United States Patent

Brinkmeier et al.

[15] **3,650,087**

[45] **Mar. 21, 1972**

[54] APPARATUS FOR COMPRESSING AND PACKAGING A STACK OF FLATTENED BAGS OR THE LIKE

[72] Inventors: **Friedhelm Brinkmeier,** Ladbergen; **Hermann Röcker,** Hulben via Urach, Germany

[73] Assignee: **Windmoller & Holscher,** Lengerich of Westphalia, Germany

[22] Filed: **July 28, 1970**

[21] Appl. No.: **58,763**

[30] **Foreign Application Priority Data**

July 28, 1970 Germany ..... P 19 39 069.3

[52] **U.S. Cl.** ..... **53/124 C**

[51] **Int. Cl.** **B65b 63/02**

[58] **Field of Search** ..... 53/124 R, 124 C, 124 TS

[56] **References Cited**

UNITED STATES PATENTS

2,768,489	10/1956	Brown et al.	53/124 C X
3,030,750	4/1962	Lowe et al	53/124 C

Primary Examiner—Travis S. McGehee

Attorney—Fleit, Gipple & Jacobson

[57] **ABSTRACT**

An apparatus for compressing and packing a stack of flattened bags or the like that comprises a compression chamber for receiving the stack, an opening in said chamber through which the said stack can be inserted, a plunger for introducing the stack in said chamber and compressing it against a backing member of the said chamber, two freely rotatable supply rolls of thermoplastic sheets disposed on opposite sides of said opening and welding means for interconnecting said sheets by a transverse weld seam to form a web of packaging material. The web is disposed across said opening to be carried into the chamber by the stack when said stack is introduced. Means are provided for displacing said plunger at right angles to said weld seam after its compression stroke. A transversely movable folding device is disposed at the same level as the plunger at the end of its compression stroke. The folding device is effective to maintain compression of the stack after the plunger has been displaced; to close the web about the stack to define a packaging sleeve for said stack from said web; and to bring the sheets of said web together in readiness for forming a second web of packaging material for a second stack. The welding means are also effective in cooperation with said folding device to weld the packaging sleeve closed about the stack and to sever the packaging sleeve from said sheets so that the said sheets remain interconnected to form said second web.

7 Claims, 5 Drawing Figures

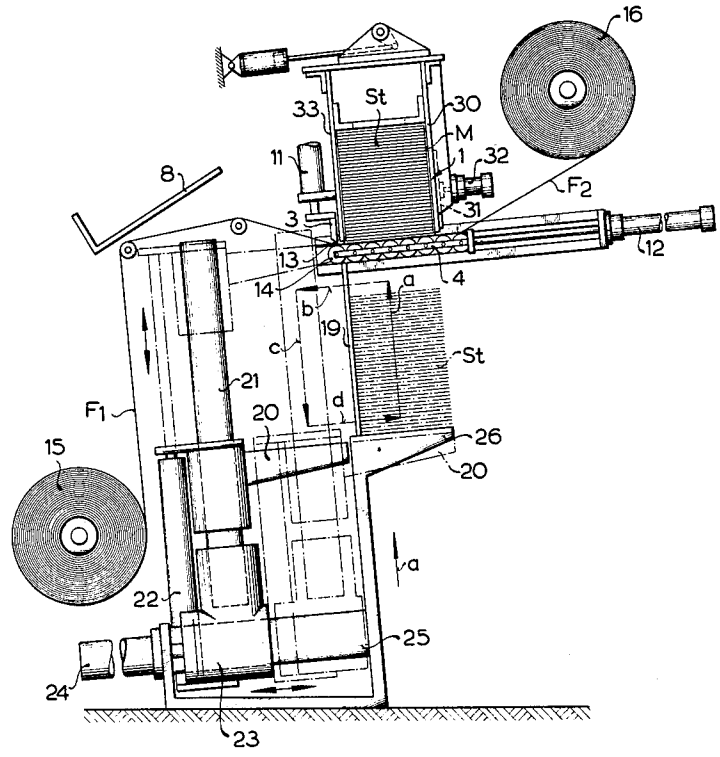
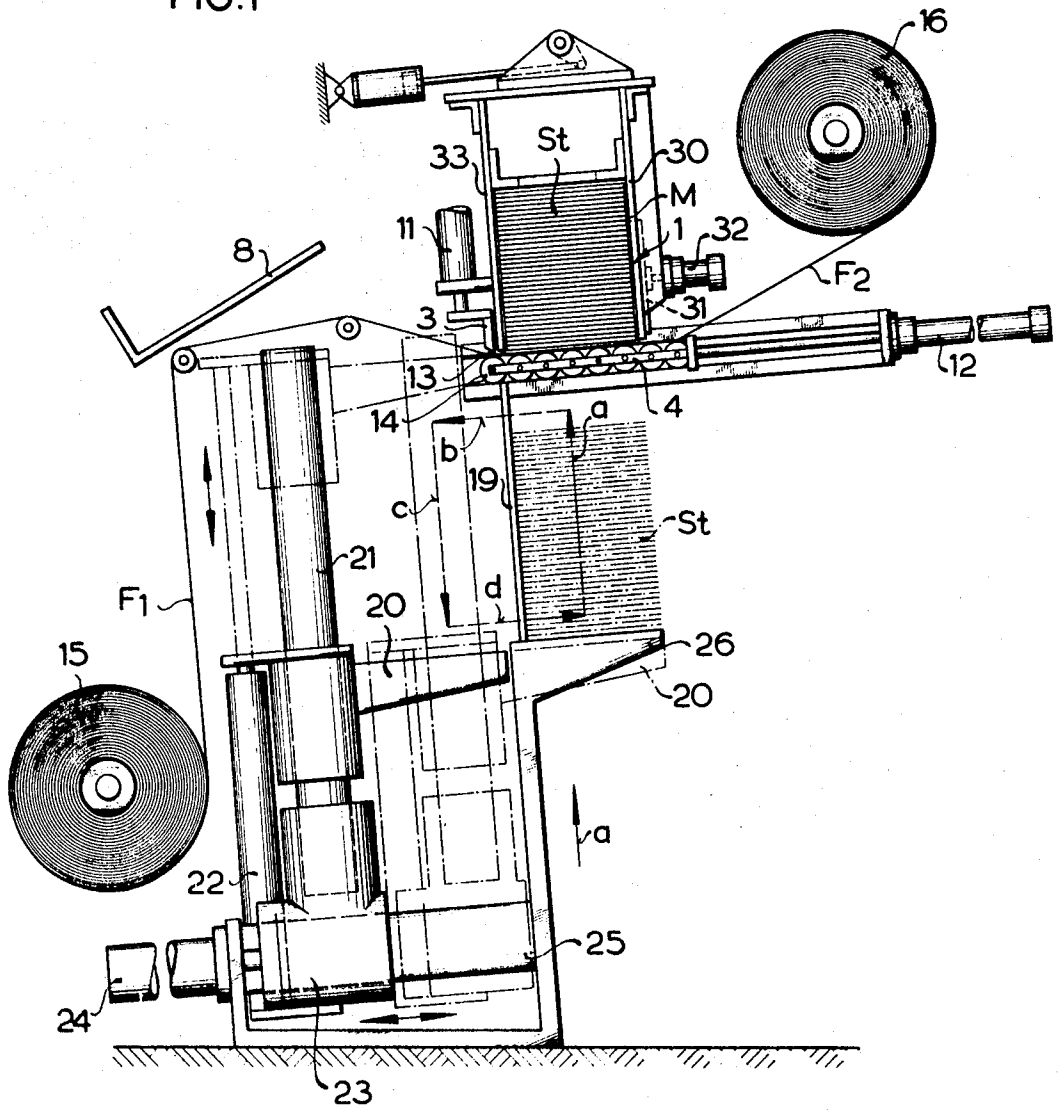


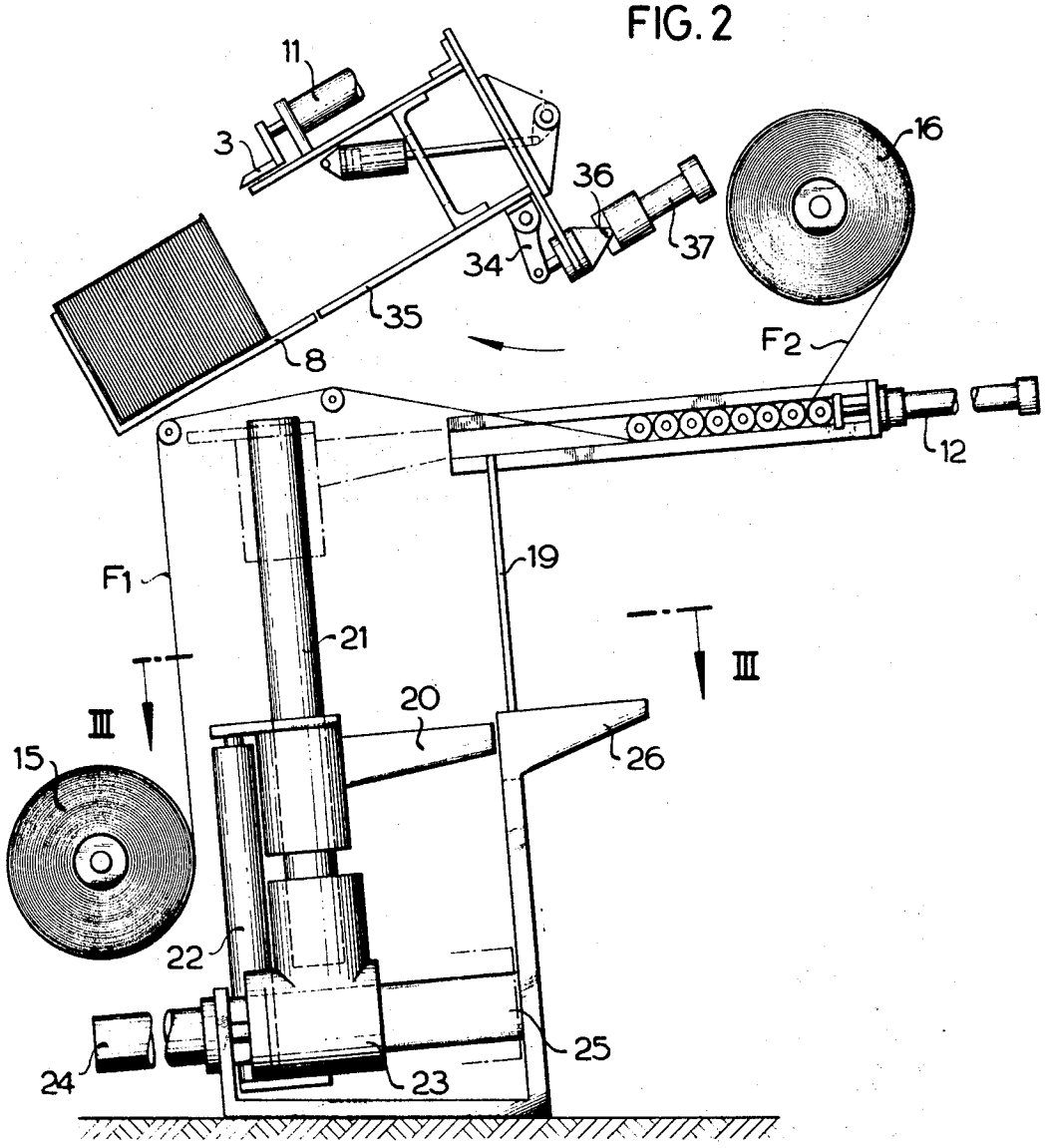
FIG.1



INVENTORS
Friedhelm BRINKMEIER
Hermann RÖCKER

By
Fleit, Gipple & Jacobson
their ATTORNEYS

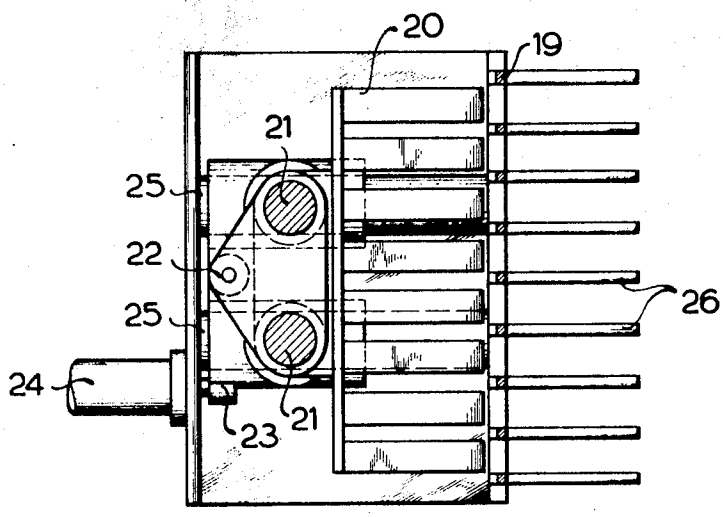
FIG. 2



INVENTORS
Friedhelm BRINKMEIER
Hermann RÖCKER

By
Fleit, Kipple & Jacobson
their ATTORNEYS

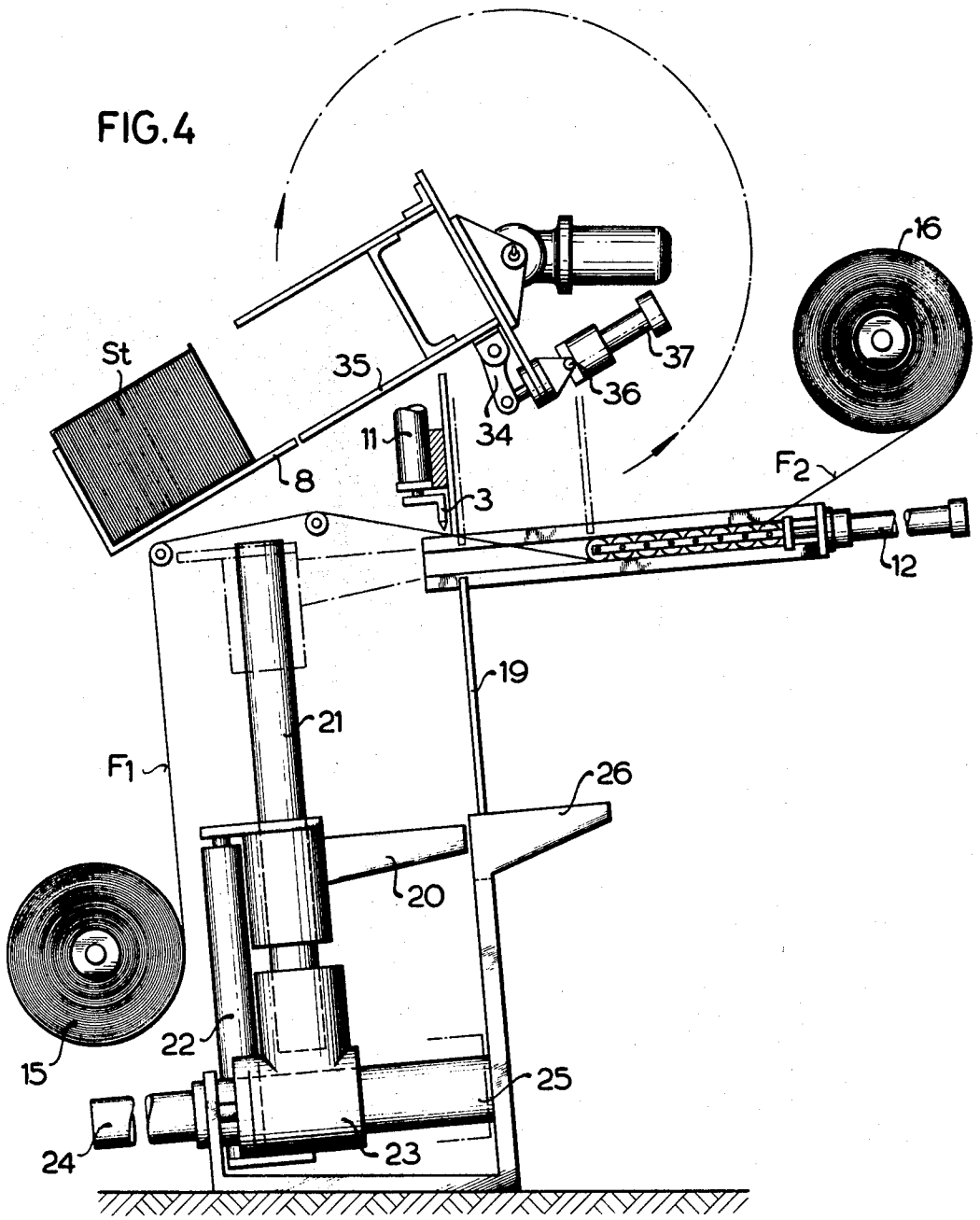
FIG. 3



INVENTORS
Friedhelm BRINKMEIER
Hermann RÖCKER

By
Fleit, Gipple & Jacobson
their ATTORNEYS

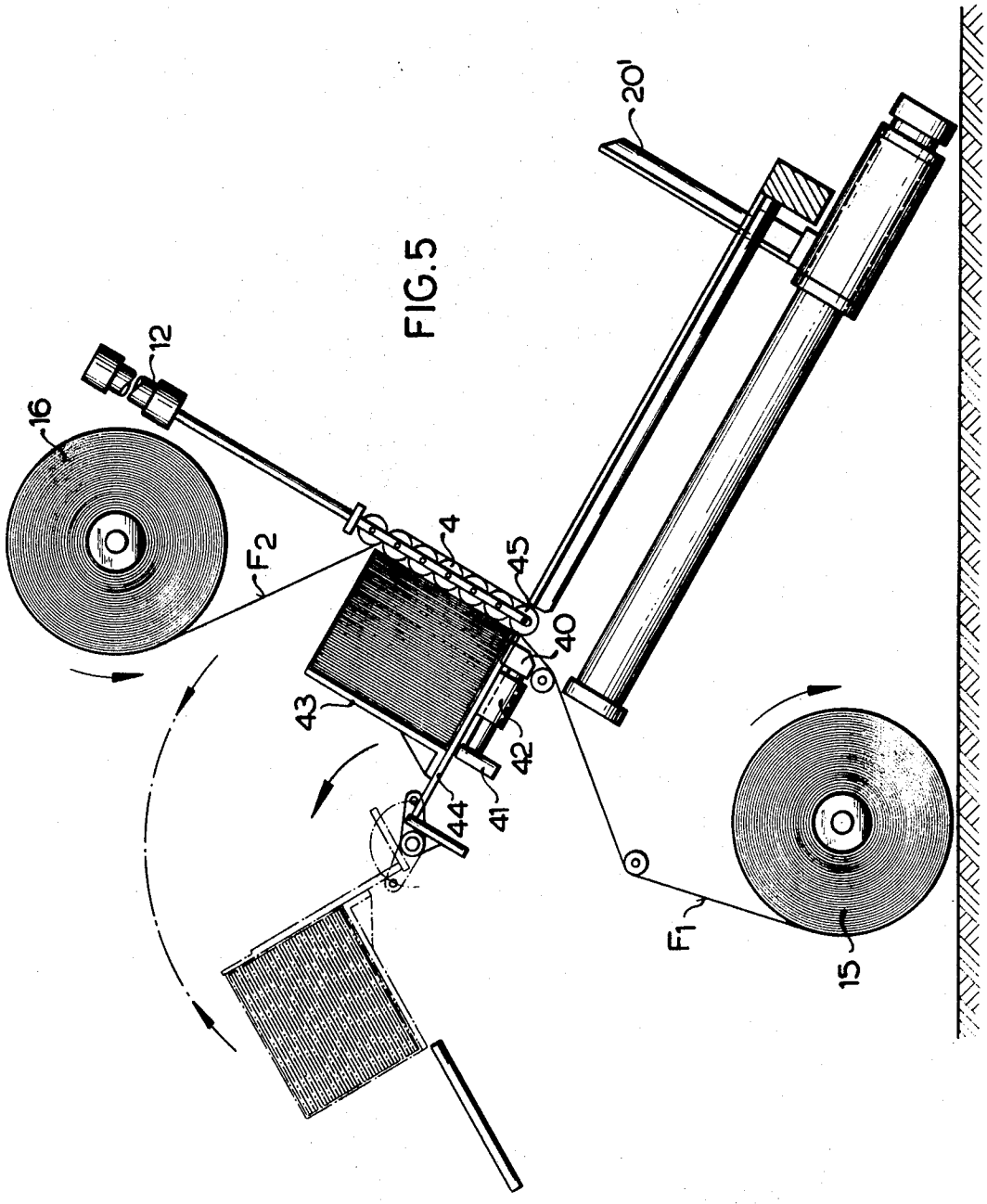
FIG. 4



INVENTORS
Friedhelm BRINKMEIER
Hermann RÖCKER

By
Fleit, Gipple & Jacobson
their ATTORNEYS

FIG.5



INVENTORS
Friedhelm BRINKMEIER
Hermann RÖCKER

By
Fleit, Gipple & Jacobson
their ATTORNEYS

APPARATUS FOR COMPRESSING AND PACKAGING A STACK OF FLATTENED BAGS OR THE LIKE

The invention relates to an apparatus for compressing and packaging a stack of flattened bags or the like, wherein the stack is introduced by a plunger into a compression chamber together with a web of material that is to be closed about the stack to form a packaging sleeve, there being provided in front of the inlet to the compression chamber a folding tool for placing the web about the stack and a tool for adjoining the ends of the web to form the sleeve.

An apparatus of this kind is disclosed in German Pat. No. 1,161,509. In this case the stack and a strip of paper of the correct length to form the packaging sleeve are pushed into the compression chamber by the plunger and compressed therein. The ends of the paper strip hanging out of the compression chamber are then laid by folding blades onto that side of the stack which is nearest the plunger and are stuck to each other with the aid of a pressing tool and pre-applied adhesive. The productive capacity of such a packaging machine is limited because the adhesive joint in the sleeve must be held under pressure for a sufficiently long period to avoid any danger of the joint rupturing under the stress of the compressed stack after the pressing tool has been withdrawn. Feeding of the long paper strip and placing it in position in front of the compression chamber also calls for a separate operation by feeding means for the strip and, again, this wastes considerable time. Further, such a packaging machine is relatively expensive because, apart from the means for compressing the stack in the compression chamber, provision must be made for means for feeding and applying adhesive to the paper that is to form the packaging sleeve and there must be specially controlled folding blades for placing the ends of the strip onto the trailing side of the stack and means for maintaining the compression of the stack after the plunger has been withdrawn.

The invention aims to provide a compressing and packaging apparatus which has an improved productive capacity without requiring a complicated construction.

In developing the invention, reference has been made to the apparatus disclosed in U.S. Pat. No. 2,741,885 where the stack is likewise pushed into a compression chamber by a plunger and thermoplastic material for the packaging sleeve is unwound from each of two freely rotatable rolls disposed on either side of the compression chamber, the two webs of packaging material being interconnected by a transverse weld seam in front of the inlet to the compression chamber. In front of the compression chamber there is also at least one transversely movable folding device for folding the web of packaging material about the side of the stack nearest the plunger, a tool for applying transverse weld seams between the juxtaposed ends of the packaging sleeve that is slung about the stack and means for severing the sleeve from the two webs of packaging material. However, compression of the stack in the same direction as it was introduced in the compression chamber is not possible and thus the bags forming the stack are not closely juxtaposed to a degree as is necessary to form a stable and compact packaged stack.

It is therefore a particular aim of the present invention to provide an apparatus in which the stack of flattened bags or the like can be compressed so as to bring about a considerable reduction in the volume of the stack and the latter is then packaged by a sleeve of thermoplastic material while it is still in this compressed condition.

According to the invention, apparatus for compressing and packaging a stack of flattened bags or the like comprises a compression chamber for receiving the stack, an opening in said chamber through which the said stack can be inserted, a plunger for introducing the stack in said chamber and compressing it against a backing member of said chamber, two freely rotatable supply rolls of thermoplastic sheets disposed on opposite sides of said opening, welding means for interconnecting said sheets by a transverse weld seam to form a web of packaging material, said web being disposed across said opening so that it is carried into the said chamber by said stack as the latter is being introduced, means for displacing said plunger at right angles to said weld seam after its compression stroke, and at least one transversely movable folding device disposed at the same level as said plunger is located at the end of its compression stroke, said folding device being effective to maintain compression of the stack after said plunger has been displaced and to close said web about the stack whereby to define a packaging sleeve for said stack from said web and bring the sheets of said web together in readiness for forming a second web of packaging material for a second stack, said welding means also being effective in cooperation with said folding device to weld the packaging sleeve closed about the stack and sever the packaging sleeve from the said sheets so that the said sheets remain interconnected to form said second web.

By reason of the stack being compressed against a backing member in the same direction as it is introduced in the compression chamber, the volume of the stack can be reduced by the required amount. By withdrawing the plunger in a direction at right angles to the compressing direction and by means of the folding device which follows directly behind the withdrawing plunger and which cooperates with the welding and severing means, the pressure in the compression chamber remains unchanged until the welding seam has been produced to close the sleeve, thereby maintaining the stack in its compressed condition after it has been packaged.

The welding means may comprise a welding jaw which is heated, reciprocatable lengthwise of the compression chamber and cooperates with the folding device which forms a second but unheated jaw. The folding device can therefore first of all serve the purpose of closing the web about the stack and then follow the movement of the heated welding jaw to serve as a cooperating jaw during transverse welding and severing. Since the heated welding jaw does not serve as a folding tool, there will thus be no difficulty in providing it with a conduit for supplying the welding current.

The compression chamber may be pivoted at an end adjacent the aforementioned backing member to permit it to be swung from a stack-receiving station to a stack-discharge station which is disposed adjacent a chute for receiving the packaged stack, whereby also to automate the withdrawal of each stack from the compression chamber. If the aforementioned construction is chosen for the welding jaws, it would be particularly advantageous to leave the heated welding jaw stationary and pivot the compression chamber so that it is swung in a direction away from the heated jaw. This will avoid the need for pivoting the welding equipment and electric conductors as the compression chamber is being swung to the discharge station.

A stationary cylindrical retaining plate may be provided between the stack-receiving and discharge stations to prevent the stack from falling out of the compression chamber prematurely. In another form of the invention, clamping means may be provided on the compression chamber for clamping the stack to the chamber during swinging movement thereof. In yet another form of the invention, the compression chamber may be formed by a substantially L-shaped support of which one limb constitutes the backing member and the other limb is inclined at an acute angle to the horizontal when the chamber is disposed at the stack-receiving station, the plunger being mounted to execute its compression stroke at the same acute angle and the compression chamber being adapted to be swung to the discharge station in an upwardly direction so that the stack remains supported by the said one limb after it has passed through a vertical position until the stack is to slide therefrom. This last-mentioned form of the invention dispenses with a chute and special means for holding the stack in the compression chamber. In all forms, the stacks of bags to be packaged can be placed on the plunger with the bags on edge or lying flat so that during packaging they will maintain a position which prevents unintentional lateral displacement of the bags. If the bags lie on edge or inclined then of course a suitable supporting surface will be necessary along the path in which the plunger moves.

Examples of the invention are illustrated in the accompanying diagrammatic drawings, wherein:

FIG. 1 is a side elevation of a compressing and packaging apparatus showing its welding means and cooperating folding device in the welding position;

FIG. 2 shows the FIG. 1 apparatus with the compression chamber swung to a stack-discharge station where the stack is ejected into a chute or other receptacle, the FIG. 2 apparatus being modified in relation to FIG. 1 with respect to means for clamping the stack in the compression chamber;

FIG. 3 is a cross section taken on the line III—III in FIG. 2;

FIG. 4 is a view similar to FIG. 2 of a second embodiment of compressing and packaging apparatus, and

FIG. 5 is a side elevation of a further embodiment of apparatus where the stack to be packaged is disposed obliquely with a corresponding oblique arrangement of a compressing plunger.

Referring to FIG. 1, the compressing and stacking apparatus comprises a compression chamber or shaft 1, a plunger 20, a welding jaw 3 and a folding device 4 which also serves as a counter-jaw for the welding jaw 3. The compression chamber 1 is pivotable about a stationary axis at one end of the chamber by means of a pneumatic or hydraulic cylinder so that it can be swung from a stack-receiving and compressing station (as shown in FIG. 1) to a stack-discharge or ejection station adjacent a chute 8. The internal cross section of the compression chamber corresponds to the length and width of bags contained in a stack *St* to be packaged. The compression chamber 1 contains an adjustable backing member which is set lengthwise of the chamber to a position that will result in a compressed stack of the desired height.

By means of a hydraulic or pneumatic cylinder 22, the plunger 20 can be reciprocated along one or more lateral guide rods 21 to move towards the compression chamber 1 in the direction of the arrow *a* and back again as indicated by the arrow *c*. The guide rods 21 are fixed to a crosshead 23 which, by means of a cylinder 24, is reciprocatable along guides 25 in the directions of the arrows *b* and *d* at right angles to the directions *a* and *c*. The arrangement is such that when the plunger 20 is in a limiting position as indicated in chain-dotted lines at the right-hand end of the guides 25 in FIG. 1, it will be aligned with the compression chamber 1 and able to introduce a stack that is supported on the plunger whereas in the other limiting position (indicated in full lines) the plunger 20 will no longer be aligned with the compression chamber. The cylinders 22 and 24 are controlled in sequence (by any conventional means which are not illustrated) so that the plunger 20 will successively move into alignment with the compression chamber (arrow *d*), towards the compression chamber (arrow *a*), out of alignment with the compression chamber (arrow *b*) and away from the compression chamber (arrow *c*). As best shown in FIG. 3, the plunger 20 is forked and a guide wall 19 for the stack *St* which is in alignment with a wall 33 of the compression chamber is suitably slotted lengthwise so that the forked plunger can pass through the wall 19. A supporting grid 26 for the stack to be packaged is provided on the wall 19 at a position corresponding to the lowered position of the plunger 20 when the latter is aligned with the compression chamber 1. The openings in the grid 26 are aligned with the longitudinal slots in the guide wall 19 so that the forked plunger 20 can also pass through the grid.

The folding device 4 is transversely displaceable by means of a hydraulic or pneumatic cylinder 12 to lie in front of the opening to the compression chamber 1. It comprises a plurality of freely rotatable rolls which are guided between two guide rails and which can roll over the side of the stack adjacent the opening of the compression chamber. The rolls are segmented so that each has two side portions which are guided between the guide rails and a central portion which must be able to turn in a direction opposite to the side portions when the folding device makes contact with the stack. As already mentioned, the folding device 4 cooperates with the welding means to constitute a counter-jaw for the jaw 3 but the device 4 is not heated. The jaw 3 is provided with a suitable severing and welding blade 13 which is brought to the required welding temperature by an electric heater (not shown) accommodated in the jaw 3. The jaw 3 is displaceable along the wall 33 in a direction perpendicular to the folding device 4 by means of a hydraulic or pneumatic cylinder 11.

To form a packaging sleeve M that is to be placed about the stack there are two identical sheets of packaging material F1 and F2 which are wound on respective supply rolls 15, 16 and which are interconnected by a transverse weld seam in the region of the opening to the compression chamber 1. The left-hand sheet F1 is brought into the plane of the folding device 4 via two direction-changing rollers while the right-hand sheet F2 is passed through two adjacent rolls of the folding device into the same plane.

The entire apparatus is slightly inclined to the vertical.

The stack *St* to be packaged is placed on the grid 26 either mechanically or by hand. At this time the plunger 20 is in its lowermost position in alignment with the compression chamber 1. The plunger is now moved upwardly in the direction of the arrow *a* towards the compression chamber. It thereby lifts the stack *St* off the grid 26 and pushes it, together with the web of packaging material formed from the interconnected sheets F1, F2 and located in the path of the stack, into the compression chamber and presses it against the aforementioned backing member so that the stack becomes compressed to the desired degree. While the plunger 20 is still in its uppermost position adjacent the opening in the compression chamber at substantially the same level as the folding device 4, the cylinder 24 displaces the plunger towards the left in the direction of the arrow *b* so that it assumes a position removed from the compression chamber. Simultaneously, and at the same speed, the folding device 4 is moved in the same direction to follow the lateral movement of the plunger so as to support the stack instead of the plunger while maintaining the stack under the same compression that was being exerted by the plunger. While so moving into position across the opening of the compression chamber 1, the folding device 4 pulls the sheet F2 of the packaging web across the underface of the stack and the leading roll 14 of the folding device 4 guides it towards the welding jaw 3 and the sheet or web portion F1 that is disposed beneath the jaw 3. The jaw 3 is then lowered by the cylinder 11 towards the two sheets F1, F2 that are being supported by the leading roll 14 and applies a transversely extending severing heat seal or weld seam. This weld seam not only closes the sleeve about the stack and severs it from the sheets F1, F2 but also makes a fresh interconnection between the sheets F1, F2. The welding position of the components is illustrated in FIG. 1.

During the welding and severing operation the plunger 20 is lowered in the direction of the arrow *c* by means of the cylinder 22 and then moved transversely in the direction of the arrow *d* with the aid of the crosshead 23 and cylinder 24 until it has resumed its starting position as indicated in chain-dotted lines in FIG. 1.

After welding, the welding jaw 3 is lifted and the folding device 4 is withdrawn from the chamber 1, a fresh web of packaging material formed from the sheets F1, F2 thereby being brought into position across the opening of the compression chamber if the latter had remained in its FIG. 1 position. However, simultaneously with the withdrawal of the folding device the compression chamber is swung towards the chute 8 to discharge the packaged stack *St*. During the swinging motion, the stack in the compression chamber can be prevented from dropping out by means of a cylindrical holding plate that extends along the swinging path of the chamber 1. Alternatively, the stack can be clamped to the compression chamber. This would prevent possible damage to the freshly formed weld seam while it slides along the cylindrical holding plate and avoid any interference between the welding equipment and the holding plate as the compression chamber is being swung. To bring about such clamping, the side wall 30 of the compression chamber in FIG. 1 is provided with a window (not visible) through which a pressure plate 31 under the in-

fluence of a cylinder **32** is inserted so that the stack is pressed against the opposite wall **33** and thereby held in the compression chamber.

The clamping means shown in FIG. **2** are different but in other respects the apparatus is the same as that shown in FIG. **1**, with the compression chamber shown swung to the stack-discharge station. In FIG. **2**, a segment of the wall **35** of the compression chamber, which segment extends along the entire length of the wall **35** and is not visible in FIG. **2**, can be pivoted into and out of a clamping position by means of a lever **34** which is pivoted to the compression chamber and which is hinged to a hydraulic or pneumatic cylinder **37** as shown at **36**.

The use of clamping means of the kind shown in FIGS. **1** and **2** also permits the compression chamber **1** to be swung to and from the stack-discharge station in the direction of the arrows shown in FIG. **4**. This, in turn, permits the welding equipment **3, 11** to be fixed in position whereas in the FIGS. **1** and **2** arrangements the welding equipment and the electric supply conduits would have to be swung to and fro together with the compression chamber.

FIG. **5** illustrates an embodiment in which the stack of bags is fed and compressed in an oblique direction instead of a near vertical direction. In this construction a chute and special clamping means for the stack can be dispensed with, a welding jaw **40** being mounted on a stationary machine frame portion **41** because pivoting of the compression chamber can take place in the same general direction as described with reference to FIG. **4**, i.e., because the welding equipment does not hinder the swinging movement of the compression chamber. This embodiment is particularly advantageous. The welding jaw **40** is reciprocatable by a cylinder **42** so as to close, during insertion of the stack in the compression chamber, the space that in the illustrated condition is taken up by the leading roll **45** of the folding device **4**. The compression chamber is here constituted by only two walls **43** and **44**, the wall **43** constituting the aforementioned backing member against which the stack is compressed. As soon as the stack has arrived at the discharge or transfer station it simply slides off the backing member **43** onto any suitable plate which can guide it onto a conveyor belt or the like.

In yet another improved version (not shown), the cylinder **42** for reciprocating the welding jaw is omitted, the latter being urged towards the gap under the action of a spring and being pushed back into the illustrated operative position against the action of the spring as the plunger **20'** introduces the stack in the compression chamber. When the plunger is withdrawn, the jaw **40** is held in position by the folding device **4** and after the latter has been withdrawn from the gap, the jaw **40** is gradually returned by the spring to close the gap by means of a wedge-shaped slide track mounted thereon.

We 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 said chamber through which the said stack can be inserted, a plunger for introducing the stack in said chamber and compressing it against a backing member of said chamber, two freely rotatable supply rolls of thermoplastic sheets disposed on opposite sides of said opening, welding means for interconnecting said sheets by a transverse weld seam to form a web of packaging material, said web being disposed across said opening so that it is carried into the said chamber by said stack as the latter is being introduced, means for displacing said plunger at right angles to said weld seam after its compression stroke, and at least one transversely movable folding device disposed at the same level as said plunger is located at the end of its compression stroke, said folding device being effective to maintain compression of the stack after said plunger has been displaced and to close said web about the stack whereby to define a packaging sleeve for said stack from said web and bring the sheets of said web together in readiness for forming a second web of packaging material for a second stack, said welding means also being effective in cooperation with said folding device to weld the packaging sleeve closed about the stack and sever the packaging sleeve from the said sheets so that the said sheets remain interconnected to form said second web.

2. Apparatus according to claim **1**, wherein the compression chamber is pivoted at an end adjacent said backing member to permit it to be swung from a stack-receiving station to a stack-discharge station which is disposed adjacent a chute for receiving the packaged stack.

3. Apparatus according to claim **2**, wherein said welding means comprise a stationary welding jaw and the chamber is adapted to be swung in a direction away from the jaw.

4. Apparatus according to claim **2**, wherein a stationary cylindrical retaining plate is provided on the said chute for preventing discharge of the packaged stacks from the chamber between said stack-receiving and discharge stations.

5. Apparatus according to claim **2** including clamping means on said chamber for clamping a stack to the chamber during swinging movement thereof.

6. Apparatus according to claim **2**, wherein the compression chamber is formed by a substantially L-shaped support of which one limb constitutes said backing member and the other limb is inclined at an acute angle to the horizontal when the said chamber is disposed at said stack-receiving station, the said plunger being mounted to execute its compression stroke at the same said acute angle, and wherein the compression chamber is adapted to be swung to said discharge station in an upwardly direction so that said stack remains supported by said one limb after it has passed through a vertical position until the stack is to slide therefrom.

7. Apparatus according to claim **2**, wherein the said welding means comprise a welding jaw which is spring-influenced toward said plunger, is brought to an operative position against spring influence under the action of said plunger introducing the stack in said chamber, is subsequently held in said operative position by said folding device and, after transverse withdrawal movement of the latter, is released under the spring influence slowly with the aid of a tapered slide track for bridging a gap in the stack supporting surface in the path of said plunger and through which a leading roller of the folding device extends during welding.

* * * * *