This invention relates to bags, more particularly to methods and apparatus for the manufacture of flat (ungusseted) paper bags.

A common way of closing a pasted-bottom paper bag after it has been filled is to tuck in side portions of the bag adjacent its mouth between the front and back walls of the bag and then stitch together the front and back walls (including the intucked portions) adjacent the mouth. Among the several objects of the invention may be noted the provision of a method and apparatus for the economical manufacture in quantity production of flat (ungusseted) paper bags and particularly multi-wall bags of this class having a diamond fold bottom, the bags being so constructed as to facilitate the intucking of the side portions of the bags adjacent the mouths of the bags and to provide top closures of neater appearance and also so constructed as to square up better when opened for filling. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions and methods hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

Fig. 1 is a side elevation of apparatus for manufacturing bags, parts being broken away in the center;
Fig. 2 is an enlarged cross section taken on line 2—2 of Fig. 1, parts being broken away in the center;
Fig. 3 is a view taken on line 3—3 of Fig. 2;
Fig. 4 is a cross section taken on line 4—4 of Fig. 2;
Fig. 5 is a view corresponding to Fig. 4 showing a moved position of parts;
Fig. 6 is a semidiagrammatic plan view showing the formation of a continuous web into continuous tubing and illustrating certain features of this invention;
Fig. 7 is a greatly enlarged cross section taken on line 7—7 of Fig. 6, partly broken away;
Fig. 8 is a view in elevation of a bag tube formed from the tubing shown in Fig. 6 and before bottoming;
Fig. 9 is a view in elevation of the lower end of Fig. 8 illustrating steps in the formation of a diamond fold bottom;
Fig. 10 is a view like Fig. 9, showing the completed bottom; and,
Fig. 11 is a view of a completed bag, the bag being shown as filled, and provided with intucked side portions adjacent its mouth and a stitched top closure.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, first to Fig. 1, there is indicated at 1 a conventional bag machine of a type adapted to segment continuous flat (ungusseted) tubing into individual bag tubes and to form a satchel bottom on each tube. At 3 is indicated a conventional tuber for forming a continuous web of paper into continuous tubing which is fed into the bag machine. Such bag machines and tubes are well known in the art, and hence detailed description thereof is omitted. The web W, as herein illustrated, is a four-ply web, and hence the tubing (and the bags made therefrom) are of four-ply construction.

At 5 is indicated the roll tower of the tuber, having rolls indicated at 7 for guiding four individual paper webs W—1, W—2, W—3 and W—4 which are combined at a combined roll 9 to form the four-ply web W. The tuber includes horns, such as indicated at 11, around which the web W is formed into flat (ungusseted) tubing, as will be readily understood in the art.

Fig. 6 illustrates the formation of the flat tubing from the web W, the tubing being designated T. In forming the flat tubing T, the web is folded on the longitudinal fold lines 13 and 15 to provide front and back walls 17 and 19 joined at the folds 13 and 15, these folds constituting the side edges of the flat tubing. The side edges of the web are brought into overlapping relation and pasted together. As is conventional, the four paper webs of the web W are laterally offset so that individual laterally offset seams as indicated at 21 in Fig. 7 are formed between the individual plies of the tubing.

In accordance with this invention, two pairs of longitudinally extending creases 23, 25 and 27, 29 are formed in the web W as it travels from the roll tower 5 toward the horns of the tuber. Creases 23 and 25 of the first pair are located at equal distances on opposite sides of the line where the web is subsequently folded in the tuber to form the side edge 13 of the tubing T. Creases 27 and 29 of the second pair are located at equal distances on opposite sides of the line where the web is subsequently folded in the tuber to form the other side edge 15 of the tubing T. The transverse spacing A (see Fig. 6) of creases 23 and 25 and of creases 27 and 29 corresponds to the front-to-back dimension of the diamond fold bottom to be formed in the bag machine I on each of the individual bag tubes into which the tubing T is segmented. The creases 23, 25, 27 and 29 are discontinuous, being so formed that they have short gaps as indicated at 31. As shown in Fig. 6, gaps 31 occur at bag length intervals along the length of the web W.

The creases 23, 25, 27 and 29 are formed in the web W in the course of its travel from the combining roll 9 to the tuber horns II by a creasing unit indicated generally as at 33 in Fig. 1, and illustrated in detail in Figs. 2—5. The creasing unit is mounted on the stand 34 of roll tower 5 of the tuber. It comprises a pair of side plates 35 (see Fig. 2) which are secured to the side frames 37 of the roll tower stand. Mounted on the side plates 35 are upper bearings 39 for a transverse camshaft 41. Below the camshaft is a transverse shaft 43 having its ends mounted in members 45 carried by the side plates. Below the shaft 43 there are two transverse shafts 47 and 49, shaft 47 being mounted at its ends in members 45 and shaft 49 being mounted at its ends in members 53 carried by the side plates. The shaft 43 is located above the plane of the reach of the web W extending from the combining roll 9 to the horns 11. The shafts 47 and 49 are located below the plane of the web.

Rotary on the shaft 43 are four bell crank levers 55, 57, 59 and 61. Levers 55 and 57 are mounted on the shaft 43 in paired relation toward one side of the creaser unit (its right side as viewed in the direction of travel of the web W). Levers 59 and 61 are mounted on the shaft 43 in paired relation toward the other side of the creasing unit. Levers 55 and 59 have arms 63 and 65, respectively, generally parallel to and above the plane of the web W extending rearward from the shaft 43 in respect to the direction of travel of the web, and upwardly extending arms 67 and 69, respectively, having their upper ends forward of the camshaft 41. Levers 57 and 61 have arms 71 and 73, respectively, generally
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3 parallel to and above the plane of the web extending forward from the shaft 43 in respect to the direction of travel of the web, and upwardly extending arms 75 and 77, respectively, having their upper ends rearward of the camshaft 41.

Male creasing rolls 79, 81, 83 and 85 are mounted for rotation in vertical longitudinal planes at the free ends of arms 63, 65, 71 and 73, respectively. Rolls 79 and 83 are cooperable with female creasing rolls 87 and 89, respectively, rotating on shaft 49. Rolls 81 and 85 are cooperable with female creasing rolls 91 and 93, respectively, rotating on shaft 47. The planes of the four pairs of creasing rolls 79—87, 81—91, 83—89 and 85—93 are located so that rolls 79—87 form crease 33, rolls 81—91 form crease 25, rolls 83—89 form crease 27 and rolls 85—93 form crease 29. A tension spring 95 connected between arms 67 and 75 biases bell crank lever 55 to rock clockwise and bell crank lever 57 to rock counterclockwise as viewed in Fig. 4 to bias roll 79 toward mating relation with roll 87 and to bias roll 81 toward mating relation with roll 91.

A similar tension spring 97 connected between arms 69 and 77 similarly biases levers 59 and 61 to bias roll 83 toward mating relation with roll 89 and to bias roll 85 toward mating relation with roll 93. Movement of arms 67 and 75 under the bias of spring 95 is limited by the engagement of stop screws 99 and 101 and that of the arms 69 and 77, respectively, with a stop bar 103 extending transversely between the side plates 35. Movement of the arms 69 and 77 under the bias of the spring 97 is limited by the engagement with the stop bar 103 of similar stop screws 105 and 107 threaded in the arms 69 and 77, respectively. The screws are adjusted to obtain proper mating relation of the creasing rolls.

Cam follower rollers designated 109, 111, 113 and 115 are provided at the upper ends of arms 67, 75, 69 and 77, respectively. Cams 117, 119, 121 and 123 are mounted on the camshaft 41 for cooperation with the respective cam follower rollers. The cams are identically developed to effect movement of the bell crank levers 55, 57, 59 and 61 once each revolution of the camshaft in such manner as to raise the creasing rolls 79, 81, 83 and 85 out of mating relation with the creasing rolls 87, 91, 89 and 93 for a short interval to provide the gaps 31 in the creases. Cams 117 and 121 are identically developed to raise and lower the rolls 79 and 83. Cams 119 and 123 are identically phased with respect to one another simultaneously to raise and lower the rolls 81 and 85, but are out of phase with cams 117 and 121 in such degree that the gaps 31 provided in creases 23 and 27 during a given revolution of the camshaft 41 and the gaps provided in creases 25 and 29 during that revolution of the camshaft are in transverse register across the width of the web W. This out-of-phase relationship of cams 117, 121 and cams 119, 123 is necessary due to the fact that rolls 81—91 and rolls 85—93 are located forward of rolls 79—87 and 83—89, as appears most clearly in Fig. 5, which shows roll 79 raised and roll 81 down but about to be raised.

The camshaft 41 is continuously driven from the bag machine at the proper speed ratio with respect thereto via a power take-off shaft 125 extending rearward from the bag machine, and a drive comprising vertical shaft 127 geared at its lower end as indicated at 129 to shaft 125 and geared at its upper end as indicated at 131 to the camshaft 41.

Further in accordance with this invention, the web W is scored to have longitudinally spaced sets of two transversely aligned short transverse creases 133 and 135. As to one set, crease 133 extends between the longitudinal creases 23 and 25, and crease 135 extends between the longitudinal creases 27 and 29. The sets of creases 133 and 135 are spaced at bag length intervals along the length of the web W and lie adjacent the gaps 31. Creases 133 and 135 are formed by an auxiliary creasing unit 137 (see Fig. 1) including two creaser blades such as indicated at 139 in Fig. 1 (each having a width corresponding to the required length for creases 133 and 135) carried by a transverse shaft 141, the blades being cooperable with a roll 143. The shaft 141 is driven in timed relation with respect to the creasing unit 33 as by a drive indicated at 145.

In the operation of the above-described apparatus, the web W travels continuously through the auxiliary creasing unit 137, wherein creases 133 and 135 are formed, and thence through the main creasing unit 33, wherein creases 23, 25, 27 and 29 are formed. Creasing rolls 79, 81, 83 and 85 are intermittently raised out of mating relation with rolls 79, 81, 83 and 85, with resultant formation of the gaps 31 in creases 23, 25, 27 and 29. The reason for intermittently raising the rolls 79, 81, 83 and 85 is to relieve stresses in the web which occur due to the tendency of the web to weave sidewise and avoid cutting of the web W such as to apt to occur if the creasing rolls are constantly maintaining in mating engagement and the stresses are not relieved.

The web W, having the longitudinal creases 23, 25, 27 and 29 and the transverse creases 133 and 135, is formed into the tubing T in the tube 3, folding on the lines 13 and 15 located centrally between the creases 23 and 29 (see Fig. 6). The tubing T feeds into the bag machine 1, wherein it is segmented into individual flat bag tubes 151 by cutting it on transverse lines such as indicated at 155 in Figs. 6 and 8 which are so located that the creases 23, 25, 27 and 29 extend from the top or mouth end of the tube, terminating short of the bottom end of the tube by the length of the gaps 31. The creases 133 and 135 are located somewhat above the bottom end of the tube.

The diamond fold bottom 153, as will be readily understood in the art, is formed by providing longitudinal slits 157 at the bottom end of the tube 151, these slits defining end flaps 159 and 161 and front and back flaps 163 and 165 (see Figs. 8 and 9). As shown in Fig. 9, the side flap 163 is folded back upon the tube on a fold line 169 for end flap 159. The folds intersect the ends of crease 133, and the fold lines 169 for end flap 161 intersect the ends of crease 135. Creases 133 and 135 come into a position extending lengthwise of the tube. Paste is applied to the flaps in a pattern as indicated at P in Fig. 9. Flap 163 is folded over on a transverse fold line 171 to overlie the end flaps. Flap 165 is folded over on a fold line 173 to overlie the flap 163. Fold line 171 intersects the upper ends of creases 133 and 135. Fold line 173 intersects the lower ends of creases 133 and 135. The flaps 163 and 165 become pasted together and pasted to the end flaps.

As a result of the above-described operations, the completed tube bag has a first pair of creases 23 and 25, create 25 being in the front wall 17 and create 23 being in the back wall 19, adjacent and parallel to its side edge 13, and aligned with the ends of fold lines 171 and 173 at the side edge 13 (and with crease 133), and a second pair of creases 27 and 29, create 27 being in the front wall 17 and create 29 being in the back wall 19, adjacent and parallel to the side edge 15, and aligned with the ends of fold lines 171 and 173 at the side edge 15 (and with crease 135). These creases 23, 25, 27 and 29 extend down from the top of the bag into the diamond fold bottom, the creases 25 and 27 in the front wall merging with fold line 171, the creases 23 and 29 in the back wall merging with fold line 173.
Fig. 11 shows the bag as it appears after being filled and closed at the top. When the bag is opened, the bottom assumes the form of a rectangle bounded at the sides by fold lines 171 and 173 and at its ends by creases 133 and 135. The bag creases up nicely by folding on the creases 23, 25, 27, 29 which extend upward from the four corners of the rectangle. To close the top of the bag, side portions thereof between creases 23, 25 and 27, 29 at the top of the bag are folded in on the creases and intuited between the front and back walls, as indicated at 175 in Fig. 11, and then the bag mouth is stitched closed at 177. It will be observed particularly from Fig. 7 that the creases, being constituted by outwardly projecting scores, enable the stated side portions readily to be intuited.

It will be understood that the gaps 31 need not occur at bag length intervals, but may occur at multiples of bag length intervals. For example, the male creasing rolls may be raised at such intervals that the gaps occur once every five bag lengths, or once every ten bag lengths, etc., as long as the frequency of raising the rolls is sufficient to avoid cutting of the web W. In such case, only a part of the bag tubes segmented from the continuous tubing T will have the gaps 31 at their lower ends. In the remainder of the bag tubes, the creases 23, 25, 27 and 29 will extend all the way to the bottom.

The principle of intermittently interrupting the creasing so as to relieve stresses in the web is applicable to forming of creases other than those indicated at 23, 25, 27 and 29. For example, it may be utilized in pre-creasing the web on lines corresponding to the folds 13 and 15 to facilitate folding of the web on these lines in the tuber and more accurately to define the width of the bags. It may be utilized in the formation of gusseted tubing to pre-crease the web on the gusset fold lines to facilitate the formation of the gussets in the tuber and more accurately to define the gussets.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions and methods without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Claim:

1. Apparatus for pre-creasing a web of paper being fed to a tuber wherein the web is formed into a tube, said apparatus comprising a pair of creasing rolls for forming a longitudinal crease in the web as it travels toward the tuber, said rolls being movable relative to one another in and out of mating relation and normally being in mating relation, and means for intermittently moving said rolls out of mating relation.

2. Apparatus as set forth in claim 1 wherein one of the creasing rolls is fixed and the other movable toward and away from the fixed roll, and wherein means is provided for biasing the movable roll toward the fixed roll.

3. In apparatus for manufacturing bags comprising a tuber for forming a continuous web of bag material into flat tubing having front and back walls joined at folds which constitute the side edges of the tubing, that improvement which comprises forming of four pairs of creasing rolls for forming four creases in the web extending longitudinally of the web as the web is fed toward the tuber, said creasing rolls being so located that the creases formed by two of said pairs of rolls are located on opposite sides of the line where the web is subsequently folded in the tuber to form one side edge of the tubing, and the creases formed by the other two pairs of rolls are located on opposite sides of the line where the web is subsequently folded in the tuber to form the other side edge of the tubing, the rolls of each pair being movable into and out of mating relation and means for intermittently moving the rolls out of mating relation.

4. In apparatus for manufacturing flat diamond fold bottom bags comprising a tuber for forming a continuous web of bag material into flat tubing having front and back walls joined at folds which constitute the side edges of the tubing and a bag machine for forming individual bag tubes and forming each bag tube with a diamond fold bottom, that improvement which comprises the provision of four pairs of creasing rolls for forming four creases in the web extending longitudinally of the web as the web is fed toward the tuber, said creasing rolls being so located that the creases formed by two of said pairs of rolls are located at equal distances on opposite sides of the line where the web is subsequently folded in the tuber to form one side edge of the tubing, and the pair of creases formed by the other two pairs of creasing rolls are located at equal distances on opposite sides of the line where the web is subsequently folded in the tuber to form the other side edge of the tubing, the two creases of each of said pairs of creases being spaced apart a distance corresponding to the front-to-back dimension of the diamond fold bottom, the rolls of each pair being movable into and out of mating relation and normally being in mating relation, and means for intermittently moving the rolls out of mating relation.

5. The improvement specified in claim 4, further characterized in that means is provided for forming transverse creases in the web as the web is fed toward the tuber, said transverse creases being spaced at bag length intervals to provide end creases for the diamond fold bottoms.

6. The improvement specified in claim 4, further characterized in that means is provided for forming longitudinally spaced sets of two transversely aligned transverse creases, one crease of each set extending between the longitudinal creases of one pair and the other extending between the longitudinal creases of the other pair, and said sets being spaced at bag length intervals to provide end creases for the diamond fold bottoms.

7. In the manufacture of bags wherein a continuous web of bag material is continuously fed into a tuber for forming it into flat tubing, that improvement which comprises forming at least one crease in the web extending longitudinally of the web as it is fed toward the tuber by means of a pair of interengageable creasing members, and intermittently separating the creasing members to allow for relief of stresses in the web which may occur because of the tendency of the web to weave sideways, thereby to avoid cutting of the web by the creasing members.

8. In the manufacture of bags wherein a continuous web of bag material is continuously fed into a tuber for forming it into flat tubing having front and back walls joined at folds which constitute the side edges of the tubing, that improvement which comprises forming two pairs of creases in the web extending longitudinally of the web as it is fed toward the tuber by means of four pairs of interengageable creasing members, the two creases of each of said pairs of creases being located on opposite sides of the line where the web is subsequently folded in the tuber to form one side edge of the tubing, the two creases of the other of said pairs of creases being located on opposite sides of the line where the web is subsequently folded in the tuber to form the other side edge of the tubing, and intermittently separating the creasing members to allow for relief of stresses in the web which may occur because of the tendency of the web to weave sideways, thereby to avoid cutting of the web by the creasing members.

9. In the manufacture of bags wherein a continuous web of bag material is continuously fed into a tuber for forming it into tubing having front and back walls joined at folds which constitute the side edges of the tub-
ing, and wherein the tubing is fed into a bag machine for segmenting it into individual bag tubes and forming each bag tube with a diamond fold bottom, that improvement which comprises forming two pairs of creases in the web extending longitudinally of the web as it is fed toward the tuber by means of four pairs of interengageable creasing members, the two creases of one of said pairs of creases being located on opposite sides of the line where the web is subsequently folded in the tuber to form one side edge of the tubing, the two creases of the other of said pairs of creases being located on opposite sides of the line where the web is subsequently folded in the tuber to form the other side edge of the tubing, and intermittently separating the creasing members to allow for relief of stresses in the web which may occur because of the tendency of the web to weave sidewise, thereby to avoid cutting of the web by the creasing members, the two creases of each pair being spaced apart a distance corresponding to the front-to-back dimension of the diamond fold bottom.

10. The improvement specified in claim 9 further characterized by the forming of transverse creases in the web as the web is fed toward the tuber, said transverse creases being spaced at bag length intervals, the segmenting and the forming of each bag tube with a bottom being such that said transverse creases provide end creases for the diamond fold bottoms.

11. The improvement specified in claim 9 further characterized in that the segmenting of the tubing into individual bag tubes and the formation of the diamond fold bottoms on the bag tubes are such that the gaps in the creases which occur because of the intermittent separation of the creasing members are located in the bottom regions of the tubes.

12. The improvement specified in claim 11 further characterized by the forming of longitudinally spaced sets of two transversely aligned transverse creases, one crease of each set extending between the longitudinal creases of one pair and the other extending between the longitudinal creases of the other pair, said sets being spaced at bag length intervals, and the segmenting and the forming of each bag tube being such that the transverse creases provide end creases for the diamond fold bottoms.

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