United States Patent [19]

Winnemoller

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[54] **APPARATUS FOR MANUFACTURING BAGS WITH AN INNER BAG WHICH HAS A Z-FOLD**

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[73] Assignee: **Windmoller & Holscher,** Lengerich of Westphalia, Germany

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[30] **Foreign Application Priority Data**

Sept. 12, 1972 Germany 2244697

[52] **U.S. Cl.** ..... **93/8 W,** 93/19, 93/35 R, 93/84 TW, 93/84 FF

[51] **Int. Cl.** **B31b 39/26**

[58] **Field of Search** ..... 93/35 R, 8 R, 8 W, 8 VB, 93/84 TW, 77 CL, 84 R, 14, 15, 16, 17, 18, 19, 20, 21, 26, 27, 36.01, 84 FF; 156/519, 522

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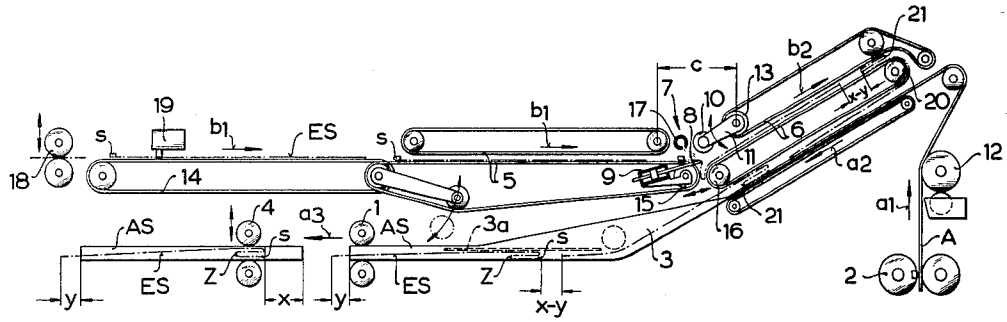
Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan
Attorney, Agent, or Firm—Fleit & Jacobson

[57] **ABSTRACT**

The invention relates to a method for manufacturing bags having a single layer or multi-layer outer bag, preferably made of paper, and an inner bag preferably made from a web of synthetic plastics material. The inner bag has a Z-fold formed therein, and this is opened out when the bag is in use. In the method of the invention, a transverse weld seam is formed in the tubular material for the inner bag before the Z-fold is formed so that the base of the inner bag can be hermetically sealed. The tubular material for the inner bag is conveyed out of a substantially horizontal conveying direction into a slightly rising conveying direction and this makes it possible to form a loop of material, which is required for forming the Z-folds. The direction of travel of the tubular material for the insert bag is then reversed and this enables the part of the Z-fold which points in the direction of travel to lie on the side of the tubular material which is against the web for the outer bag.

12 Claims, 12 Drawing Figures



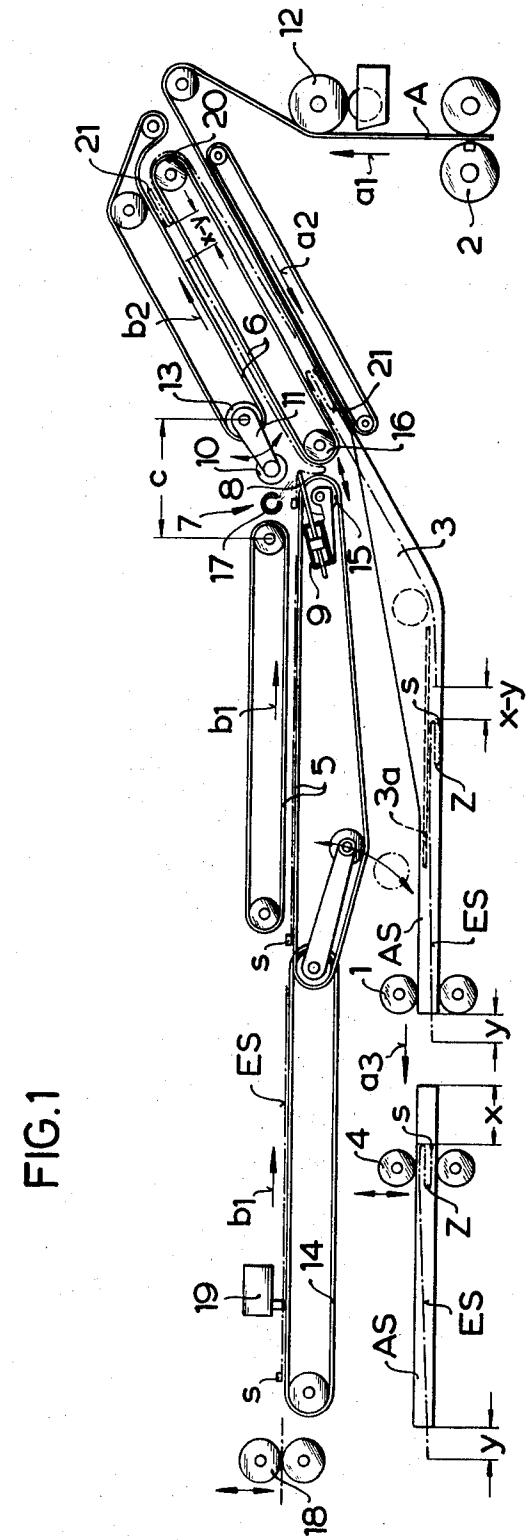

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FIG.1

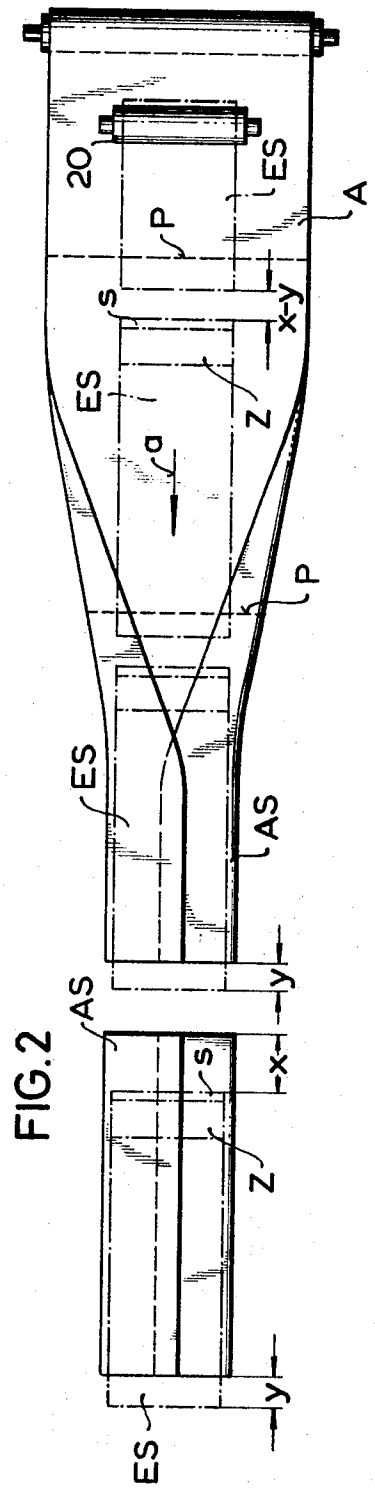
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FIG.2

FIG.3

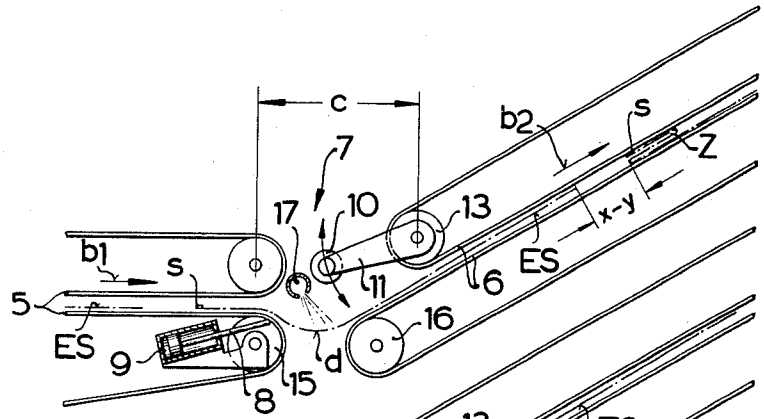

FIG.4

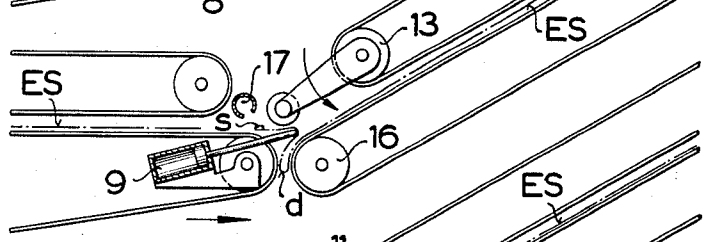

FIG.5

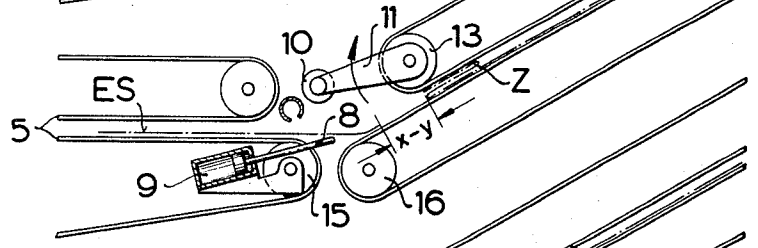

FIG.6

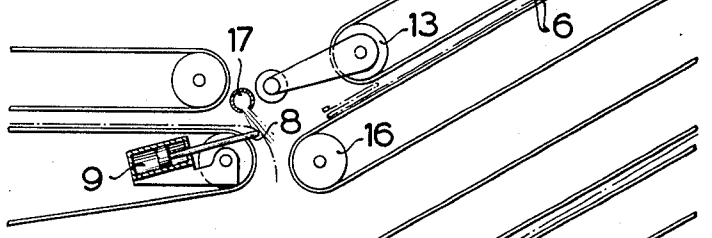

FIG.7

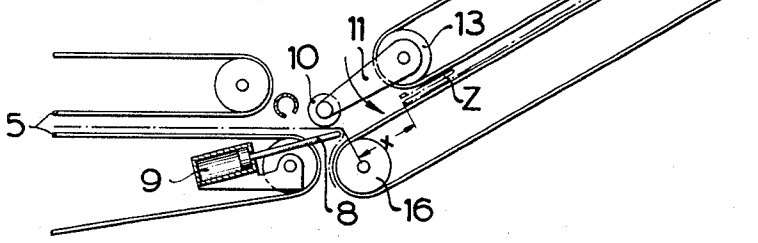

FIG. 8

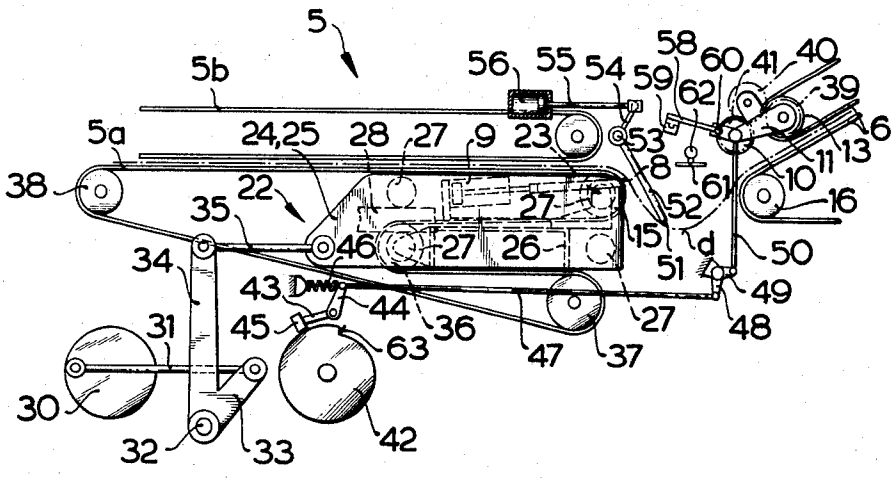
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FIG. 9

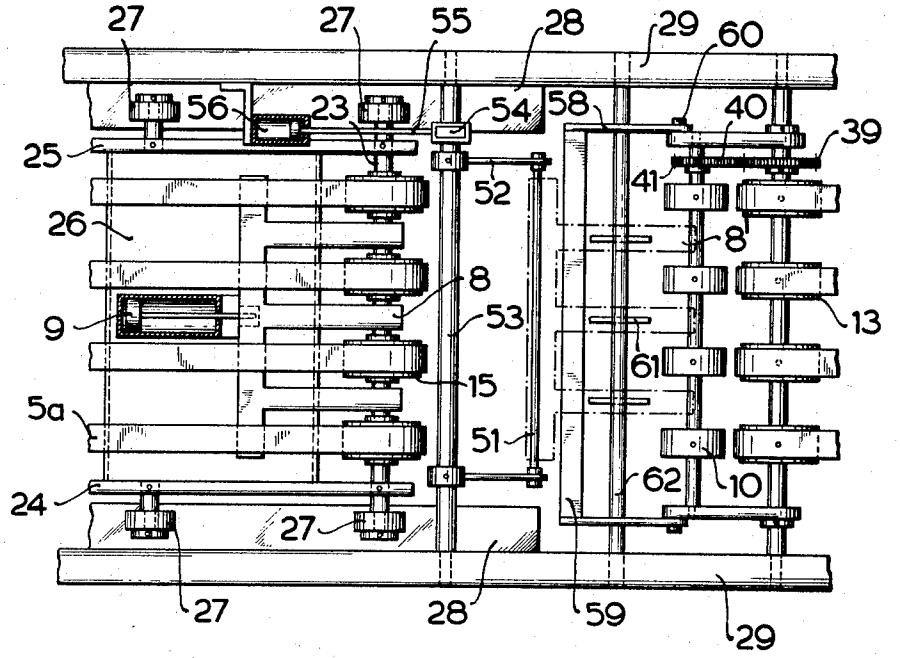
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FIG.10

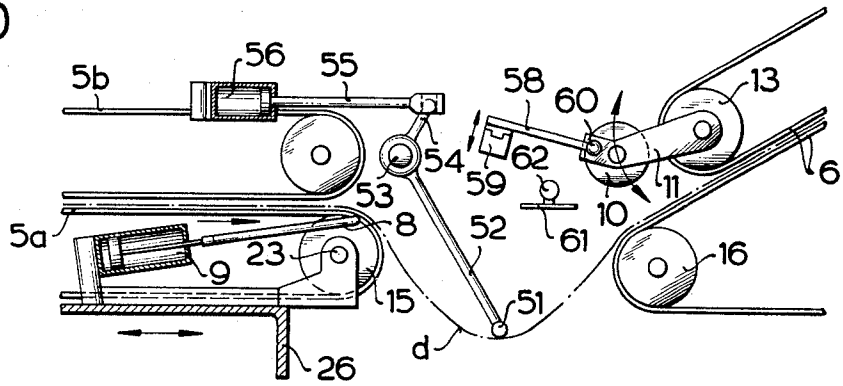


FIG.11

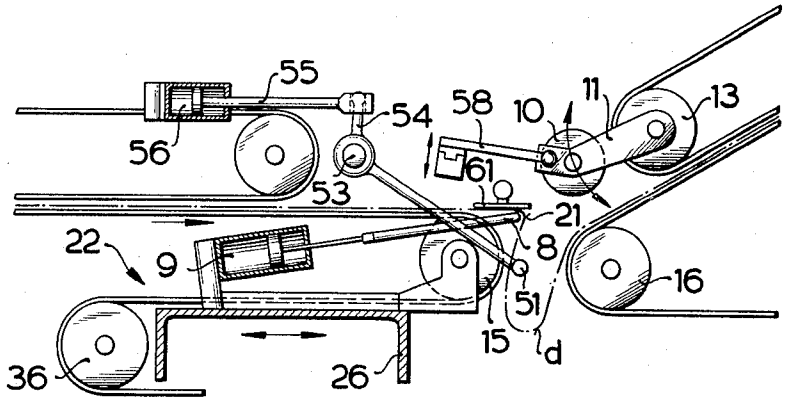
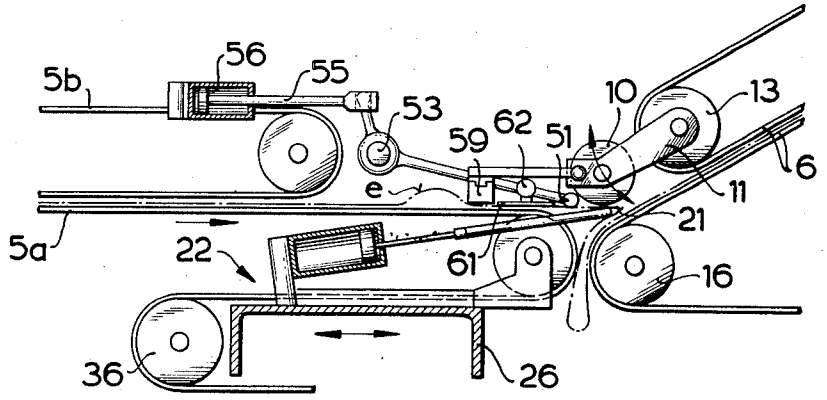


FIG.12



APPARATUS FOR MANUFACTURING BAGS WITH AN INNER BAG WHICH HAS A Z-FOLD

The invention relates to a method and an apparatus for manufacturing bags of the type having a single-layer or multi-layer outer bag, preferably made of paper, and an inner bag, preferably made from a web of synthetic plastics material. The inner bag has a Z-fold formed therein, and this is opened out when the bag is in use. If the Z-fold is adjacent to the mouth of the bag it enables the filling-end of the inner bag, which at first lies flush with the outer bag, to be pulled out of the outer bag directly before the filling of the bag. Thus, the inner bag can subsequently be welded closed. If the Z-fold is formed at the other base end of the bag, it enables the inner bag to stretch and fit snugly into any folds in the base of the outer bag into which it did not previously extend.

A bag of this type having a Z-fold at the filling end of the inner bag is illustrated and described in U.S. Pat. No. 2,803,173, together with a method and an apparatus for its manufacture. The use of the Z-fold at the base of the bag is the subject of one of our own co-pending applications.

The method of manufacture disclosed in the aforementioned U.S. specification, and the corresponding apparatus, are concerned with the formation of the Z-fold inside a continuously conveyed tubular web for the inner bags which is provided inside a continuous tube for the outer bags. The inner and outer bags are cut simultaneously from the respective webs by transverse severing cuts. Thus, after manufacture, the ends of the inner bag are flush with the ends of the outer bag, and only the filling end of the inner bag, which is to be pulled out before the bag is filled, can be closed by a weld seam after filling. It is not possible to weld the base of the inner bag through the outer bag. The only way of forming a base closure is by means of a sewn seam which holds the outer bag and inner bag together and a so-called 'rider strip.' The gas or water tightness expected of the plastic inner bag is thus substantially reduced.

To mitigate this serious disadvantage, it is an aim of the present invention to close the base of the inner bag independently of the base of the outer bag, by means of a weld seam.

French Specification No. 2,000,222 discloses a method and an apparatus for manufacturing bags of this type, wherein the inner bag is stretched before it is fixed into the outer bag, so that the filling end of the inner bag, projects beyond the adjacent end of the outer bag after manufacture. However this is disadvantageous because the filling end of the inner bag is easily damaged and soiled. From this French specification it is known to provide the inner bags with a welded base seam before the severed individual inner bags are joined to a web for forming the outer bags, and preferably even before said inner bags are severed from the tubular web from which the inner bags are manufactured. If this known method is combined with the method disclosed in U.S. Pat. No. 2,803,173 then it is possible to manufacture bags which have an inner bag closable at both ends by means of a weld seam. However, just as before, the base of the inner bag is then flush with the base end of the outer bag so that, in practice, the base closure of the outer bag can only be a sewn seam which has to be arranged adjacent to, or below, the welded

base seam of the inner bag. Bags having an outer bag which is closed at the base by a glued fold-over or 'pinch-bottom' closure or by means of a cross-bottom fold, cannot be manufactured by such a method. For the purpose of manufacturing such bags it is necessary to start with pre-cut blanks for the inner bags to enable the outer bags to be severed at previously provided transverse perforations (for 'pinch-bottom' closures or for a cross-bottom fold with overlapping layers and/or to obtain inner bags which are of a different length to the outer bags (in particular for cross-bottom folds). However, with the method and apparatus described in the aforementioned U.S. specification, it is not possible to form Z-folds in pre-cut inner bag blanks. When the bags are already cut from a continuous tubular web and are already provided with transverse weld seams and Z-folds, the Z-folds would be opened up during the accelerating of inner bags for the purpose of producing the desired mutual spacing between successive inner bags unless some extremely expensive apparatus were provided to prevent this or unless a method were provided enabling pre-cut transversely-welded insert bag blanks (which subsequently are conveyed to and laid on the outer bag web) to be provided with a Z-fold. A further aim of the invention is to provide such a method and an apparatus for carrying out the method. The method and apparatus should advantageously be such that they can be used for processing a continuous tubular web which is provided with transverse weld seams and from which the inner bags can be severed at the same time as the tubular web for the outer bags is severed.

The method and the apparatus according to the aforementioned U.S. specification, have a further disadvantage. The parts of the Z-folds which point in the direction of travel lie on the side away from the web for the outer bags when the tubular web for the inner bags has been laid on the web for the outer bags. During subsequent formation of the outer bag web into a tube, these parts of the Z-fold are located at the upper side of the combined webs and are drawn past the lower part of a stationary sheet metal template. Because of the friction occurring between these parts and the template there is the danger that these parts of the Z-folds may be pushed in a direction opposite to the direction of travel of the webs, causing difficulties in the through passage of the webs during the formation of a tube by the outer bag web.

A further aim of the invention is to avoid this disadvantage, not only during processing of pre-cut inner bags, but also during processing of a continuous tubular web for the inner bags.

The invention provides a method of manufacturing a bag having an outer bag and an inner bag which has a Z-fold formed therein, said method comprising forming a Z-fold in tubular material for the inner bag, shaping a single layer or multi-layer web for the outer bag to form a tube, conveying the inner bag material to the web so that it is enveloped by the tube during the formation of the latter, and dividing the resulting assembly from the web, wherein a transverse weld seam is formed in the tubular material as the base of the inner bag before the Z-folds are formed therein, wherein the tubular material is conveyed out of a substantially horizontal conveying direction into a slightly rising conveying direction during the formation of the Z-fold, and wherein the tubular material provided with Z-folds is

deflected to travel in the opposite direction before being conveyed to the web for the outer bag.

The term 'tubular material for the inner bag' is intended to encompass both a pre-cut inner bag blank and continuous tubular web from which the inner bag can be formed. By forming the transverse weld seam before the Z-folds the inner bag, often called an insert bag because it is mostly still customary for the inner bag to be inserted by hand, can be closed hermetically by means of a weld seam not only at the filling end but also at the base end, in contrast to inner bags which are manufactured by the method of the above-mentioned U.S. specification.

The feature that the tubular material for the insert bag is conveyed out of a substantially horizontal conveying direction into a slightly rising conveying direction, makes it possible to form a loop of material, which is required for forming the Z-folds, substantially under the influence of gravity on the material; the slightly rising direction of conveying aiding the bending of the material to form the loop. Furthermore, because only a slight alteration of the conveying direction is used, the leading end of pre-cut inner bag blanks passes effortlessly from the horizontal conveying direction into the slightly rising conveying direction and this permits the formation of the Z-folds in the inner bag blanks. This is not possible using the method of the above-mentioned U.S. specification, in which the two corresponding conveying directions are at an angle of about 90° in relation to one another. Such a change of conveying direction can easily be perfected by a web but this is not the case for a series of pre-cut bag blanks whose free leading end in each case would have to be threaded into the downstream conveyor.

The feature that the tubular material for the insert bag is deflected before being conveyed to the web for the outer bag so that its direction of travel is reversed, enables that the part of the Z-fold which points in the direction of travel to lie on the side of the tubular material which is against the web for the outer bag, so that displacement due to friction on a stationary sheet metal templete like that in the U.S. specification, and resultant difficulties during the tube formation, are avoided.

For the processing of pre-cut inner bag blanks where the Z-fold is at or near to one of the bag ends, the Z-fold is advantageously formed at or near to the trailing end of the inner bag blank with respect to the direction of travel of the bland. In contrast to an older suggestion of the applicant company (German Application No. P 21 10 815.6) in which a simple fold-over of 180° is made adjacent to the mouth of the inner bag, the inventor of the subject matter of the present application has recognised that a Z-fold can be provided particularly advantageously at or near to the opposite, base, end.

For carrying out the method according to the invention there is provided an apparatus comprising means for manufacturing outer bags from single layer or multi-layer webs, means for producing transverse weld seams at predetermined locations in the inner bag tubular material, and conveying means comprising a first conveyor in the form of a double belt conveyor for conveying the tubular material substantially horizontally at a higher speed than the speed of travel of the web for the outer bags and being provided at its discharge end with belt guide means movable forwards and backwards with respect to the conveying direction and a second conveyor in the form of a double belt conveyor arranged downstream of the first conveyor for conveying the tubular material at the same speed as the speed of travel of the web for the outer bags and laying it onto the web, the second conveyor being disposed for conveying the tubular material firstly slightly upwardly and then in the opposite direction and in substantially the same direction as the direction of travel of the web; lower belt guide rollers of the first conveyor at the discharge end of that conveyor are movable forwardly and backwardly with respect to the travel of the web through the first conveyor and these rollers carry respective conveyor belts which have mutually axial interspaces; wherein folding fingers pass through the interspaces and are movable forwards and backwards with and relatively to the belt guide rollers and extend up to as far as the inlet region of the second conveyor, and wherein a lower belt guide roller or rollers on the inlet side of the second conveyor co-operates with individual rollers which are movable forwards and backwards, said individual rollers and the spaces therebetween being respectively substantially in alignment with the lower belt guide rollers of the first conveyor and the interspaces therebetween.

As the lower belt guide rollers of the first conveyor and the folding fingers are movable forwards and backwards, a loop of material for the inner bags is formed by the weight of the material in the free space created when these belt guide rollers and the folding fingers are moved backwards. This loop is formed because of the higher speed of the first conveyor in relation to that of the second conveyor. During the subsequent forwards movement of the rollers and that of the folding fingers the leading fold of the Z-fold is formed by the folding fingers and the rearward fold is formed at the bottom of the loop. The co-operation between the lower belt guide roller or rollers on the inlet side of the second conveyor and the individual rollers provides an arrangement for gripping and simultaneously conveying the leading fold of the Z-fold which is introduced thereto by the folding fingers, which extend up to as far as the inlet region of the second conveyor. Because the folding fingers engage into the interspaces between the individual rollers the fingers are not gripped and so the fold can be firmly gripped. The folding fingers, during their subsequent backwards movement, can be withdrawn from the fold effortlessly and without carrying the material out of the rollers with them. Because the second conveyor, preferably a little way downstream of the individual rollers, is constructed as a double belt conveyor, the Z-folds cannot become displaced or travel upwards again during their conveyance.

During the processing of cut sections, the folding fingers remain in their advanced position for a short period of time after the folding process and serve for conveying the leading end of the next inner bag blank to the second conveyor.

Moreover, for increasing effectiveness, the individual rollers are moved back and subsequently are moved forwards again before the supply of each new leading end to the second conveyor so that when pre-cut blanks are being processed, these rollers are actuated twice, once for the inlet of the leading end and once for the formation of the Z-fold(s).

In order to ensure successful transfer of the leading fold of the Z-fold by the individual rollers in co-operation with the lower belt guide roller or rollers, the individual rollers are preferably drivable.

For adaptation to different material thicknesses existing in the Z-fold, the individual rollers are advantageously spring-biassed to move forwards and are capable of yielding.

For breakdown-free operation with materials which are difficult to process, for example those which are strongly statically charged, means are provided for safely ensuring the formation of downwardly directed loops of the inner bag material between the two conveyors. In one embodiment, these means consist of a nozzle which is arranged above the conveying plane of the first conveyor and is disposed in the gap between this and the second conveyor, the airstream from said nozzles being directed downwards towards the inner bag tubular material which is passing through the gap. According to a second embodiment, which can be used alone or in connection with the previous embodiment, a rod is secured between the free ends of laterally rotatably mounted levers and sinks into the loop of material because of its weight. Before the advancing of the folding fingers, a drive can raise the rod above the conveying plane of the first conveyor, and it can be held there until the next time it is released.

The drive may be a cam which is connected with a frame supporting the lower belt guide rollers of the first conveyor and which is movable forwards and backwards during operation of the apparatus. More preferably, the drive for the rod is pneumatic.

When the tubular material for the inner bags is a continuous web it sometimes happens that, during the time after the gripping of the leading fold of the Z-fold and before the folding fingers and the lower belt guide rollers of the first conveyor have been withdrawn, the surplus tubular material resulting from the difference in the conveyor speeds is not drawn off sufficiently rapidly by the second conveyor and, because of the lack of space for accommodating the tubular web material of the loop to be formed, becomes pushed up into folds in a completely undesirable manner and travels into the second conveyor in this form. In order to avoid this, there is provided a brake in the form of a brake member adapted to be applied, from above, onto the web which is supported by the first conveyor during the aforesaid time. This brake member brakes the web to such an extent that only the material which is drawn off by the second conveyor is drawn through under the brake member and any surplus material accumulates before the brake member as an upwardly directed bulge. For this purpose, the belt rollers for the upper conveyor belt of the first conveyor can be suitably set back.

Since the period of time in which it is desirable to brake the tubular web material approximately corresponds to the time for advancing the individual rollers, the brake member has a holder secured to bearings for the individual rollers so that it can be brought into and out of engagement with the web at the same time as these rollers.

Since the gaps between pre-cut inner bag blanks prevent the aforementioned undesirable formation of folds the brake member can be adjusted to remain outside the conveying plane.

In order to ensure safe conveying of the tubular material for the inner bag along the conveying path as far as the inlet of the second conveyor, stationary guide rods can be adjacent to the conveying path and above the conveying plane.

Examples of the invention will now be described with reference to the accompanying drawings, in which:-

FIG. **1** is a diagrammatic side view of an apparatus in accordance with the invention for processing pre-cut inner bag blanks;

FIG. **2** is a plan view of the lower portion of the apparatus of FIG. **1**, illustrating the joining of inner bags provided with Z-folds to a web for the outer bags;

FIGS. **3** to **5** show the formation of the Z-fold at the trailing end of an inner bag blank, in three stages;

FIGS. **6** and **7** illustrate two stages in the formation of a simple fold-over on the leading end of the inner bag;

FIG. **8** shows, schematically, a second embodiment of an apparatus for forming Z-folds, not only in pre-cut blanks but also in a continuous web;

FIG. **9** is a partial and simplified plan view of FIG. **8** on an enlarged scale;

FIGS. **10** to **12** illustrate three stages in the formation of a Z-fold Z in a continuous tubular web for the inner bags, by means of the apparatus according to FIGS. **8** and **9**.

In FIGS. **1** and **2** inner bag blanks ES are made of synthetic plastics film and are pre-cut. Each blank is provided with a base weld seam *s*. The filling end of each inner bag ES projects a distance *y* beyond the cut-off end of a tubular outer bag AS to permit the inner bag to be closed by welding after it has been filled. The base of the inner bag ES is spaced at a distance *x* from the base of the outer bag, and is provided with a Z-fold. As shown in a co-pending application, this distance *x* enables the outer bag to be provided with a base fold independently of the inner bag.

The folding of pre-cut inner bags enables them to be given a length which is different from the length of the tubular outer bags as is necessary, for example, for the filling end of the inner bag to project by the distance *y*. The filling end excludes the need for having the outer bag tubular web A divided into individual outer bag sections by means of transverse severing cuts and it makes it compulsory to sever the outer bag tubular sections at transverse perforations P which are provided beforehand in the web or the webs A.

A pair of feed rolls **1** is provided for continuously advancing the single layer or multi-layer paper web A for the outer bags, in the direction *a***1** to *a***3**. The transverse perforations P are produced by a perforating device **2** and are spaced apart at the desired lengths of the tubular outer bag sections. The paper web A is shaped around a sheet metal template **3***a* in a tube-forming apparatus **3** so as to form the outer tube AS, and is divided into individual outer bag tube sections by severing at the transverse perforations P by means of a pair of severing rolls **4** which operates at a higher peripheral speed than that of the feed rolls **1**.

The apparatus for forming the Z-folds on the inner bag blanks ES comprises a first conveyor **5** which conveys the blanks substantially horizontally in direction *b***1**; a second conveyor **6** which is arranged downstream thereof and slightly rises in the direction *b***2** to convey the blanks upwardly and then conveys them downwardly in the opposite direction but substantially in the same direction as the direction of travel *a***2** of the outer bag web, thus laying the series of inner bags successively onto the outer bag web A; and a transverse folding apparatus **7**, arranged between the aforesaid conveyors **5** and **6**, for forming the Z-fold Z on the trailing

end of the inner bag blanks with respect to the direction of travel thereof.

The conveyors **5** and **6** are each constructed as a double belt conveyor. Whereas the second conveyor **6** has the same conveying speed as the outer bag web A, the conveying speed of the first conveyor **5** is greater, and is adjustable in dependence on the depth of the Z-folds to be formed. A feed belt **14** is arranged upstream of the conveyor **5** and conveys a pre-cut inner bag blank, closed at the trailing end by a weld seam, to the conveyor **5.** These blanks can be severed from a tubular web of plastics material by means of a severing device **18** which is synchronised with the operation of the other parts of the apparatus. The tubular web of plastics material is provided with the transverse weld seams and the transverse perforations arranged adjacent thereto in a preceding work step. A photocell **19** scans the leading ends of the blanks and controls the feeding speed of the blanks in a manner such that correct processing is ensured.

The conveyors **5** and **6** are spaced at a distance *c* from one another. The first conveyor **5** consists of several parallel individual belts each associated with a respective lower deflector roller **15.** The lower deflector roller **15** at the discharge end of the first conveyor **5** is movable forwards and backwards i.e., towards and away from a stationary lower deflector roller **16** on the input side of the second conveyor. A blow nozzle **17** is provided above the conveying plane of the first conveyor in the gap *c* between this conveyor and the second conveyor and an airstream from the nozzle is directed downwardly towards the inner bag blanks ES passing through the gap *c*.

The transverse folding apparatus **7** comprises a folding knife **8,** which is mounted so as to be slidable in the conveying direction of the second conveyor **6,** on the bearing member for the deflector roller **15,** and which is movable forwards and backwards by means of a compressed air cylinder **9.** The folding knife **8** is in the form of a comb, and its individual folding fingers pass through interspaces between the individual deflector rollers **15.** Associated with the folding knife **8** are rollers **10** which are movable forwards and backwards and are pivotable about the axis of the upper deflector roller **13** of the second conveyor **6** by means of swivel arms **11.** The rollers **10** are adapted to be intermittently pressed against the lower deflector roller **16** of said second conveyor **6** during the operation of the apparatus. The rollers **10** and the spaces therebetween are in alignment respectively with the rollers **15** and the interspaces between rollers **15,** so that the fingers of the folding knife **8** can pass between the rollers **10.** The operation of the transverse folding apparatus is synchronised with the operation of the machine for forming the outer bags; the operational relationship between the two being adjustable by hand.

The method of operating the apparatus illustrated in FIG. **1,** for forming the Z-fold Z, is described in greater detail below, with reference to FIGS. **1, 3** to **5.** The individual inner bag blanks ES are conveyed, one after the other, in the direction of conveyance *b*1 by means of the feed belt **14;** the said blanks are each closed at their trailing end in airtight manner by a transverse weld seam *s*. Since the first conveyor **5** has a higher conveying speed than that of the conveyor **6** a loop *d* is formed in each inner bag blank which passes through the gap *c* between the aforesaid conveyors, see FIG. **3.** The action of the air from the nozzle **17** ensures that the loop *d* always hangs downwardly. By forwardly advancing the lower deflector roller **15** on the outlet side of the first conveyor **5** towards the lower deflector roller **16** on the inlet side of the second conveyor **6,** the loop *d* (as is shown in FIG. **4**) sags to an even greater extent. Shortly before the rear end of the inner bag blank reaches the gap *c*, it is transversely folded by the folding knife **8** which is advancing at that time and carries the fold over the loop *d*, then passing under the rollers **10.** The rollers **10** move downwards towards the deflector roller **16** and these together grip the transverse fold and make the Z-fold Z at the rear end of the inner bag, as shown in FIG. **4.** As the individual folding fingers of the folding knife **8** engage between the gaps of the forwardly and backwardly movable rollers **10,** the leading fold can be gripped firmly by the rollers and the folding fingers are subsequently able to withdraw again. The folding knife **8** remains near to the deflector roller **16** for a short period of time after the folding process in order, as is shown in FIG. **5,** to safely introduce the next inner bag blank into the second conveyor **6.** Subsequently the folding knife **8** and the deflector roller **15** of the first conveyor move back again into their initial positions which are shown in FIG. **3.**

The inner bags provided with the Z-fold at the trailing or base end are conveyed onwards by the second conveyor **6** spaced apart by the required distance which corresponds to the dimension *x* minus *y*, and, as can be seen from FIGS. **1** and **2,** are deflected by the lower deflector roller **20** on the outlet side, into the travel direction *b*2 which substantially corresponds to the travel direction *a*2 of the outer web and, synchronously, are laid onto the outer bag web A which subsequently is shaped into a tube over the inner bags by the tube-forming apparatus **3.**

As a result of the reversal of the direction of travel of the inner bags, parts **21** of the Z-folds which point in the direction of travel come to lie upon the outer bag web (see FIG. **1**) and are thus protected from contact with the stationary sheet metal template **3***a* under which the inner bags are drawn in direct contact therewith during formation of a tube in the outer web. Thus, the Z-fold cannot be displaced and no breakdowns occur during the passage of the part **21** past the template.

For securing the inner bags to the paper web A, a gluing mechanism **12** applies spots of glue onto the paper web for attaching the inner bags to the paper web. Further gluing mechanisms (not shown) apply longitudinal coatings of adhesive onto the paper web for gluing the outer tube.

The outer bag web A has been provided with transverse perforations P whilst passing through the perforating device **2.** Furthermore FIG. **2** shows that the inner bags have been laid onto the outer web in such manner that their leading or filling ends project beyond the transverse perforations P by the amount *y*. From this double tubular web, the pair of severing rollers **4** severs tubular pieces, AS, ES along the transverse perforations P and the filling ends *y* of the inner bags, which project beyond the transverse perforations P, slip out of the severed piece of outer tube. The bottom end of the inner bag which is provided with the Z-fold remains a distance in the outer bag for the purpose indicated hereinbefore.

With the described transverse folding apparatus it is possible additionally to fold back the leading or filling end of the inner bag by 180° so that the inner bag does not project from the outer bag and so is protected against damage and soiling. For this purpose, the folding knife **8**, after the formation of the Z-fold Z, is moved back to such an extent that, as is shown in FIG. **6**, a length *y* of the leading end of the succeeding inner bag blank is tilted downwardly over the edges of the folding knife by its own weight and by the airstream issuing from the nozzle **17**. The folding knife **8** is then moved forward again towards the second conveyor **6**, so that it transversely folds the tilted-down end of the tubular piece and pushes the transverse fold under the rollers **10**, which are moving upwardly as shown in FIG. **7**.

The apparatus according to FIGS. **8** to **12** has the same basic structure as that which has just been described and the same reference numerals are used for like parts. A carriage **22** carries the lower belt rollers **15** which have a common axis **23** and which deflect the lower belts **5***a* so that they perform their forwards and backwards movement. The carriage **22** has two side walls **24** and **25** which are joined together by a cross-bar **26**. The side walls each carry, at the outside, four runner rollers **27** which run in pairs on the upper and/or lower side of two runner rails **28** secured on the frame walls **29** shown in FIG. **9**. The carriage **22** is drivable by a crank wheel **30** which is synchronised with the operation of the apparatus. The crank wheel drives the carriage via a connecting rod **31**, a two-armed lever **33**, **34** which is stationarily mounted at the point **32**, and a draw bar **35** articulated on the carriage. The belts **5***a* are guided over further rollers **36** mounted in the carriage and over stationary rollers **37** and **38**. Thus, the displacement of the carriage is made possible whilst the belts **5***a* remain tensionsed. The compressed air cylinder **9** for the folding knife **8**, which lies substantially on the axis **23**, is fixed on the cross-bar **26**.

The rollers **10** are drivable horizontally by the belt guide rollers **13** via the gear wheels **39** to **41**, and vertically by a cam mechanism comprising a cam **42** upon which slides a cam follower **45** which is biassed towards the cam by a spring **46** and secured on a stationarily mounted double lever **43**, **44**. The to and fro movement produced at the end of the lever arm **44** is transmitted via a draw bar **47** to a further stationarily-mounted two-armed lever **48**, **49** which transforms the movement into vertical movement which is transmitted to the levers **11** by means of draw bars **50** arranged at both sides of the carriage.

For assisting or ensuring the formation of the loop *d*, even when strongly statically charged material is being used, a weighting rod **51** is arranged between the free ends of two lateral levers **52**. The levers **52** are secured on a shaft **53** which is mounted rotatably in the side frames **29**, and which in its turn can be pivoted via a further lever **54** on which the piston rod **55** of a pneumatic cylinder **56** is rotatably articulated.

Holders **58** are screwed onto the levers **11** of the rollers **10**; a braking member **59** being arranged between said holders **58**. By releasing and re-tightening of the securing screws **60**, the height of the braking member **59** can be adjusted.

Above the level of the horizontal conveying path, in the gap between the conveyors **5** and **6**, holding-down means **61** are secured on a cross-bar **62** mounted in the side frames **29**.

In FIG. **9**, the folding knife **8** is shown in chain-dotted lines in their furthest advanced position **8'**. This shows how the folding fingers engage into the gaps between the rollers **10**.

FIG. **10** shows the initial position of those parts which co-operate during the formation of the Z-folds during the formation of the material loop *d* in a continuous tubular web under the action of the weighting rod **51**. The rod lies in the loop because of its own weight, both sides of the compressed air cylinder **56** being opened to the atmosphere.

During the subsequent advancing of the carriage **22** and of the folding knife **8** relatively thereto, the loop *d* is made narrower for enabling formation of the rear fold of the Z-fold and the front fold of the Z-fold **21** is pre-formed by the folding knife. The weighting rod **51** is then lifted by the activation of the compressed air drive in the cylinder **56** so that it comes out of the loop at the correct time. The raised position of the weighting rod **51'** is illustrated in FIG. **12**. The holding-down means **61** serve (as illustrated) for guiding the material which, consequently, cannot be deflected upwards.

In FIG. **12**, the carriage **22** is located in its most advanced position, and the folding knife **8** has pushed the front fold **21** of the Z-fold under the advanced rollers **10**; so that this fold is firmly gripped between the rollers **10** and the roller **16**, and has already moved a small distance backwards. At this stage, before the braking member **59** and rollers **10** are lowered, a bulge *e* is formed from the material which is supplied at the higher speed from the conveyor **5**. When the braking member **59** is lowered the supply of material corresponds to that conveyed at the lower conveying speed of the conveyor **6**, so that formation of unrequired folds and supply of surplus of material is avoided.

The second embodiment of the apparatus according to the invention is just as suitable for processing a continuous tubular web (as described) as for the processing pre-cut inner bag blanks. In the latter case, however, the braking member **59** is not required and its holders **58** are adjusted by means of the screws **60** so that the braking member does not touch the blanks. If the weighting rod **51** is not required, then it can be held in the position shown in FIG. **12**. The nozzle **17** shown in FIGS. **1** to **7** may additionally be present and, if desired, may be used alone or in combination with the weighting rod.

In the event of the formation of a front fold-over on pre-cut inner bag blanks, corresponding to that shown in FIGS. **6** and **7**, the cam disc **42** (FIG. **8**) is provided with two steps **63** which are arranged relatively closely behind one another on the periphery thereof, with a rising path lying between them. The cam disc with two steps **63** can also be used for aiding transfer to the conveyor **6** of leading ends which are not to be folded over.

I claim:

1. An apparatus for manufacturing a carrying bag including an outer bag and an inner bag having a Z-fold formed therein comprising means for conveying a web having at least one layer for forming said outer bag in a first direction at a first speed, means for conveying a tubular material having transverse weld seams for forming the base of said inner bag, said tubular material conveying means including a first double-belt conveyor for conveying said tubular material in a substantially

horizontal second direction at a higher speed than said first speed at which said web is conveyed, belt guide means positioned at the discharge end of said first double-belt conveyor and being movable forward and backward with respect to said second direction in which said tubular material is conveyed, a second double-belt conveyor positioned downstream from said first double-belt conveyor for conveying said tubular material at said first speed at which said web is conveyed and for depositing said tubular material onto said web, said second double-belt conveyor being positioned to convey said tubular material first slightly upwardly with respect to said substantially horizontal second direction and to then reverse the direction of travel of said tubular material so that it is traveling slightly downward in the opposite direction and in substantially the same direction as said first direction in which said web is conveyed, said belt guide means including first spaced apart belt guide rollers, spaced apart conveyor belts mounted on said first belt guide rollers, folding fingers mounted to be moveable forward and backward with respect to said first belt guide rollers, said folding fingers being mounted to be moved through the spaces between said conveyor belts and first belt guide rollers and to extend as far as the inlet end of said second double-belt conveyor, second belt guide rollers positioned at the inlet end of said second conveyor, spaced apart individual rollers mounted so as to be moveable forward and backward to cooperate with said second belt guide rollers, said individual rollers and the spaces between said rollers, respectively, being substantially in alignment with said first belt guide rollers and the spaces therebetween, means for shaping said web into tubular shape to form said outer bag and to envelop said inner bag, and means for dividing the resulting carrying bag from said web.

2. The apparatus of claim **1** in which said apparatus is suitable for handling pre-cut inner bag blanks of tubular material, said apparatus further comprising means for moving said individual rollers backwards during the Z-fold forming operation and subsequently moving said individual rollers forward before the leading end of the next inner bag is supplied to said second double-belt conveyor.

3. The apparatus of claim **1** and further comprising means for moving said individual rollers.

4. The apparatus of claim **1** and further comprising means for spring biasing said individual rollers in the forward direction.

5. The apparatus of claim **1** and further comprising a nozzle positioned between said first and second double-belt conveyors and above the conveying plane of said first double-belt conveyor for directing an airstream downward toward said tubular material as it passes between said first and second double-belt conveyors.

6. The apparatus of claim **1** and further comprising levers rotatably mounted laterally of said first double-belt conveyor, a weighting rod secured between the free ends of said levers and adapted to be rotated between a position above the conveying plane of said first double-belt conveyor and a position in which said rod applies weight to said tubular material, and means for rotating said levers so that said weighting rod moves away from said tubular material and above said conveying plane before said folding fingers are moved forward, said rod being capable of being held in said position above said conveying plane.

7. The apparatus of claim **6** and further comprising a frame supporting said first belt guide rollers, said frame being movable forward and backward with said first guide belt rollers and a cam drive for said weighting rod connected to said frame.

8. The apparatus of claim **6** in which said means for rotating said levers and moving said weighting rod is pneumatic.

9. The apparatus of claim **1** and further comprising a braking member positioned above said tubular material supported by said first double-belt conveyor and adapted to be brought into contact with said tubular material.

10. The apparatus of claim **9** in which said braking member is mounted to bearings on said individual rollers.

11. The apparatus of claim **10** and further comprising means for adjusting said braking members so that it remains positioned above said tubular material when said individual rollers are moved forward and backward.

12. The apparatus of claim **1** and further comprising stationary guide rods arranged adjacent to the conveying path between said first and second double-belt conveyors and above the conveying plane.

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