

[54] **APPARATUS FOR COMPRESSING AND PACKAGING STACKS OF FLATTENED JUXTAPOSED BAGS OR LIKE SHEET ARTICLES**

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- [22] Filed: **July 7, 1971**
- [21] Appl. No.: **160,291**
- [30] **Foreign Application Priority Data**
 July 13, 1970 Germany..... P 20 34 696.7
- [52] U.S. Cl..... **53/124 C**
- [51] Int. Cl..... **B65b 63/02**
- [58] Field of Search..... **53/124 C**

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[57] **ABSTRACT**
 In an apparatus for compressing and wrapping stacks of sheet articles, wherein each stack is introduced by a substantially vertically reciprocable plunger through a bottom opening in a compression chamber and carries with it a web of wrapping material stretched in front of the opening, the stack being compressed by the plunger against a backing member of the chamber and the web being closed as a sleeve about the compressed stack by means of a folding device before the stack is discharged, the improvement of providing a folding device comprising a slide member which can be reciprocated to and from across substantially the entire bottom opening, providing the chamber with a further opening at one side and arranging for the backing member to be withdrawable from the compressed stack before the slide member is moved away from the bottom opening to discharge the wrapped stack through the side opening.

5 Claims, 2 Drawing Figures

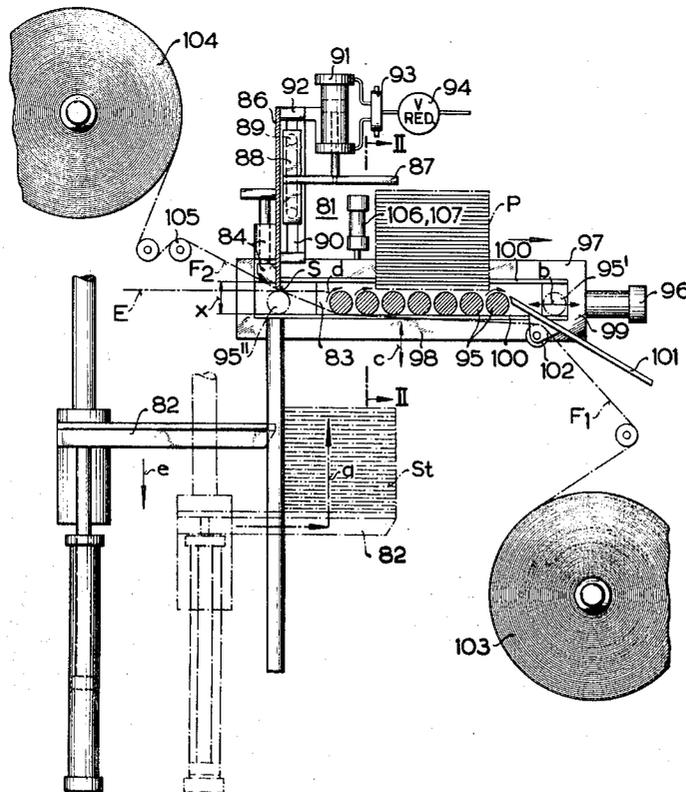
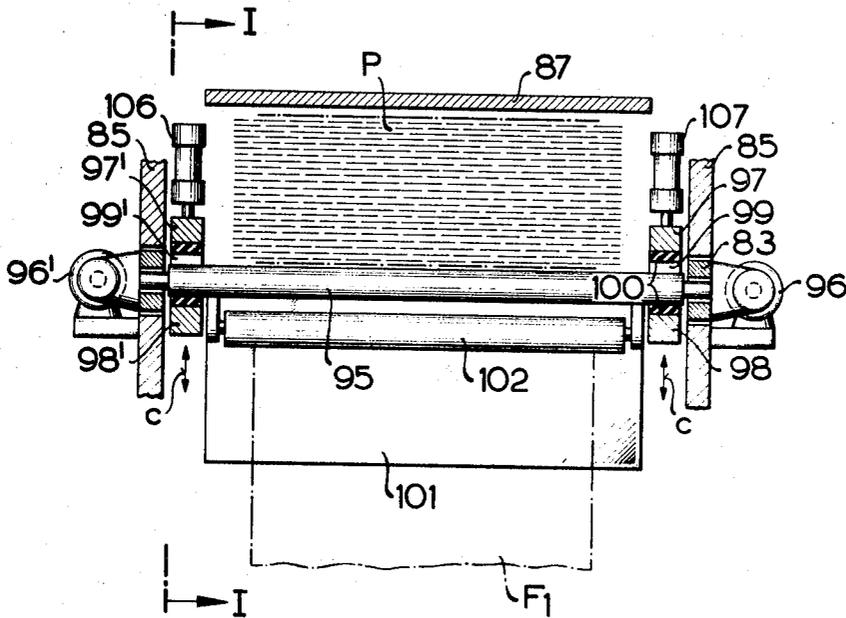


FIG. 2



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**APPARATUS FOR COMPRESSING AND
PACKAGING STACKS OF FLATTENED
JUXTAPOSED BAGS OR LIKE SHEET ARTICLES**

The invention relates to an apparatus for compressing and packaging stacks of flattened juxtaposed bags or like sheet articles comprising a downwardly open compression chamber against a backing member of which the stack is compressed by means of a plunger which is reciprocated in a vertical or steeply inclined direction. As the stack is introduced in the compression chamber through the bottom opening, it takes with it a web of packaging material that is disposed in front of the bottom opening and, after the stack has been compressed, at least one folding device which is reciprocable to and from the bottom opening is effective to close the web of packaging material about the stack, a tool being provided for joining the ends of the web to form a packaging sleeve.

An apparatus for the above-mentioned description is disclosed in German specification No. 1,161,509. In our own German Patent Application No. P 19 39 069.3 (British Patent Application No. 36552/70), we have described an improved such apparatus in which two freely rotatable supply rolls of thermoplastic sheets are disposed on opposite sides of the bottom opening, welding means are provided for interconnecting the sheets by a transverse weld seam to form the web of packaging material which is disposed across the opening to be carried into the chamber by the stack, means are provided for displacing the plunger at right-angles to the weld seam after its compression stroke, the transversely movable folding device is disposed at the same level as that in which the plunger is located at the end of its compression stroke, and in which the folding device is effective not only to close the web about the stack to define the packaging sleeve but also to bring the sheets of the web together in readiness for forming a second web of packaging material for a second stack, the welding means being effective in co-operation with the folding device to weld the packaging sleeve closed about the stack and to sever the packaging sleeve from the sheets so that the sheets remain interconnected to form the second web.

In the apparatus forming the subject of our aforementioned copending application, the compression chamber can be swung away laterally so as to move the packaged stack into the vicinity of a conveyor to which it is transferred. The apparatus can be used with a plunger that is reciprocable horizontally or vertically or in any inclined direction although a vertical or steeply inclined direction is preferred so that the opening in the chamber can be at the bottom and the bags in the stack will lie substantially horizontally during compression and packaging. Such a horizontal disposition is advantageous because, no matter how slippery the bag material might be, there will be little danger of the bags in the stack becoming displaced under gravity.

The aim of the present invention is to provide a compressing and packaging apparatus in which the discharge of the packaged stacks from the compression chamber is simplified.

According to the invention, there is provided an apparatus for compressing and packaging a stack of flattened bags or other sheet articles, comprising a compression chamber for receiving the stack through a bottom opening therein, a plunger effective to introduce

the stack in the chamber together with a web of packaging material disposed across the bottom chamber opening and to compress the stack against a backing member of the chamber, the plunger being reciprocable in a vertical or steeply inclined direction, at least one folding device effective to close the web about the compressed stack, and means for joining the web ends to form a packaging sleeve about the stack, wherein said folding device comprises a slide member which is reciprocable to and from across substantially the entire bottom chamber opening transversely to the reciprocating direction of the plunger, the compression chamber has a further opening at one side and the backing member is withdrawable from the compressed stack before the slide member is moved away from the bottom opening to discharge the packaged stack through the side opening.

By reason of the side opening and withdrawal of the backing member before the folding device comprising the slide member is withdrawn from the bottom opening, the packaged stack resting on the folding device can simply be taken out through the side opening whilst remaining supported on the folding device, without the need for pivoting the relatively heavy compression chamber. This represents a saving in costs because a pivotal drive for the compression chamber and special means for discharging the packaged stack can be dispensed with.

In one preferred embodiment, a stripping device is provided adjacent the chamber side opening. This stripping device is adapted to be moved in front of the side opening after discharge of the packaged stack and to sweep the package from the folding device when the latter is returned to across the bottom opening.

If, as in our aforementioned copending application, the slide member is provided with a plurality of rotatable rollers which extend transversely to the reciprocating direction of the slide member, then the ends of these rollers are preferably disposed between upper and lower roller tracks which are movable parallel to the movement of the slide member as well as towards and away from the rollers, the upper roller tracks being engageable with the rollers when the slide member is moved to across the bottom chamber opening (i.e. during the operative stroke of the slide member) and the lower roller tracks being engageable with the rollers when the slide member is moved away from the bottom opening (return stroke of the slide member). Thus, during the operative stroke of the slide member, the rollers are rotated by the upper tracks and they run with practically negligible friction over the bottom of the stack so as to close the web of packaging material about the stack and define the sleeve. The same direction of rotation of the rollers is maintained during the return stroke of the slide member at which time they are engaged by the lower roller tracks. As a result, the rotating rollers will, during the return stroke of the slide member, move the stack that is resting thereon out through the side opening of the compression chamber in the same direction as the slide member is being withdrawn but at a speed which is twice that of the slide member during its return stroke. If the folding device is provided with a ramp, then the packaged stack can run off the rollers down the ramp and be taken away.

The faces of the roller tracks may be lined with an elastic friction covering, preferably rubber, to ensure

that the rollers will roll along the roller tracks without slipping.

An example of the invention will now be described with reference to the accompanying diagrammatic drawings, wherein:

FIG. 1 is a side elevation of a compressing and packaging apparatus, partly sectioned on the line I—I of FIG. 2, and

FIG. 2 is a sectional view taken on the line II—II in FIG. 1.

The basic construction and function of the illustrated apparatus is very similar to the apparatus disclosed in our aforementioned copending application. The apparatus comprises a compression chamber 81, a plunger 82, a folding device 83 and separating welding means 84. The arrangement of these components is such that the plunger 82 executes its operative stroke (to compress a stack in the compression chamber) in a vertical or steeply inclined upward direction indicated by the arrow *a*. Accordingly, the compression chamber 81 has a bottom opening to enable a stack *St* of flattened bags or other sheet articles to be introduced. The folding device 83 for closing a web of packaging material about the stack after the latter has been compressed is therefore reciprocable across the bottom chamber opening in a horizontal or only slightly inclined direction. The compression chamber 81 is stationary. It is formed by a side wall 86 (which is secured to a frame 85 of the apparatus shown in FIG. 2) and a backing member 87 which extends at right-angles to the side wall 86. The backing member 87 is connected to lateral guide bars 88 provided with rollers 89. The rollers engage in slotted members 90 fixed to the side wall 86. These means are provided to enable the backing member 87 to be displaced in a substantially vertical direction whilst accurately remaining at right-angles to the side wall 86. Displacement of the backing member 87 is effected by means of a piston of a backing cylinder 91 which is supported from the side wall 86 by a bracket 92. The movement of the piston of the cylinder 91 can be reversed by means of a valve 93. Pressure for operating the cylinder 91 is infinitely variable by means of a reduction valve 94 in a fluid conduit for the backing cylinder. The compression chamber 81 is open at the side opposite the wall 86, i.e., it is open at that side from which the slide member 83 is advanced to reach the bottom opening.

The folding device is in the form of a flat slide member comprising a flat frame 83 which, as shown in FIG. 2, is displaceably mounted in the frame 85 at both ends of the compression chamber and is reciprocated by pressure cylinders 96, 96'. The frame 83 contains a multitude of loosely rotatable rollers 95 which extend transversely to the reciprocating direction of the frame 83 across the entire width of the compression chamber and together define a roller grating. The ends of the rollers 95 are disposed between roller tracks 97, 98 and 97', 98' which extend parallel to the direction of movement of the frame or member 83 to both sides of the compression chamber. As shown in FIG. 1, the roller tracks 97 and 98 on the one hand and 97' and 98' on the other hand constitute pairs forming part of slotted members or frames 99 and 99', respectively. The spacing *x* between the roller tracks of each pair is larger than the diameter of the rollers 95. The slotted members or frames 99, 99' are displaceable in the direction of the arrow *c* (transversely to the direction of move-

ment *b* of the folding device) by means of two double acting pressure drives 106, 107. The arrangement is such that the upper roller tracks 97, 97' contact the rollers 95 during the operative stroke of the slide member 83 (which occurs when the slide member is moving from right to left in FIG. 1) whilst the roller tracks 98, 98' contact the rollers 95 during the return stroke of the slide member. The roller tracks are lined with elastic friction covering 100, preferably of rubber, which ensure positive rolling of the rollers along the roller tracks. At the end of the slide member 83 remote from the compression chamber 81 there is secured a ramp 101 which carries a guide roll 102 for a sheet of packaging material *F*₁ unwound from a supply reel 103. This sheet *F*₁ is joined by means of a transverse weld seam *S* to a sheet *F*₂ of packaging material unwound from a supply reel 104, so that the sheets *F*₁, *F*₂ together define a web of packaging material for wrapping about a stack that has been compressed in the chamber 81.

Upon commencement of a compressing and packaging operation, the slide member 83 and its rollers 95 are disposed at a limiting position to the right hand side of the slotted members 99, 99' (as is indicated in FIG. 1 by the roller shown in chain-dotted lines at 95'). The slotted members 99, 99' are in a lowered position (not shown) at which the roller tracks 97, 97' are in contact with the rollers 95. The web *F*₁, *F*₂ of packaging material is positioned across the bottom opening of the chamber 81 by means of the aforementioned guide roll 102 and further guide rolls such as 105. The backing member 87 is, under the influence of the backing cylinder 91, in a lowermost position determined by the slots in the slotted members 90. The plunger 82 supporting the stack *St* is in the lowered position shown in chain-dotted lines in FIG. 1. When the plunger 82 is now elevated, it eventually introduces the stack *St* through the bottom opening of the compression chamber 81, the stack carrying the web *F*₁, *F*₂ with it into the chamber. After the top of the stack has met the backing member 87, it is compressed between the backing member and the plunger to an extent regulated by the reduction valve 94. Eventually the plunger 82 reaches an uppermost position at which its surface is flush with the tops of the rollers 95 at an imaginary plane *E*, the backing member 87 being displaced upwardly under the greater pressure of the plunger 82 relatively to the pressure exerted by the cylinder 91. The compressed stack will now be contained entirely within the chamber 81 and will be covered on three sides by the web *F*₁, *F*₂ of packaging material. The slide member 83 now executes its operative stroke (towards the left hand side of FIG. 1) to close the web about the bottom of the compressed stack, the plunger 82 being simultaneously moved away from the compression chamber 81 in the same direction as and at the same speed as the slide member 83. As the slide member moves to the left, the rollers 95 are rotated by the upper roller tracks 97, 97' with which they are still in contact. The rollers therefore rotate clockwise as indicated by the arrow *d* in FIG. 1 and close the web about the bottom of the compressed stack. When the slide member 83 has reached a left-hand limiting position indicated by the roller shown in chain-dotted lines at 95'' in FIG. 1, the web has been closed about the stack to define a sleeve of which the ends are joined by a separating welding apparatus 84 which is also effective to sever the sleeve from the remainder of the web, the sheets *F*₁ and *F*₂ again becom-

ing interconnected by a transverse weld seam S to form a web for packaging the next stack that is to be compressed. After a short period which is sufficient to allow the weld seams to cool, the valve 93 is operated to reverse the action of the fluid on the piston of the cylinder 91 so that the backing member 87 will be lifted off the compressed and packaged stack P. At the same time the slotted members 99, 99' are displaced upwardly so that the roller tracks 98, 98' make contact with the rollers 95 as shown in FIG. 1. The packaged stack P will now rest on the rollers 95 and, as the slide member 83 is moved to the right hand side of FIG. 1, will be withdrawn through the open side of the compression chamber 81 at a greater speed than that of the slide member 83 because at this time the rollers 95 are rolling along the roller tracks 98, 98' to rotate in the direction of the arrow d. Eventually, the packaged stack P rolls off the rollers 95 at the position of the ramp 101 along which it can slide to a conveyor (not shown). During withdrawal of the stack P, the plunger 82 is moved downwardly in the direction of the arrow e as shown in full lines in FIG. 1. When reaching its lowermost position, the plunger 82 is displaced towards the right hand side to the position shown in chain-dotted lines where it receives the next stack St to be compressed and packaged.

I claim:

1. Apparatus for compressing and packaging a stack of flattened bags or the like, comprising a compression chamber for receiving the stack, an opening in the bottom of said chamber through which the said stack can be inserted, a plunger for introducing the stack in said chamber through said bottom opening and compressing it against a backing member of said chamber, said plunger being mounted for reciprocal movement in the substantially vertical direction, means for disposing packaging sheets across said opening so that they are carried into the said chamber by said stack as said stack is introduced, at least one folding device disposed at generally the same level as said plunger is located at the end of its compression stroke and being moveable to close said sheets about the stack, and means for joining

the sheet ends to form a packaging sleeve about the stack, said folding device being mounted for reciprocal movement across substantially the entire bottom opening of said compression chamber transversely to the direction of reciprocation of said plunger, said backing member being moveable in a direction away from the compressed stack, said compression chamber having a side opening through which the stack can be discharged, said folding device being moveable away from the bottom opening in said compression chamber after said backing member has been moved away from said compressed stack to discharge the stack through said side opening.

2. The apparatus of claim 1 and further comprising a stripping device adjacent to the side opening in said compression chamber and adapted to remove the packaged stack from said folding device after discharge of the packaged stack and as said folding device is moved across the bottom opening of said compression chamber to close said sheets about the stack.

3. The apparatus of claim 1 in which said folding device comprises upper and lower roller tracks and a plurality of rotatable rollers extending transversely to the direction of reciprocation of said folding device disposed between said upper and lower roller tracks, said upper and lower roller tracks being moveable in the substantially vertical direction and means for moving said roller tracks such that said upper roller track engages said rollers when said folding device is moved across the bottom opening of said compression chamber to close said sheets about the stack and such that said lower roller track engages said rollers when said folding device is moved to discharge the packaged stack.

4. The apparatus of claim 3 in which said roller tracks are lined with an elastic friction covering.

5. The apparatus of claim 1 in which a ramp is mounted to said folding device for discharging the packaged stack after it is removed from said compression chamber.

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