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[56]

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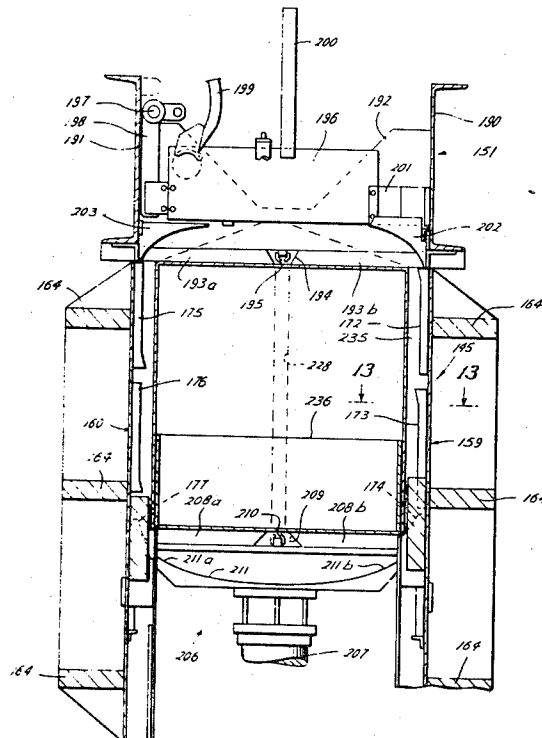
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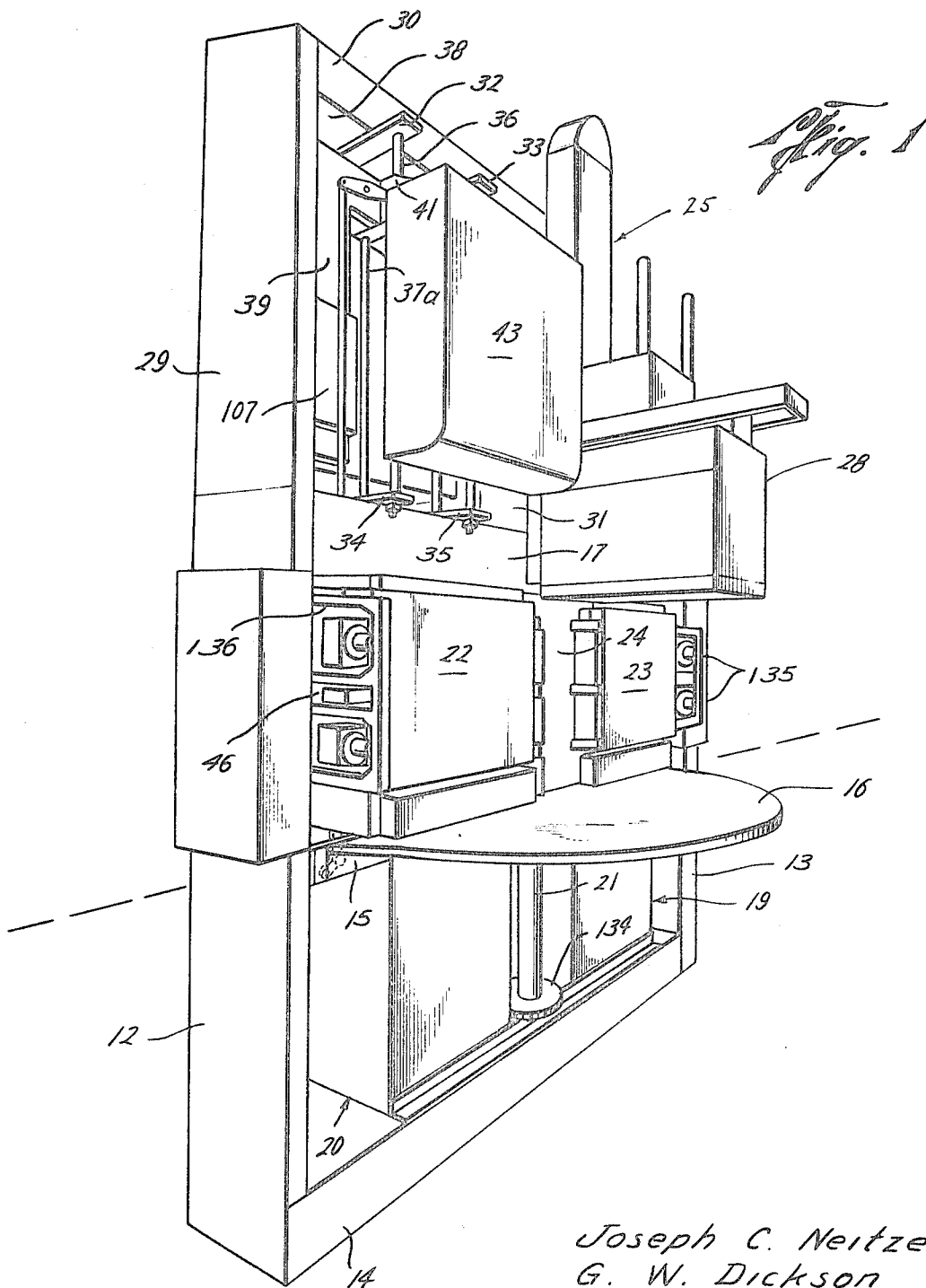
[54] BALE BANDING APPARATUS

8 Claims, 13 Drawing Figs.

[52] U.S. Cl. **100/26,**
100/223
[51] Int. Cl. **B65b 13/04**
[50] Field of Search. **53/124,**
198; 100/26, 25, 223, 3

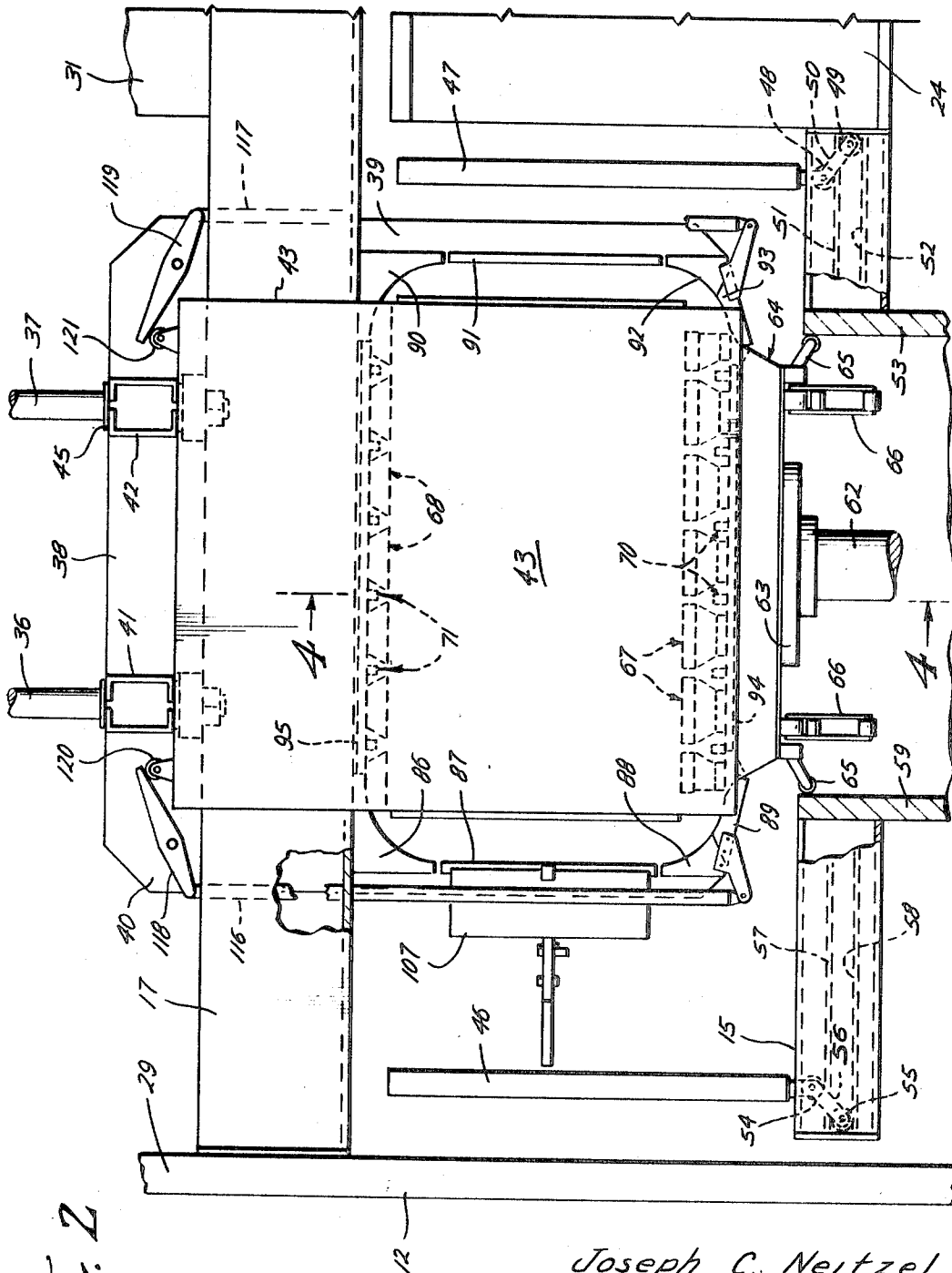
ABSTRACT: A fiber baling press is provided with automatic means for applying longitudinal as well as transverse banding to the bale, such means consisting of tracks and banding heads arranged so as to permit normal opening of the side and end doors of the press for releasing the bale.





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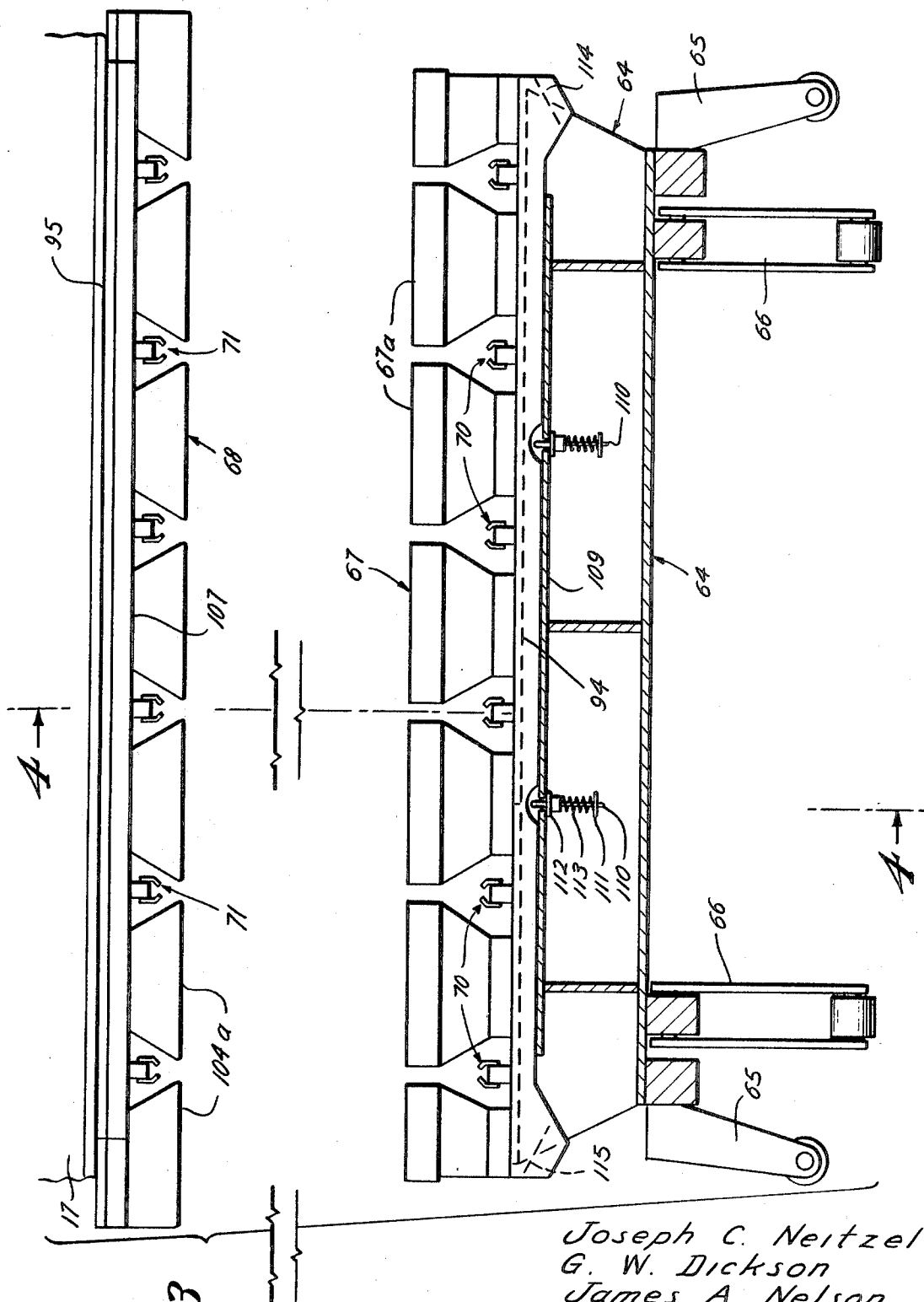


Fig. 3

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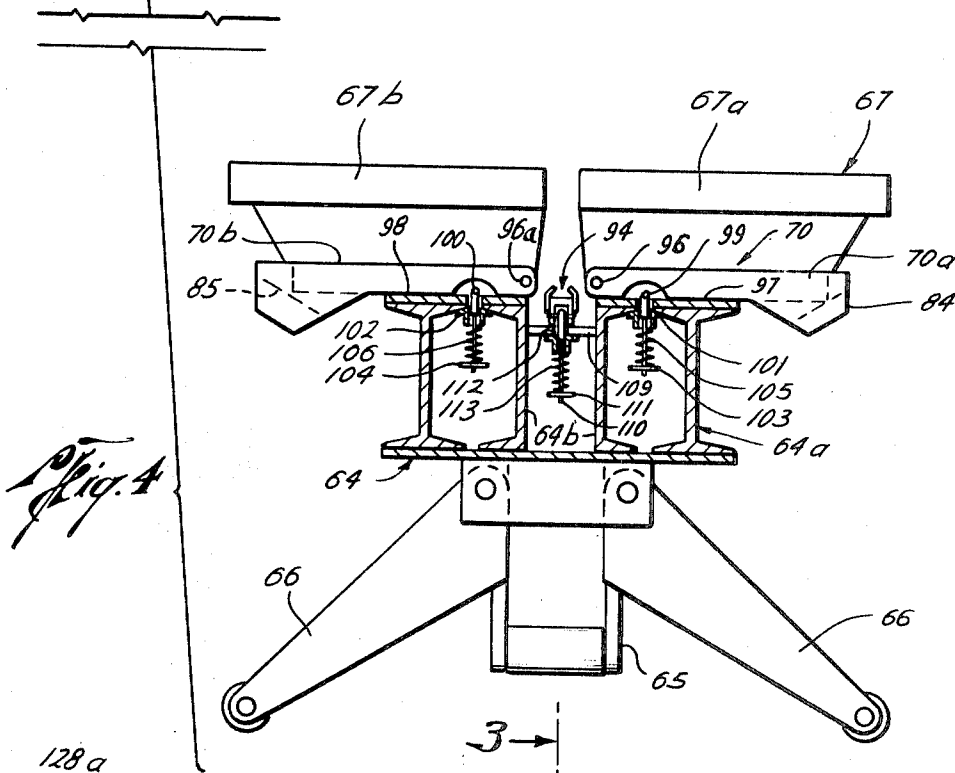
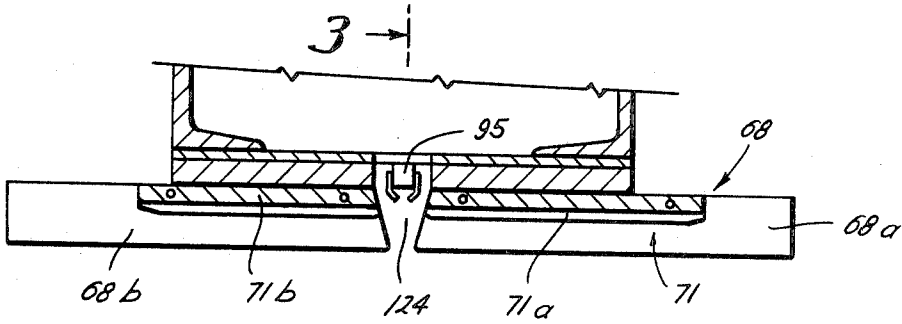


Fig. 5

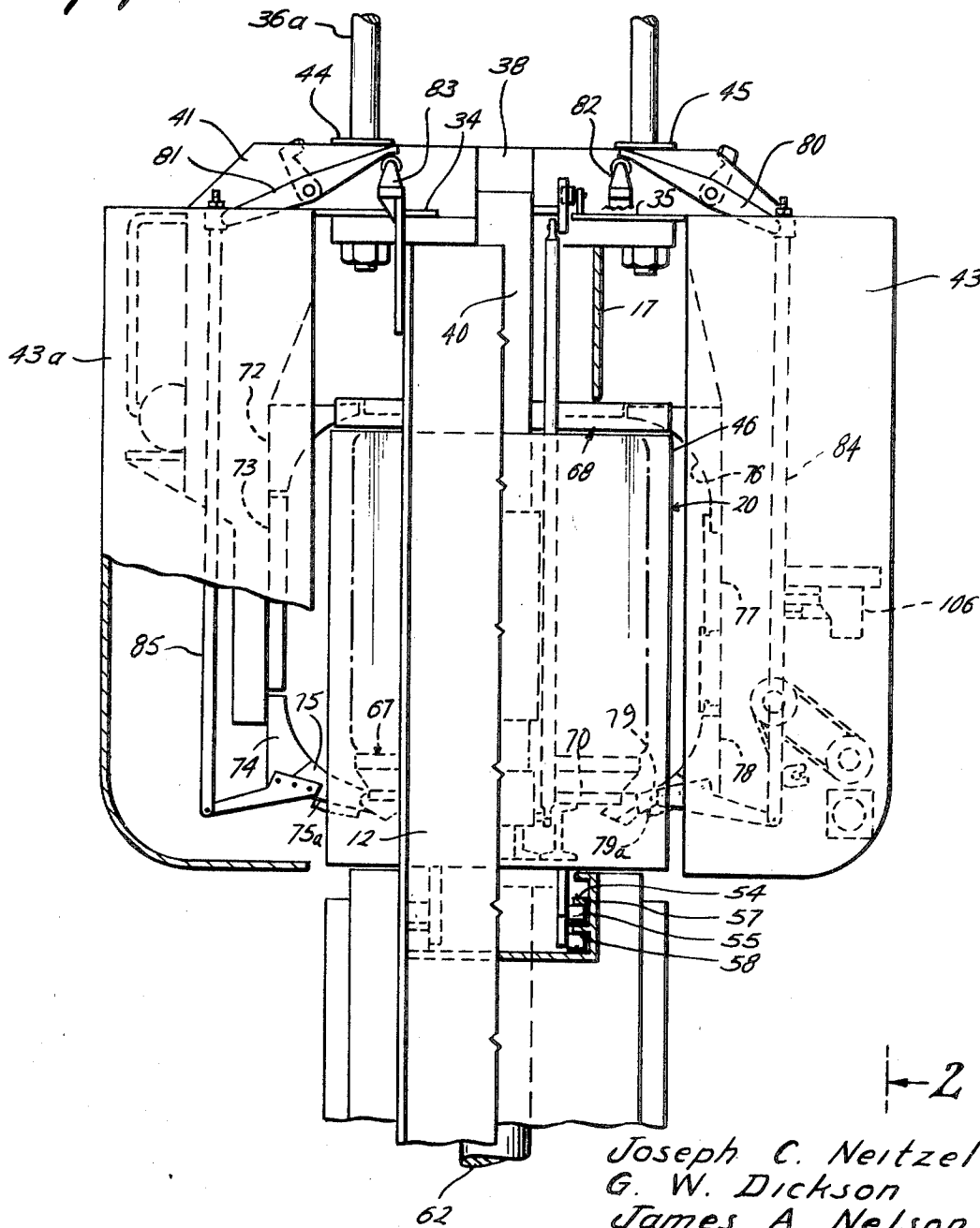
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Fig. 6

← 2



← 2

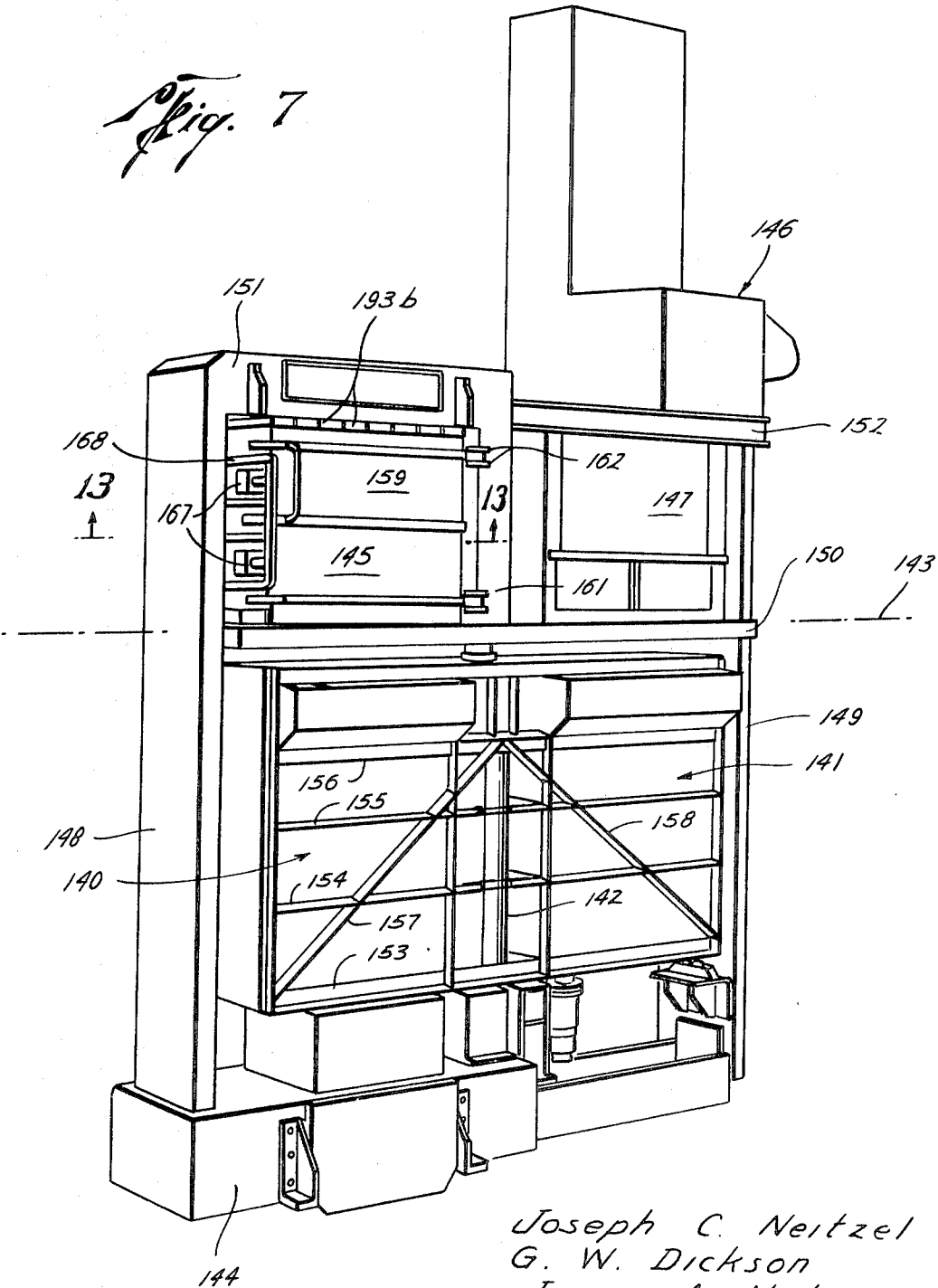
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Fig. 7



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Fig. 8

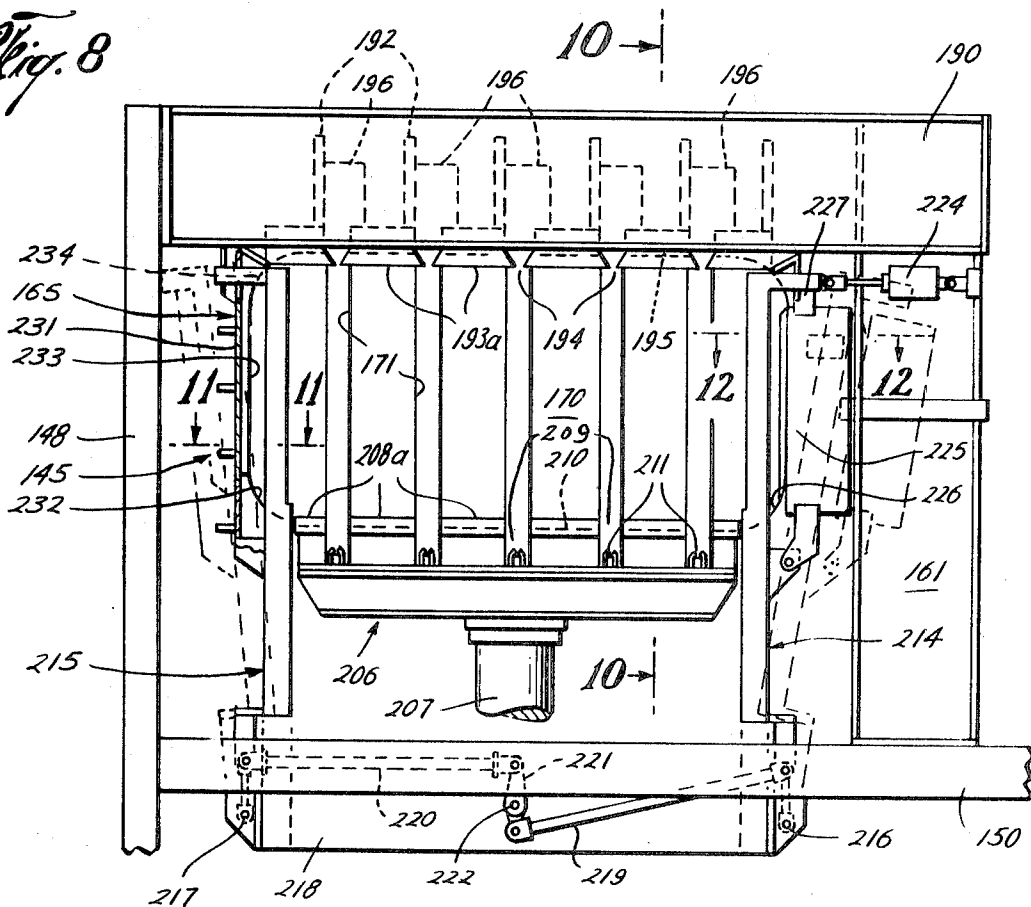
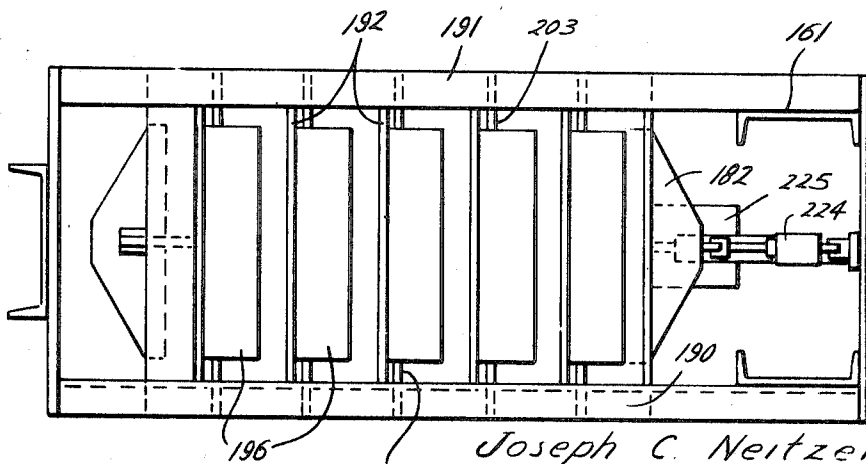
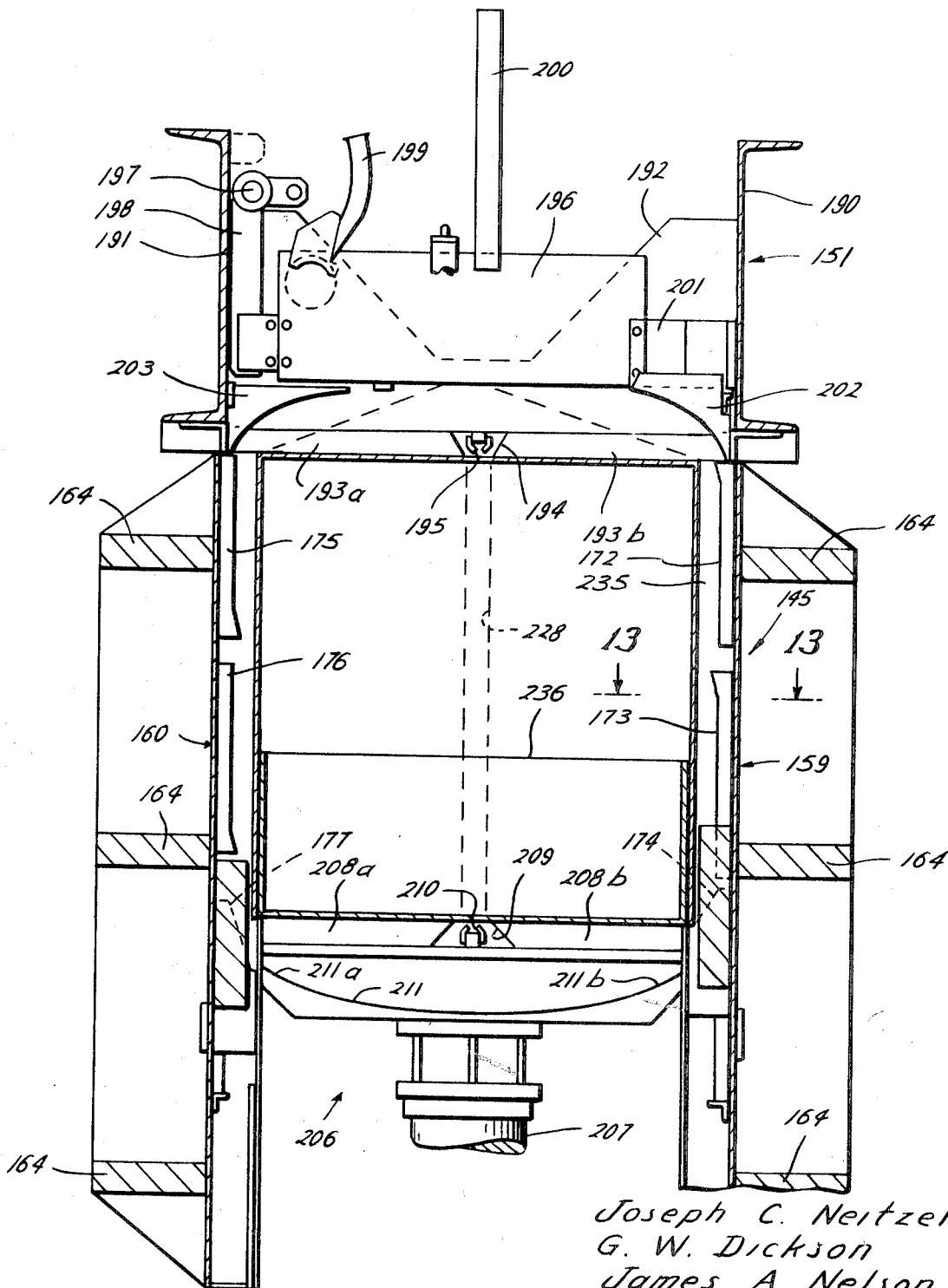


Fig. 9



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Fig. 11

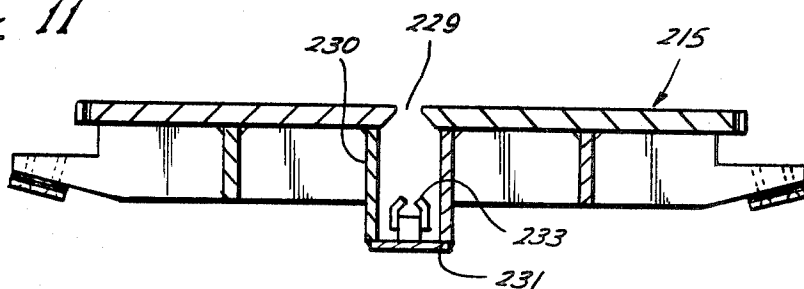


Fig. 12

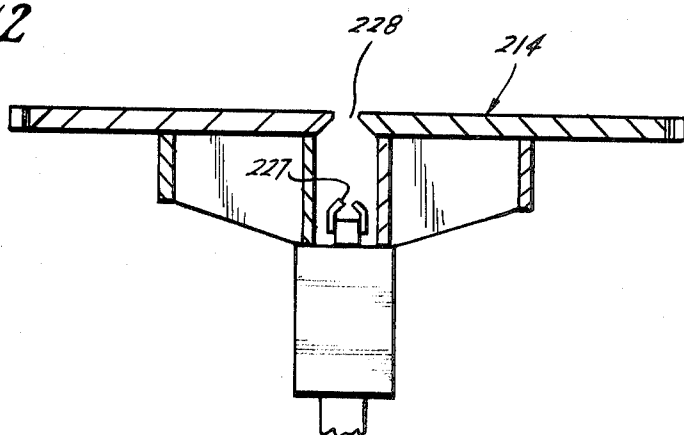
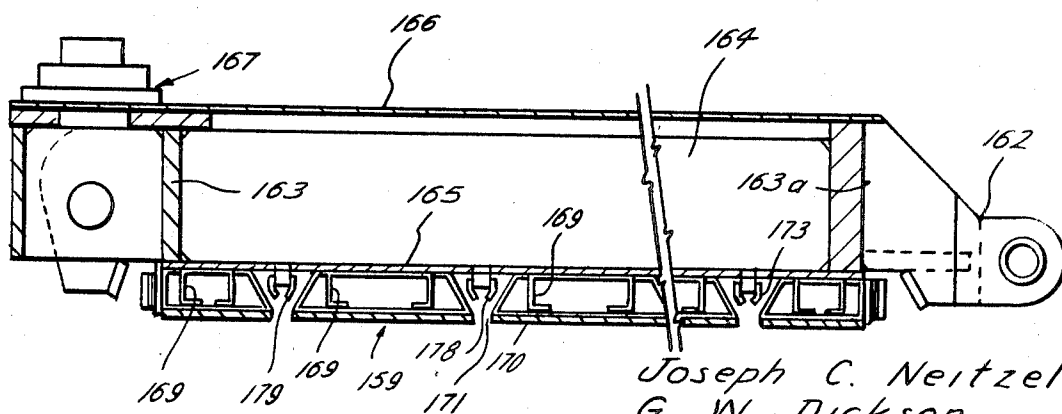


Fig. 13



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BALE BANDING APPARATUS

RELATED APPLICATION

U.S. Pat. No. 26,289 in the names of Joseph C. Neitzel and Tibor Laky discloses and claims automatic, transverse banding means for a two-box type of press having side-by-side boxes rotatable about a center post and provided with the usual side doors pivotally supported upon the center post. Band track elements traverse the top and bottom platens in the press chamber, while other track parts are carried by overhead structure and are movable from positions clearing the press box doorways to positions traversing these doorways to complete envelopment of the bale. Where the type of press covered in the above patent is utilized for baling synthetic fibers, it is frequently desirable to enclose the bale within a cardboard or other protective container. However, with the increased demand for higher density bales, there is a tendency for the container to crack at the ends when the pressure is released from the ram for removing the bale. For this reason, it is highly desirable to apply a longitudinal strap while the bale remains under compression and to do so automatically.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to bale-banding equipment for applying both transverse and longitudinal banding automatically about a bale and without obstructing the openings through which the bale must be withdrawn from the press.

2. Description of the Prior Art

After the banding of a bale, either manually or by means of automatic equipment as described and claimed in the above-mentioned Neitzel et al., patent, the bale, after the pressure of the follow block is relaxed, heretofore has been turned 90° in the press chamber and a longitudinal band then applied manually. Frequently, it has been necessary to move the bale to another location for application of the longitudinal band. However, in some cases, the expansive force exerted by the bale has been sufficient to crack the paperboard container at the corners as soon as the follow block is relaxed and before the longitudinal banding can be applied.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide means for applying longitudinal banding about a bale of fibers, before relaxing the pressure applied thereto by the follow block.

Another object is to provide means for automatically applying longitudinal as well as transverse banding about a fibrous bale, whether formed in a rotary, two-box press or a stationary box press.

In accordance with one form of the present invention, a rotary, two-box press is provided with an overhead, track-supporting frame which can be lowered into position, when the press doors and end walls are opened after completion of the pressing operation, for completing band guiding tracks extending transversely as well as longitudinally about the bale. The portions of the transverse tracks carried in the top and bottom platens are split longitudinally to permit the intersecting longitudinal banding to pass therethrough. Since the follow block is subject to slight disalignment with respect to the press walls, means are provided to insure proper alignment of all connecting track parts. The band-feeding heads are carried by the overhead frame.

Another form of the invention is applicable to a stationary box press in which all rotating parts of the press are located below the floor level. Band-guiding tracks are mounted in the side and end walls of the stationary box press. The transverse band-feeding heads are mounted on the top sill structure and the longitudinal band feeding head is mounted on the inside end door. This construction eliminates the overhead, track-carrying framing provided in the first form.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which illustrate the invention,

FIG. 1 is a perspective front view illustrating a more or less conventional type of rotating, two-box press equipped with banding apparatus in accordance with the present invention.

FIG. 2 is an enlarged front view illustrating the upper press box portion of the apparatus with the doors opened and the track-carrying framing lowered into banding position, parts being broken away and sectioned.

FIG. 3 is an enlarged vertical longitudinal section taken substantially on line 3—3 of FIG. 4.

FIG. 4 is a vertical transverse section through aligned top and bottom platens and is taken substantially on line 4—4 of FIGS. 2 and 3.

FIG. 5 is a view similar to FIG. 4 and showing a modification.

FIG. 6 is an end view of the press in FIG. 2, parts being broken away and sectioned.

FIG. 7 is a front perspective view of another modification.

FIG. 8 is an enlarged partial front view of the press in FIG. 7 with the front and back doors removed.

FIG. 9 is a top view of the structure in FIG. 8.

FIG. 10 is a vertical transverse section taken on line 10—10 of FIG. 8.

FIG. 11 is an enlarged horizontal section taken on line 11—11 of FIG. 8.

FIG. 12 is an enlarged horizontal section taken on line 12—12 of FIG. 8.

FIG. 13 is an enlarged horizontal sectional view of the front door of the press box and taken on line 13—13 of FIG. 10.

DESCRIPTION OF PREFERRED EMBODIMENTS

The press shown in FIGS. 1 and 2 is of the two-box, rotary type including massive framing consisting of upright side members 12 and 13, base structure 14, floor level bracing 15 mounting a rotating guard disk 16, and top sill structure 17. A pair of identical press boxes, generally designated 19 and 20, on opposite sides of center post 21 extend from base structure 14 to sill structure 17, these boxes being open at the top and the bottom and, at their upper portions, being equipped with side (front and rear) doors 22 and 23 hinged to center beam structure 24. Above right-hand box 19 there is provided a conventional trumper 25 which serves to direct fiber fed thereto into underlying press box 19. Projecting forwardly from the midportion of top sill structure is a cover box magazine 28 which accommodates a box part to be fed into the top of press box 19 when in a 90° position, as will be explained.

Side member 12 extends above top sill structure 17, as at 29, and is joined at the top by a lintel 30 to the upper end of an intermediate vertical beam 31. Traversing the under side of lintel 30 are transverse bars 32 and 33 which are aligned respectively with transverse bars 34 and 35 on the upper surface of top sill 17. Slide rods 36 and 37 extend between the adjacent ends of the pairs of bars 32 and 34 and 33 and 35, two other slide rods 36a and 37a extending between the opposite ends of the pairs of bars. A yoke formed of a horizontal top member 38 and vertical side members 39 and 40 is movably located between framing uprights 29 and 31 and has transverse beam structures 41 and 42 projecting sidewardly from top member 38. These transverse beam structures are secured to the top portions of banding track and propulsion mechanisms, as illustrated in detail in the above-mentioned patent, and enclosed within front and back hoods as at 43 and 43a. Beams 41 and 42 mount bearing sleeves 44 and 45 which are slidable on rods 36—37a inclusive. Top sill structure 17 is formed of transversely spaced sidewalls or channels between which vertical legs 39 and 40 of the yoke move when the yoke and banding and guide mechanisms in hoods 43 are lowered, as will be explained (FIG. 6).

The top portions of press boxes 19 and 20, within which the fiber is pressed into bales, are formed by front doors, as 22, and corresponding rear doors 23 all hingedly supported from center structure 24, and outer and inner end walls 46 and 47. The inner end walls 47 are carried on rollers 48 and 49 journaled in angular brackets 50 and which run on tracks 51 and 52 formed on the inner faces of the portions of bracing 15 projecting from lower box end walls 53 (FIG. 2). Outer end walls 46 are carried by means of rollers 54 and 55 journaled in brackets 56 and running upon lower tracks 57 and 58 formed on the extensions of bracing 15 projecting outwardly from lower box end walls 59. The offset pairs of rollers 48 and 49 and 54 and 55 provide stable supports for the end walls upon tracks which are carried around with the boxes, even though the tops of the end walls, when rolled outwardly, are unbraced.

Mounted in a well beneath base structure 14 (FIG. 1) is an hydraulic ram including piston rod 62 carrying a pressure plate 63 which may bear against the under side of the follow block, generally designated 64, in the press box currently in the press position. Guides 65 and 66 depend from the follow block for cooperation with the side and end walls of the well and also the lower part of the press box when the ram is projected thereinto (FIG. 2). Extending transversely on the top surface of the follow block are the usual wooden battens, generally designated 67, and transverse battens 68 on the bottom surface of top sill structure 17 form the top platen.

Transverse track parts, generally designated 70 and 71, are mounted between spaced pairs of top and bottom battens 67 and 68 and cooperate with vertical track parts 72-75 and 76-79 in the hoods 43 and 43a, as explained in the above-mentioned patent, for directing banding transversely about the bale when the front and back doors have been opened and end walls 46 and 47 withdrawn manually. Transverse band driving, cutting, tightening, and securing heads 106 are also carried in hood 43, while longitudinal banding head 107 is carried by yoke outer leg 40. In the lowered operating positions of the transverse banding mechanism in hoods 43 and 43a, any slight disalignment of the follow block structure is compensated by enforced alignment of the resiliently mounted lower transverse track sections 70 by engagement of levers 80 and 81 with fixed stops 82 and 83 acting through links 84 and 85 to rotate the pivoted lower track extremities 75 and 79 against cam surfaces 84 and 85 at the distal ends of horizontal, pivoted track parts 70a and 70b. Any resultant disalignment of corresponding track parts 70a and 70b will not adversely affect feeding of the banding through and between the aligned track parts. Reciprocating yoke 38, 39, 40 also carries vertical end track parts 86-89 and 90-93 for cooperating with horizontal, longitudinally extending track parts 94 and 95 (FIG. 4) mounted respectively on the top and bottom platen structures.

FIGS. 3 and 4 illustrate the transverse and longitudinal tracks in greater detail and their mountings on the top and bottom platen structures. Bottom longitudinal track part 94 is located below the level of transverse track parts 70, the latter being longitudinally split, as at 70a and 70b, to permit the passage therebetween of banding released from longitudinal track part 94. Transverse track parts 70a and 70b are pivotally connected at 96 and 96a (FIG. 4) at the sides of the longitudinal slot formed between the spaced inner ends of the transverse follow block batten elements 67 which are also split, as at 67a and 67b. Track parts 70a and 70b are resiliently held against the flat upper surfaces of the separated top webs 97 and 98 of follow block beam structure 64a by means of short rods 99 and 100 pinned to the track parts. The rods depend through holes in the top webs and mount spring seat washers 101, 102, 103, and 104. Lower washers 103 and 104 are locked against longitudinal movement on the rods, as by nuts or cotter keys, and are constantly urged downwardly together with rods 99 and 100 and the connected track parts by coiled springs 105 and 106. As noted, band-driving head 107 is mounted on outer vertical yoke leg 40 for propelling banding through the longitudinal track parts.

Longitudinal track member 94 carried by the follow block structure is mounted on transverse bridge plates 109 inside web portions 64b of the follow block beam 64a. Track 94 is resiliently maintained in its normal position abutting mounting plates 109 by means of rods 110, washers 111 and 112, and coil compression springs 113, as in the case of transverse track elements 70a and 70b. At the ends of longitudinal track element 94 there are provided inclined camming surfaces 114 and 115 which may be transversely of dovetail shape. Lowermost, pivoted, vertical track parts 89 and 93 are rotated by vertical links 116 and 117 when levers 118 and 119 engage stop rollers 120 and 121 projecting upwardly from the top surface of top sill structure 17, as the yoke and hoods 43 and 43a approach their lowered operating positions, to cause proper alignment of the track 94 irrespective of slight canting or displacement of the follow block.

Also shown in FIGS. 3 and 4 is the upper platen structure including longitudinally split, transverse battens 68a and 68b to which are rigidly secured transverse track parts 71a and 71b aligned with corresponding track parts 70a and 70b carried by the follow block. In the longitudinal slot 124 between the adjacent inner ends of batten parts 68a and 68b there is mounted the upper longitudinal track section 95 with which the upper corner track parts 86 and 90 carried by yoke legs 40 and 39 are operatively associated in the operating position of yoke.

FIG. 5 illustrates a slightly modified mounting of the split, transverse track parts 125a and 125b carried by the follow block 126 in the slot 127 between the ends of the split battens 128a and 128b. Here, the transverse track parts 125a and 125b rest upon the upper surface of the follow block beam and are not secured thereto, except by means of spring mounts 129 and 130. However, a channel member 131 rigidly connects the adjacent inner ends of each pair of track parts. The bottom web of the U-shaped member extends beneath longitudinal track part 132 and mounts the spring attachments 133 resiliently securing the transverse track sections to the follow block structure.

In operation, with the machinery in the position shown in FIG. 1, fiber is fed into the top of right-hand press box 19, by means of tramper 25, until the predetermined quantity of fiber is contained therein. The boxes then will be rotated about center post 21, through the intermediary of turning mechanism including gearing 134, to bring the tramper-filled box 19 into position above ram plunger 62, 63 and move the other box 20 beneath the tramper for filling. Ram 62, 63 is then actuated to drive the follow block structure 64 upwardly into the superimposed box 19. The side (front and back) and end doors are secured in position by hydraulic locking brackets 135 and 136. When the bale is compressed the proper amount, side doors 22 and 23 are opened, releasing the end walls which are rolled outwardly by hand, to expose the bale therein. Where synthetic fibers are being pressed, the bale may be covered by paperboard box material, which, however, does not interfere with the application of banding. A bottom box part may be initially placed on the follow block beneath the tramper and the top box part fed into the top of the box when in the intermediate, 90° position and beneath magazine 28. Next, yoke 38, 39, 40 and the vertical parts of the transverse and longitudinal banding mechanisms in hoods 43, 43a and at the ends are lowered by suitable power mechanism to cause the corresponding transverse track sections 70a, 70b and 71a, 71b to become aligned with the corresponding vertical track sections 72-75 and 76-79. At the same time, the end track sections 86-89 and 90-93 will be lowered to extend along the ends of the bale with the corner sections aligned with the ends of longitudinal tracks 94 and 95. The banding heads 106, carried in hood 43, and also the end banding head 107 will then be actuated to drive banding through the transverse and longitudinal tracks enveloping the bale. Finally, the banding heads will be reversed, as explained in the above-mentioned patent, to withdraw the bands from the tracks into tight engagement with the bale and the bands then cut off and sealed. The split arrangements of transverse batten bars 67a and 67b and track sections 70a and 70b permit

the longitudinal track sections to pass through these members in approaching the bale, of course, crossing the transverse bands already applied. Likewise, the longitudinal banding at the top passes between track parts 71a and 71b.

After the banding is completed, follow block structure 64 is lowered sufficiently to permit removal of the finished bale, the press box end walls and side doors are returned to their closed positions, and the follow block is lowered to the bottom of the press box for repetition of the cycle.

FIGS. 7-13 inclusive show a modified form of the invention applied to a stationary box-type of press. Boxes 140 and 141 rotate about center post 142 wholly below the flooring 143. The hydraulic cylinder portion of the ram structure is mounted in and beneath heavy base beams 144. A single, stationary press box, generally designated 145, is mounted directly above the left-hand box 140. The trampler 146 is mounted above the right-hand portion of the equipment and feeds fibers through a rectangular chute box 147 into the one of the rotating boxes 140 and 141 which is located therebeneath. Rotating boxes 140 and 141 below floor level 143 do not in themselves constitute the present invention and will not be further described. All of the box parts are enclosed within framing, including the mentioned heavy base structure 144, upright end members 148 and 149, floor level bracing 150, and top sill structures 151 and 152. The rotating boxes below the floor level are braced by horizontal bars 153-156 and diagonals 157 and 158. Press box 145 is provided with front and rear doors 159 and 160 which are pivotally mounted on intermediate vertical beam 161 by means of hinges 162. The front and back doors are constructed generally alike (FIG. 13) and each includes heavy vertical and horizontal framing braces 163, 163a, and 164 connected on the inside by a plate 165 and covered on the outside by sheathing 166. Mounted on outside vertical frame 163 of the front door are hydraulic door locks 167 which cooperate with a locking frame 168 pivotally secured to the outer end of rear door 160. Braces 169 secured to the inner face of plates 165 of both doors mount stainless steel interior sheeting 170 having vertical slots 171. Within these slots are secured vertical banding guide track sections 172, 173, and 174 at the front and 175, 176, and 177 at the rear. Multiple sets of vertically aligned track sections are mounted in each of the front and back doors, as suggested in part at 173, 178, and 179 in FIG. 13, the corresponding sets of vertical tracks in each door being transversely aligned. Bottom track sections 174, 177, etc., are vertically slidable by means (such as by hand manipulation) not shown for shielding the lower parts of the slots 171 during pressing, as will be explained. Track section 174 is shown in its raised shielding position, while track section 177 is in its lowered position preparatory to banding.

As best shown in FIGS. 8, 9, and 10, top sill structure 151 is formed in part of a pair of longitudinal channel beams 190 and 191 spanned by recessed gussets 192. On the under surface of the sill structure are mounted aligned pairs of transverse battens 193a and 193b. Extending along slot 194 between the spaced inner ends of the transverse battens and also secured to the under surface of the top sill structure is a longitudinal top track section 195 (FIGS. 9 and 10). A transverse banding head structure 196 is pivotally secured at 197 to a lug 198 projecting from channel beam 191 between each pair of gusset members 192. These banding heads are commercially obtainable and will not be detailed here, although, generally, they follow the construction illustrated in the above-mentioned patent. A curved feed tube 199 provides for delivery of banding to each head, and each head is provided with a magazine 200 for clamping seals. Each head, in its lower operating position, is secured at its free end to a bracket 201 projecting from the opposite channel beam 190. The heads are pivotally mounted so they can be elevated to provide access to the top platen and the track structure carried thereby. The feeding mechanism of each banding head 196 is vertically aligned with vertical track sections 172-174 and 175-177 carried by the front and back doors. Corner track sections 202

and 203 also carried by the top sill structure provide for directing the lead ends of the banding into top track members 172, etc., and for receiving the banding from track members 175, etc.

The follow block structure, generally designated 206, is mounted on hydraulic ram 207 so as to be urged upwardly through rotatable box 140 or 141 and into the stationary box thereabove during the pressing operation. Pairs of aligned battens 208a and 208b are secured to the top of the follow block structure (FIGS. 8 and 10), a slot 209 between the spaced inner ends of these batten members accommodating the lower longitudinal track section 210. Also mounted on the follow block structure, in the transverse spaces between aligned pairs of battens 208a, 208b, are transverse track sections 211 having upwardly and outwardly curved extremity portions, as at 211a and 211b, which, when the front and back doors are closed.

The end door structures, generally designated 214 and 215, are pivotally mounted at 216 and 217 on heavy frame structure 218 at the bottom of stationary box 145. The doors are interconnected by links 219 and 220 secured at their inner ends to the extremities of a lever 221 centrally pivoted at 222 on the box framing. Inner end door 214 may be opened and closed, together with outer end door 215 linked thereto, by an air motor 224. Mounted on inner door 214 is the banding head 225 which is aligned with corner track sections 226 and 227 also carried by the inner end door and which, in turn, are aligned with longitudinal track sections 195 in the top platen structure and 210 in the follow block structure. The inner end door 214 (FIGS. 10 and 12) is provided with a central longitudinal slot 228 for permitting the passage therethrough of the longitudinal bale banding fed by head 225.

The outer end door is also longitudinally split at 229 (FIG. 11) and provided with an outward channel 230 which mounts on its base web 231 the vertical track sections 232, 233, and 234 which, also, are aligned and register with longitudinal track sections 195 in the top platen structure and 210 in the follow block structure when the end doors are closed, as shown in solid lines in FIG. 8. FIG. 8 also shows in dotted lines the opened positions of the end doors. Accordingly, the bale-forming chamber in stationary box 145 is surrounded by tracks for applying five bands transversely about the bale and other tracks, at 90° thereto, for applying a single longitudinal band about the bale. The vertical transverse track sections are carried by the front and back doors, while the vertical longitudinal track sections are carried by the inner and outer end doors, and all of these track sections move into their banding positions when the press box doors are closed for forming the bale. FIG. 10 shows the bale space within press box 145 enveloped in telescoping upper and lower boxes or cartons 235 and 236, as are frequently provided in the baling of synthetic fibers.

It is believed the operation of the form in FIGS. 7-13 inclusive will be apparent from the above description. However, briefly, with reference to FIG. 7, when box 141 is filled to the desirable extent with fiber by trampler 146, the boxes are rotated to bring box 141 beneath press box 145 and place box 140 under the trampler for filling. If desired, a lower carton section 236 will be placed upon the follow block before the box is charged with fiber. Upper carton section 235 will be properly installed in the press box. Thereupon, ram 207 will be operated in the usual manner to force follow block structure 206 upwardly through the superimposed rotatable box and to the position of FIG. 10 at the bottom of the press box. Next, bottom track sections 174 and 177 in the front and back doors will be lowered to their banding positions. This movement may be necessary to prevent the fiber from entering the portions of the slots, as 171, in the front and back doors which are below the lower edge of upper carton 235. In the pressed position of FIG. 10, lower box section 236 will have covered these open portions of slots 171 so that bottom track sections 174 and 177 may be lowered, as explained. Heads 196 carried by the top sill structure will be operated to drive multiple

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transverse bands through track sections 202, 172, 173, 174, 211, 177, 176, 175, and 203, back to head 196 for tightening. When the transverse banding is tightened, it will pull through slots 209 between battens 208a in the follow block and also slots 171 in both the front and rear doors. The transverse banding will remain tensioned by heads 196 on three sides of the bale (front side, rear side, and bottom). Following this, head 225 will then be operating to drive banding in a counter-clockwise direction through the registering longitudinal sections 227, 195, 234, 233, 232, 210, and 226, back to head 225 for tightening. When the longitudinal banding is tightened, it will pull out of slots 229, 194, and 209. The longitudinal banding will remain tensioned by head 225 around three sides of the bale (the top, the bottom, and the outside end). At this time, both the transverse and longitudinal banding will be seal clamped and cut off by heads 196 and 225. Thus, the bale will be fully enveloped, both transversely and longitudinally, by banding before opening of the front, back, and end doors. As the follow block is lowered for releasing the bale, the transverse and longitudinal banding close tightly around the bale. This effectively prevents cracking of protective carton parts 235 and 236 at the corners due to expansion of the fibers when released from the press chambers.

The invention may be modified in various respects as will occur to those skilled in the art, and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

We claim:

1. The combination with a press box having front, back, and end walls and top and bottom platens defining a press chamber, means for shifting at least one each of said front and backwalls and said end walls to permit access to and removal of a bale in said chamber, of band guide means surrounding said chamber endwise and means located at the top of said chamber for driving banding through said guide means and securing the banding about a bale in said chamber free of said guide means, whereby the banding is sealed at the top of said blade.

2. The combination described in claim 1 in which said band-guide means includes track parts traversing the chamber ends and said platens lengthwise of said chamber.

3. The combination described in claim 2 further including a

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second band-guide means surrounding said chamber and arranged perpendicular to said first guide means and including track parts for traversing the chamber front and backwalls and at least partly shiftable to permit access to and removal of a bale in the chamber.

4. The combination described in claim 3 in which said first band-guide means includes first track members extending in one direction and second, intersecting track members, said first track members being longitudinally split in alignment with said second track members to permit the passage through said first track members of banding released from said second track members.

5. The combination described in claim 4 in which said intersecting track members traverse and are supported by said platens.

6. The combination described in claim 3 in which said band-guide means include intersecting endwise and crosswise track members, said crosswise track members being recessed intermediate of their ends to provide space aligned with said endwise track members for the passage of banding released from the latter track members during securement of said banding about the bale.

7. The combination described in claim 6 in which a plurality of divided, crosswise track members traverse the top and bottom of said chamber and single, endwise, intersecting track members are provided at each of the top and bottom of said chamber.

8. The combination with a press box having front, back, and end walls forming a bale-pressing chamber and shiftable between bale-confining and bale-releasing positions, top and bottom platens in said chamber, and a press ram for actuating one of said platens, of band-guide means extending endwise around said chamber including end track parts for extending along the ends of said chamber, frame means carrying said end track parts, and means for moving said track parts into banding positions extending across said ends and away from said banding positions to clear said ends for movement of said end walls into their bale-confining positions, and means located at the top of said chamber for feeding banding through said guide means when said track parts are in said latter positions, whereby the banding is sealed at the top of said bale.

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