United States Patent

[11] 3,576,154

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[21] Appl. No. **790,579**
[22] Filed **Jan. 13, 1969**
[45] Patented **Apr. 27, 1971**

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[32] Priority **Jan. 13, 1968**
[33] **Germany**
[31] **P 16 11 710.5**

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[54] **PROCESS AND APPARATUS FOR MANUFACTURING BAGS COMPRISING A LINER BAG WHICH PROTRUDES FROM THE OPENING**
4 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **93/33,** 93/8, 93/36.01, 93/36.6, 93/77
[51] **Int. Cl.** **B31b 1/20,** B31b 1/62, B31b 7/02
[50] **Field of Search** ..... 93/8 (WA), 33 (dl), 36 (MM), 36.01, 36.6, 58 (.6), 77 (CL), 84 (TW)

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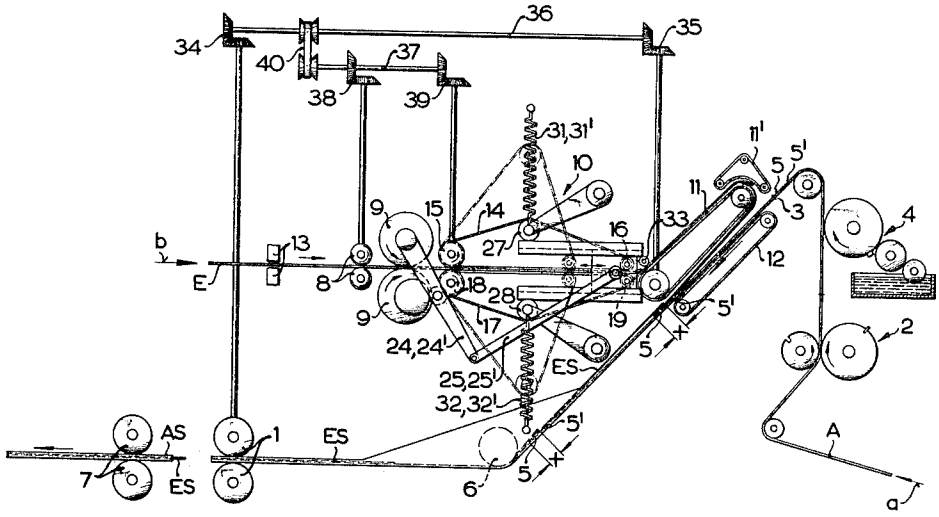
ABSTRACT: The bag comprises a single- or multiple-ply wrapper bag, preferably of paper, and a liner bag, preferably of plastics material sheeting, which protrudes from the wrapper bag at its filling end. The wrapper bag web consists in known manner of two or more transversely staggered plies and is divided into still connected, predetermined wrapper bag lengths by transverse perforation lines. Pieces corresponding to the length of the liner bags are cut from the liner bag web and are caused to overlap to the extent by which the liner bag is to protrude from the wrapper bag. The liner bag pieces are adhered at their leading end to the wrapper bag web while the overlap is retained so that the leading edges of the liner bag pieces are integral with the transverse perforation lines of the wrapper bag web, or are spaced a predetermined direction apart in the direction of travel behind said perforation lines. The wrapper bag web is subsequently formed into a tube which encloses the liner bag pieces adhered thereto. The wrapper bag web is torn along the transverse perforation lines into tube sections, which are fed to any desired, known end-closing machine.

Bags which comprise so-called liner bags are used for packaging delicate bulk materials, which are, e.g., hygroscopic or tend to dust off, or substances which are deleterious to health. The liner bags consist preferably of gas- or vaportight materials, particularly of plastics material sheeting, and in most cases have tightly adhered or heat-sealed seams to ensure a hermetic seal of the delicate contents from the atmosphere and contaminations. The wrapper bag which encloses the liner bag consists of strong paper. It protects the liner bag from damage and permits of making the liner bag from thin, inexpensive sheeting.

In many cases, the liner bag is longer than the wrapper bag and with its filling end protrudes from the wrapper bag. When the liner bag has been filled, it can be carefully sealed at said protruding end, e.g., by a heat-sealed seam. The sealed filling end is then pushed or rolled up into the wrapper bag, which is subsequently closed, e.g., by a stitched transverse seam or by folding its end portion.

In the previous practice, the wrapper and liner bags have been made separately and the liner bag has been inserted into the wrapper bag by hand with its closed end leading. This manual work is time consuming and must be performed by two workers where the bags are large in size.



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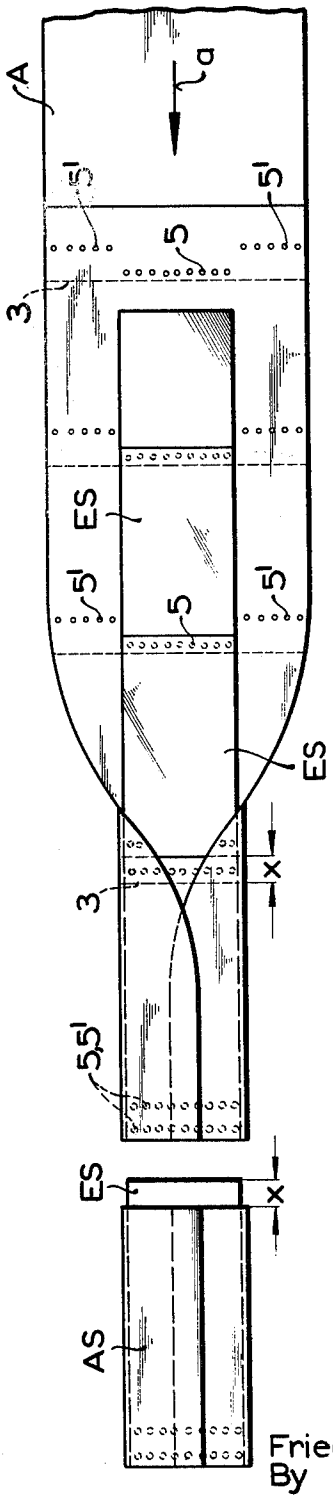
SHEET 1 OF 5

FIG.1



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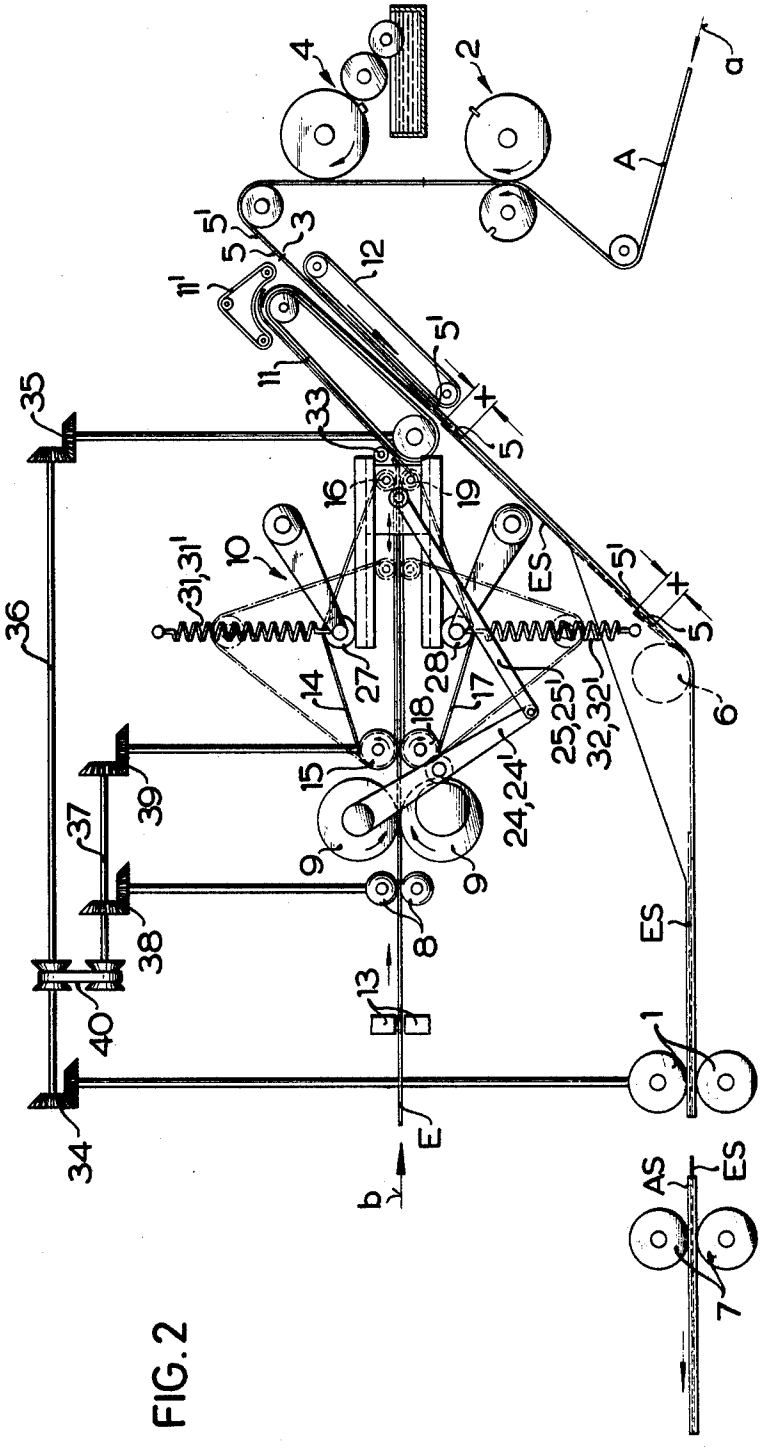

FIG. 2

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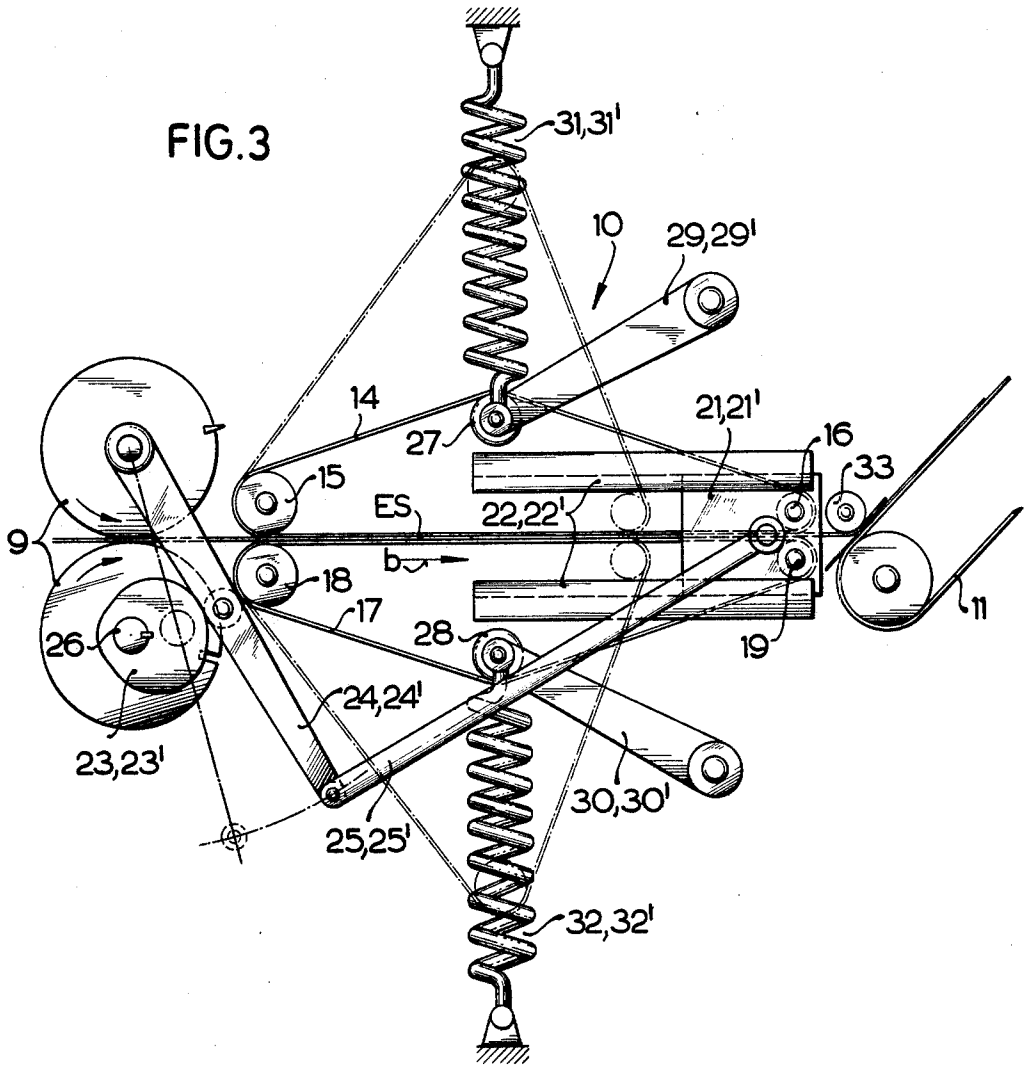
FIG.3



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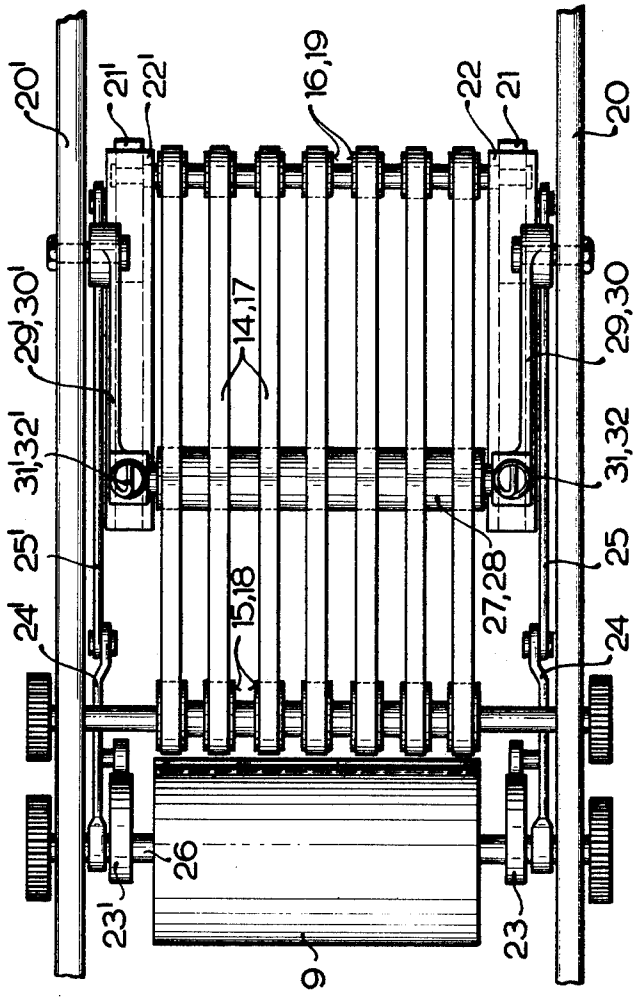

FIG. 4

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FIG.5

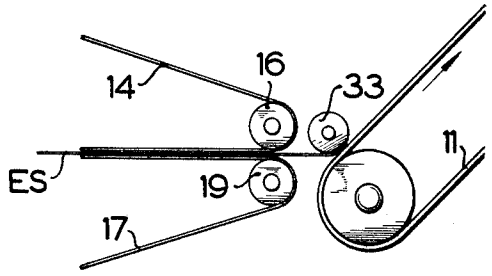


FIG.6

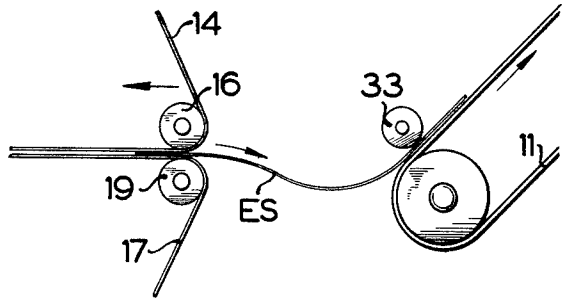


FIG.7

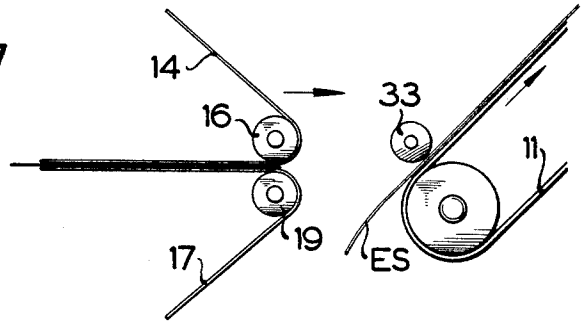
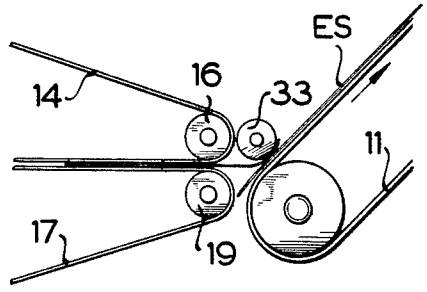


FIG.8



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PROCESS AND APPARATUS FOR MANUFACTURING BAGS COMPRISING A LINER BAG WHICH PROTRUDES FROM THE OPENING

It is an object of the invention to enable the manufacture of bags having a liner bag which protrudes from the opening in an automatic, continuous operation.

According to the invention, the wrapper bag web consisting in known manner of two or more transversely staggered piles, e.g., of paper, is divided into predetermined wrapper bag lengths by transverse perforation lines, the liner bag web consisting, e.g., of plastics material sheeting is cut into pieces corresponding to the length of the liner bag, and these pieces are caused to overlap in the direction of travel to the extent by which the liner bag is to protrude from the wrapper bag. While the overlap is retained, the liner bag pieces are now fed to the wrapper bag web and at their leading end are so tacked to the wrapper bag web with glue dots that their leading ends are aligned with the transverse perforation lines of the wrapper bag web or spaced a predetermined distance behind said perforation lines in the direction of travel. Thereafter, the wrapper bag web is formed into a tube, which encloses the adhesively tacked liner bag pieces, and is torn at the transverse perforation lines to form individual tube sections, which are fed to any desired and known end-closing machine.

When the transverse perforation line is being torn, the liner bag which is adhesively tacked in the wrapper bag tube participates in the movement of the latter and easily slips from the overlapping succeeding liner so as to protrude from the wrapper bag tube to the extent of the previous overlap.

The liner bag material consists according to the invention of a tubing, e.g., a plastics material sheeting, preferably in the form of a seamless extrusion. In a development of the invention, the tube sections of plastics material sheeting may be sealed at their leading edge by heat sealing before they are fed to the wrapper bag web. This method ensures that the liner bag will be perfectly tight.

The liner bag material may also be processed in the form of a single wide web of sheeting. In this case, the liner bag tube is formed in accordance with the invention at the same time as the wrapper bag tube. The longitudinal and transverse seams which are required in this case are formed by adhering or heat sealing during the formation of the tube.

Further according to the invention the wrapper bag tube may be closed at its leading end by a stitched transverse seam, which also closes the leading end of the liner bag tube. This practice eliminates the need for separate means for closing said tube end.

According to the invention, the apparatus for carrying out the process comprises known means for feeding single-ply tubing for the wrapper bags and known means for feeding and cross-cutting liner bag webs or tubings, the first-mentioned means having associated with them a known transverse perforator and a glue applicator for applying glue dots to the wrapper bag web, which perforator and glue applicator precede the tube-laying device in the direction of travel, and a known tear-off device succeeding said tube-laying device, whereas the last-mentioned means are succeeded by an apparatus for overlapping the pieces which have been cut from the liner bag web or tubing, and a conveyor which revolves at the speed of travel of the wrapper bag web and places the series of overlapping liner bag pieces on the wrapper bag web, the arrangement of the conveyor being such that the liner bag pieces are applied to the wrapper bag web between the transverse perforator and the glue applicator, on the one hand, and the tube-laying device, on the other hand.

The overlapping of the pieces which have been cut from the liner bag web may be effected with known apparatus, such as are used for shingling the bags which are delivered by bagmaking machines. These known apparatus are not suitable for highly flexible, thin sheetings and for this reason can be used only with limitations in the present process.

According to the invention, an apparatus which serves to overlap the pieces which have been cut from the liner bag web is capable of overlapping with high accuracy and reliability

even highly flexible, thin materials. This apparatus comprises a double belt conveyor, which is disposed between the guillotine and the conveyor for supplying the cutoff pieces to the wrapper bag web, and which comprises upper and lower conveyor belts, which revolve at a higher speed than the succeeding conveyor, said double belt conveyor comprising a pair of delivery belt pulleys for delivering the pieces to the succeeding conveyor, which belt pulleys are forwardly and rearwardly movable in the direction of travel in synchronism with the machine cycle and while the belt tension is maintained by tensioning rollers, which engage the two outer courses of the belts, whereby the preceding end of the pieces is threaded into the succeeding conveyor which moves at a lower speed, and the trailing end is prematurely released.

The free trailing end of the piece which is now moving at a lower speed descends by gravity out of the path of the piece which succeeds at a higher speed. The latter piece is moved by the advancing belt pulleys beyond the trailing end and is threaded into the succeeding conveyor before the trailing end has been received by the succeeding conveyor. The amount of the resulting overlap will depend on the difference between the speed of the double belt conveyor and of the succeeding conveyor.

To enable an adjustment of the overlapping apparatus to the various bag sizes included in the manufacturing program, it is a development of the invention to provide an infinitely variable transmission, which connects the drive means for feeding the wrapper bag web to the double belt conveyor and the pair of feed rolls for the liner bag web. For each size of bag, the infinitely variable transmission permits a simple and exact adjustment of the length of the liner bag and the overlap and the distance by which the liner bag protrudes from the wrapper bag.

According to the invention, the pair of belt pulleys at the delivery end of the double belt conveyor are mounted in lateral carriages, which are displaceable parallel to the plane of travel of said conveyor and which are reciprocated in synchronism with the machine cycle by pusher cams mounted on the cutter shaft of the guillotine.

The use of the described overlapping device is not restricted to the present process but may be used alone for shingling any other flat workpieces, e.g., in the formation of stacks of workpieces.

The invention will now be explained more fully with reference to the drawing, in which:

FIG. 1 is a diagrammatic top plan view illustrating the process steps.

FIG. 2 is a diagrammatic side elevation showing an apparatus for carrying out the process.

FIG. 3 is an enlarged side elevation showing the apparatus for overlapping the liner bags.

FIG. 4 is a top plan view showing the overlapping apparatus according to FIG. 3.

FIGS. 5 to 8 show four different phases of the overlapping operation.

The apparatus shown in FIG. 2 and serving to carry out the process comprises a known tube-laying device 6 for processing the wrapper bag web A. The device 6 comprises a pair of feed rolls 1, which are preceded by known glue applicators, which are not shown in the drawing and serve to apply glue for the adhered seams of the wrapper bag tube, and a known guillotine 9 having associated with it a pair of feed rolls 8 and serving to cut off pieces of liner bags web or tube pieces ES from the liner bag web E. According to the invention, the tube-laying device 6 is preceded in the direction of travel by a known transverse perforator 2 for producing transverse perforation lines 3 in the web A, and a glue applicator 4 for applying glue dots 5, 5' to said web, and succeeded by a known tearing device 7, which tears off individual wrapper bag tubes AS from the web A along the transverse perforation lines 3. The guillotine 9 is succeeded according to the invention by an apparatus 10, which will be described more fully hereinafter and serves to overlap the

liner bag web or tube pieces ES which have been cut from the web or tubing E, and a conveyor 11, 11', 33, preferably a belt conveyor, which comprises a back-pressure belt 12 and revolves at the speed of travel of the wrapper bag web A and supplies the latter with the cutoff web or tube pieces ES while preserving the overlap x which has been produced by the apparatus 10.

The wrapper bag web A consisting of one or more paper piles which have staggered longitudinal edges is withdrawn by the pair of feed rolls 1 at a uniform speed from one or more supply rolls, which are not shown on the drawing, and moves in the direction a initially through the perforator 2, in which it is provided with transverse through perforation lines 3, which are spaced by the length of the wrapper bag tubes. Thereafter, the web moves through the glue applicator 4, which applies glue dots 5 to the inside surface of the web at points which are spaced in the direction of travel a behind the transverse perforation lines 3.

The wrapper bag web A then moves through the tube-laying device 6, where it is formed into a tube, and finally the tear-off device 7, which tears the individual bag tubes AS from the web A along the transverse perforation lines 3.

In the embodiment shown by way of example, the liner bag web E consists of a seamless extruded tubing of plastics material. The web E is withdrawn by the pair of feed rolls 8 at a uniform speed by a supply roll, which is not shown on the drawing, and is cut into individual tube sections ES by the guillotine 9. The length of these tube sections is approximately the same as the length of the outer bag tubes AS plus the distance x (FIG. 1) by which the liner bag tube ES should protrude from the wrapper bag tube AS. The liner bag tubes ES are subsequently overlapped by the device 10 by said amount x and are delivered to the belt conveyor 11, which feeds it to the wrapper bag web A in synchronism therewith while the overlap x is maintained, and places the tubes ES on the inside surface of the web A between the glue applicator 4 and the tube-laying apparatus 6 and in such a manner that the leading ends of the tube sections lie on the glue dots 5. The pressure-applying belt 12 ensures that the tube sections ES will be tacked to the wrapper bag web A.

The overlapped tube sections ES then move together with the wrapper bag web A through the tube-laying device 6, which lays the wrapper bag web A about the liner bag tubes ES. The tear-off device finally tears the individual bag tubes AS along the transverse perforation lines 3 from the web A, which has been laid to form a tube. During this tear-off operation, the associated liner bag tube ES slips easily away from the overlapping succeeding tube and now protrudes by the overlap distance x from the wrapper bag tube AS, as is apparent from FIG. 1.

The interfitting tubes AS, ES are subsequently sealed in known manner at their leading end by a transverse seam or a folded end closure.

If a folded end closure, e.g., a folded crossed end closure, is to be formed, it will be desirable to use the glue applicator 4 to apply the glue dots 5 as well as further glue dots 5' to the side portions of the wrapper bag web A, which side portions are subsequently reversely folded in the tube-laying device 6 to the liner bag material. The liner bag tube ES is then tacked by the glue dots 5, 5' to the outer bag tube AS on all sides and will reliably open when the outer bag tube is subsequently pulled open at its bottom end in the succeeding end closure-forming device.

The interfitting tubes AS, ES may be jointly closed by transverse stitched seams at their preceding ends.

If the tightness of the liner bag is to meet high requirements, the same should be sealed in known manner at its leading end by a transverse heat-sealed seam before it is applied to the wrapper bag web. The heat sealing device 13 used for producing this transverse seam is of known type and as shown in FIG. 2 preferably precedes the guillotine 9.

According to FIGS. 3 and 4, the apparatus 10 for overlapping the liner bag tube pieces ES comprises a double belt conveyor having an upper conveyor belt 14, which revolves about the belt pulleys 15, 16, and a lower conveyor belt 17, which revolves about the belt pulleys 18, 19. The arrangement of the belt pulleys is such that adjacent courses of the belts 14, 17 contact each other in the plane in which the tubes ES are conveyed and these courses move in the direction of travel b of the tubes ES. The pair of belt pulleys 15, 18 at the receiving end are mounted in fixed position in the machine frame 20, 20'. The pair of belt pulleys 16, 19 at the delivery end are mounted in lateral slots 21, 21', which are displaceable in lateral guides 22, 22' which are parallel to the plane in which the tubes ES are conveyed. By the pusher cams 23, 23', the carriages 21, 21' are reciprocated with the aid of the roller-carrying follower levers and the pull rods 25, 25'. The pusher cams 23, 23' are carried by the cutter shaft 26 of the cross-cutter 9 so that the carriages 21, 21' are reciprocated in synchronism with the cycle of the apparatus. The two outer courses of the belt conveyors 14, 17 are engaged by tension rollers 27, 28, which are guided by the lateral links 29, 29' and 30, 30' and tensioned by the springs 31, 31' and 32, 32'. The tension rollers 27, 28 ensure that a uniform tension of the conveyor belts 14, 17 will be maintained when the pair of belt pulleys 16, 19 at the delivery end are reciprocated by the carriages 21, 21'.

The arrangement of the double belt conveyor 14, 17 is such that the pair of belt pulleys 16, 19 at the delivery end are disposed in its outermost, right-hand dead center position as close as possible to the delivery end of the belt conveyor 11 and a draw-in roll 33 associated with the conveyor 11.

As is apparent from FIG. 2, the pair of feed rolls 1 for advancing the wrapper bag web A and the belt conveyor 11 for feeding the liner bag webs ES to the latter are driven by means of the bevel gear trains 34, 35 from the driving shaft 36 of the apparatus, whereas the pair of feed rolls 8 for advancing the liner bag tubing E and the double belt conveyor 14, 17 for overlapping the liner bag tubes ES are driven from the countershaft 37 by means of the pairs of bevel gears 38, 39. The countershaft 37 is connected to the driving shaft 40 by the infinitely variable gear 40, which permits of an arbitrary change of the speed at which the liner bag tubes ES are conveyed relative to the wrapper bag web A.

It will be assumed that the liner bag should protrude from the wrapper bag by 10 percent of the length of the latter (see reference character x in FIG. 1). In accordance therewith, the length of the wrapper bag tube ES should exceed the length of the outer bag tube AS by 10 percent. For this reason, the liner bag web E is conveyed at a speed which is 10 percent higher than the speed at which the wrapper bag web A is conveyed. The latter speed is adjusted by means of the infinitely variable transmission 40. At the same time, this results in an overlap x of the liner bag tubes by 10 percent of the length of the outer bag tubes upon the transition to the speed of travel of the wrapper bag web A in the conveyors 11, 33.

The liner bag tubing E is fed by the pair of feed rolls 8 at the above mentioned, higher speed of travel and is cut by the guillotine 9 into tube sections ES, which are gripped by the double belt conveyor 14, 17 and fed at the higher speed of travel to the conveyor belt 11, which revolves at the lower speed of travel of the wrapper bag web A. At the time when the tube sections are transferred to the conveyor belt 11, the carriage 21, 21' and the pair of belt rollers 16, 19 are in its right-hand dead center position, which is shown in solid lines in FIG. 2. The leading end of the tube section ES emerges from the belt pulleys 16, 19 and by the latter is threaded into the conveyor 11, 33, as is shown in FIG. 5. The tube section ES is then moved by the conveyor 11, 33 at the lower speed of travel of the latter. During that time, the carriage 21, 21' carrying the pair of belt pulleys 16, 19 is moved to its left-hand dead center position so that space is afforded for the sagging (FIG. 6) of the tube section ES which is advanced at its leading end at the lower speed and at its trailing end at the higher speed, by the double belt conveyor 14, 17. Due to said sagging, the trailing end portion of the tube is lowered as soon

as it has emerged from the double belt conveyor 14, 17 (FIG. 7). The pair of belt pulleys 16, 19 are then quickly returned to its right-hand dead center position to thread the leading end of the succeeding tube section from the double belt conveyor 14, 17 into the succeeding conveyor so that said succeeding tube section overlaps that end of the tube section which has not yet been drawn in by the conveyor 11, 33 (FIG. 8). The distance of the resulting overlap will depend on the difference of the speeds of travel of the double belt conveyor 14, 17 and the conveyor 11, 33 and in the present case amounts to exactly 10 percent of the length of the wrapper bag tube.

I claim:

1. Apparatus for manufacturing bags comprising a single- or multi-ply wrapper bag, preferably of paper, and a liner bag, preferably of plastic material sheeting, which protrudes from the wrapper bag at its filling end comprising means for feeding a wrapper web for the wrapper bags, and means for feeding and cross-cutting a liner bag web, the first-mentioned means including a transverse perforator and a glue applicator for applying glue dots to the wrapper and a tube-laying device, which perforator and glue applicator precede the tube-laying device in the direction of travel, and a severing device succeeding said tube-laying device, the last-mentioned means being succeeded by an apparatus for overlapping the pieces which have been cut from the liner bag web, and a conveyor which revolves at the speed of travel of the wrapper web and places the series of overlapping liner pieces on the wrapper web, the arrangement of the conveyor being such that the liner bag pieces are applied to the wrapper web between the transverse perforator and the glue applicator, on the one hand, and the tube-laying device, on the other hand, the required longitudinal and transverse seams being formed by adhering or heat sealing during the formation of the bags.

2. Apparatus for overlapping web sections fed in succession, preferably the pieces which have been cut from a liner bag web in an apparatus according to claim 1, characterized by a double belt conveyor, which is disposed between the cross-cutting means and the conveyor for supplying the cutoff pieces to the wrapper bag web, and which comprises upper and lower conveyor belts, which revolve at a higher speed than the succeeding conveyor, said double belt conveyor comprising a pair of delivery belt pulleys for delivering the pieces to the succeeding conveyor, which belt pulleys are forwardly and rearwardly movable in the direction of travel in synchronism with the machine cycle and while the belt tension is maintained by tensioning rollers, which engage the two outer courses of the belts, whereby the preceding end of the pieces is threaded into the succeeding conveyor, which moves at a lower speed, and the trailing end is prematurely released.

3. Apparatus according to claim 2, characterized by an infinitely variable transmission, which connects the drive mans for feeding the wrapper bag web to the double belt conveyor and the pair of feed rolls for the liner bag web.

4. Apparatus according to claim 3, characterized in that the pair of belt pulleys at the delivery end of the double belt conveyor are mounted in lateral carriages, which are displaceable parallel to the plane of travel of said conveyor and which are reciprocated in synchronism with the machine cycle by pusher cams mounted on the cutter shaft of the cross-cutting means.