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Lee et al.

[11] **3,710,536**

[45] **Jan. 16, 1973**

[54] **METHOD OF AND AN APPARATUS FOR AUTOMATICALLY COMPRESSING AND BANDING A STACK OF ARTICLES**

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[52] **U.S. Cl.**.....**53/24,** 53/74, 53/124 A, 53/124 C, 53/124 CC

[51] **Int. Cl.**.....**B65b 13/20**

[58] **Field of Search.**53/74, 24, 124 A, 124 C, 124 D, 53/124 E, 124 R, 124 CC

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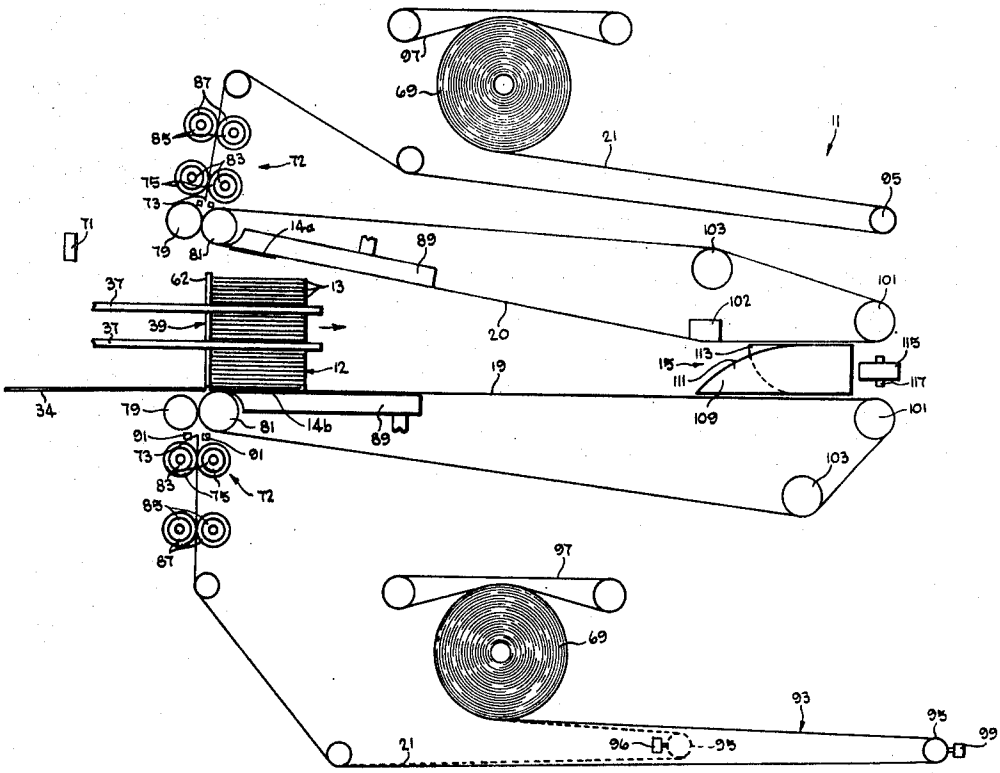
[57] **ABSTRACT**

A stack of articles is fed forwardly along a path and a pair of banding or wrapper sheets are brought into engagement with stack. The stack is compressed between oppositely directed forces and ends of the two wrapping sheets are overlapped and joined to form an endless band about the articles. When the compressing forces are relieved, the articles are held in a compressed and stacked state by the band. Preferably, the stacks are compressed between a pair of endless, continuously moving belts; and individual wrapper sheets are severed from long supply webs prior to being joined into an endless band about a compressed stack.

10 Claims, 7 Drawing Figures



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SHEET 1 OF 2

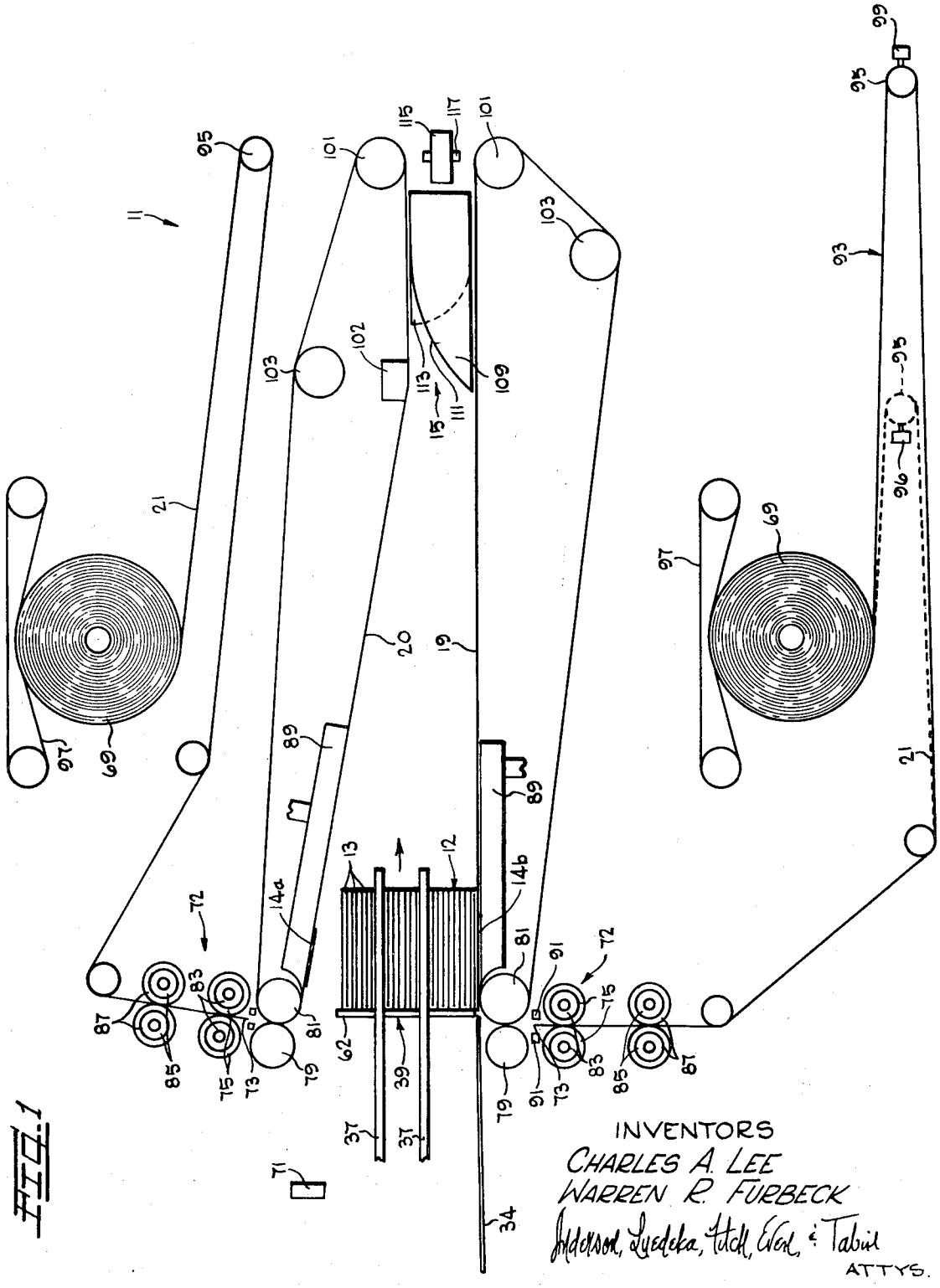

FIG. 1

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FIG. 2

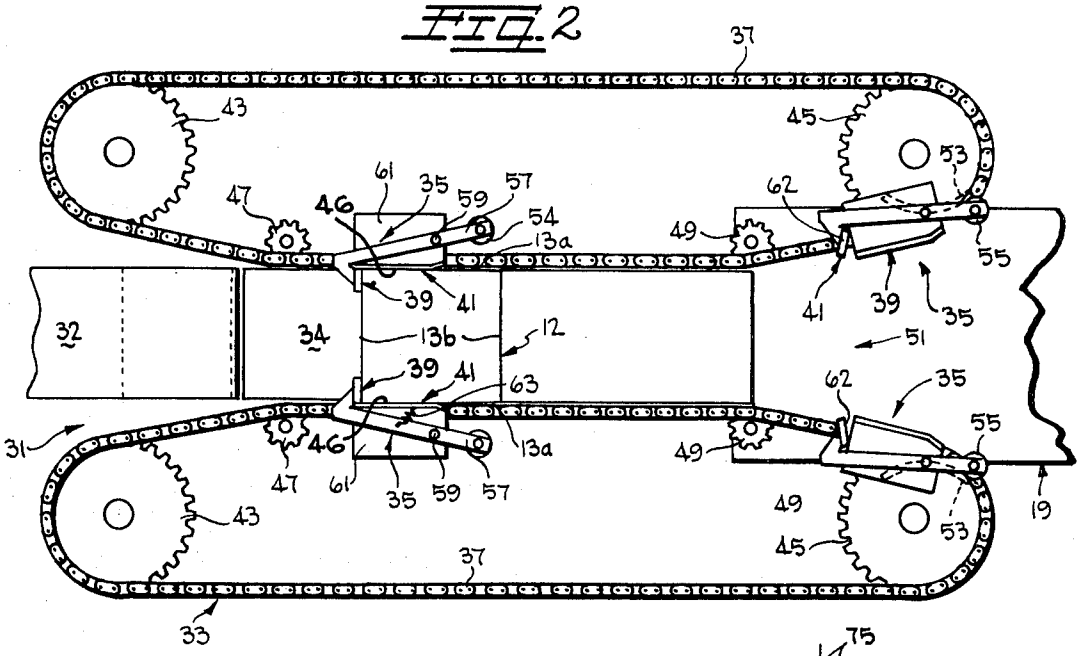


FIG. 6

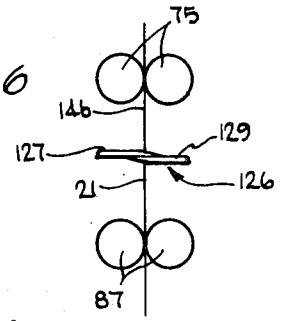


FIG. 3

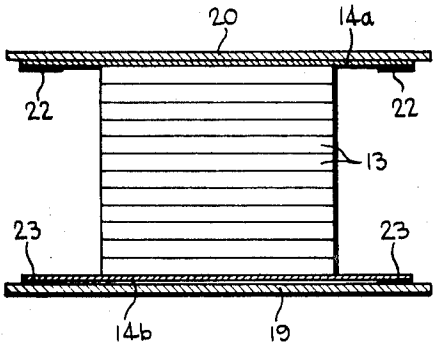


FIG. 4

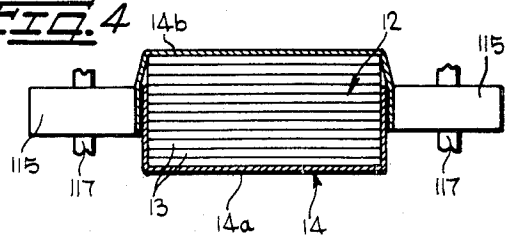


FIG. 7

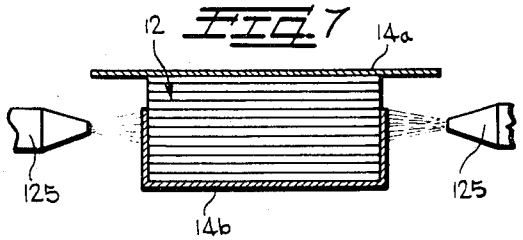
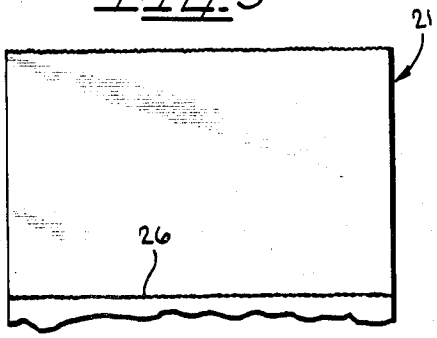


FIG. 5



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METHOD OF AND AN APPARATUS FOR AUTOMATICALLY COMPRESSING AND BANDING A STACK OF ARTICLES

This invention relates to a method of and an apparatus for automatically compressing and banding an article or stack of articles.

In U.S. Pat. No. 3,513,628, which is assigned to the assignee of this application, an apparatus is disclosed for compressing articles such as, for example, cellulosic pads, creped tissues, and disposable diapers as they move along a predetermined path between a pair of converging compressing belts. More particularly, the stack height is reduced about one half thereby decreasing the bulk of the articles to facilitate handling, storage, transportation and to provide a uniform size for packaging. This compressed stack is discharged into and between a pair of stationary holder jaws. A preformed band is manually telescoped on the jaws, and then manually the stack of compressed articles and encompassing band are removed simultaneously from the holder jaws whereby the articles are free to expand into direct contact with the encircling band which holds the articles compressed.

The manual operations of telescoping the band on the jaws and removing the articles and band from the jaws limit the speed of the banding operation and involve a labor cost. Thus, it is particularly advantageous to provide equipment for automatically compressing and banding such articles as diapers at higher rates of speed and more economically. Also, it is possible to reduce costs by substituting for the preformed band, a band which is formed automatically from a continuous web of material.

Accordingly, an object of the invention is to provide an automatic compressing and banding apparatus of the foregoing kind.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a diagrammatic illustration of an apparatus for practicing the method of the invention and embodying the novel features of the invention;

FIG. 2 is a plan view of an infeed conveying means for use with the apparatus of FIG. 1;

FIG. 3 is a diagrammatic cross-sectional view of a stack of articles with wrapper sheets thereon prior to compression of the stack;

FIG. 4 illustrates a compressed and banded stack of articles;

FIG. 5 is a diagrammatic illustration of a web from which wrapping sheets are separated;

FIG. 6 illustrates a knife means for severing a wrapper sheet from a web; and

FIG. 7 illustrates means for applying an adhesive to the wrapper sheets.

As shown in the drawings for purposes of illustration, the invention is embodied in an apparatus **11** for automatically compressing and banding a stack **12** of flat stacked articles **13** such as disposable diapers, cellulosic pads, creped tissues or the like as the stack is conveyed continuously or substantially continuously along a predetermined path at a relatively high rate of speed. The preferred method practiced by the apparatus **11** includes the following steps: feeding the stack **12** forwardly along a predetermined path as indicated by the directional arrow in FIG. **1**, feeding banding or wrapper sheets **14***a* and **14***b* to be joined into an endless band **14** (FIG. **4**) into position for engaging the stack, compressing the stack with oppositely acting forces and holding the stack compressed with wrapper sheets disposed thereon, over-lapping and joining ends of the wrapper sheets to form a continuous band about the compressed stack of articles **12**, and relieving the oppositely directed forces holding the articles in a compressed state whereby the articles are held in a compressed and banded state such as illustrated in FIG. **4**. Thus, a stack of articles such as shown in FIG. **3** may have its stack height reduced significantly and be quickly and automatically banded while continuously or substantially continuously moving through the apparatus **11**.

The appearance of the stack is improved if the individual articles are all neatly aligned when banded. However, when articles such as disposable diapers are received from a previous operation, the individual articles within the stack may have longitudinally extending sides **13***a* or transverse or end sides **13***b* misaligned or slightly staggered. As will be explained in greater detail, the articles are aligned while the stack is being fed into position between a pair of endless compression belts **19** and **20**.

Also, to reduce the cost of the band, it is preferred that each wrapper sheet **14***a* and **14***b* be severed from a continuous web **21** of banding material. The wrapper sheets **14***a* and **14***b* have adhesive or cohesive adhering areas **22** and **23** (as best seen in FIG. **3**) which are overlapped and pressed into adhering engagement with each other. The adhering areas may be either cohesive strips located on the webs **21**; or, as described in a second embodiment of the invention, the wrapper sheets have an adhesive applied to the ends thereof as another operation of the compressing and banding process. Also, as will be explained the wrapper sheets **14***a* and **14***b* may be severed from a continuous web by means of a pull thereon to separate the sheet from the web at a line of perforations **26**, a score line, or another kind of pre-weakened area; or alternatively a knife means may be provided to cut wrapper sheets from the webs. The feeding of the wrapper sheets is made in timed relationship to the stack movement to assure registry therewith; and, to this end, it is preferred that the wrapper sheets be conveyed by the compressing belts and adhered thereto by a pressure differential as the wrapper sheets are brought into engagement with opposite sides of the stack.

Referring now in greater detail to individual elements of illustrated apparatus **11**, a continuous stream of separated stacks **12** of diapers issue from a diaper making machine (not shown) and are brought into position at an inlet opening or mouth **31**, as best seen in FIG. **2**, of an infeed conveyor means **33** which is driven in timed relationship to the diaper making machine either by having a drive directly attached to the diaper making machine or by having a separated drive adjusted to have its speed coordinated with the speed of diaper stacks moving from a conveyor belt **32** into the inlet mouth **31** of the conveying means **33**. The inlet conveying means **33** serves not only to convey the diaper stacks to the compression belts **19** and **20** but

also is preferably formed so as to align the longitudinally extending sides 13*a* and transverse ends 13*b* of the individual articles into vertical planes to provide neat stacks.

More specifically, the illustrated infeed conveying means 33 comprises a horizontal, stationary dead plate 34, pusher means 35 and a pair of endless bands in the form of chains 37 disposed on opposite sides of the path of travel of an article stack 12 along the dead plate 34 and further comprises rear pushers 39 for pushing engagement with the rearward ends 13*b* of the articles and side pushers 41 for pushing engagement with the longitudinally extending sides 13*a* of the articles in the stack 12. The endless chains 37 are guided for movement between an idler sprocket 43 at the inlet end 31 of the conveying means and a drive sprocket 45 at a discharge end 51 of the infeed conveyor means. The chains 37 are guided along their respective forward runs to form a converging inlet mouth at the inlet sprockets 43 and a diverging discharge mouth at the drive sprockets 45. Intermediate the sprockets 43 and 45, the chains 37 are guided along a straight line horizontal path between an upstream and a downstream, smaller idler sprocket 47 and 49.

The side pushers 41 have a vertically extending wall 46 which extends the height of the stack 12 to abut each adjacent side of the articles in the stack. As an aligned pair of side pushers move about the inlet sprockets 43, they are carried along converging paths to abut first any sides of articles projecting outwardly. During the intermediate straight line movement the side pushers 41 have forced the articles into aligned positions with their longitudinally extending sides 13*a* aligned in parallel, vertical planes with the respective vertical walls 46 of the side pushers.

The preferred pusher means 35 are shifted from an operative pushing position to an inoperative release position to deposit each stack 12 on the lower compression belt 19 for continued movement. To this end, stationary, arcuately shaped cams 53 are provided at the discharge end of the conveying means 33 to engage a cam follower roller 55 on each of the rear pushers 39 which comprises a pair of vertically spaced, pivotally mounted lever arms 57 pivoted on a vertical pivot pin 59 attached to a bracket 61 fixed to the chain. The lever arms 57 are urged by contractile springs 63 into an operative position to project into the space between the inner runs of the chains 37 to abut the trailing rearward ends 13*b* of the articles. In this instance, the contractile springs 63 have one end fixed to the lever arm and an opposite end fixed to an inner vertical side wall of the bracket 61 fixed to a chain 37. Each end pusher 39 is provided with a vertically extending bar 62 which is joined to the upper and lower lever arms and has a flat vertical forward face to abut and push each article and thereby slide the stack 12 forwardly on the underlying dead plate 34. Recapitulating, the rear pusher lever arms are normally biased by springs 63 into position to abut a stack 12 until a cam follower 55 thereon engages the cam 53 and pivots the lever arms outwardly from the stack, as shown at the discharge end of the conveying means 33 whereby a neat stack 12 is shifted from the dead plate 34 to the continuously moving lower compression belt 19.

The upper and lower wrapper sheets 14*a* and 14*b* are detached from upper and lower continuous webs 21 which are stripped from large supply rolls 69. To sever the individual wrapper sheets 14*a* and 14*b* and to time their movement to be precisely positioned relative to the incoming stack 12, a sensing means 71 in the form of a sonic detector having a sonic beam emitted by transmitter and received by a receiver is positioned to detect arrival of a stack 12 at a predetermined position such as when the stack is passing the sprockets 49 of the infeed conveyor means. Alternatively, an electric eye system or feeler switch may be used for the sensing means 71. A signal generated upon the sensing of the stack 12 is used to operate a selectively operable means 72 to detach the wrapper sheets from their continuous webs 21. As the wrapper sheets 14*a* and 14*b* are detached and fed in identical manners, a description of one will suffice for a description of the other; and common reference characters have been applied to similar elements.

Prior to sensing an incoming stack 12, a leading edge 73 of the lower continuous web 21 is stationary and is projecting upwardly from the nip of a pair of first or early feed rolls 75 for movement to a feed nip established between feed roll 79 and a forward idler roll 81 for the lower compression belt 19. The detection of the stack 12 by the sensing means 71 is used to energize electro, brake-clutch units 83 for each of the early feed rolls 75 to begin to turn these rolls to feed the web 21. Similar electro, brake-clutch units 85 are also provided for a second or delayed set of second feed rolls 87 to cause them to also rotate to feed a lower portion of the web. As will be explained, the early and delayed sets of feed rolls feed the web at the same speed but are started and stopped at different times.

A line of perforations in the web 21 is disposed intermediate the early feed rolls 75 and delayed feed rolls 87 and the web is slack between these sets of feed rolls as the delayed set of feed rolls were operated for a short period of time after the first set of feed rolls were stopped. That is, the web accumulated between the sets of feed rolls is slightly longer than the spacing between their respective nips. Therefore, when the early set of feed rolls is first operated while the other delayed set of feed rolls are stationary, the slack is rapidly taken up and the web is jerked with sufficient tensile force to separate the wrapper sheet at the line of perforations between these sets of feed rolls.

The now discrete bottom wrapper sheet 14*b* is fed forward by the early feed rolls 75 and away from the stationary, new leading edge of the web 21 which is awaiting to be fed by the delayed set of feed rolls 87. The detached wrapper sheet 14*b* is fed by the early feed rolls 75 into the nip between the idler roller 79 and the compression belt roller 81, at which position, suction from a vacuum box 89 disposed beneath the forward end of the compression belt 19 becomes effective to adhere the leading end of the bottom wrapper sheet 14*b* to the bottom compression belt 19 to cause the same to follow the curvature of the mesh belt about the roller 81 and to engage the incoming stack 12 which is now superimposed thereon. Thus, the timing of wrapper sheet separation and speed of the feed of the wrapper sheet is so correlated to the stack movement

from the sensing means **71** to a position over the compression belt **81** that the stack **12** is laid on the lower wrapper sheet **14***b* while the upper wrapper sheet **14***a* is directly overhead but spaced from the top of the stack **12**. In this instance, the wrapper sheets **14***a* and **14***b* have a length less than that of the longitudinal length of the articles in the stack **12** and are preferably centered on the stack.

After separation of a sheet **14***b*, the new leading edge **73** of the web **21** is fed upwardly by the delayed set of feed rolls **87** into the nip between the early feed rolls **75**. At this time the leading edge of the web is spaced from the trailing edge of the detached wrapper sheet **14***b* by a gap; and as the leading end **73** moves upward from the nip of the early feed rolls **75**, it is sensed by a sensing means **91** in the form of an electric eye system which then causes an electrical circuit to switch the electric brake-clutch units **83** for the set of early feed rolls **75** to a braking position to halt further feed of the web **21** thereby. Alternatively, a sonic sensor system may be used for the sensing means **91**. A short period of time later, as determined by a timer or timing circuit in the electrical circuit, the electrical brake-clutch units **85** for the delayed feed rolls are actuated to a braking position to halt further feeding of the now slack web between these sets of feed rolls. When the delayed feed rolls stop, the perforated line for severing the next wrapper sheet will then be positioned in a slack, slightly buckled portion of the web and positioned between the early feed rolls **75** and delayed feed rolls **87**.

Preferably, a length of the web **21** is temporarily stored for furnishing and feeding forwardly a number of wrapper sheets **14***b* before having to turn the large diameter supply roll **69** to unwind additional web therefrom. In this instance, a temporary loop **93** is formed by a movable dancer roll **95** which is adapted to move between a first or full loop position, such as is shown in solid lines in FIG. **1**, and a minimum loop position such as is shown in dotted lines in FIG. **1**. As the web **67** is fed forwardly by the slower feed rolls **87**, the dancer roll **95** is pulled by the web, to the left as viewed in FIG. **1**, against a spring force which maintains a predetermined tension on the web **21**. After a number of wrapper sheets **14***b* have been detached, the dancer roll **95** will have been moved to the minimum loop limit position shown in dotted lines in FIG. **1** at which the dancer roll **95** operates a limit switch **96** to energize a motor drive means for turning the supply roller **69**. In this instance, the motor drive includes an endless belt **97** which is driven to unwind additional web from a supply roll **69** at a constant speed; and as the web unwinds a spring force pushes the dancer roller **95** to the right to expand the size of the loop until the dancer roll reaches the other limit position at which a limit switch **99** is operated to stop the belt drive **97** to prevent further unwinding of web material from the supply roll **69**. Alternatively, a timer may be used to cause the drive of the unwinding belt **97** to be maintained for a predetermined period of time in which to make the loop. Thus, it is not necessary to start and stop the turning of the supply roll **69** for each time that the wrapper sheet is detached. This is preferred inasmuch as the supply roll has considerable inertia and would have to be started and stopped many times each minute for high volume production runs.

The vacuum boxes **89** extend partially about the compression belt rollers **81** and the latter have a central grooved portion to receive the arcuate portion of the vacuum box **81** to permit a pressure differential to be established across leading edges of the wrapper sheets so that they are adhered to the meshed compression belts to travel therewith without slipping or sliding thereon. Thus, the wrapper sheets **14***a* and **14***b* are maintained in registry with each incoming stack **12** of articles. The vacuum boxes **89** extend along the compression belts for a sufficient distance to assure that a stack **12** of only minimal height will be undergoing compression before the wrapper sheets are released from the pressure differential with the compressed articles holding the wrapper sheets against the upper and lower compression belts **19** and **21**.

The lower compression belt **19** is a meshed belt which moves along a substantially horizontal run across a supporting dead plate (not shown) to its discharge end at which is a rearward drive roller **101**. From its drive roller **101** the compression belt travels downwardly and rearwardly to an idler roller **103** and then rearwardly to the forward idler roller **81**. The upper compression belt **20** travels downwardly and forwardly along an inclined path from its forward idler roller **81** with the upper wrapper sheet **14***a* being held thereon and spaced above the top article of the stack **12** until the stack moves inwardly of its roller **81**. The upper compression belt **20** is also driven by a drive roller **101** and has an idler roller **103** in its return run to the forward roller **81**. The upper compression belt **20** is also backed by a stationary dead plate (not shown) along its forward run and the stack height is gradually and continually reduced until a minimum stack height is obtained at a fixed guide **102** which holds the upper compression belt for travel along a straight line path of movement to its driving roller **101** and through the banding station.

The speeds of the compression belts **19** and **20** are correlated so that there is no slipping or differential movement between the upper and lower articles in the stack during compression. Thus, the compression belts apply oppositely directed forces to the top and bottom of the stack to reduce the stack height while carrying the same forwardly.

At the folding station **15**, lower folders in the form of curved plates **109** engage the outwardly extending ends of the lower wrapping sheet **14***b* and cam the same upwardly along cam surface **111** to generally vertical positions along the longitudinally extending sides **13***a* of the stacked articles with cohesive areas **23** thereon facing outwardly and positioned at about the center of the stack height. As illustrated in FIG. **3**, the compression belts **19** and **21** are wider than the wrapper sheets and the wrapper sheets are wider than articles. The width of the wrapper sheets is preferably equal and sufficient to provide over-lapped adhered ends when the band **14** is formed therefrom as seen in FIG. **4**. The width of the upper and lower sheets may be different if desired. Shortly after the folding of the lower wrapping sheet, ends of the upper wrapping sheet **14***a* are folded inwardly and downwardly by an upper folder **113** in the form of a curved plate which cams the edges of the upper wrapper sheet downwardly to position its cohesive areas **22** outwardly of but aligned with the cohesive areas **23** on the lower wrapper sheet.

To assure a good tight adhesion against separation of the adhered ends of the wrapper sheets **14***a* and **14***b*, cohesive areas **22** and **23** are pressed tightly against each other by a pair of rotatable sealing rollers **115** journaled to turn about vertically extending shafts **117**. The compression rollers **115** are idlers, i.e., not driven in this instance, and are spaced to have the rolling peripheral surface thereon at a distance to force the over-lapped ends tightly against the vertically and longitudinally extending sides of the stack **12**. As the compressed and banded articles discharge from the compression belts **19** and **20** at the discharge roller **101**, the articles are held in banded and compressed state by the now endless band thereabout formed by the joined wrapper sheets **14***a* and **14***b*. The stack height may expand slightly from that height it has at discharge.

In accordance with a further embodiment of the invention, the cost of the endless band may be further reduced by elimination of the printed cohesive areas **22** and **23** on the web **21** and by the substitution of means **125**, FIG. **7**, for applying an adhesive onto the ends of at least one wrapper sheet immediately prior to the pressing of the overlapped ends of the wrapper sheets together to be bound by the applied adhesive which may be a glue or hot resinous plastic. In this embodiment of the invention, the web **21** for the wrapper sheet may be a web of paper material or a plastic film without any adhesive or cohesive material previously printed thereon.

As a further alternative to having perforations or other weakened areas in the web **21**, the latter may be a continuous, uninterrupted web, i.e., without such perforations or weakened areas and a knife means **126** may be used to sever the web at the location at which the perforations were located between the sets of feed rolls **75** and **87**. The illustrated knife means **126** has a first blade **127** for cooperation with a second blade **129** to sever a wrapper sheet from the web **21**. By eliminating both the printed cohesive areas and the perforations in sheet, the cost of the wrapping material may be used.

As an aid to understanding the invention, a brief review of the operation of the illustrated apparatus will be given. A stack of articles such as disposable diapers are moved continuously forward from a diaper machine by an infeed conveyor means **33** which has a pair of pusher means **35** movable to abut rear pushers **39** against the vertical ends **13***b* of the stacked diapers while simultaneously the side pushers **41** engage the longitudinally extending sides **13***a* of the articles and force the sides and ends of the articles into respective vertical planes thereby forming a neatly aligned stack.

The stack is pushed along the dead plate of the infeed conveyor means **33** by the pusher means **35** and is discharged therefrom onto the lower compressing belt **19**. As the stack is discharging from the infeed conveyor means **33**, a sensing means **71** senses the position of the stack and operates electro brake-clutch units **83** to operate the upper and lower sets of early feed rolls **75** which take up the slack in the web and exert sufficient tension forces on the webs **21** to separate wrapper sheets **14***a* and **14***b* from the respective webs **21**. The early feed rolls **75** feed the wrapper sheets forwardly to the forward rollers **81** for the respective upper and lower compression belts **19** and **21** to which they are adhered by suction pressure differentials imparted by the vacuum boxes **89**. When the trailing ends of the separated wrapper sheets are separated from the new leading ends of the webs projecting from the delayed feed rolls **87**, the latter are turned with energization of their electro brake-clutch units **85** to feed the new leading web end into and through the nip of the early feed rolls **75** to be sensed by the sensing means **91** which then actuates the brake-clutch units **83** to the braking position. After a short time delay, the brake-clutch units **85** are actuated to stop rotation of the delayed set of feed rolls **87** with slack now present in the web between the sets of feed rolls and with a line of perforations now positioned between these sets of feed rolls.

The separated wrapper sheets **14***a* and **14***b* are aligned with the stack **12** and move with the compression belts **19** and **21** forwardly while the upper wrapping sheet **14***b* is moved downwardly and forwardly into engagement with the top of the stack whereupon the stack will be compressed as it is carried forwardly between the compression belts **19** and **21**. As the stack is moving forwardly, the webs **21** are feeding forwardly be means of the slower feed rolls **87** until a sensing means senses the leading edge **73** of each web **21** and stops further feeding movement by deenergizing the clutches for the feed rolls **87**.

As the stack **12** moves into the folding station **15**, it is now completely compressed, e.g., to about one-half its original uncompressed height. At the folding station the wrapper ends are folded into the overlapped relationship and the adhesive or cohesive areas are brought into engagement by means such as the sealing rollers **115**. Thus, the compressed and banded stack is discharged from the apparatus **11**.

The various drives for the compression belts **19** and **21**, the infeed conveyor **33**, and the sets of feed rolls **75** and **87** are preferably of the variable speed kind to enable small and delicate adjustments of speeds, e.g., adjustment of the compression belts relative to one another and to the infeed conveyor means **33**, to prevent wrinkling or misalignment of the wrapper sheets **14***a* and **14***b*. Also, it is preferred to have adjustable time delays in the electrical circuits used to operate the electro brake-clutches for the sets of feed rolls **75** and **87** so that the time period from the sensing of the stack by the sensing means **71** and the stack arrival to the juxtapose sheets may be synchronized. Also, the time period between the operation of the feed rolls **75** and feed rolls **87** is adjustable to control the slack and the size of the gap formed between the trailing end of a wrapper sheet and the newly formed leading end **73** for the web **21**.

From the foregoing it will be seen that stacks of articles may be automatically banded and compressed without the use of preformed endless bands or the manual labor used heretofore with the compressing and banding operation disclosed in U.S. Pat. No. 3,513,628. The speed of banding may be increased significantly from that of a manual operation and the cost per band itself may be reduced by the use of a continuous web of banding material in the formation of the band during the compressing process. The movement of the stack and of the wrapper sheets is closely controlled and timed so that the wrapper sheets are centered on the compressed stack and their fastened ends neatly aligned and adhered to each other to form a continuous neat appearing band and package stack.

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the invention by such disclosure but, rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A method of compressing and banding a stack of compressible articles comprising the steps of feeding the stack of articles forwardly along a given path, conveying wrapper sheets on upper and lower compression belts while applying a pressure differential across at least the upper compression belt to hold a wrapper sheet thereon for movement into engagement with the top of a stack, moving the wrapper sheets into engagement with the stack, compressing the stack with oppositely acting forces and holding the stack compressed with wrapper sheets disposed thereon, folding portions of the wrapper sheets into an overlapped relationship and joining the overlapped ends by adhering the ends together to form an endless band and releasing the oppositely directed forces whereby the band holds the articles in a compressed state in a banded stack.

2. A method of banding and compressing a vertical stack of articles with an endless band comprising the steps of: continuously feeding a stack of compressible articles forwardly along a given path, sensing the position of the stack as it moves into a compressing and banding station, separating wrapper sheets from at least one continuous web of wrapper material, positioning a lower wrapper sheet beneath the stack and an upper wrapper sheet on top of the stack, compressing the stack of articles to reduce the height of the stack, folding the ends of the lower wrapper sheet upwardly to and about the sides of the stack and folding the ends of the upper sheet downwardly, overlapping and bonding the ends of the wrapper sheets and applying pressure to cause the wrapper ends to adhere to each other to form the band, and releasing compressing forces whereby the articles are held in a compressed state in the stack.

3. An apparatus for compressing and banding a stack of compressible articles comprising, means for conveying a stack of articles forwardly along a given path, means for moving wrapper sheets into engagement with the stack, means for compressing the stack with the wrapper sheets thereon and for moving the stack, means for bringing the ends of the wrapper sheets together for causing the same to be joined and thereby to hold the articles in a compressed state, said means for compressing the stack comprising a pair of endless, air permeable belts which compress the stack therebetween while moving the same forwardly along said path whereby a pressure differential established across at least one of said air permeable belts holds an associated wrapper sheet against movement relative thereto while moving the same into engagement with said stack of articles.

4. An apparatus for compressing and banding a stack of compressible articles comprising, means for conveying a stack of articles forwardly along a given path, means for moving wrapper sheets into engagement with the stack, means for compressing the stack with the wrapper sheets thereon and for moving the stack, means for bringing the ends of the wrapper sheets together for causing the same to be joined and thereby to hold the articles in a compressed state, means for supporting and unwinding a web of wrapper material from a supply roll, means for severing individual wrapper sheets from said web of wrapper material for application to said stack in timed relationship to the movement of said stack along said path, said means for severing wrapper sheets from said web including first and second sets of feed rolls spaced longitudinally along said web for feeding said wrapper sheet and said web, said web having weakened areas therein for separating upon the application of said tensile forces to said web when said web is in the nip of both said first and second sets of feed rolls, means for sensing an incoming stack for compression, means operable by said sensing means to cause said first and second sets of feed rolls to feed said web and to sever a wrapper sheet from said web, and means for sensing movement of said web and for positioning another weakened area between said first and second sets of feed rolls for separation with the next feeding operation of the sets of feed rolls.

5. An apparatus in accordance with claim 4 including selectively operable means for unwinding said web from said supply roll and tensioned control means associated with said web to operate said selectively operable means to unwind said web from said supply roll.

6. An apparatus in accordance with claim 5 in which said tensioned control means includes a dancer roll movable between a first limit position to cause said selectively operable means to unwind further web and another limit position at which the unwinding of said web is terminated.

7. An apparatus for compressing and banding a stack of compressible articles comprising, means for conveying a stack of articles forwardly along a given path, means for moving wrapper sheets into engagement with the stack, means for compressing the stack with the wrapper sheets thereon and for moving the stack, means for bringing the ends of the wrapper sheets together for causing the same to be joined and thereby to hold the articles in a compressed state, and aligning means for aligning sides of said articles in said stack prior to compression thereof, said aligning means including end pushers for pushing against rearward sides of said articles and side pushers for pushing against the longitudinally extending sides of said articles.

8. An apparatus in accordance with claim 7 including a pair of endless bands positioned along opposite sides of said path of travel for said stack, said endless bands carrying said end pushers and said side pushers into engagement with said stack for moving the stack along said path of travel.

9. An apparatus for compressing and banding a vertical stack of disposable diapers, said apparatus comprising an infeed conveying and article aligning means having a pair of endless belts between which the stack of diapers are moved along a predetermined substantially horizontal path of movement, pushers carried by said endless bands for movement into engagement with the stack to push the same into alignment while being conveyed along said path, means for sensing the movement of said stack into position for receiving wrapper sheets, a means operable by said sensing means to separate an upper and lower wrapper sheet from continuous web of wrapper material, an upper and lower continuous air permeable compression belt for compressing the stack

while conveying the same forwardly along said path, means for providing a pressure differential across a portion of said compression belts to cause the respective wrapper sheets to adhere thereto and to travel in timed relationship to the travel of said stack, said compression belts holding said wrapper sheets in engagement with said upper and lower disposable diapers in said stack while compressing the same to the maximum extent, means for folding ends of the upper and lower wrapper sheets into overlapped positions, and means for pressing the overlapped ends to cause adhesive materials to bond together the ends of the upper and lower wrapper sheets, said endless compression belts discharging said compressed and banded diapers.

10. An apparatus in accordance with claim **9** in which said means for separating said sheets comprises first and second sets of spaced feed rolls with said first set of feed rolls operable to apply a tension force to said web held by said second set of feed rolls thereby separating the web at a predetermined weakened area between said sets of feed rolls.

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