirely or in part for varying the number of flutes or the character of the flutes or both.

While the invention has been illustrated and described in great detail in the drawing and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

While the invention has been illustrated and described as being applicable to the formation of circular sectioned walled containers, the invention is equally applicable with slight modifications to a non-circular outlined article. In such event, the corresponding arrangements would be of an outline corresponding in general to the final outline of the container desired. The term "ring" therefore, as used herein is not intended to be restricted to a truly circular arrangement but is intended to include within the scope thereof arrangements capable of producing articles

of outline such as illustrated in Figs. 18 and 19 of the copending application, Serial No. 316,742 beforementioned and the creasing arrangements in the present invention would be similarly modified so as to function in accordance with the present disclosure and as a substitute for the arrangements disclosed in Figs. 15 to 17 inclusive of the last mentioned copending application.

The invention claimed is:

1. In a fiber stock container forming machine, a pair of confronting creasing arrangements having registering central openings therethrough, and means for engaging a blank therebetween and centrally thereof for drawing the blank through the arrangements, each including a peripheral series of spaced creasing wheels, the wheels in the arrangements overlapping each other.

2. In a fiber stock container forming machine, a pair of confronting creasing arrangements having registering central openings therethrough, and means for engaging a blank therebetween and centrally thereof for drawing the blank through the arrangements, each including a peripheral series of spaced creasing wheels, the wheels of one arrangement being staggered relative to the wheels of the other arrangement.

3. In a fiber stock container forming machine, a pair of confronting creasing arrangements having registering central openings therethrough, and means for centrally engaging a blank therebetween to move the blank therebetween to form a seamless fiber stock container with an initially fluted side wall, each arrangement including a peripheral series of rotatable creasing members.

4. A fiber stock creasing arrangement, including a support structure having a central opening therethrough and an opening defining peripheral series of creasing members, each member being rotatably mounted, the support structure being of multiple part character suitably secured together and provided with means for individually and rotatably supporting the members.

5. A fiber stock creasing arrangement including a base ring having radial slots extending outwardly from the ring opening and forming spacing tongues, a rotatable creasing member in each slot, groove means in one face of the ring and substantially transverse to each slot and between the tongue end and tongue connection to the ring, complementary groove forming means secured in fixed relation to the ring, and means rotatably supporting the members and seated in the complementary grooves.

6. A fiber stock creasing arrangement including a base ring having radial slots extending outwardly from the ring opening and forming spacing tongues, a rotatable creasing member in each slot, groove means in one face of the ring and substantially transverse to each slot and between the tongue end and tongue connection to the ring, complementary groove forming means secured in fixed relation to the ring, and means rotatably supporting the members and seated in the complementary grooves, said last mentioned means including oppositely directed hubs upon each rotatable member.

7. A fiber stock creasing arrangement including a base ring having radial slots extending outwardly from the ring opening and forming spacing tongues, a rotatable creasing member in each slot, groove means in one face of the ring and substantially transverse to each slot and between the tongue end and tongue connection

to the ring, complementary groove forming means secured in fixed relation to the ring, and means rotatably supporting the members and seated in the complementary grooves, the complementary groove forming means including a similarly slotted ring secured to the base ring.

8. A fiber stock creasing arrangement including a base ring having radial slots extending outwardly from the ring opening and forming spacing tongues, a rotatable creasing member in each slot, groove means in one face of the ring and substantially transverse to each slot and between the tongue end and tongue connection to the ring, complementary groove forming means secured in fixed relation to the ring, and means rotatably supporting the members and seated in the complementary grooves, said last mentioned means including oppositely directed hubs upon each rotatable member, the complementary groove forming means including a similarly slotted ring secured to the base ring.

9. A fiber stock creasing arrangement including a base ring having a radial slots extending outwardly from the ring opening and forming spacing tongues, a rotatable creasing member in each slot, groove means in one face of the ring and substantially transverse to each slot and between the tongue end and tongue connection to the ring, complementary groove forming means secured in fixed relation to the ring, and means rotatably supporting the members and seated in the complementary grooves, said last mentioned means including oppositely directed hubs upon each rotatable member, the complementary groove forming means including a similarly slotted ring secured to the base ring, the comple-

mentary grooves forming a circular bearing, the confronting walls of each slot adjacent thereto having radial positioning contact with the rotatable members at opposite sides thereof.

10. In a creasing structure, a creasing wheel having a peripheral outer face with curved marginal edges merging into divergingly and outwardly directed frusto-conical-like side walls, the latter terminating short of the central axis, means projecting oppositely axially from the wheel for support of the same, and parallel faces extending from the axial means outwardly to the outer inclined frusto-conical-like side walls, the parallel faces being adapted for wheel alignment maintenance.

11. In the process of forming a deep seamless fiber stock container from a flat blank, the combination of creasing the blank except for the central portion thereof by drawing the blank between confronting fluting arrangements peripherally juxtapositioned adjacent and on opposite sides of the blank by pressure applied only to the central portion of the blank for fluting the outer portion thereof into alternately oppositely directed U-shaped sectioned flutes, the pressure being continued to nest the resulting side wall fluted blank in a receiver die, laterally flattening the midportions of each U-shaped flute previously formed and towards each other therein, and then distributing longitudinally as well as laterally the flattened fluted side wall stock to form a single smooth side wall formation devoid of excessive localization of stock in the resulting container.

LEE M. WILEY.