Dec. 10, 1940. F. G. ROBINSON 2,224,656

PAPER OR LIKE BAG MAKING MACHINE

Filed May 14, 1940 5 Sheets-Sheet 1

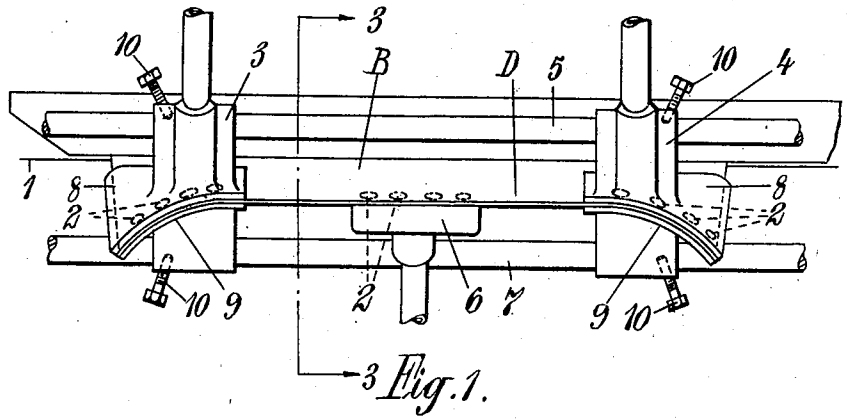


Fig. 1.

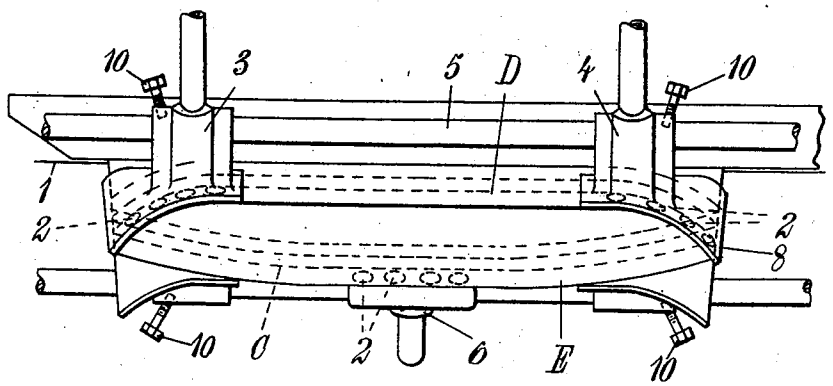


Fig. 2.

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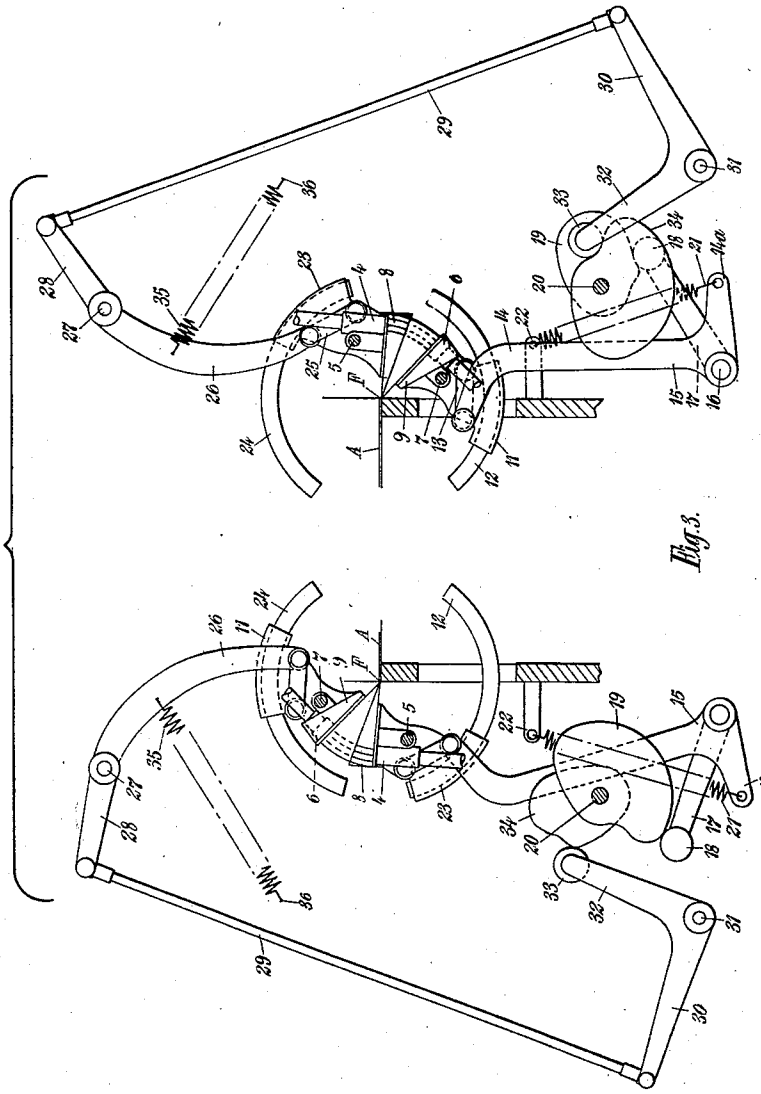


Fig. 3.

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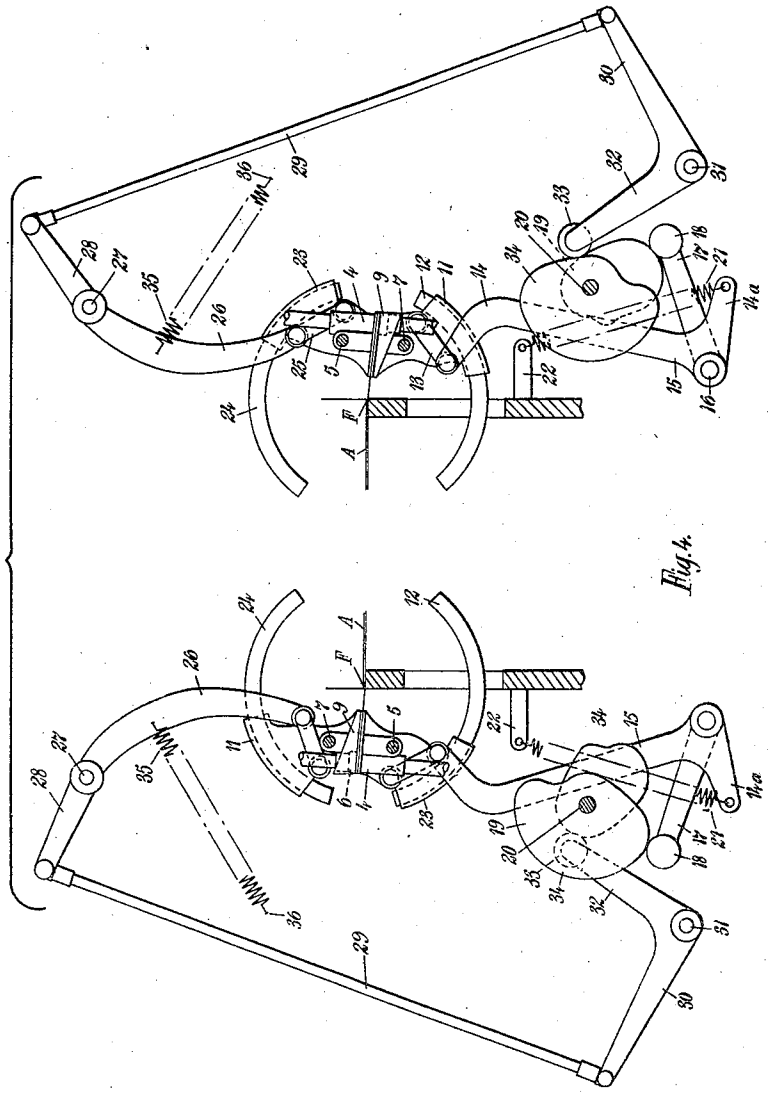


Fig. 4.

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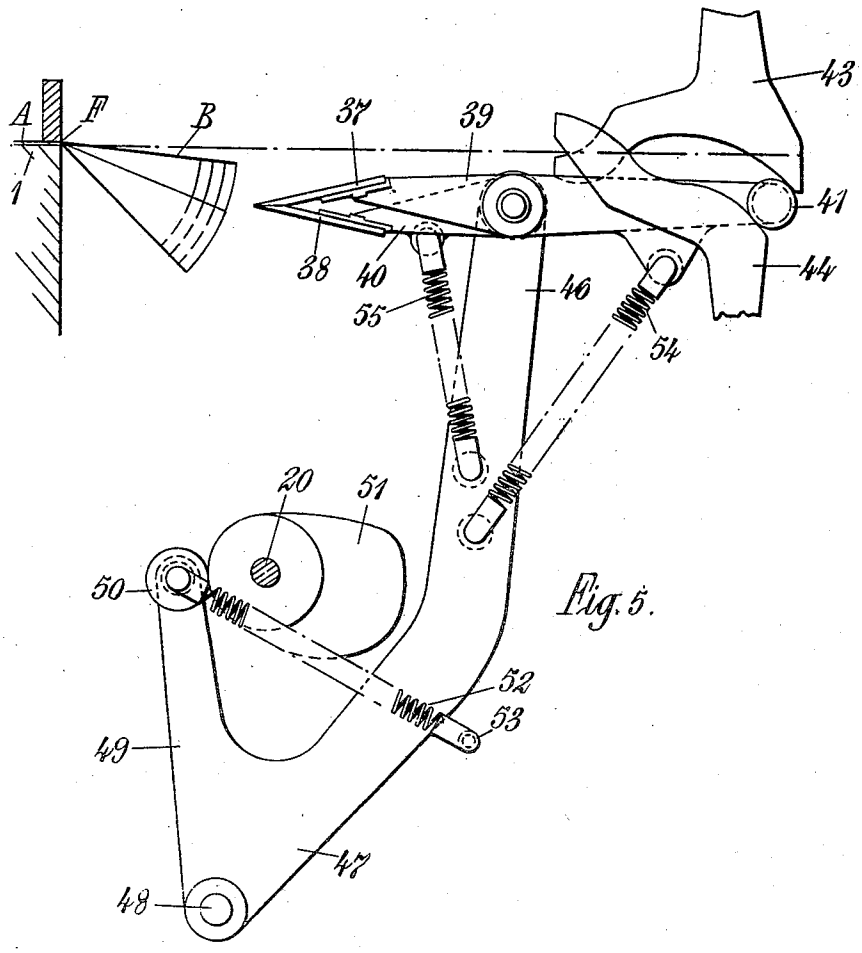


Fig. 5.

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Filed May 14, 1940 5 Sheets-Sheet 5

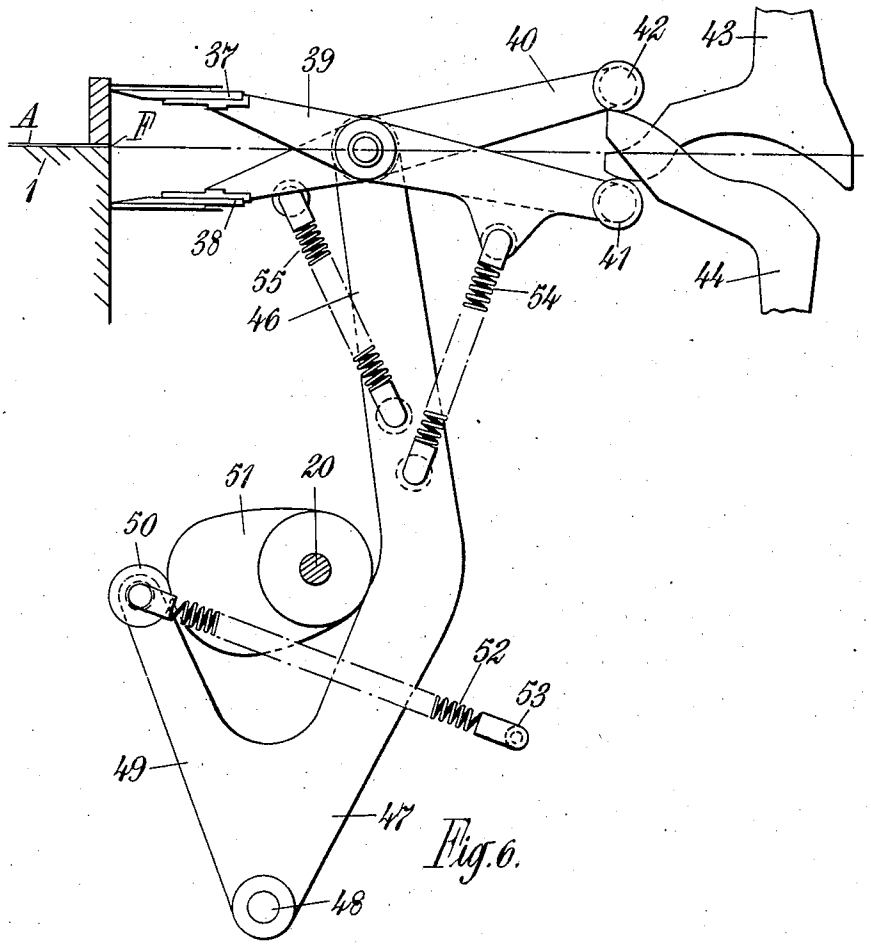


Fig. 6.

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Patented Dec. 10, 1940

2,224,656

UNITED STATES PATENT OFFICE

2,224,656

PAPER OR LIKE BAG MAKING MACHINE

Foster Gotch Robinson, Bristol, England, assignor to Paper Sacks Limited, Bristol, England

Application May 14, 1940, Serial No. 335,164
In Great Britain February 21, 1939

18 Claims. (Cl. 93—27)

This invention relates to paper or like bag making machines and more particularly to the bottom folding mechanism or machine for folding the ends of multiply bag tubes into blockbottom or like form.

The invention is especially suitable in the making of multiply blockbottom bags from multiply tubes the ends of which are staggered relatively to one another, for example, as described in Patent No. 2,073,222.

In folding the ends of a multiply or multi-wall tube into blockbottom form it is first necessary to separate the opposite faces of the mouth or the end so that the subsequent folding operations can take place. Heretofore, the plies have been secured together by local application of adhesive between the plies prior to the bottom folding operations and suckers or grippers have been applied to the outer surfaces of the outermost ply to open the ends of the tube or a pair of expanding fingers has been inserted through an opening in one face of the interply pasted tube to effect the opening. It will be appreciated that unless the plies have been previously secured together these known methods of opening the ends of the tube would be unsatisfactory for the inner plies would not necessarily follow the outermost ply in the opening movement.

The securing of the plies together by adhesive of necessity increases the cost and the time of the manufacturing process for, apart from the time taken to apply the adhesive, a considerable period of time is required for drying out the interply pasted tubes. Among further disadvantages of interply pasting is that buckling or distortion of the inner plies occurs during folding due to their attachment by the adhesive preventing the plies from accommodating themselves in bending.

The object of the invention is to eliminate the necessity for adhesive securing or interply pasting with its consequent disadvantages whilst ensuring that the opening of the end or mouth of the multiply tube will be effectively performed.

According to a feature of the invention the opening of the end of a flattened multiply paper or like tube is effected by arching the tube transversely and applying suction devices to the faces of the tube.

The invention also comprises opening the end of a flattened multiply paper or like tube having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost, of arching the tube or bag transversely by suitable arching or bending means and applying suction devices to the longest ply of each face of the tube or bag.

The arching of the tube may be effected by various means such as metal fingers or rods or by plates.

Where plates are utilised these are curved and are arranged at the sides of the tube in association with the suction devices which are movable into co-operative relation with the end of the tube.

It is to be understood that the term "arching" is intended to cover the bending of the corner portions only of the tube or bending the longitudinal margins of the tube or arching the whole of the tube transversely.

A convenient embodiment of the invention is illustrated in the accompanying somewhat diagrammatic drawings in which:

Figure 1 is an elevational view of the main elements for opening the end of a multiply tube, the parts being in position in engagement with the tube end prior to the opening thereof;

Figure 2 is a view similar to that of Figure 1, but showing the parts in the position in which the bag end has been opened;

Figure 3 is a sectional view of the parts shown in Figure 1, taken on the line 3—3 of Figure 1 and drawn to a slightly smaller scale, and showing in addition a cam-controlled leverage mechanism for controlling the movements of the suction devices and curved plates;

Figure 4 is a view similar to that of Figure 3 but showing the parts in position corresponding with that of Figure 2;

Figure 5 shows a form of mechanism for effecting the final opening of a bag end; and

Figure 6 shows the operative position of the mechanism of Figure 5.

In carrying the invention into effect according to the convenient mode illustrated in the drawings and as applied by way of example to the forming from a multiply tube of a pasted bag such as described in Patent No. 2,073,222, the multiply tube A in flattened form is fed side foremost into a bottom folding machine and into a position in which it lies horizontally with its ends B projecting laterally from the bed I of the machine for operation upon by bottom folding mechanism (not shown). The tube referred to has staggered end margins C on both faces and at both ends thereof, the longest ply D of one face being the outermost and the longest ply E of the other face being innermost, it being understood that the staggering of the plies at one end of the tube is the reverse of that at the other end.

The first operation necessary in folding the end of the tube is the opening of the end and for this purpose swingable suction devices together with tube bending means are provided both above and below the end of the bag tube. Each suction device comprises a series of suction nozzles or suckers 2, preferably of rubber, commonly connected to a manifold (not shown) which through a flexible pipe is in communication at certain times with a source of suction provided in any convenient manner. As shown, there are two upper suction devices 3 and 4 secured to a swingable rod or mounting 5 and a single lower suction device 6 secured to a lower swingable rod or mounting 7 in a position substantially centrally between the upper suction devices 3 and 4. Secured to the rods or mountings of the suction devices are curved plate members symmetrically arranged at each side of the tube. Thus, the upper pair 8 of such curved plates is secured to the rod or mounting 5 while the lower pair 9 is secured to the rod or mounting 7. Since, in the example shown in Figures 1 and 2, the curved plates are adapted for operating upon the tube end with the longest ply D of the upper face outermost, the curved plates 8 and 9 extend downwardly but it is to be understood that for operating upon the other end of the tube in which the longest ply of the lower face is outermost the plates curve upwardly. The nozzles 2 of the upper suction devices 3 and 4 are mounted in the curved surface of the upper plate members 8 which are respectively secured to the suction devices 3 and 4 while the lower suction device is centrally mounted between the lower curved plate members 9. The plate members 8 and 9 and the upper suction devices 3 and 4 thus form two symmetrical assemblies and these plate members and suction devices are slidably mounted on the rods or mountings 5 and 7 and adapted to be clamped thereon, conveniently by means of set screws 10, whereby the two assemblies may be adjusted to or from each other or the central suction device to accommodate various widths of bag tube.

In operation, the suction devices with the curved plates are swung towards each other into engagement respectively with the opposite faces of the tube end, as shown in Figure 1, the two pairs of curved plates co-operating to arch the corners of the tube end downwardly whereby the shorter inner plies of the upper face are arched or curved within the longer outer ply D. Suction is then applied through the nozzles 2 of the upper suction devices 3 and 4 to this longer outer ply D and suction is also applied through the lower nozzles of the central suction device 6 to the longest ply E of the lower face of the tube which is the innermost ply, and the lower suction device 6 together with the lower plates 9 and then moved in a downward direction whilst the upper plates 8 and suction devices 3 and 4 remain stationary thus drawing the longer ply E of the lower face downwardly, this longer ply carrying the shorter outer plies with it, and opening the mouth of the tube as shown in Figure 2. Subsequently both upper and lower plates and suction devices are further moved relatively to each other to permit opening of the tube end into rectangular form by mechanism later described. Due to the curving or arching of the sides or corners of the tube the shorter inner plies of the upper face are held in arched form within and under the influence of the longer outer ply D and there is no tendency for these inner plies to be drawn downwardly with the lower face of the tube during the opening of the tube end.

As previously referred to, for operating upon the opposite end of the tube with the longest ply of the lower face outermost, the ends of the plates referred to are curved upwardly so as to bend the corners of the tube upwardly and the suction devices are reversely arranged as shown on the left side of Figures 3 and 4 so that the opening of this end of the tube is effected by the upper suction device 6 pulling the long inside ply of the upper face upwardly whilst the lower suction devices 3 and 4 hold the longest outermost ply of the lower face stationary with the inner shorter plies held thereto by the arching or curving referred to.

A suitable mechanism for effecting and controlling the movements of the suction devices and curved plate members is illustrated in Figures 3 and 4. As shown, the mounting or rod 7 of the lower suction device 6 and the curved plate members 9 is rigidly secured at its ends to slide members 11, only one of which is shown. The slide member 11 is mounted for sliding movement on an arcuate guide member 12 the curve of which is struck about the centre F, i. e. a point through which the line corresponding with the top edge of the machine bed passes. The slide member 11 has pivotally secured thereto one end of a link 13 the other end of which is pivotally secured to an arm 14 of a bell-crank lever 15 pivoted at a suitable point 16 on the machine frame. The other arm 17 of the bell-crank lever is provided with a cam roller 18 which engages a cam 19 secured to a shaft 20, the roller being maintained in contact with the cam by a spring 21 extending between the bell-crank lever or a projection 14a thereof and a suitable point 22 on the machine frame.

Similarly, the mounting or rod 5 of the upper suction devices 3 and 4 and upper curved plates 8 is rigidly secured at its ends to slide members 23 each of which is mounted for sliding movement on an arcuate guide member 24, the curve of which is struck about the centre F. The guide member 24 has one end of a link 25 pivoted thereto, the other end of which is pivoted to one arm 26 of a bell-crank lever pivoted at a point 27 to a suitable fixed part. The other arm 28 of the bell-crank lever is coupled by a rod 29 to one arm 30 of a further bell-crank lever, pivoted on a fixed point 31, the second arm 32 of which carries a roller 33 which is held in engagement with a second cam 34 on shaft 20 under the action of a spring 35 extending between the lever arm 26 and a fixed point 36.

It will be appreciated that by rotation of the cam shaft 20 the mountings of the suction devices and curved plate members are first swung about centre F towards each other to effect engagement of the suction devices and plates with the tube end, and after suction has been applied the lower mounting is then swung downwardly whereby the opening of the tube is effected and subsequently both mountings are moved further away from each other to permit operation of the final opening mechanism to be described.

A similar mechanism to that described above is arranged at the other side of the machine, as shown at the left of Figures 3 and 4, for operation upon the other end of the tube and similar reference numerals have been applied thereto. This mechanism however differs from that previously described in consequence of the fact that the curved plates and suction devices are re-

versed. Thus the leverage mechanism 13 to 18 is connected to operate the slide 23 and the mounting or rod 5 which is now lowermost while the leverage mechanism 25 to 33 is connected to operate the slide 11 and the mounting or rod 7 which is now uppermost and in addition the cams 19 and 34 are designed to give the correct movement to the mountings 5 and 7 as previously described.

A suitable form of mechanism for further opening the tube end into rectangular form is shown in Figures 5 and 6 of the drawings. As shown in these figures, plate members 37 and 38, conveniently of rectangular shape, are respectively secured to or formed integral with one end of swinging arms 39 and 40 the other ends of which carry respectively rollers 41 and 42 which engage fixed cam members 43 and 44. The arms 39 and 40 are pivotally secured at a mid-point 45 to one arm 46 of a bell-crank lever 47 which is pivoted to a suitable fixed part at a point 48. The other arm 49 of the bell-crank lever 47 carries a roller 50 which is held in engagement with a cam 51 secured to the shaft 20 by means of a spring 52 extending between arms 49 and a fixed point 53. The rollers 41 and 42 are held in engagement with the cams 43 and 44 by means of springs 54 and 55 extending between the arms 39 and 40 and the bell-crank lever arm 46.

After the initial opening of the tube end by means of the mechanism described with reference to Figures 1 to 4, the plates 37 and 38 of the mechanism shown in Figures 5 and 6 are swung by the bell-crank lever 47 under the action of the cam 51 into the initially opened end of the tube and are moved relatively to each other under control of the cams 43 and 44 to effect the further opening of the tube end into rectangular form as shown in Figure 6.

Thereafter, suitable known folding tools (not shown) may be movable longitudinally of the tube to complete the folding of the bag end by folding down the end flaps and valve end flap over which the side flaps may be subsequently secured.

The arching of the end or ends of the tube may be effected by other means such as metal fingers or rods, preferably carried by the movable suction devices or the mountings thereof so as to engage and arch the end or ends of the tube upon the suction devices being moved into operative position and such rods or fingers may be adjustably mounted so as to be movable to accommodate tubes of various widths.

Instead of providing the pairs of curved plate members as previously described these may be replaced by two plate members one for engaging each face of the tube end and each having curved portions at both ends and such plate members may be secured to the mountings of the suction devices in a readily removable manner so that they can be replaced by similar plates of different width for operation upon different width tubes.

By the opening of the tube ends in the manner described the securing of the plies together by adhesive is eliminated thus affording the advantages of speeding up production, reduction in costs by economy in paste and production of improved bags without distortion or buckling of plies as previously referred to.

I claim:

1. Mechanism for opening the end of a flattened multiply paper or like bag tube comprising arching means for engaging and arching the closed tube end transversely, suction devices for applying suction to the faces of the tube end while the tube is held by said arching means, and means for moving the suction devices relatively to one another whilst suction is applied to effect opening of the end of the tube.

2. Mechanism for opening the end of a flattened multiply paper or like bag tube comprising curved plates for engaging and arching the tube end transversely, movable suction devices associated with said curved plates for applying suction to the faces of the tube end while the tube is held by said curved plates, and means for moving said suction devices relatively to each other while the suction is applied to effect opening of the end of the tube.

3. Mechanism for opening the end of a flattened multiply paper or like bag tube comprising curved plates for engaging opposite faces of the tube end and arching the tube end transversely, swingable mountings to which said curved plates are secured, suction nozzles carried on said swingable mountings for applying suction to the faces of the tube end while the tube is engaged by said curved plates, and means for swinging said mountings relatively to one another while the suction is applied through said nozzles to effect opening of the end of the tube.

4. Mechanism for opening the end of a flattened multiply paper or like bag tube comprising two pairs of curved plates symmetrically arranged with respect to the tube end, one pair of said curved plates for engaging one face of the tube end at the corners thereof and the other pair of curved plates for engaging the other face of the tube end at the corners thereof to effect arching of the tube transversely, three suction devices for applying suction to the faces of the tube end during engagement by said pairs of curved plates, two of said suction devices being associated with the pair of curved plates for engaging one face of the tube end and the third suction device being associated with and arranged centrally between the pair of curved plates for engaging the other face of the tube end, two movable mountings one for each pair of curved plates and associated suction devices, and means for moving said mountings relatively to each other whilst suction is applied to effect opening of the tube end.

5. Mechanism for opening the end of a flattened multiply paper or like bag tube according to claim 4, wherein each of said three suction devices comprises a series of nozzles, the nozzles of the two suction devices for applying suction to one face of the tube end being mounted in the curved plates associated therewith.

6. Mechanism for opening the end of a flattened multiply paper or like bag tube according to claim 4, wherein the curved plates of each pair are adjustably mounted to permit adjustment towards and from each other for accommodating various widths of bag tubes.

7. Mechanism for opening the end of a flattened multiply paper or like bag tube having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost, comprising arching means for engaging and arching the closed tube end transversely, suction devices for applying suction to the longest ply of each face of the tube end while arched by said arching means, and means for moving the suction devices relatively to each other while the suction is applied to effect opening of the tube end.

8. Mechanism for opening the end of a flat-

tened multiply paper or like bag tube having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost, comprising curved plates for engaging and arching the tube end transversely, movable suction devices associated with the curved plates for applying suction to the longest ply of each face of the tube end while arched by said arching means and means for moving the said suction devices relatively to each other while the suction is applied to effect opening of the tube end.

9. Mechanism for opening the end of a flattened multiply paper or like bag tube having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost comprising curved plates for engaging opposite faces of the tube end and arching the tube end transversely, movable mountings to which said curved plates are secured, suction devices for applying suction to the longest ply of each face of the tube end while arched by said curved plates, said suction devices being carried on the said movable mountings, and means for moving said mountings relatively to each other while the suction is applied to cause said suction devices to move away from each other carrying with them the faces at the tube end to open the latter.

10. Mechanism for opening the end of a flattened multiply paper or like bag tube as claimed in claim 9, and including in combination means operable after the initial opening of the bag end to effect further opening thereof into retangular form.

11. Mechanism for opening the end of a flattened multiply paper or like bag tube having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost, comprising two pairs of curved plates symmetrically arranged with respect to the tube end, one pair for engaging one face of the tube end at the corners thereof and the other pair for engaging the other face of the tube end at the corners thereof to arch the tube end transversely, three suction devices each comprising a series of nozzles for applying suction to the longest ply of each face of the tube end during engagement by said pairs of curved plates, two of said suction devices being associated with the pair of curved plates for engaging one face of the tube end and the third suction device being associated with and arranged centrally between the pair of curved plates for engaging the other face of the tube end, two swingable mountings one for each pair of curved plates and associated suction devices, and means for swinging said mountings away from each other whilst suction is applied through the nozzles of the suction devices to cause the faces of the tube end to be moved away from each other and effect opening of the tube end.

12. Mechanism for opening the end of a flattened multiply paper or like bag having staggered end margins on both faces, the longest ply of one face being outermost and the longest ply of the other face being innermost, comprising two swingable shafts, a pair of curved plates adjustably mounted on each shaft, said pairs of curved plates being symmetrically arranged with respect to the tube end, one pair for engaging one face of the tube end at the corners thereof and the other pair for engaging the other face of the tube end at the corners thereof to arch the tube transversely, a series of suction nozzles mounted in each of the curved plates of one pair for applying suction to the longest ply of one face of the tube end, a suction device comprising a series of nozzles for applying suction to the longest ply of the other face of the tube end and mounted on the swingable shaft of the other pair of curved plates centrally between the latter, and means for swinging said swingable shafts whilst suction is applied through said nozzles to cause relative movement between the said pairs of curved plates and the suction devices associated therewith and effect opening of the tube end.

13. Mechanism for opening the end of a flattened multiply paper or like bag tube according to claim 12, wherein the said means for swinging said swingable shafts comprises cam-controlled leverage mechanism effective to cause engagement of the suction devices and curved plates with the tube end and subsequent relative movement of the respective pairs of plates and suction devices to open the end of the tube.

14. Mechanism for opening the end of a flattened multiply paper or like bag tube according to claim 12, and including in combination means operable after the initial opening of the tube end to effect further opening thereof into rectangular form.

15. Mechanism for opening the end of a flattened multiply paper or like bag tube comprising in combination arching means for engaging and arching the closed tube end transversely, suction devices for applying suction to the faces of the tube end while the tube is engaged by said arching means, cam-controlled leverage mechanism for moving the suction devices relatively to each other while the suction is applied to effect initial opening of the tube end, and means operable after the initial opening of the tube end to effect further opening thereof into rectangular form.

16. Mechanism for opening the end of a flattened multiply paper or like bag tube according to claim 15, wherein the said means which is operable after the initial opening of the tube end comprises a pair of plates and means for first moving said plates longitudinally of the tube into the initially opened tube end and subsequently moving said plates relatively to each other to effect the further opening of the tube end.

17. Apparatus for opening the ends of a flattened multiply paper or like bag tube consisting of two spaced mechanisms each comprising bending means for engaging and arching a closed end of the tube transversely, movable suction devices associated with said bending means for applying suction to the faces of the tube end while the tube is engaged by said bending means, and means for moving said suction devices relatively to each other while the suction is applied to effect opening of the tube end, and means for receiving a bag tube in position between said spaced mechanisms and with the ends of the tube situated for operation upon by said mechanisms.

18. Apparatus for opening the ends of a flattened multiply paper or like bag tube having staggered end margins on both faces and at both ends, the longest ply of one face being outermost and the longest ply of the other face being innermost, consisting of two spaced mechanisms one for operating on each end of the tube and each comprising two pairs of curved plates symmetrically arranged with respect to the tube end, one pair for engaging one face of the tube end at the corners thereof and the other pair for engaging the other face of the tube end at the cor-

ners thereof to arch the tube end transversely, three suction devices each comprising a series of nozzles for applying suction to the longest ply of each face of the tube end during engagement by said pairs of curved plates, two of said suction devices being associated with the pair of curved plates for engaging one face of the tube end and the third suction device being associated with and arranged centrally between the pair of curved plates for engaging the other face of the tube end, two swingable mountings one for each pair of curved plates and associated suction devices, and means for swinging said mountings away from each other whilst suction is applied through the nozzles of the suction devices to cause the faces of the tube end to be moved away from each other and effect opening of the tube end, and means for receiving a bag tube in position between said spaced mechanisms with the ends of the tube situated for operation upon by said mechanisms.

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