

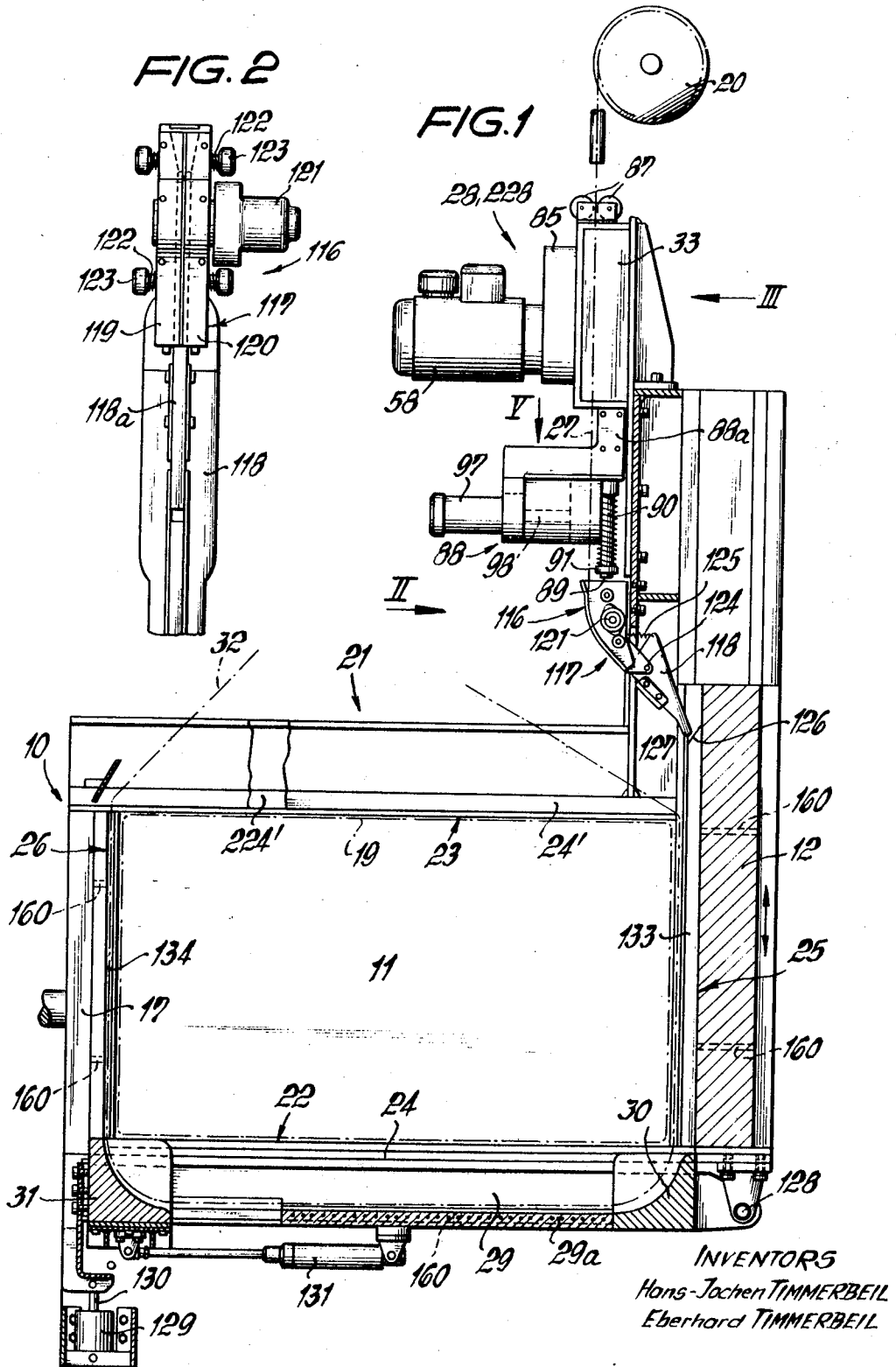
June 2, 1970

HANS-JOCHEN TIMMERBEIL ET AL
METHOD FOR APPLYING STRAPS TO PACKAGES OF
COMPRESSED MATERIAL

3,515,055

Filed April 8, 1968

4 Sheets-Sheet 1



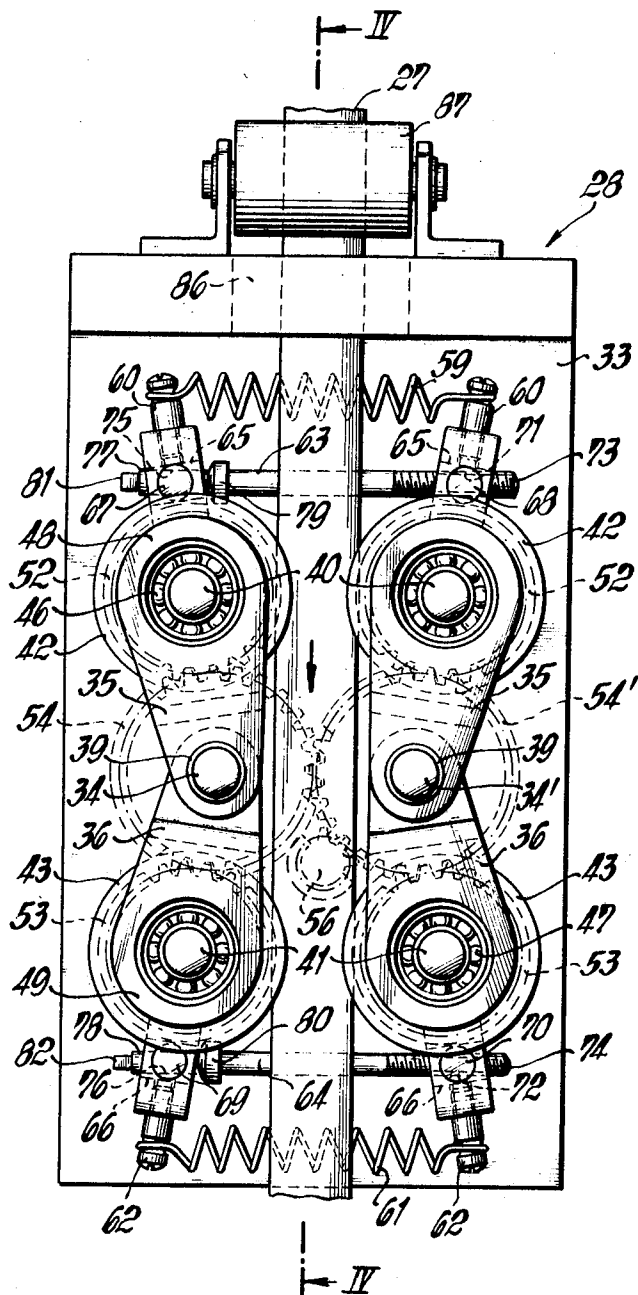
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FIG. 3



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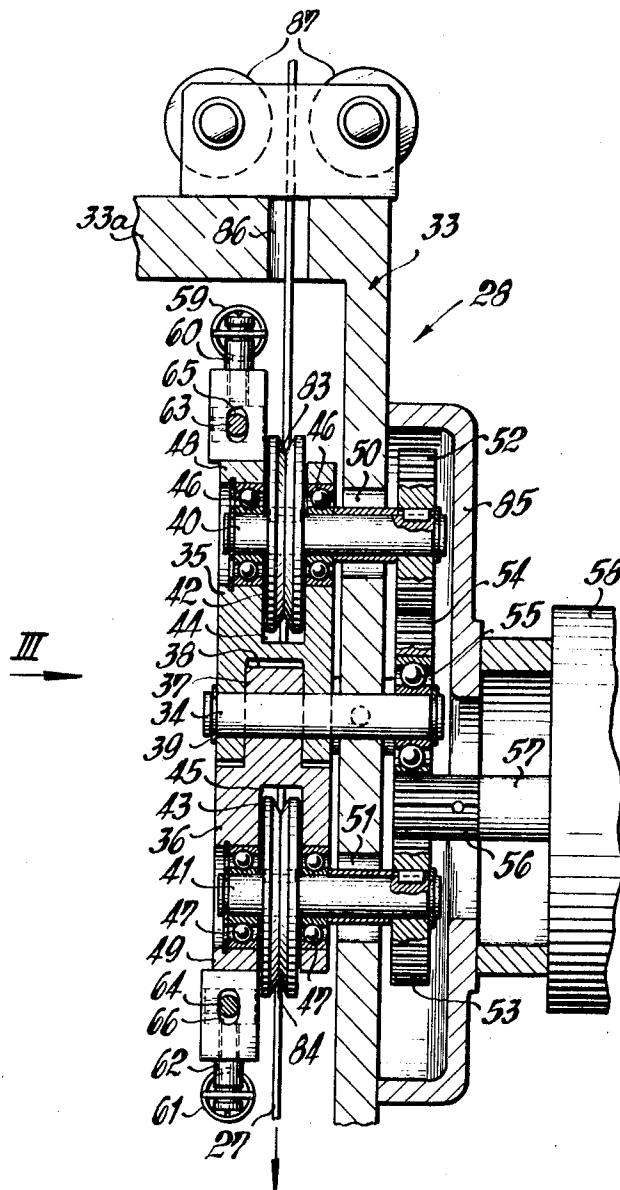
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FIG. 4



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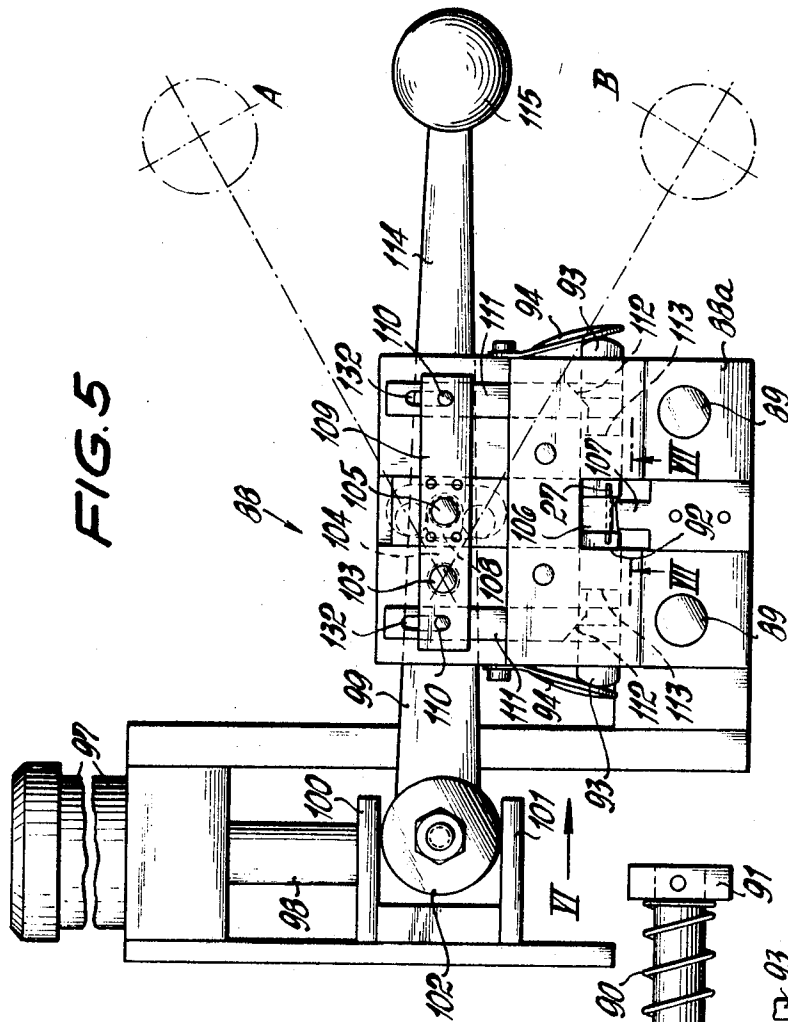


FIG. 5

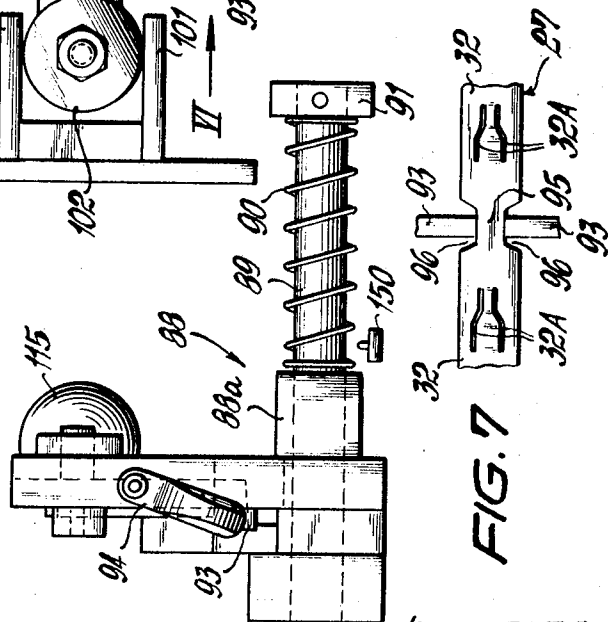
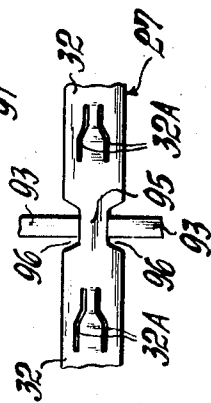


FIG. 6



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METHOD FOR APPLYING STRAPS TO PACKAGES OF COMPRESSED MATERIAL

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T 33,621

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5 Claims

ABSTRACT OF THE DISCLOSURE

Bales are compressed in the chamber of a baler and are provided with straps prior to expulsion from the chamber. A continuous web of band material is fed lengthwise by the feed of a strapping machine so that the leading portion of the web advances through a set of grooves provided in the walls of the chamber. The leading portion is then severed from the web by a cutoff which is operated intermittently in response to detection of information encoded on the web. The ends of the severed leading portion are joined to each other to form a hoop of predetermined length which determines the extent to which the package can expand upon expulsion from the chamber.

BACKGROUND OF THE INVENTION

The present invention relates to a method for applying straps around bales and other packages of compressible material.

In accordance with the prevailing practice in strapping of bales or like packages of compressible material, the package is compressed and the leading portion of a metallic band or web is applied around the thus compressed package. The leading portion is then severed from the band to form a strap and is tightened around the package. Finally, the ends of the strap are joined to each other to form a hoop and the surplus of the strap is trimmed off. A drawback of such procedure is that the length of hoops which are applied to one and the same package or to a series of successive packages is not the same. Therefore, the dimensions of packages are not uniform which presents problems in stacking, storage and transportation. Moreover, the apparatus for the practice of this method must employ complicated strap tightening, trimming and joining devices. Since the material of packages often contains large quantities of dust or dirt, it is difficult to properly protect various devices of a complicated strapping machine from contamination, particularly when the material of the packages consists mainly of natural or synthetic fibers, certain types of raw products, waste or the like.

It is also known to employ for strapping of packages a machine which applies to package straps of predetermined length. In such a machine, the straps are applied by hand which is a tedious and time-consuming procedure. As a rule, the machine must be serviced by at least two, normally by three, four or more persons, especially if the packages are rather large and heavy so that it is difficult to apply a strap therearound.

SUMMARY OF THE INVENTION

It is an object of our invention to provide a novel and improved method of applying straps to bales or other packages of compressible material in a time-, space- and work-saving operation.

Another object of the invention is to provide a meth-

od according to which the ultimate dimensions of strapped packages are predictable in advance so that the finished packages can be readily stacked, stored and transported.

A further object of the invention is to provide a method according to which the packages can be strapped by resorting to prefabricated straps or to straps which are obtained by subdivision of a continuous web or belt of strap material.

The improved method comprises the steps of confining a package in a chamber wherein the package is maintained in compressed condition, mechanically applying a strap of predetermined length around the package in the chamber, joining the end portions of the strap whereby the strap forms a circumferentially complete hoop, and removing the package from the chamber so that its material expands to the extent permitted by the predetermined length of the strap. The mechanical applying step may comprise advancing the strap lengthwise along a predetermined path extending around the package in the chamber so that both end portions of the strap extend from the path and are readily accessible for the joining step which can be carried out by hand, especially if the end portions of the strap are formed with customary zig-zag shaped incisions or slits.

The strap may constitute the leading portion of an elongated continuous web of metallic or plastic band material and is severed from the remainder of the web upon completion of the mechanical applying step. The web is fed mechanically along a predetermined path a portion of which extends around the package in the chamber.

In accordance with another feature of our method, the web may be provided with notches or other types of encoded information and is tracked while it moves lengthwise along the predetermined path. The web is severed to separate the leading portion in response to detection of encoded information whereby the severed leading portion forms a strap. The encoded information is applied to the web at intervals corresponding to the desired length of straps.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved method, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of an apparatus with which the method of our invention may be carried out, portions of the baling and strapping machines being shown in vertical section;

FIG. 2 is an enlarged front elevational view of a threading device substantially as seen in the direction of the arrow II shown in FIG. 1;

FIG. 3 is an enlarged front elevational view of the feed in the strapping machine of FIG. 1, substantially as seen in the direction of the arrows III shown in FIGS. 1 and 4;

FIG. 4 is a sectional view of the feed substantially as seen in the direction of arrows from the line IV—IV of FIG. 3;

FIG. 5 is an enlarged top plan view of a severing device or cutoff in the strapping machine, substantially as seen in the direction of arrow V in FIG. 1;

FIG. 6 is a fragmentary side elevational view of the severing device, substantially as seen in the direction of arrow VI in FIG. 5; and

FIG. 7 is a fragmentary view of a detail of the severing device, substantially as seen in the direction of arrows from line VII—VII of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The combined baling and strapping apparatus with which the method of our invention may be carried out comprises a baling machine or baler 10 which defines a chamber 11 adapted to receive a supply of compressible material which is to be compressed to assume a desired shape and to form a block-shaped package 19 prior to strapping. The baler 10 comprises a movable wall here shown as a plunger or ram 17 which is reciprocable into and away from the chamber 11 to condense the contents of the chamber and to impart to such contents a desired shape and density. The chamber 11 has an outlet located opposite the ram 17 and normally closed by a plate-like vertical front wall 12 which is movable up and down between a retracted or idle and an extended or operative position. The latter position of the front wall 12 is shown in FIG. 1. This front wall resembles a slide or gate and can be reciprocated by a hydraulic or pneumatic cylinder and piston assembly, not shown.

The strapping machine of the improved apparatus serves to apply one or more metallic or plastic straps 32 around the package 19 while the package dwells in the chamber 11 of the baler 10. The straps 32 are applied in such a way that they loosely surround the package 19 in the chamber 11. However, when the package is expelled by the ram 17 through the outlet of the chamber 11 upon lifting of the front wall 12, its material expands and bears against the straps 32 whereby the straps impart to the package a desired shape which is best suited for stacking, storage, transportation and/or other manipulation of such packages.

In accordance with a feature of the present invention, the strapping machine is arranged to mechanically apply to the package 19 one or more straps 32 of predetermined length so that the dimensions of the package upon expulsion from the chamber 11 can be determined in advance. In the embodiment which is illustrated in the drawing, the straps 32 are obtained by subdivision of a continuous length or web 27 of metallic band material which is provided with longitudinally spaced codes in the form of pairwise arranged mirror symmetrical notches 96 (FIG. 7). These notches 96 are detected while the web 27 is being fed lengthwise and the detector then triggers the operation of a severing device or cutoff 88 which severs the leading portion of the web to produce a strap 32. The web 27 is stored in a source of supply including a bobbin or reel 20 and is withdrawn at intervals. The leading portion of the web 27 is fed lengthwise to a strapping station 21 of the baler 10 and is applied around the package 19 in the chamber 11 prior to being severed from the remainder of the web. The end portions of the resulting strap 32 are preferably provided with suitably configured (preferably zig-zag shaped) incisions or slits 32A (shown in FIG. 7) which enable the person in charge to rapidly couple the end portions to each other and to thus convert the strap 32 into a circumferentially complete hoop which prevents undue expansion of compacted material upon expulsion of the package 19 from the chamber 11. However, it is equally within the purview of our invention to join the end portions of straps 32 by resorting to suitable joining or uniting devices. As a rule, joining of the end portions of a strap 32 by hand presents no serious problems because the length of a strap exceeds the circumferential length of a condensed package 19 in the chamber 11 of the baler 10.

The baler 10 comprises two additional walls 22, 23 which respectively define the bottom and top sides of the chamber 11. These walls 22, 23 are respectively provided with parallel horizontal grooves 24, 24' whose ends register with the ends of vertical grooves 133, 134 respectively provided in the front wall 12 and in the front face of the ram 17. Thus, when the ram 17 and the walls 12, 22,

23 assume the positions shown in FIG. 1, the grooves 24, 24', 133 and 134 form four mutually inclined portions of a circumferentially complete passage which defines a path for a strap 32. The groove 24 constitutes the inlet of a relatively deep cutout 29 in the wall 22. The upper side of the groove 24' in the top wall 23 is open so that the end portions of the strap 32 can extend upwardly and beyond the groove 24' in order to facilitate convenient manual coupling of such end portions by way of the incisions 32A shown in FIG. 7.

The strapping machine comprises a feed 28 which advances the web 27 lengthwise toward the strapping station 21, such web being guided along a predetermined path to travel substantially vertically downwardly from the reel 20 toward the groove 133 in the front wall 12. The devices 116 for threading the leading end of the web 27 into the upper end of the groove 133 will be described later. The leading end of the web 27 then enters into and travels along the cutout 29 in the bottom wall 22 and is deflected into the groove 134 of the ram 17 to issue through the left-hand end portion of the groove 24' in the top wall 23. Suitably configured deflectors 30, 31 are installed at the intake and discharge ends of the cutout 29. It is preferred to provide the walls 12, 22, 23 and the ram 17 with removable channel-shaped inserts which respectively define the groove 133, the cutout 29 and the grooves 134 and 24'. FIG. 1 shows three of these inserts, namely, the insert 25 in the front wall 12 which defines the groove 133, the insert 29A in the bottom wall 22 which defines the cutout 29, and the insert 26 in the front face of the ram 17 which defines the groove 134. An advantage of such inserts is that they can be readily replaced by inserts defining wider or narrower grooves, depending on the width of the web 27. Also, the operator can readily remove and replace damaged inserts or those inserts which must be replaced due to excessive wear. The aforementioned detector arrests the feed 28 when the end portions of the foremost strap 32 extend upwardly beyond the groove 24' in the top wall 23 of the baler 10 so that they are readily accessible and can be readily coupled to each other. Also, the detector initiates the operation of the aforementioned severing device 88 which severs the web 27 so as to separate the trailing end of the front strap 32 from the leading end of the remainder of the web.

The construction of the feed 28 is shown in FIGS. 3 and 4. This feed comprises a frame 33 for two parallel horizontal supporting shafts 34, 34' each of which supports two one-armed levers or carriers 35, 36. The levers 35 extend upwardly and their upper end portions are bifurcated, as at 48, to define slots 44 which accommodate upper advancing rollers 42. The levers 36 extend downwardly and have bifurcated lower end portions 49 which define slots 45 to accommodate lower advancing rollers 43. The lower end portions of the levers 35 are also bifurcated to form slots 38 for the upper end portions 37 of the respective levers 36. Split rings 39 are employed to hold the levers 35, 36 against axial movement along the respective supporting shafts 34, 34'. The advancing rollers 42, 43 are respectively mounted on driven shafts 40, 41 which are rotatable in antifriction bearings 46, 47 mounted in the bifurcated end portions 48, 49 of the levers 35, 36. The shafts 40, 41 are parallel to the shafts 34, 34' and are rigidly connected with the respective advancing rollers 42, 43. These driven shafts 40, 41 extend with requisite clearance through apertures or holes 50, 51 provided in the frame 33 and their outwardly extending end portions are rigid with gears 52, 53. The dimensions of apertures 50, 51 are such that they permit limited pivotal movements of levers 35, 36 with reference to the respective supporting shafts 34, 34'. The pairs of gears 52, 53 respectively mesh with gears 54, 54' which are respectively mounted on supporting shafts 34, 34' and one of which (e.g., the gear 54') is driven by a pinion or gear 56 mounted on the output shaft 57 of a variable-speed electric braking motor 58 which is the prime mover

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of the feed 28. It will be noted that portions of the supporting shafts 34, 34' extend from the frame 33 and that the gears 54, 54' are mounted on such outwardly extending portions of the supporting shafts. These gears 54, 54' rotate on antifriction bearings 55 one of which is shown in FIG. 4. The gears 54, 54' are in mesh so that the gear 54' drives the gear 54 and the latter drives one pair of gears 52, 53. The other pair of gears 52, 53 receives torque directly from the gear 54'. It will be noted that the gears 52, 53 remain in mesh with the respective gears 54, 54' even if the levers 35, 36 are caused to change their angular positions by respectively moving the upper advancing rollers 42 and/or the lower advancing rollers 43 nearer to or further away from each other.

The upper end portions of the upwardly extending levers 35 are connected to each other by a resilient element here shown as a helical spring 59 which tends to move the upper rollers 42 toward each other. The lower end portions of the downwardly extending levers 36 are biased toward each other by a similar helical spring 61 which tends to reduce the distance between the lower rollers 43. The ends of the spring 59 are coupled to the levers 35 by threaded retainers 60; similar retainers 62 are employed to couple the ends of the lower spring 61 to the lower levers 36.

FIG. 3 shows that the levers 35 and 36 are respectively mirror symmetrical with reference to a vertical plane which passes midway between the supporting shafts 34, 34'. Two adjustable spacers or distancing members 63, 64 are provided to respectively determine the minimum distances between the upper advancing rollers 42 and the lower advancing rollers 43. The upper distancing member 63 is adjustably connected with a trunnion 68 which is rotatable in the upper end portion of the right-hand lever 35. This right-hand lever 35 has a relatively large through bore 65 for the threaded right-hand end portion 73 of the distancing member 63. The end portion 73 meshes with internal threads 71 of the trunnion 68. The left-hand end portion 77 of the distancing member 63 is slidable in a diametral bore 75 of a trunnion 67 which is rotatable in the upper end portion of the left-hand lever 35. This upper end portion has a relatively large bore 65 for the member 63. The tip 81 at the leftmost end of the distancing member 63 is of square, hexagonal or other noncircular outline so that it can be engaged and rotated by a suitable tool in order to change the axial position of the distancing member 63 with reference to the right-hand trunnion 68 and to thereby change the minimum distance between the upper advancing rollers 42. The member 63 has a flange or stop 79 which bears against the left-hand lever 35 when the spring 59 is free to contract to such an extent that the upper advancing rollers 42 are located at a minimum distance from each other.

The lower distancing member 64 for the levers 36 of advancing rollers 43 is similar to the upper distancing member 63. Its threaded right-hand end portion 74 meshes with internal threads 72 of a trunnion 70 which is rotatable in the lower end portion of the right-hand lever 36. The latter has a bore 66 which receives the end portion 74 with requisite clearance to permit some pivoting of the lever 36. A second trunnion 69 in the lower end portion of the left-hand lever 36 has a bore 76 which permits axial movements of the left-hand end portion 78 of the distancing member 64. The end portion 78 passes with clearance through a bore 66 in the left-hand lever 36 and has a tip 82 of non-circular outline which can be engaged by a tool to change the axial position of the distancing member 64 with reference to the right-hand lever 36. A flange-like stop 80 on the distancing member 64 abuts against the left-hand lever 36 when the spring 61 is permitted to contract so as to locate the lower advancing rollers 43 at a minimum distance from each other.

The rollers 42, 43 are provided with V-shaped circumferential grooves 83, 84 (FIG. 4) which accommodate

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the marginal portions of the web 27. The springs 59, 61 cause the rollers 42, 43 to bear against the marginal portions of the web 27 with a requisite force which suffices to move the web lengthwise when the motor 58 is on. The distancing members 63, 64 are adjusted in such a way that, when the web 27 is removed from the path between the rollers 42, 43, the distance between the bottoms of grooves 83, 84 in the upper and lower rollers 42, 43 is slightly less than the width of the web so that the leading end of the web can be reintroduced between the rollers 42 and thereupon between the rollers 43 by exertion of a relatively small force. The distancing members 63, 64 enable the feed 28 to transport webs 27 of different widths.

The gear transmission including the gears 52, 53, 54, 54', 56 is outwardly adjacent to the frame 33 and is protected by a cover 85 which is detachably coupled to the casing of the motor 58. The top wall 33a of the frame 33 has an inlet 86 which admits the web 27 into the range of the upper advancing rollers 42. This top wall 33a further supports a pair of spaced guide rolls 87 which direct the leading end of the web 27 into the inlet 86. The rolls 87 are located at a level below the reel 20.

The feed 28 could be provided with driven advancing rollers which would engage the two sides of the web 27. However, the provision of rollers 42 and/or 43 which engage the marginal portions of the web 27 or the marginal portions of discrete straps 32 is preferred when the end portions of straps 32 are provided with incisions 32A because the strap portions adjacent to such incisions are normally located in different planes to facilitate the joining of end portions when the strap is applied around the package. The portions adjacent to the incisions 32A would be flattened if the rollers 42, 43 were replaced by rollers which engage the sides of the web 27.

The aforementioned severing device or cutoff 88 of the strapping machine is mounted at a level below the feed 28 and is shown in FIGS. 1, 5 and 6. It is reciprocable along two stationary columns or tie rods 89 and is biased upwardly by two strong resilient elements here shown as helical springs 90 which surround the columns and bear against collars 91 affixed to the lower ends of the columns. The uppermost convolutions of the springs 90 bear against an actuating portion of the housing 88A of the severing device 88. The latter also carries the aforementioned detector which detects the notches 96 (FIG. 7) of the web 27 and causes the feed 28 to stop the forward movement of the web. As shown in FIG. 5, the housing 88A of the severing device 88 is provided with a vertical guide channel 92 for the web 27. The latter is indicated by phantom lines. The detector comprises two reciprocable sensing elements 93 which are biased into the channel 92 by two leaf springs 94 mounted on the housing 88A. The tips of the sensing elements 93 track the edge faces of the web 27 and penetrate into the notches 96 of the web when a length corresponding to the desired length of a strap 32 advances beyond the detecting station. When the tips of the sensing elements 93 enter a pair of notches 96, they temporarily couple the housing 88A to the travelling web 27 and cause the housing to move downwardly along the columns 89 against the opposition of helical springs 90. The aforementioned actuating portion of the housing 88A then actuates a control switch 150 (FIG. 6) which arrests the motor 58 of the feed 28 so that the web 27 comes to a halt. The control switch 150 also actuates a valve (not shown) which admits compressed air or another pressure medium to the lower chamber of a cylinder 97 which forms part of the severing device 88 and whose piston rod 98 carries at its lower end two parallel plates 100, 101 straddling a disk 102 on one arm of a two-armed motion transmitting lever 99 which is fulcrumed in the housing 88A, as at 103. The right-hand arm 104 of the lever 99 (as viewed in FIG. 5) carries a coupling pin 105 for a reciprocable knife 106 which can penetrate into

the channel 92 of the housing 88A and then cooperates with a fixed counterknife 107 to sever the web 27. The coupling pin 105 of the arm 104 extends into an elongated slot 108 of the knife 106, and the latter is further connected with a crosshead 109 which carries two pins 110 for two wedge-like disengaging members 111 each of which can move one of the sensing elements 93 to retracted position. The disengaging members 111 are provided with inclined cam faces 112 which can engage complementary cam faces in recesses 113 provided in the respective sensing elements 93.

The right-hand arm 104 of the lever 99 is provided with an extension 114 which carries a handle or knob 115 serving to facilitate manually induced severing of the web 27 at the will of the operator.

FIG. 5 illustrates the motion transmitting lever 99 in an intermediate position, i.e., in a position in which the knob 115 is located substantially midway between its end positions A and B. By moving the knob 115 to the phantom-line end position B, the operator causes the knife 106 to sever the web 27 because the extension 114 then pivots the lever 99 in a clockwise direction, i.e., in the direction in which the lever 99 pivots when the piston rod 98 of the cylinder 97 performs a working (upward) stroke. When the knob 115 assumes the end position A, the cam faces 112 of the wedge-like displacing members 111 are withdrawn from the recesses 113 of the sensing elements 93 so that the tips of these sensing elements can engage the edge faces of the web 27 under the action of leaf springs 94. When the knob 115 is moved to the end position B, the web 27 is severed between the cutting edges of the knives 106, 107 and the cam faces 112 of the displacing members 111 penetrate into the recesses 113 to move the sensing elements 93 apart, i.e., to withdraw the tips of sensing elements 93 from the notches 96 whereby the springs 90 expand and return the housing 88A of the severing device 88 to its upper end position.

When the motion transmitting lever 99 returns to the position shown in FIG. 5, the knife 106 is disengaged from the knife 107. However, and since the pins 110 on the crosshead 109 of the knife 106 extend into elongated slots 132 of the displacing members 111, these displacing members temporarily remain in their lower end positions to maintain the sensing elements 93 in spaced apart positions and to permit forward transport of the web 27 or upward transport of the housing 88A to move the notches 96 at the leading end of the web beyond the sensing elements. The cam faces 112 are disengaged from the sensing elements 93 shortly before the knob 115 returns to the position A; the sensing elements then move inwardly (springs 94) and their tips engage the edge faces of the web 27 to enter the next pair of notches 96 when the feed 28 completes the advance of a fresh strap 32 beyond the detecting station. The web 27 need not be advanced prior to return movement of the knob 115 to the position A because the housing 88A moves upwardly (springs 90) when the tips of the sensing elements 93 are withdrawn from a pair of notches so that, when the leaf springs 94 are free to move the sensing elements 93 inwardly, the tips of the sensing elements engage the edge faces of the web 27 at a point behind the previously detected notches 96. The motor 58 of the feed can be started by the control switch 150 when the latter is disengaged from the housing 88A or by a separate switch which can be actuated by hand or by the extension 114 when the knob 115 returns to the position A.

The severing device 88 is mounted upstream of the deflecting or threading device 116 (FIGS. 1 and 2) which serves to direct the leading end of the web 27 into the groove 133 of the front wall 12. The device 116 comprises an arcuate first guide member 117 and a second guide member 118 which is pivotally connected to the guide member 117 by a horizontal pin 124. The first guide member 117 has two cover portions 119, 120 which can

be moved apart by a pneumatic cylinder 121. This is advisable in order to facilitate removal of the trailing end of a freshly severed strap 32 from the guide member 117 so that the operator can grasp both end portions of the strap 32 in order to couple them together and to convert the strap into a hoop. Springs 122 are provided to bias the cover portions 119, 120 toward each other. The bias of these springs can be adjusted by screws 123. The springs 122 are free to expand when the feed 28 advances the web 27 lengthwise; therefore, the web 27 is properly guided and is compelled to enter the groove 133 in the front wall 12 of the baler 10.

The second guide member 118 is biased by a spring 125 so that it tends to turn in a counterclockwise direction, as viewed in FIG. 1, whereby its lower end urges the web 27 against an inclined guide face 126 in the inlet of the groove 133. The guide face 126 pivots the guide member 118 in a clockwise direction when the front wall 12 is lifted to permit expulsion of a freshly strapped package 19 from the chamber 11. As shown in FIG. 2, the guide member 118 defines an open channel 118a which faces away from the front wall 12 and through which the web 27 advances toward the groove 133. The sides of the channel 118a are bounded by guide rails 127. When the leading end of the web 27 advances beyond the guide member 117, it is automatically threaded into the channel 118a and advances into the groove 133, thereupon into the cutout 29, into the groove 134 and emerges from the groove 24' of the top wall 23. The insert 29A of the bottom wall 22 which defines the cutout 29 is pivotally connected to the remainder of the bottom wall 22 by a horizontal pintle 128 adjacent to the deflector 30. Such pivotal mounting of the insert 29A is necessary because the insert 29A carries the deflector 31 which extends into the path of the ram 17 when the insert 29A is moved to the position shown in FIG. 1. Therefore, the insert 29A is pivoted in a counterclockwise direction about the pintle 128 when the ram 17 performs a series of working strokes to compact the material of the package 19 in the chamber 11. When the compacting operation is completed, the ram 17 assumes the position shown in FIG. 1 and the insert 29A can be returned to the illustrated position. The means for pivoting the insert 29A about the pintle 128 comprises a pneumatic cylinder 129 which is mounted on the bottom wall 22 or on another fixed portion of the baler 10 and whose piston rod 130 is articulately coupled to the insert 29A. The insert 29A can be pivoted by two or more cylinders 129.

The deflector 31 is adjustably coupled to the insert 29A and is reciprocable therealong by a pneumatic cylinder 131 which can move it toward or away from the pintle 128. The cylinder 131 is preferably of the single-acting type and may be provided with an air cushion or with a spring which tends to maintain the deflector 31 in one end position. The position of the deflector 31 with reference to the insert 29A is adjusted in such a way that the deflector 31 compels the leading end of the web 27 to enter the groove 134 when the ram 17 assumes the position shown in FIG. 1.

The operation is as follows:

The baling machine 10 is set in operation when the chamber 11 receives a supply of material which is to be compacted to form a package or bale 19. When the ram 17 completes the last compacting stroke, it comes to rest in the position shown in FIG. 1. During such compacting of material in the chamber 11, the strapping machine remains idle and the cylinder 129 maintains the piston rod 130 in the lower end position so that the deflector 31 is located below the path of the ram 17. The lower chamber of the cylinder 129 is thereupon connected with a source of compressed gas to lift the insert 29A to the position shown in FIG. 1. The front wall 12 remains in its lower end position to close the outlet of the chamber 11, i.e., the compacted package 19 is held against expansion of the ram 17, by the front wall 12 and by the top

and bottom walls 23, 22 of the baling machine 10. The operator thereupon closes a master switch (not shown) to start the motor 58 of the feed 28 at full speed whereby the rollers 42, 43 advance the web 27 toward and through the threading device 116 so that the leading end of the web passes through the groove 133 of the front wall 12, along the concave face of the deflector 30, into and along the cutout 29 of the insert 29A (which is held in the position shown in FIG. 1), along the concave face of the deflector 31, along the groove 134 of the ram 17, and through and upwardly beyond the groove 24' in the top wall 23. The feed 28 is arrested when the sensing elements 93 of the detector penetrate into the next-following pair of notches 96 in the web 27 and move the actuating portion of the housing 88A of the severing device 88 into engagement with the control switch 150 which stops the motor 58. This control switch 150 also causes the piston rod 98 of the cylinder 97 in the severing device 88 to perform an upward stroke and to pivot the motion transmitting lever 99 in a counterclockwise direction, as viewed in FIG. 5, so that the movable knife 106 cooperates with the fixed counterknife and severs the web 27 to separate from the web a strap 32.

When the severing operation is completed, i.e., when the strap 32 is separated from the remainder of the web 27, the cylinder 129 is actuated to move the insert 29A and cutout 29 downwardly and away from the chamber 11 in order to move the deflector 31 out of the way preparatory to a forward stroke of the ram 17 which is necessary to expel a strapped package 19 from the baling machine 10 upon lifting of the front wall 12. The cylinder 121 is also actuated to move the cover portions 119, 120 of the arcuate guide member 117 apart so that the operator can grasp the trailing end portion of the freshly severed strap 32 in order to couple such trailing end portion with the leading end portion. In the next step, the front wall 12 is lifted to expose the outlet of the chamber 11 and the ram 17 is moved to the right, as viewed in FIG. 1, to expel the package 19 from the baler 10. The ram 17 is then returned to fully retracted position and the front wall 12 is returned to its lower end position so that the chamber 11 can receive a fresh supply of compressible material. The grooves 133, 134 and the cutout 29 can be cleaned by jets of compressed air issuing from nozzles 160 provided in the inserts 25, 26 and 29A. The provision of such nozzles 160 is advisable if the material of the packages 19 is brittle or contains a substantial amount of dust. The nozzles 160 receive compressed air prior to introduction of a fresh strap 32 into the passage defined by the grooves 133, 24, 134, 24' and cutout 29. This insures that the leading end of the fresh strap 32 can readily advance through the passage to emerge from the groove 24' within easy reach for coupling with the trailing end.

The apparatus of FIG. 1 can be supervised by a single person, especially if the operation of the baling and strapping machines is programmed so that the admission of compressible material into the chamber 11, the conversion of such material into a package 19, the movements of insert 29A and deflector 31, the movements of front wall 12, the starting and stoppage of the motor 58 and the replacement of the reel 20 with a fresh reel are carried out in a fully automatic way. All the operator has to do is to join the ends of straps 32 upon application of straps around the packages in the chamber 11 and to supply to the feed 28 individual straps if the strapping machine does not utilize a web 27. As stated before, the joining of the end portions of straps 32 could be carried out by suitable uniting devices; however, it is often preferred to perform such operation by hand, especially if the package contains dust or waste because particles of foreign matter could contaminate the uniting device.

The severing device 88 can sever the web 27 even be-

fore the feed 28 comes to a halt, as long as the housing 88A moves with the web while the knife 106 performs a cutting stroke, i.e., this knife should preferably sever the web when the speed at which the web moves with reference to the housing 88A is zero.

The lever 99 of the severing device 88 can be pivoted by hand to move the knob 115 to the position A when the operator wishes to introduce the leading end of a fresh web 27 into the channel 92.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A method for applying strips around packages of compressible material, comprising the steps of providing an elongated web with encoded informations spaced a predetermined distance in direction of the elongation of the web from each other; mechanically feeding a leading portion of said web provided with said coded informations and applying said leading portion about a package maintained in compressed condition in a chamber; tracking the web during application of the leading portion around said package; automatically stopping further feeding of said web and severing the same to separate said leading portion from the remainder thereof in response to detection of encoded information; joining the end portions of the thus severed leading web portion to form therefrom a hoop around the compressed package; and removing the package from the chamber so that the material of the package expands to the extent permitted by the hoop.

2. A method as defined in claim 1, further comprising the step of providing the web with spaced incisions, said joining step comprising manually connecting the end portions of the web by way of said incisions.

3. A method as defined in claim 1, wherein the step of providing said web with coded information comprises the step of forming a plurality of pairs of opposite cutouts in said web, said pairs of opposite cutouts being spaced said predetermined distance from each other.

4. A method as defined in claim 3, wherein said step of severing is carried out in the region of a respective pair of opposite cutouts.

5. A method as defined in claim 3 and further comprising the step of providing the web with spaced incisions respectively located in direction of elongation of the web to opposite sides of each pair of cutouts and adjacent thereto.

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