# United States Patent [19]

**Nichols**

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[45] **Nov. 20, 1973**


[54] **COTTON BALE COMPRESSING APPARATUS**


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[22] Filed: **Apr. 17, 1970**

[21] Appl. No.: **33,132**

**Related U.S. Application Data**

[62] Division of Ser. No. 734,057, June 3, 1968, Pat. No. 3,590,731.

[52] **U.S. Cl.** ..... **100/53,** 100/244, 100/269 R, 100/29 S

[51] **Int. Cl.** ..... **B30b 7/04**

[58] **Field of Search** ..... 53/124 C; 100/53, 100/295, 232, 2, 3, 35, 98 R, 98 A, 244, 264, 269 R



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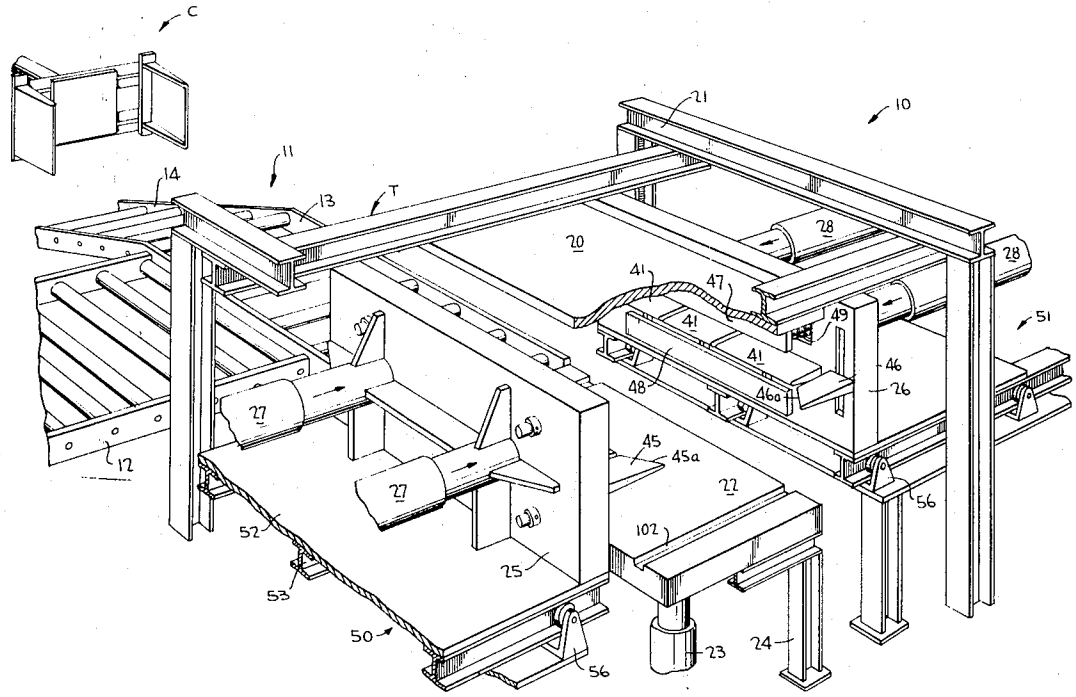
[57] **ABSTRACT**

Blade members are provided on the side platens of the compressor to tuck the holding bands into the interior as slack is formed during the compressing operation. Additional blade segments are utilized to tuck the wrapper at the ends of the bale; both the blade members and segments being mounted for movement to accommodate for the reduction in girth in the bale as it is compressed. Spring biased stripper plates for the blade members and segments are provided on the side platens, which plates also serve to stabilize the bale during the compressing operation. Special stabilized carriage mounting for the side platens and fluid circuitry for automatically sequencing the entire bale handling and compressing operation are provided.


**10 Claims, 13 Drawing Figures**



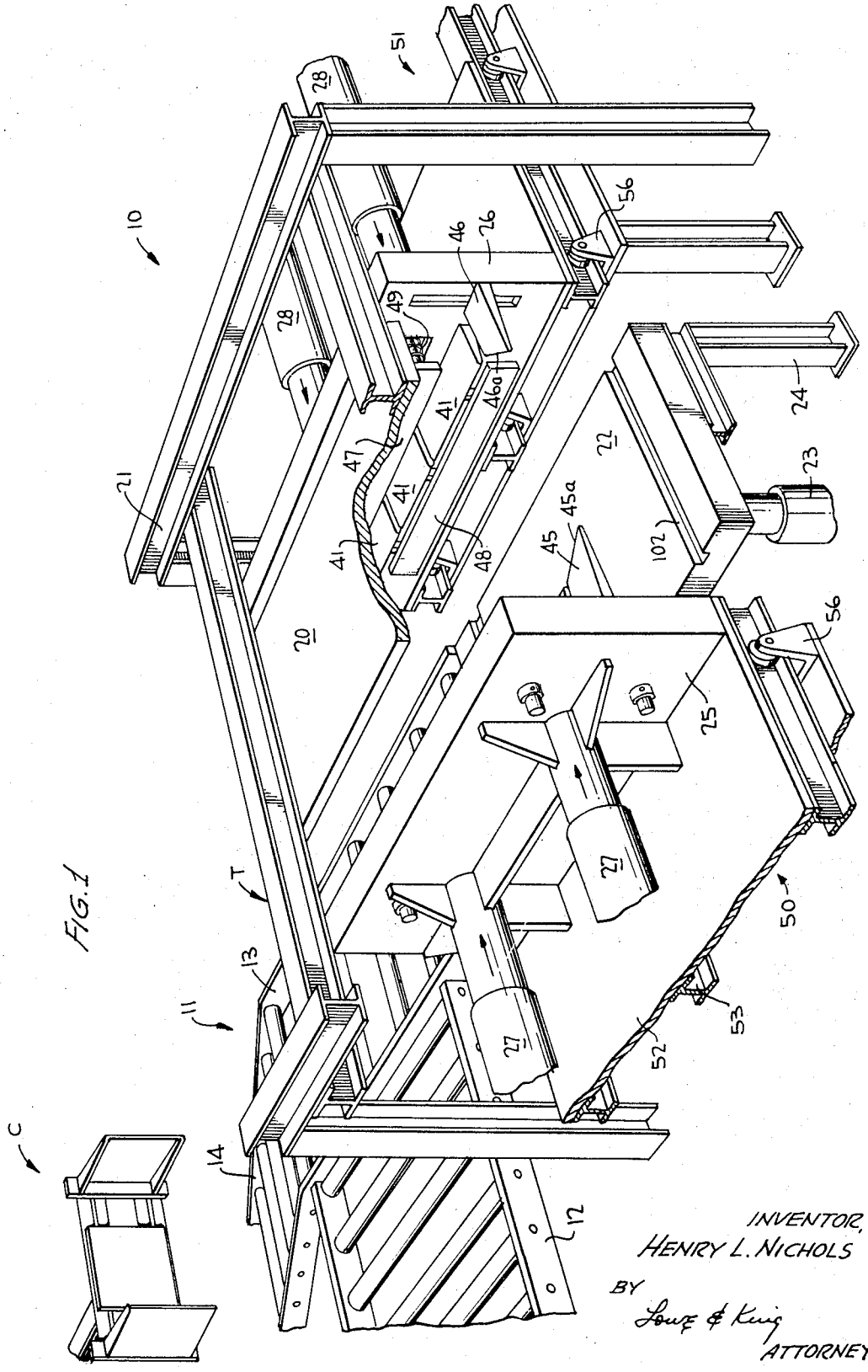



FIG. 1

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FIG. 2

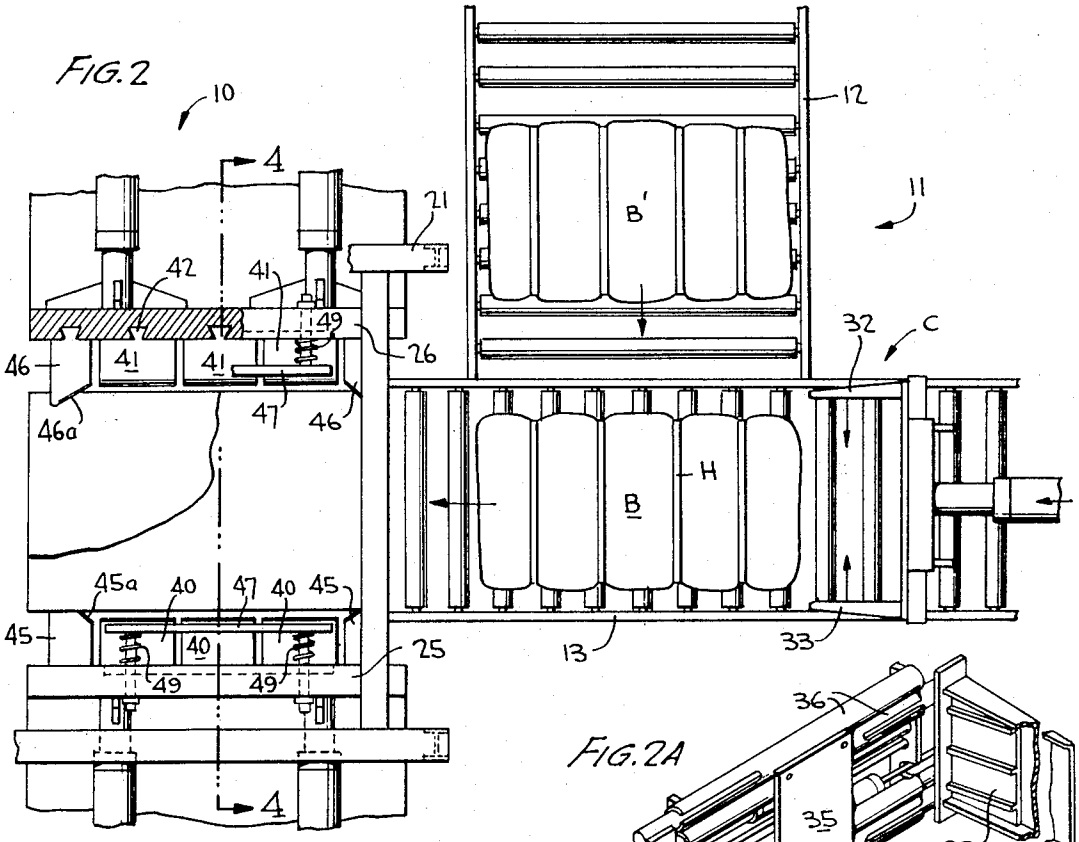


FIG. 2A

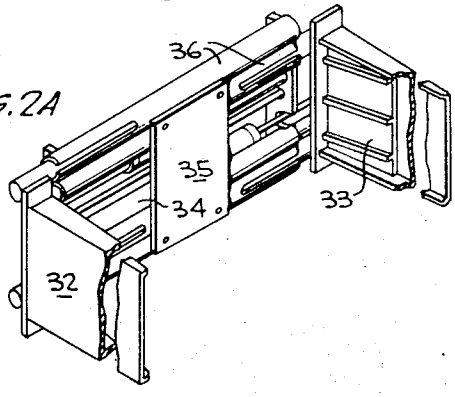


FIG. 4

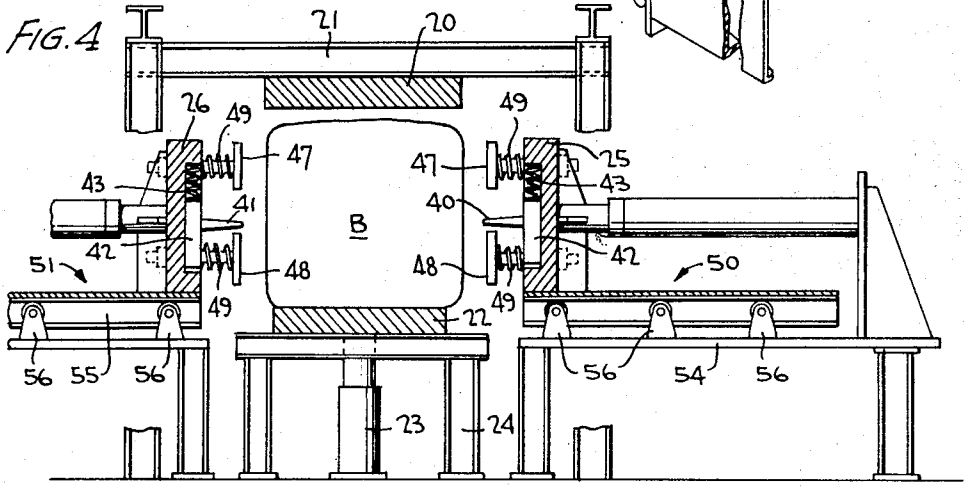


FIG. 4A

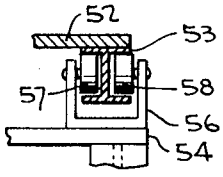


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FIG. 3

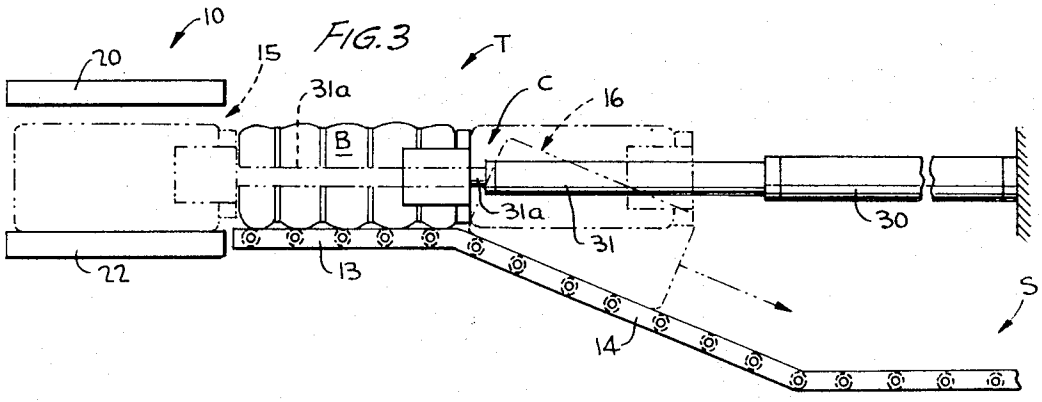


FIG. 6

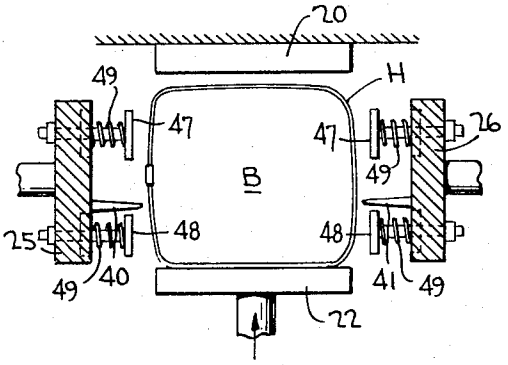


FIG. 7

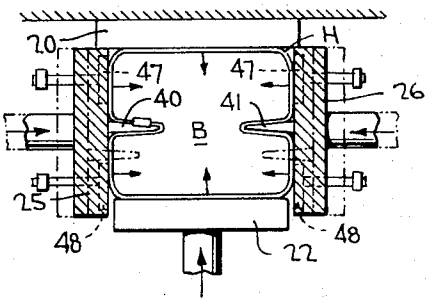


FIG. 8

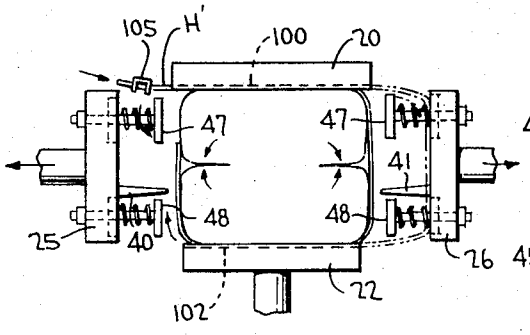


FIG. 9

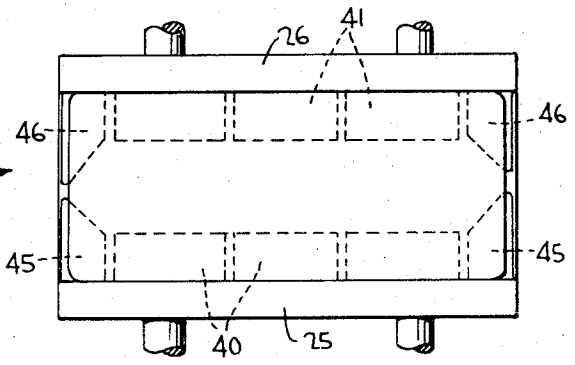


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FIG. 5

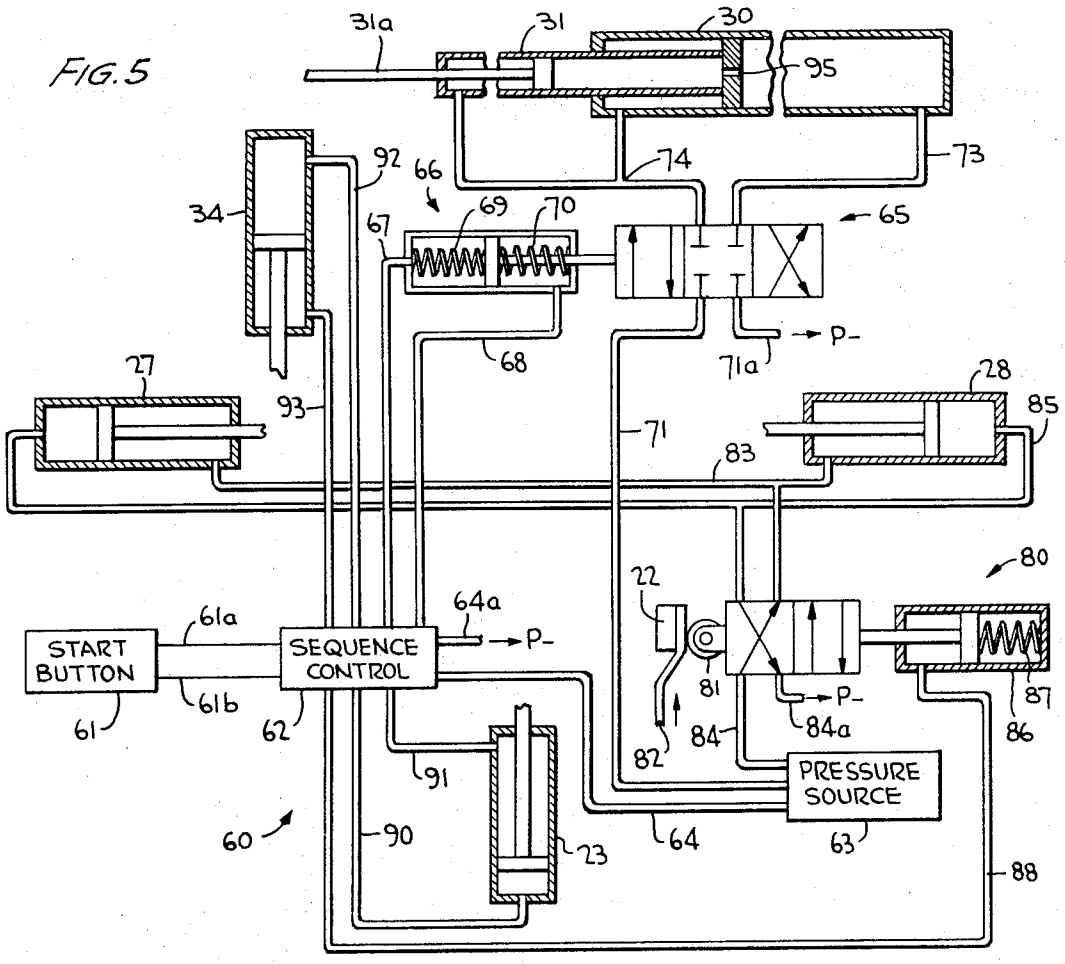



FIG. 10

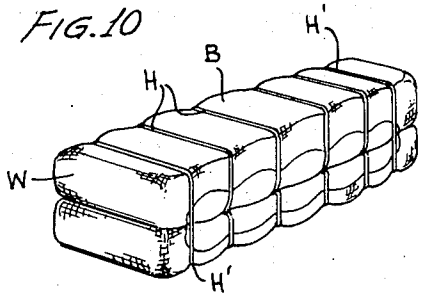
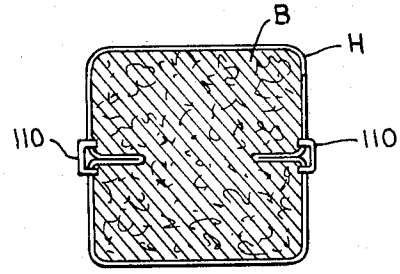



FIG. 11

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# COTTON BALE COMPRESSING APPARATUS

This is a division of my copending application entitled COTTON BALE HANDLING AND COMPRESSING SYSTEM, Ser. No. 734,057, filed June 3, 1968, now U. S. Pat. No. 3,590,731, issued July 6, 1971.

The present invention relates to apparatus, methods and articles of manufacture concerning compressing bales of material, and more particularly to a compressing system and the resulting product involved in transforming gin bales of cotton into bales of reduced size.

In the processing of cotton from the gin to the final user, it is necessary to compress the bale to a relatively high density for economical shipping. That is, the gin bales which are generally formed by the grower as the cotton is removed from the gin are usually pressed to a density of only about 10 pounds per cubic foot, which leaves the dimensions of the bale at about 28 inches wide, 48 inches high and 54 inches long. Then, the final or high density compressing operation is performed at central warehouses or shipping points to a standard density of about 26 pounds per cubic foot and standard dimensions of about 28 inches by 20 inches by 56 inches for domestic shipments. If the bale happens to be destined for export, the bale is compressed further to occupy even less space; the parameters being approximately 34 pounds per cubic foot and about 23 inches by 20 inches by 60 inches.

In the past, it has involved a considerable amount of manpower and time to effect this recompressing operation. First, the gin bale is loaded into a small prepress, or, as commonly known in the art, a "dinky" press, wherein a compression is applied sufficient to loosen the bands that hold the bale together. The next step involves the manual cutting and removing of the bands whereupon the bales are delivered to the high compression press. At the press, the operator must open the side doors to receive the bale, and finally operate the press to apply the pressure to perform the compressing operation. After the bale has been compressed and rebanded, at least one of the doors of the press must be reopened and the bale removed manually. Lastly, the jute bagging which surrounds the bale and extends over the bale ends is sewn together to take up the slack caused by the compressing of the bale to a smaller size.

Several attempts have been made to automate the above bale handling and compressing operation to obtain an increase in efficiency. While these attempts have generally been successful in reducing the manual labor required, such has been left to be desired in terms of obtaining a genuine increase in efficiency over the method described, in that the arrangements are unusually complicated and expensive to build and subject to high maintenance costs. For example, one system that has been suggested employs a plurality of cages which are utilized to transfer bales along a conveyor track in an endless path past separate operating stations where the various functions are performed. Because of the reasons given, warehouse operators have found it difficult to justify the cost of such an automated system, especially since the system is usually utilized only a few months of the year after the cotton harvesting season.

Furthermore, in the prior art automated systems such as the one described, there is still required the separate step of delivering the bale to the dinky press wherein the holding bands of the gin bale are loosened and removed as well as the step of sewing the slack portion of the wrapper together at the end of the bale. This retaining of these steps in the operation not only adds to the overall cycle time, but is further undesirable and inefficient in that workmen are required to perform these functions.



Thus, it is one object of the present invention to provide an improved system for compressing bales of compressible material, such as cotton.

It is another object of the present invention to provide a bale compressor apparatus which allows the elimination of the step of loosening and removing the holding bands prior to the compressing operation.

It is still another object of the present invention to provide an improved apparatus wherein the holding bands are retained on the gin bale during the compressing operation and wherein there are no protrusions from the outer confines of the finished bale.

Briefly describing the main concepts of the simplified bale compressor system, there is provided A novel bale compressor characterized by the provision of a blade member on at least one of the platens of the compressor; said blade member serving to apply localized pressure to the holding bands of the bale and tuck the slack portion caused by the compressing operation into the bale and out of the way. With this arrangement, it will be realized that the separate step of applying the bale to the dinky press and removing the bands has been completely eliminated for an increase in efficiency of the overall operation. In addition, it has been discovered that the pressure of the bands on the bale as they are pushed inwardly actually aids in the compressing process by exerting an inwardly gripping pressure on the upper and lower halves of the bale as the blade members move inwardly.

Preferably, opposed blade members are mounted on the side platens and extend substantially along the length of the bale so as to form a crease along the sides of the bale. The blade members are preferably wedge shaped to aid in insertion and withdrawal from the compressible material and are mounted on slidable mounts so as to allow for slight movement transverse to the longitudinal axis of the bale upon reduction in the size of the girth of the bale during the compressing operation. To further aid in inserting the blade members into the bale, said members may be formed as a plurality of independently movable sections so that each can independently seek the point of entrance of least resistance, such as between two of the layers of cotton. The tucked portion of the holding bands inside the bale resist being removed since the adjacent cotton on the interior of the bale tends to interlock with the edges of the band and since the opposed faces of the tucked portions are maintained in contiguous relationship by the additional holding bands or equivalent once the blade members are withdrawn. Spring actuated plates on the side platens engage the sides of bale B adjacent the tucking blades to stabilize the bale during compression and then to strip the bale from said blades.

Also provided on the side doors or platens are blade segments which engage the end portions of the bale to effect an extension of the crease around the full circumference of the bale whereby any slack in the wrapper or jute bagging on the bale will also be tucked into the bale and the previously required sewing operation mentioned above is eliminated. Additionally, the side platens are mounted for straight line movement rather than pivotal movement as in most prior art arrange-

ments; the carriages for the platens including I-beam runners which are supported on pairs of rollers positioned on opposite sides of the web of the I-beams for greater stability. Alternatively to applying additional holding bands to retain the bale in a compressed condition upon removal from the compressor, the holding bands which have been tucked into the bale may serve as the sole means for retaining the bale in the compressed condition by provision of a clip engaging the bands across the opening where the tucked portion enters the bale. Of course, a combination of these two alternatives could be utilized if desired or necessary in situations where the bale is compressed a maximum amount.

The finished compressed bale has distinct advantages as a new article of manufacture in that it is easier and safer to handle as compared to prior art compressed bales. That is, all of the bands retained on the bale are maintained in a taut condition with no slack protruding to catch parts of the machine and thereby hinder removal or to present a hazard to the workmen by presenting sharp edges. Further, with the extension of the characteristic crease along the ends of the bale to tuck the wrapper into the interior, there are no loose parts on the bale whatsoever, thereby presenting a neater product and increasing customer satisfaction.

Still other objects and advantages of the present invention will become readily apparent to those skilled in this art from the following detailed description, wherein I have shown and described only the preferred embodiment of the invention, simply by way of illustration of the best mode contemplated by me of carrying out my invention. As will be realized, the invention is capable of other and different embodiments, and its several details are capable of modification in various obvious respects, all without departing from the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

In the drawings:

FIG. **1** is a perspective view of a compressor assembly which is constructed in accordance with the principles of the present invention;

FIG. **2** is a top view of the assembly illustrated in FIG. **1** with certain parts broken away and with bales in the transporting positions for clarity.

FIG. **2***a* is a detailed perspective view of the clamp utilized in the bale handling arrangement of the assembly shown in FIG. **2**;

FIG. **3** is a side view of a portion of the handling system illustrating the movement of the clamp to perform the transfer and removal operations;

FIG. **4** is a cross-sectional view taken along line **4—4** of FIG. **2**;

FIG. **4***a* is a detailed cross-sectional view of the mounting system for the side door carriages;

FIG. **5** is a schematic diagram of a fluid control system for automatically operating the bale handling and compressor apparatus shown in FIGS. **1–4**;

FIGS. **6–8** are end views of the bale compressor apparatus showing the sequence of the compressing operation thereby illustrating the action of the compressing platens;

FIG. **9** is a top view of the bale with the side platens positioned in the inward or compressing position;

FIG. **10** is a perspective view of a finished bale which has been compressed by the apparatus of the invention; and

FIG. **11** is a cross-sectional view of the bale showing the tucked portions of the holding bands with the alternative means for retaining the bale in the compressed condition.

Making reference now to FIGS. **1–4** for a more specific description of the concepts of the present invention, there is shown a compressor assembly **10** particularly adapted for operation on conventional size bales of cotton. It will, of course, be realized by those skilled in the art, and as will be apparent from the discussion of the principles of the invention stated herein, that the compressor **10** of the present invention could be utilized to process other types of baled compressible material without significant or substantive modification to the structure disclosed herein.

The handling system **11** disclosed and claimed in my **11** parent application forms no part of the present invention and is illustrated herein merely to permit a fuller understanding of how the compressor **10** is loaded and unloaded through one end of the structure. Thus, the system **11.** comprises an infeeder conveyor **12** extending at a 90° angle to a transfer platform **13** positioned at one end and at the horizontal level of the compressor **10** and forming a transfer station T, as best shown in FIGS. **1** and **3.** Extending from the transfer platform **13** on the opposite side from the end of the compressor **10** and in line therewith is an inclined removal conveyor **14.** Preferably the conveyors **12, 14** and the transfer platform **13** are made of idler rollers extending perpendicular to the intended line of travel of a bale B (FIG. **2**) to be processed so as to allow for freer movement of the same.

As shown in FIGS. **2** and **3,** the bale B positioned at the transfer station T on the transfer platform **13** is ready to be loaded by clamp C into the compressor **10** to a compressing station, generally indicated by the dash-dot outline **15** of FIG. **3.** After the compressing operation has been completed, the bale B is removed by the clamp C through the same end of the compressor **10** back through the transfer station T and released for movement by gravity down the inclined conveyor **14,** as denoted by the dashed-dot outline **16** also shown in FIG. **3.** The bale B then is positioned at a suitable pickup station S where it can be removed by any conventional means, such as by a clamp equipped fork lift. If necessary or desirable, the movement of the bale B along the conveyor **14** could be positively controlled by suitable motorized means serving to drive said bale B forwardly to the station S. Once the bale B has been so processed, the next bale B′ positioned on the infeeder conveyor **12** (FIG. **2**) is in readiness to be handled and compressed in the same manner.

The preferred embodiment of the compressor assembly **10** comprises an upper platen **20** which is supported above the compressing station **15** by a suitable welded superstructure **21.** Lower platen **22** is movable upwardly toward said upper platen **20** in response to fluid power cylinders **23** (only one shown) to cause the compressing of the bale B; said lower platen **22** normally resting on a subframe **24** in alignment with the transfer conveyor **13** so that said bale B can be loaded and unloaded in a horizontal plane (see FIG. **4**). Opposed side platens or doors **25, 26** which are also movable inwardly during the compressing operation are operated

by pairs of fluid actuating cylinders **27, 28,** respectively. As denoted by the arrows in FIG. **1,** the platens **22, 25, 26** thus all move inwardly to perform the compressing operation from three sides with the upper platen **20** serving as a stationary backup. It should be noted that the upper platen **20** could equally well be movable with respect to the lower platen **22** to carry out the compressing operation if desired, without departing from the principles of the present invention.

The clamp C is also preferably movable by the use of a fluid cylinder arrangement and, in particular, a double fluid cylinder **30** is provided for this purpose having an extensible piston-cylinder **31** and an inner piston **31***a*. As shown in FIG. **3,** the piston-cylinder **31** is operative upon extension to place the clamp C into engagement with the bale B at the transfer station T. The compressing station **15** is reached in turn by the clamp C through extension of piston **31***a* (note dotted line position in FIG. **3**) and it follows that the removal position **16** is reached by return of both the piston-cylinder **31** and the piston **31***a* into the cylinder **30.**

The construction of the clamp C comprises a pair of opposed side members **32, 33** (note FIGS. **2** and **2***a*) which perform a gripping function along the sides of the bale B in response to the inward operating action of cylinders **34.** To properly guide the side members **32, 33,** frame **35** of the clamp C includes suitable telescopic slide supports **36.**

Proceeding with a detailed description of one of the salient features of the compressor assembly **10,** reference is made to FIGS. **1, 2** and **4,** wherein are shown horizontal blade member sections **40, 41** mounted on the side platen **25, 26,** respectively, and adapted to apply localized pressure to bands H (FIG. **2**) retained on the bale B during the compressing operation so as to tuck the slack portion of said bands H into the interior of the bale B and thus out of the way. Each of the blade member sections **40, 41** is mounted for limited upward movement by integral dovetail slides **42** (FIGS. **2** and **4**) held within companion slots formed in the face of the side platens **25, 26.** Springs **43** (FIG. **4**) are provided in the slots above the blade member sections **40, 41** to normally bias the same to the lower position. Thus, upon the inward movement of the side doors **25, 26,** the blade member sections **40, 41** are allowed the slight upward movement that might be required for each section to find the desired point of entry of least resistance. Also, additional upward movement necessitated by the reduction in the height and the girth of the bale B caused by the simultaneous compression of said bale B by the lower platen **22** is allowed by this arrangement.

In addition, the respective side doors **25, 26** include blade segments **45, 46** at both ends thereof. These blade segments **45, 46** by their orientation are positioned to engage the end portions of the bale B when positioned in the inward position. Operative edges **45***a*, **46***a* of the respective blade segments are angled inwardly at an acute angle with respect to the bale B for two important reasons. First, the edges **45***a*, **46***a* are operative to cause a slight self-centering operation on the bale B as the platens **25, 26** move inwardly; this function being by virtue of the opposed edges **45***a*, **46***a* acting with differential pressure on the respective ends of the bale B if said bale B is closer to one end than the other, with this continuing until equal amounts of force are tending to shift the bale endwise at which point the centered position has been reached. Secondly, and more importantly, the blade segment **45, 46** extend into the bale B to form an extension of the side creases across the ends to effect a tucking of wrapper W, such as jute bagging (see FIGS. **4** and **10**), into the interior of the bale B, which eliminates the step of sewing the slack wrapper together as has always been necessary in the past. As illustrated, both the blade member sections **40, 41** and the blade segments **45, 46** are wedge shaped in cross section to allow easy entry and removal into and from the compressible material of the bale B. Also, the blade segments **45, 46** are mounted for independent upward movement so as to seek an area of reduced resistance for entering and to allow shifting as compression takes place.

Upper and lower stripper plates **47, 48,** respectively, are mounted on the side platens **25, 26** by compression springs **49** so as to engage the sides of the bale B as said platens move inwardly on the compressing stroke. Because of the side support thus afforded to the bale B, any tendency for said bale B to S, that is, squirm, between the upper and lower platens **20, 22** upon applying pressure is abated. Upon withdrawal of the platens **25, 26** the plates **47, 48** serve the equally important function of stripping the bale B from the blade member sections **40, 41** and the blade segments **45, 46** so as to keep said bale B centered on the lower platen **22** for removal by the clamp C. While upper and lower plates **47, 48** are preferred, in some instances it may be found that a single plate on each platen **25, 26** may suffice to carry out the desired objectives.

A special mounting arrangement for the doors **25, 26** to stabilize the same against the reactive forces during compression is provided in the form of carriages **50, 51** (FIGS. **1** and **4**), each of which comprises a base **52,** to which respective doors **25, 26** are affixed, and a plurality of I-beam runners **53** on the underneath side thereof. To support these carriages **50, 51** are a pair of tables **54, 55** (FIG. **4**) upon the upper surface of which are mounted a plurality of rows of aligned U-shaped supports **56** (FIGS. **1** and **4**); each support **56** carrying a pair of opposed rollers **57, 58,** the side faces of which embrace the web of the I-beam runners **53,** as shown in FIG. **4***a*. As illustrated, the rollers **57, 58** support the carriages **50, 51** by engaging the underneath side of the upper cross piece with just sufficient clearance to allow counter movement between said rollers **57, 58** and the lower cross piece. It can be seen that the substantial forces applied during the compressing operation are checked by the captive rollers **57, 58** along the length of the carriages **50, 51.**

Before considering the operation of the bale compressor **10** and handling system **11,** reference is made to FIG. **5** wherein is shown a fluid circuit **60** which will now be described. A start button **61** is interconnected through lines **61***a*, **61***b* to a sequence control **62** that serves to actuate the various cylinders of the bale compressor **10** and handling system **11** in an automatic fashion. The specific construction of the sequence control **62** does not form any part of the present invention and may comprise a conventional motorized step valve, for example. In any case, the sequence control **62** is operative to provide timed pressure and exhaust to connected control or output lines in sequence from pressure source **63** via supply line **64** and vent **64***a*.

To control the operation of the double cylinder **30** which carries the clamp C, a three-position valve **65** is

controlled by an actuator **66** connected to the sequence control **62** through control lines **67, 68.** The valve **65** is normally in the closed position illustrated due to the self-centering action of opposed springs **69, 70** incorporated within the actuator **66.** This means that supply line **71** from pressure source **63** and vent **71***a* are not connected to either the power side of the cylinder **30** through feed line **73** or to the return side of the cylinder **30** through branched feed line **74.**

In accordance with an auxiliary feature of the invention, the opposed actuating cylinders **27, 28** for the side platens **25, 26** are operated in unison in response to the initial upward movement of the lower platen **23.** This is effected through a two-position valve **80** having a roller follower actuator **81** which is responsive to cam track **82** carried by the lower platen **22.** In the position shown in FIG. **5,** the return sides of the cylinders **27, 28** are connected to the pressure source **63** through branched feed line **83** and supply line **84.** To actuate the side doors **25, 26,** branched feed line **85** is connected to supply line **84** and the feed line **83** to vent **84a** as the lower platen moves up so that the low portion of the cam track **82** allows the valve **80** to shift to the left as viewed in FIG. **5.** Auxiliary actuator **86** is provided on the opposite end of the valve **80** with a spring **87** being provided to normally bias the valve to the left-hand position but with a pressure chamber on the opposite side for actuation through output line **88** connected to the sequence control **62.** The actuating cylinder **23** for the lower platen **22** is connected directly to the sequence control **62** through output lines **90, 91** as are the operating cylinders **34** for the clamp C through output lines **92, 93.**

In the operation of the bale compressor **10** and handling system **11,** assuming that the bale B is in position on the transfer platform **13** as shown in FIG. **2,** the operator pushes the button **61** which activates the sequence control **62** to start the operation. First, the line **68** is pressurized so as to shift the valve **65** to the left and thereby interconnect the supply line **71** to the feed line **73** connected to the power side of the double cylinder **30.** The piston-cylinder **31** is responsive to the pressure and is shifted rapidly to the left until its limit of movement at the end of the cylinder **30** has been reached; this shifting being under no load conditions so that fluid pressure does not build up sufficiently to enter small aperture **95** to the piston **31***a*. At this point, the output line **68** is exhausted through the vent **64***a* and the valve **65** is returned to the neutral position. The clamp C has now moved to the position shown in FIG. **3** wherein it embraces the end of the bale B and is ready to deliver the same to the compressor **10.**

To do this in accordance with the principles of the invention, the cylinders **34** of the clamp C are next actuated through pressurization of one side of each of the cylinders **34** via the output line **93** which causes the side members **32, 33** to move inwardly (as deonoted by the arrows in FIG. **2**) and firmly grip the bale B to assure positive handling and delivery of the bale B. With the pressure held on the side members **32, 33** through the cylinders **34,** pressure is again applied to the double cylinder through feed line **73** via the valve **65** and upon a build up of substantial pressure on the power side of the cylinder **31,** pressurized fluid is now effective to enter the aperture **95** to operate the piston and thereby transfer the bale B to the position **15** shown in FIG. **3.** Once in the position **15,** the side members **32, 33** of the clamp C are released by operation of the sequence control **62** through pressurization of the line **92** to the cylinders **34** and venting of the line **93** via the vent **64a** so that the clamp C can be removed from the compressing station for the compressing operation. The latter is accomplished by briefly applying pressure through the line **67** to shift the valve **65** to the right and apply pressure through the branched feed line **74** on the return side of the pistons **31, 31***a*.

The compressor apparatus **10** is now ready for actuation and accordingly sequence control **62** is programmed to at this point apply pressure through the feed line **90** to cause the piston of the cylinder **23** to raise the lower platen **22** (note start of compressing sequence in FIG. **6**). As the lower platen is raised a predetermined amount the lower portion of the cam track **82** shifts the valve **80** to the left thereby applying pressure to the power side of the cylinders **27, 28** through branched feed line **85** to move the side doors **25, 26** inwardly against the bale B. As the blade member sections **40, 41** engage the sides of the bale B, localized pressure is applied to the holding bands H and the slack portions caused by the continuing compressing of the bale B against the upper platen **20** by the lower platen **22** are tucked into the inside of the bale along the crease formed (note FIGS. **7** and **9**).

As the girth of the bale B, or more particularly the height of the same, is reduced by compression between the upper and lower platens **20, 22,** said blade member sections **40, 41** move upwardly through the intermediate dotted line positions in FIG. **7** until the full line positions are reached. It will be realized that as the holding bands H are drawn tighter and tighter from the position of first engagement in FIG. **6** through the dotted line position of FIG. **7** and finally to the full line position of FIG. **7,** a considerable amount of compession is applied to the upper and lower halves of the bale B through the action of the bands H themselves, as denoted by the inwardly directed force arrows in FIG. **7.** In other words, as the crease is formed in the bale B, the bands are exerting an inward pressure from three sides so that the compression of the bale B is accomplished widthwise and is materially aided heightwise. The pressure of the cotton has been found to be relatively constant throughout the bale B due to the several points of force provided by this arrangement.

Once the desired amount of compression has been reached, the sequence control **62** next transmits a pressure signal through the output line **88** to the actuator **86** to shift the valve **80** to the right even though the lower platen **22** remains in its upper position. This allows pressure to be applied to the return side of the cylinders **27, 28** through the branched feed line **83** and the power side to be vented through vent **84***a*. The relationship of the operative platens **22, 25, 26** is at this point, as shown in FIG. **8.** Here, the side platens **25, 26** are withdrawn and the blade member sections **40, 41** are lowered in response to the action of the springs **43** in readiness for the next compressing operation.

As shown in FIG. **8,** when the blade member sections **40, 41** have been withdrawn, the force of compression in the bale B by the upper and lower platens **20, 22** pushes the opposed sides of the V-shaped tucked portions into contact (note arrows, FIG. **8**). As thus positioned, one side of the tucked portion resists being withdrawn and is held against outward forces that would tend to loosen the bands H by action of the other

side of said tucked portion which is held in a stiffened condition by the face-to-face contact. Also, the frictional contact between the edges of the tucked portion and the surrounding cotton aid in preventing deleterious loosening of the bands H in this mode. Advantageously, both the mutual resistance of the sides of the tucked portions and the frictional resistance with the cotton are of help in maintaining the compression of the bale B in its final mode, now to be described.

Thus, the bale B receives a number of additional holding bands H' which may be manually inserted through suitable guide slots **100, 102** in the respective platens **20, 22** along the path of movement denoted in FIG. **8.** It should be noted that with the platen **26** withdrawn during installation of the additional holding band H', the dotted line path is followed past said platen **26** and then upon the lead end of the band H' reaching the left-hand side of the bale as shown in FIG. **8,** the band will be drawn tight to the solid line position shown. Next, the trailing end of the band H' with a suitable clip **105** may be brought down into engagement with the leading end and fastened thereto to complete the operation. It should be noted that because the original holding bands H remain on the bale B (see FIG. **7**) the removal of the pressure of the side door **25** does not allow release of the widthwise compression since these bands are performing a holding function through the mutual resistance and frictional engagement of the tucked portion just described.

Before proceeding with the remainder of the operation, it is important to note that with the finished bale having the additional straps H' applied thereto and removed from the compressor **10** (to be described), the bale B is held under compression with certain results and advantages not heretofore attainable. First, in the finished bale B or article of manufacture shown in FIG. **10,** the bands H continue to perform a holding operation of the bale B along the center thereof through the mutual resistance and frictional engagement between the opposing sides of the V-shaped tucked portion. Secondly, and of particular advantage, is the fact that there are no protrusions of the bands H from the bale B which might cause hindrance or injury to anyone during further handling of the bale B. Also, the wrapper or jute bagging W has been neatly tucked into the extension of the crease along the ends of the bale B as clearly illustrated in this figure. With this combination of additional holding bands H' and the original holding bands H to retain the bale B under compression after being removed from the compressor **10,** when the final destination is reached and the cotton is to be released from the bale B, it is contemplated that only two bands H' must be cut whereupon the bands H can, because of their slackness, be conveniently slipped over one end of the band B. In cases of particularly resilient material being baled, it may be necessary to also cut the bands H; however, since the bands H are not in any case returned to a taut condition, the bands H are more easily cut and removed than before.

If desired, an alternative manner of maintaining the finished bale B under compression after being removed from the compressor **10** may be used, as illustrated in FIG. **11.** This involves the installation of clips **110** on the holding bands H while the bale B is still in the compressor **10** so as to span the opening at the point where the tucked portion of said holding band H enters the bale B. With the clips **110** firmly attached, the opposed sides of the tucked portions remain in contact with each other and the bale B is held securely without the use of the additional bands H'.

Proceeding with the remainder of the operation of the handling system, once the pressure on the power side of the cylinder **23** has been lowered through application of pressure through the output line **91** and release of pressure through the output line **90** in response to the sequence control **62,** the bale B is once again positioned at the level of the transfer platform **13** and in readiness for removal by the clamp C. Thus, pressure is momentarily applied to the power side of the double piston **30** through the valve **65** by operation of the actuator **66** in response to the sequence control **62.** In position within the compressor **10** the cylinders **34** of the clamp C are once again actuated by pressurizing lines **93** to bring the side members **32, 33** into firm engagement with the sides of the bale B. Thus held, the bale B is pulled from the compressor **10** by applying return pressure to the pistons **31, 31***a* of the double piston **30** through shifting of the valve **65** by the sequence control **62** so that the supply line **71** pressurizes the branched feed line **74.** The clamp C then moves directly and in a straight line to the more remote dotted line position of FIG. **3** where the bale B is positioned above the removal conveyor **14.** Once the side members **32, 33** of the clamp C are released by appropriate action of the sequence control **62,** the forward end of the bale drops to the conveyor **14** and the position **16** where the bale B is preferably delivered by gravity to pickup station S below the cylinder **30** for receipt by a fork lift truck or other suitable means. At this point, the sequence control **62** is reset for the next cycle for operation exactly as above on the next bale B' in line.

Outstanding results and advantages should now be clear to those skilled in the art with regard to the new concepts set forth relating to bale compressing. With the use of blade members **40, 41** or their equivalent to apply localized pressure to the holding bands H to tuck the slack portion of said bands H into the interior of the bale B, a substantial amount of efficiency is gained in that a complete step in the process of the prior art is eliminated and the need for men to perform this function is also eliminated. Furthermore, with the employment of blade segments **45, 46** to engage the end portions of the bale to tuck in the wrapper W, another step is eliminated and similar savings are realized.

In this disclosure, there is shown and described only the preferred embodiment of the invention, but, as aforementioned, it is to be understood that the invention is capable of various changes or modifications within the scope of the inventive concept as expressed by the accompanying claims.

I claim:

**1.** A bale compressor for operating on elongated bales of resilient material having a plurality of holding bands extending around the girth thereof comprising upper and lower platens and a pair of side platens extending in the direction of the longitudinal axis of the bale, means for moving said platens relative to each other to compress said bale, and means including a blade member on at least one of said platens for tucking said bands into the interior of said resilient bale during the compressing operation, said blade member having an operative leading edge of a predetermined width at least greater than the width of each band, whreby when said bands are tucked into said resilient bale the

same are accommodated within the outer confines of said bale and held by limited re-expansion of said resilient material.

**2.** The bale compressor of claim **1** wherein said blade member is extending in the direction of said longitudinal axis of said bale along substantially the full length of said bale so as to form an elongated crease in said bale during the compressing operation, whereby said bands are tucked inside within said crease formed in said bale.

**3.** The bale compressor of claim **2** wherein said blade member is wedge shaped to allow easy insertion and withdrawal during the compressing operation and wherein is further provided plate means extending along said one platen adjacent said blade means and spring means for biasing said plate means toward said bale to stabilize said bale during the compressing operation and to strip said bale from said blade means thereafter.

**4.** The bale compressor of claim **2** wherein is further provided means for mounting said blade member for sliding movement transversely to the longitudinal axis of said bale to accommodate reduction in size of the girth of said bale during the compressing operation.

**5.** The bale compressor of claim **4** wherein said blade member includes a plurality of blade sections, said sections being mounted for independent sliding movement whereby each section can seek the adjacent area of least resistance upon entering said bale.

**6.** The bale compressor of claim **1** wherein said blade member is further provided with a pair of blade segments positioned at the ends thereof and each having an operative leading edge for tucking in the adjacent end portions of said bale.

**7.** The bale compressor of claim **6** wherein is provided means for mounting said blade segments for sliding movement transversely to the longitudinal axis of said bale to accommodate reduction in size of the girth of said bale during the compressing operation.

**8.** The bale compressor of claim **6** wherein the operative leading edges of said blade segments extend beyond the ends of said bale and said edges are directed inwardly at an acute angle toward the center of said bale to form a crease along the end faces of said bale and for centering of said bale during the compressing operation.

**9.** The bale compressor of claim **1** wherein said side platens are mounted on movable carriages, said carriages including I-beam runners positioned in an upright fashion, and a plurality of pairs of rollers for supporting each runner, the outer periphery of said rollers guidably engaging the inside faces of the cross pieces of said I-beam and the opposed side faces of said pairs of rollers guidably engaging the web of said I-beam.

**10.** The bale compressor of claim **1** wherein said platen moving means includes fluid cylinders and wherein is further provided control circuit means for controlling the actuation of said cylinders including switch means for initiating operation of said side platens in response to the movement of one of the other platens.

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