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APPARATUS FOR SEPARATING CONJOINTLY GATHERED BAG TUBE WALLS

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FIG. 3.

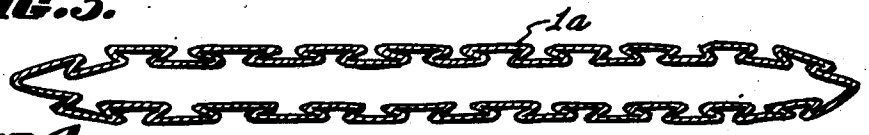


FIG. 4.

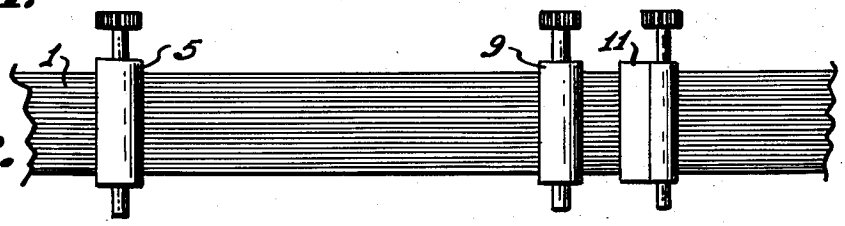


FIG. 2.

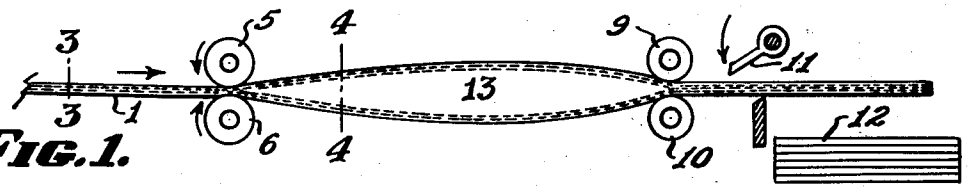


FIG. 1.

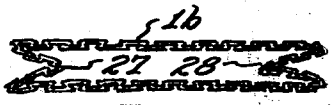


FIG. 8.

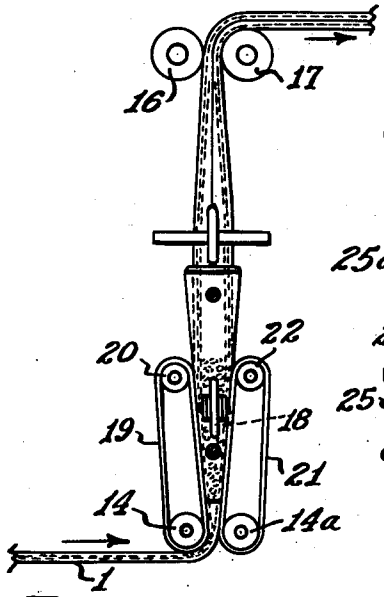


FIG. 5.

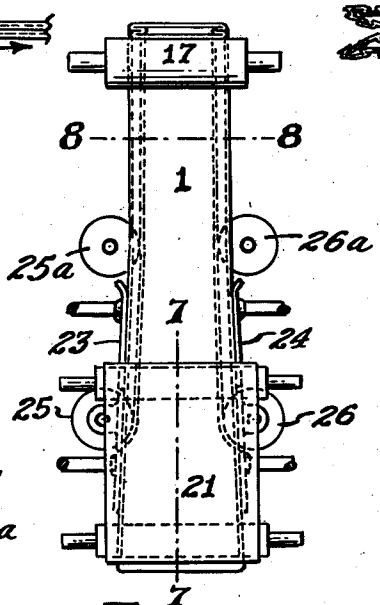
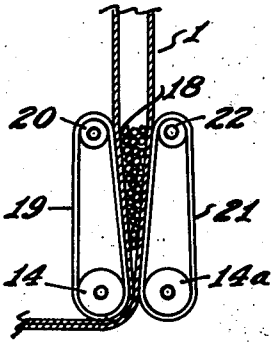


FIG. 6.

FIG. 7.



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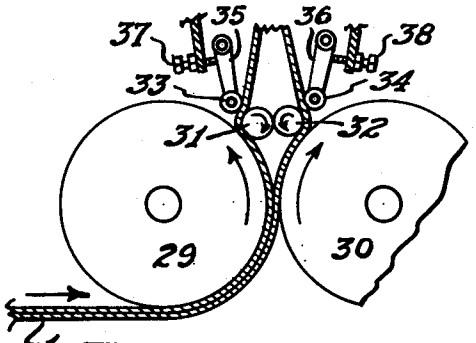

FIG. 9.

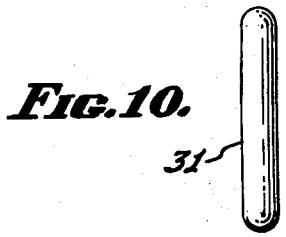

FIG. 10.

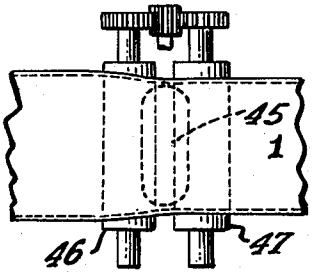

FIG. 12.

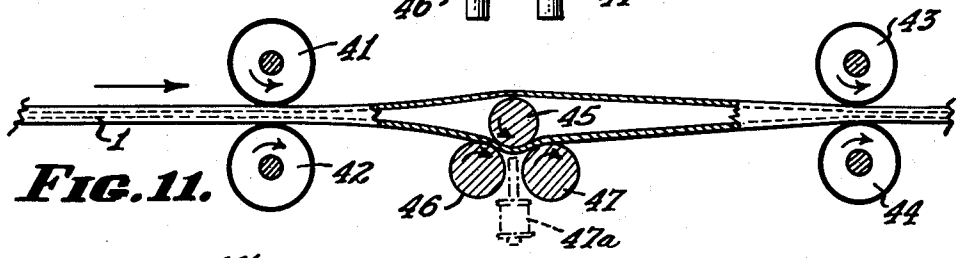

FIG. 11.

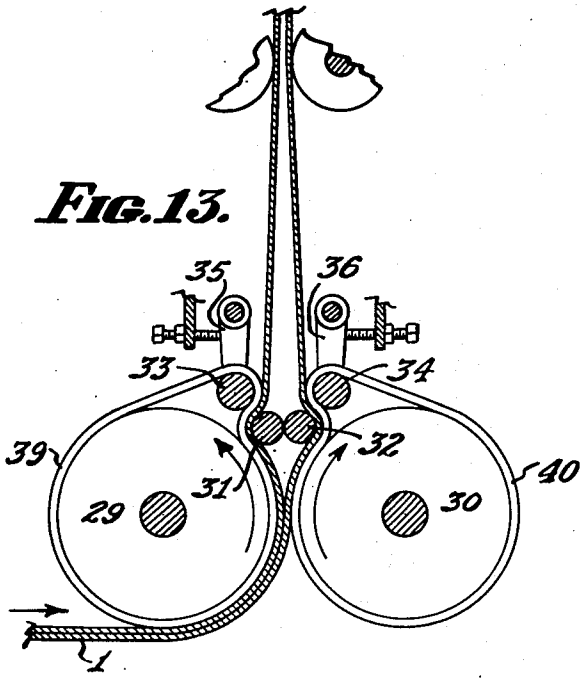

FIG. 13.

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APPARATUS FOR SEPARATING CONJOINTLY GATHERED BAG TUBE WALLS

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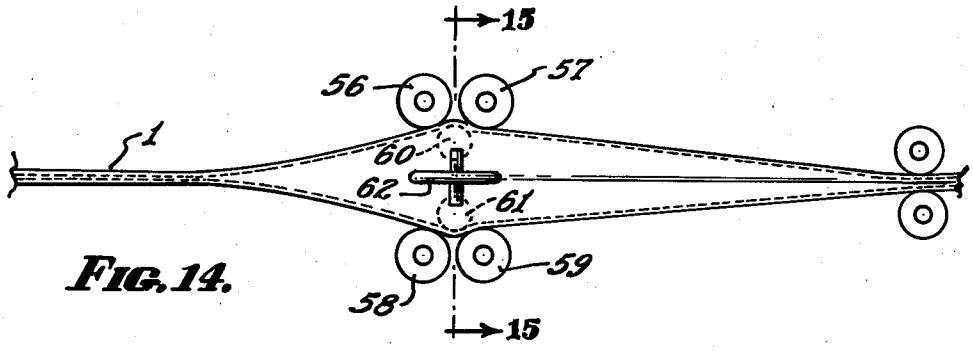

FIG. 14.

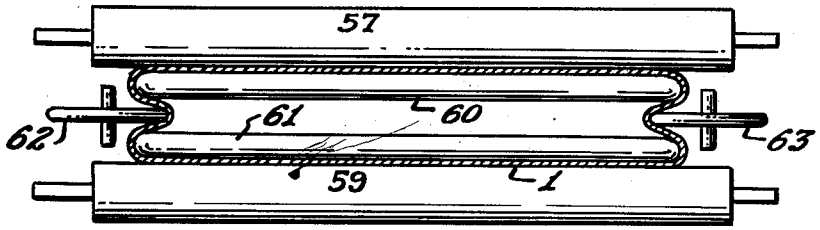

FIG. 15.

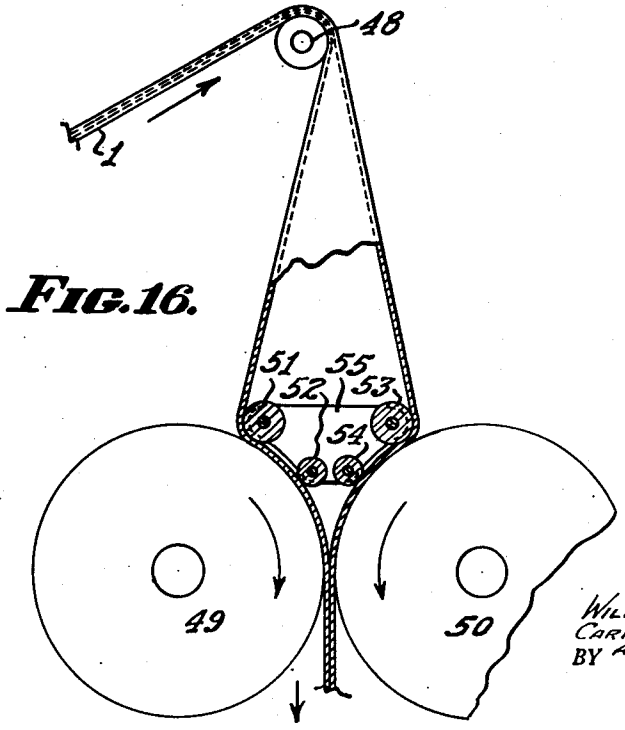

FIG. 16.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR SEPARATING CONJOINTLY GATHERED BAG TUBE WALLS

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Application August 24, 1948, Serial No. 45,888

5 Claims. (Cl. 93—8)

1

In a process of making bags a bag tube having one or more longitudinal seams may be first formed from suitable web material, after which the bag tube may be creped and then corrugated, the corrugations being crushed. The bag tube, as will be understood, is characterized by superposed walls; and then creping, corrugating and crushing steps are performed concurrently on these superposed walls, resulting in conjoint creping crinkles and in conjoint corrugations and pleats. This results in causing the walls to cling together. While such bag tubes are useful without preliminary separation of the walls, there are many uses for which such a separation would be desirable.

A principal object of this invention therefore is the provision of methods and means for effecting a separation of conjointly gathered bag tube walls.

In effecting such a separation, it is desirable to leave as much as possible of the resident stretchability in the walls themselves, so that another object of this invention is the provision of means and methods for effecting such a separation without unduly diminishing the stretchability of the resultant product.

It is an object of this invention to provide a means for separating the walls of a conjointly gathered bag tube in a continuous operation, which is carried on prior to the severance of the bag tube structure into bag lengths, and may be carried on if desired as an incident to the manufacture of bag tubes having conjointly gathered walls.

Another object of the invention is the provision of a means and method whereby separation of conjointly gathered walls may be carried on in a flat bag tube, and as an incident to this operation, the bag tube may be given another form, for example, the form of an intucked or bellows-folded bag tube.

These and other objects of the invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, we accomplish by those procedures, and through the use of those assemblies of apparatus of which we shall now describe certain exemplary embodiments. Reference is made to the accompanying drawings wherein:

Figure 1 is a diagrammatic representation of one procedure which we may employ for separating the conjointly gathered walls of a bag tube.

Figure 2 is a plan view of the same apparatus.

Figure 3 is a sectional view of the conjointly gathered bag tube structure prior to separation,

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and is taken along the section line 3—3 of Figure 1.

Figure 4 is a sectional view of the walls of the bag tube after they have been separated, and is taken along the section line 4—4 of Figure 1.

Figure 5 is a diagrammatic side elevation of another type of apparatus which we may employ.

Figure 6 is a front elevation thereof.

Figure 7 is a sectional view taken along the section line 7—7 of Figure 6.

Figure 8 is a sectional view of an intucked or bellows-folded bag tube, and is taken along the section line 8—8 of Figure 6.

Figure 9 is a vertical sectional view of another form of apparatus which we may employ.

Figure 10 is a plan view of a roller element.

Figure 11 is an elevational view with parts in section showing yet another form of wall separating means.

Figure 12 is a plan view related to Figure 11.

Figure 13 is a vertical sectional view showing a modification of the apparatus of Figure 9.

Figure 14 is a side elevation of another separating and in tucking apparatus.

Figure 15 is a sectional view taken along the line 15—15 of Figure 14.

Figure 16 is a sectional view of yet another separating means.

In Figure 3, we have indicated diagrammatically at 1 a bag tube which may be thought of, by way of example, as a tubular paper structure with superposed walls, these walls being characterized by conjoint, transverse, creping crinkles and by conjoint longitudinal corrugations which have been crushed to form pleats as at 2. It will be understood that these conjoint rugosities have the effect of holding the bag walls together and retarding their separation. The bag tube will be characterized by one or more adhesively secured longitudinal seams, which have not been illustrated because they are variable in number and placement, and do not affect the operation of the present invention. Moreover, the precise manner in which the bag tube of Figure 3 has been manufactured does not form a limitation on the present invention and will not here be outlined, excepting to indicate that it is a continuous process resulting in the formation of the bag tube in indefinite lengths which may be handled as such. It will be understood, moreover, that the specific types of rugosities which cause the bag walls to cling together do not form a limitation on this invention, and indeed that

this invention is applicable to the separation of the walls of any bag tube which have been caused to cling together lightly through any agency such, for example, as a light application of adhesive.

The problem to which this invention is addressed is that of separating the walls of a bag tube in a continuous length, and by continuously acting means. This problem is complicated by the fact that the bag tube, at the point or area where the separation is being made, is substantially closed so that interior separating means cannot be supported in the tube by direct connection to external supports. As a consequence, we have had to devise separating means, and methods for their use, where the separating means either require no external support, or may be supported within the bag tube by external means acting wholly through the bag tube walls which are interposed between the external means and the interior separating means.

In Figure 1, we have illustrated a simple mode of effecting separation. The bag tube 1 is shown as travelling in the direction of the arrows and passing first through a pair of pinch rolls 5 and 6. Another pair of pinch rolls 9 and 10, is shown in spaced relation to the first pair of pinch rolls; and from these latter rolls the bag tube may travel to a station where it is cut into desired bag lengths, as by a fly-knife apparatus 11, the lengths being stacked as at 12.

In order to effect separation, after the bag tube has passed through the pinch rolls 5 and 6, but before it is engaged by the subsequent pinch rolls, we inflate it with air or other gas. This gas is entrapped within the bag tube in that portion of it which extends between the two sets of pinch rolls. This portion is indicated at 13, and a cross-section of the bag tube after the separation has been effected by these means is indicated at 1—*a* in Figure 4.

The air or other gas entrapped in the section 13 of the bag tube remains between the pairs of pinch rolls because it is largely prevented from escaping between the layers of the bag forming material as engaged and compressed by these pinch rolls. Thus the body of air or gas remains in one place while the bag tube travels, and continuously acts to effect a separation of the walls of the traveling bag tube.

While it is to be expected that some air or gas will escape between the pinch rolls, it will be understood that this escape is slow, so that the method illustrated in Figure 1 is effective in producing a separation of conjointly gathered bag tube walls in a bag tube of very considerable length, i. e. a bag tube forming a roll of the material of a size convenient for handling in factory operations. Covering the pinch rolls 5, 6 and 9, 10 with a layer of soft rubber improves the contact produced between opposite bag walls when pressed together, and hence helps to prevent the passage of air or gas through the pinch rolls. Should the gas become depleted in the section 13, it is within the scope of our invention to renew it by separating rolls 9 and 10, reinflating the section and clamping the rolls down again upon the material. This may likewise be done if there is any appreciable loss of air through the body of the web from which the bag tube is made.

In Figures 5 to 7 inclusive, we have shown the bag tube 1 extending between lower pinch rolls 14 and 15 and upper pinch rolls 16 and 17. In the flight of the bag tube between these pairs of rolls, we have indicated a filling of freely flowable material 18. This material may be any substance of sufficient weight and resistance to abrasion, having freely flowing characteristics and devoid of marked tendency to cling to the separated walls of the bag tube. By way of example, hard, metallic or ceramic balls are excellent for use in this embodiment of our invention.

The material 18 should have sufficient weight to act as effective separation means for the bag tube walls against the resistance of these walls to separation, and sufficient weight to keep it in the lower part of the flight of the bag tube between the sets of pressure rolls. By reason of the weight involved, we usually prefer to provide means to limit the expansion of the bag walls after they have been separated, to avoid an undue removal of stretchability therefrom. One such means is illustrated in Figures 5 to 7. Here we have shown an endless belt 19 passing around the pinch roll 14 and an upper roll 20. Another endless belt 21 passes around the pinch roll 14*a* and an upper roll 22. The apparatus is arranged so that the facing surfaces of these belts form a sort of funnel shaped orifice through which the bag tube passes. A pair of tapered side plates 23 and 24, complete the outlines of this orifice. The steel balls 18 or other separating material remain in the orifice by gravity. They separate the bag tube walls, but the extent of this separation is limited by the belts 19 and 21 and by the plates 23 and 24 so that an undue stretching of the bag tube walls does not occur.

The plates 23 and 24 form the side portions of the bag tube flat, as will be understood. This has an additional advantage in that we may use indenting rollers indicated at 25 and 26 to intuck the side edges of the bag tube before it reaches the pinch rolls 16 and 17. In this way we may form the intucked or bellows folded tube shown at 1—*b* in Figure 8, and characterized by the re-entrant portions 27 and 28. The indenting may be done (as shown) at a point where the steel balls will support the edge portions of the formed bag tube beyond the engaging points of the peripheries of the discs 25 and 26, so that the folding becomes positive. Additional discs as at 25*a* and 26*a* may be employed to maintain the folds until the bag tube is engaged and collapsed by the upper pinch rolls 16 and 17. This form of bag tube is advantageous for many purposes. When cut to lengths, it may be closed by a bottom seam, and when so treated it may be more readily inserted into an outer bag or other structure to be lined, by reason of its initially lesser width.

In Figures 9 and 13, we have illustrated yet another mode and apparatus for effecting the separation of bag tube walls. Here the bag tube 1 passes between relatively large rolls 29 and 30. It is possible to effect separation with a single small roll, such as illustrated in Figure 10, inserted within the bag tube, and acting under the influence of gravity to maintain a position near the large rolls 29 and 30. However, a less frictional and more positively controlled arrangement is preferred, as illustrated in said figures and now to be described.

A pair of small rolls 31 and 32 are inserted in the bag tube and come to rest adjacent the bite between rolls 29 and 30. These small rolls are

preferably of the form shown in Figure 10, having rounded ends. They are supported by rolls 29 and 30 through the walls of the bag tube 1, as will be clear from Figure 9; but in order that they may retain their positions adjacent the bite of rolls 29 and 30 we provide external retainers. These may take the form of rolls 33 and 34 mounted upon sets of arms 35 and 36 so that the positions of the rolls may be made adjustable. Adjustment may be had through set screws 37 and 38 or other suitable means engaging external frame members of the machine. The small rolls 33 and 34 lie partly above the interior rolls 31 and 32, and, engaging them only through the walls of the bag tube 1, they nevertheless serve to keep the rolls 31 and 32 in position with their axes substantially in a horizontal plane. While we have illustrated a vertical movement of the bag tube, this is not necessary in the structures of Figures 9 and 13 where the separating means are positively retained in position.

A variant of this apparatus is illustrated in Figure 13 where we have passed belts 39 and 40 about the peripheries of the large rolls 29 and 30 and the retaining rolls 33 and 34. These belts further assist in driving rolls 31, 32, 33 and 34, in maintaining the positions of the separating rolls 31 and 32, and in carrying the walls of the bag tube through the apparatus itself without undue stressing and stretching. It will be understood that the roll arrangement is such that the separating rolls 31 and 32 not only turn with each other at their line of meeting but also turn with the web material of the bag tube 1 as this material passes over their surfaces. The frictional stresses on the material of the bag tube in this apparatus are at a minimum.

The pinch rolls 29 and 30 are preferably driven, which in turn drives the remainder of the illustrated rolls through the medium of the belts 39 and 40 and the walls of the bag tube. Other driving combinations may be employed.

In Figure 16 we have shown the bag tube 1 passing over a diverting roll 48 and downwardly between relatively large pinch rolls 49 and 50. Within the bag tube we provide a series of small rolls 51, 52, 53 and 54 journaled in a cage of which an end plate is shown at 55. The arrangement of rolls is such that opposite pairs rest, through the bag tube walls, against the respective pinch rolls. Frictional relationships are minimized because all rolls can rotate with the bag tube walls, and the equal and opposite downward forces tend to hold the internal assembly of rollers from displacement.

In Figures 11 and 12, we have illustrated yet another embodiment of separating means. The bag tube 1 may be drawn forwardly by pinch rolls 41 and 42 and by another pair of pinch rolls 43 and 44 in spaced relationship to the first pair, or by any other instrumentalities in a machine assembly having the effect of moving the bag tube. In threading the bag tube through this apparatus, we have inserted within it a separating roll 45, preferably of the form shown in Figure 10. This roll is supported, through the lower wall of the bag tube, upon external rolls 46 and 47 which are preferably driven. It will be seen that in this pyramid system of rolls, the roll 45 can rotate so as to move with the web forming the lower wall of the bag tube as it moves through the apparatus. Similarly, rolls 46 and 47 will rotate so as to move with the surface of the lower wall of the bag tube. The position of the roll 45 may be maintained by gravity alone, assuming

that it has sufficient weight. We prefer to employ magnetic means for the purpose. Thus we may make the walls 46 and 47 electromagnetic as by incorporating the coils in their structure in known ways, and by making the roll 45 of magnetizable material so that it will be attracted to the surfaces of the rolls 46 and 47 and held thereagainst, with the interposition of the lower wall of the bag tube therebetween. Or a separate magnetic retainer may be employed as at 47*a* as to assist in keeping the roll 45 from moving or working sidewise of the bag tube in the direction of the roll axis.

The upper wall of the bag tube 1 will, of course, slide over the surface of the roll 45 which surface is moving in the opposite direction. Since, however, this upper wall is not pressed against the surface of the roll 45, there will be no substantial frictional relationship at this point.

Any of the separation means hereinabove described and illustrated may be combined with intucking means as will be readily understood in the light of the teachings made therein. Magnetic retaining means may also be employed in lieu of or in addition to mechanical means for retaining the position of the internal separating mechanism as the bag tube travels.

In Figures 14 and 15 we have shown an arrangement which is especially advantageous for intucking as an incident to separation. Here the bag tube 1 passes between spaced pairs of magnetic rolls 56, 57 and 58, 59. Within the tube are small rolls 60 and 61 maintained respectively against opposite pairs of the magnetic rolls, and separated from each other. Intucking discs 62 and 63 act to depress the bag walls between the small rolls 60 and 61, these rolls acting in a positive way to define and support the edge folds formed in the bag tube walls.

The extent of intucking can be varied by varying the length of the small rolls 60 and 61, and varying the position of the discs 62 and 63 and the spacing of the rolls 57 and 59.

Modifications may be made in our invention without departing from the spirit of it. Having thus described our invention in certain exemplary embodiments, what we claim as new and desire to secure by Letters Patent is:

1. In apparatus for the purpose described, a pair of rolls through which a bag tube may be passed, a pair of smaller rolls to be located within said bag tube in a position to rest against each other and means for engaging said smaller rolls through said walls to maintain said rolls in a position such that their axes lie substantially continuously in a plane substantially parallel to the plane of the axes of the first mentioned rolls, said means comprising a pair of rolls, and endless belts each passing over the surface of one of said first mentioned rolls and one of said last mentioned rolls.

2. In apparatus for separating bag tube walls, means for continuously moving a supply of bag tubing, a separating roll to be positioned within and in engagement with one wall of the bag tubing to cause separation of the walls thereof, two retaining rolls for said separating rolls mounted in opposed relation to said separating roll externally of said one wall of the bag tubing and being spaced apart a distance sufficient to support said separating roll in pyramidal fashion, and additional means acting on said separating roll to maintain it in contact with said retaining rolls, whereby movement of said separating roll

in the direction of movement of the bag tubing will be resisted by the retaining rolls, and the separating roll thereby maintained in proper separating position within the bag tubing.

3. The structure claimed in claim 2 wherein said additional means comprises a second separating roll contacting said first mentioned separating roll, and additional retaining rolls on the opposite side of said bag tubing for retaining said second separating roll in position within the bag tubing.

4. The structure claimed in claim 2 wherein said additional means comprises an electro-magnet positioned to attract said separating roll to the surfaces of said retaining rolls, said separating roll being made of magnetizable material.

5. The structure claimed in claim 2 including intucking means acting to engage opposite side edges of the bag tubing to intuck the side edges of the bag tubing, and pinch rolls lying beyond

said intucking means through which the bag tubing is passed in intucked condition.

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