

[54] END FOLDING MACHINE

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[51] Int. Cl. ... B65b 11/18, B65b 11/12, B65b 11/22

[58] Field of Search 53/32, 33, 45, 224, 53/232, 209, 210, 223, 230, 231, 378, 387; 93/39.1 R, 39.1 P, 51 R, 51 M

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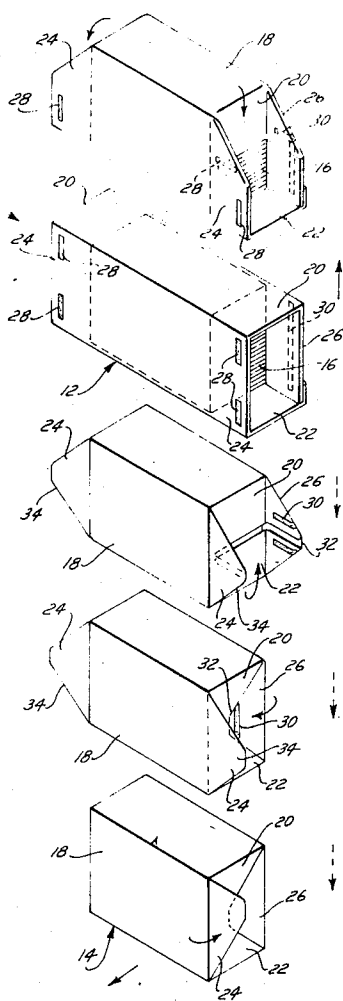
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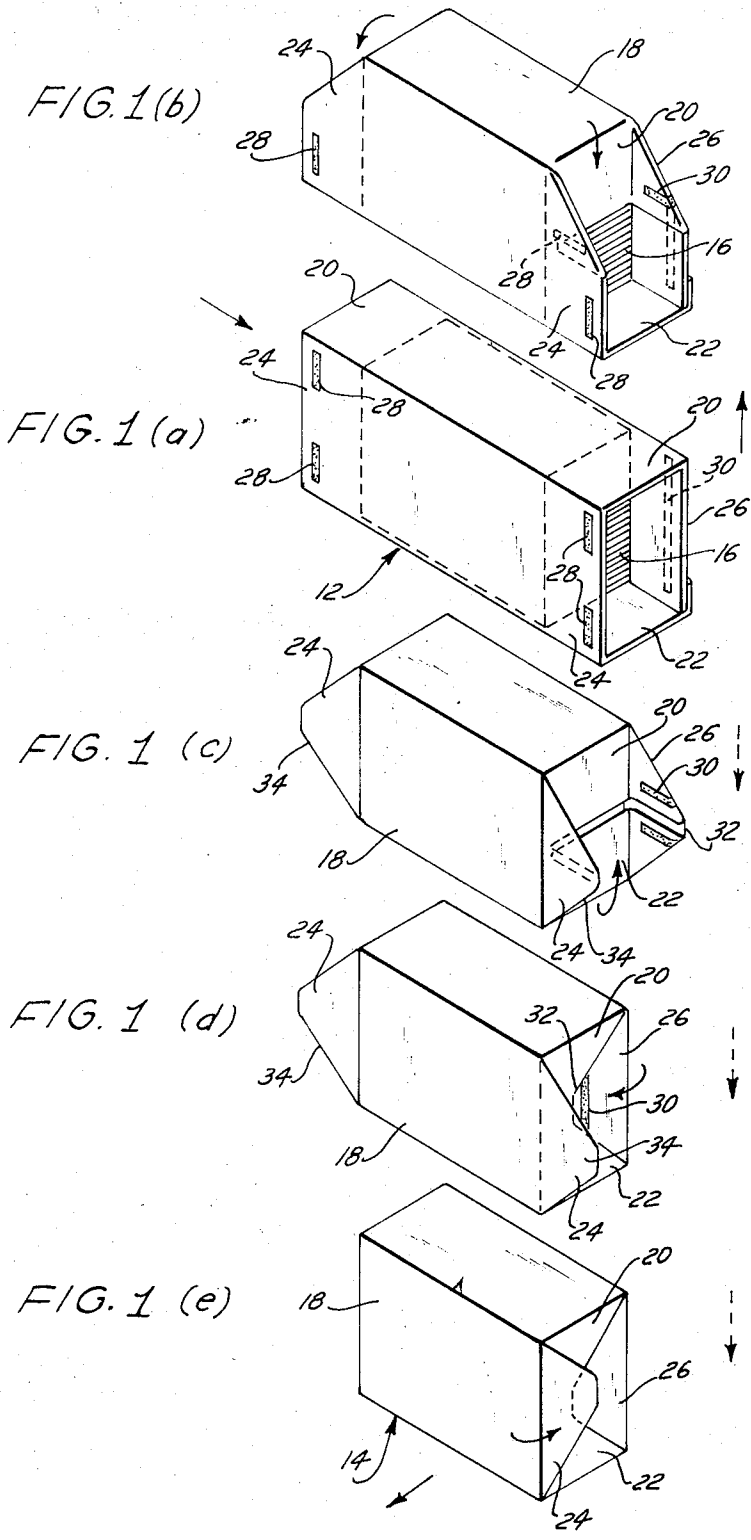
[57] ABSTRACT

An end flap folding mechanism is provided for completing the wrapping of wrapper material about a stack or bundle of paper bags. The mechanism re-

ceives a partially wrapped package containing a stack of bags in which the wrapping material is in tubular form about the stack and also projects beyond each end thereof. This partially wrapped package is transported to an elevator which cooperates in moving the partially wrapped package through several stationary folding stations. Initially, the elevator moves the partially wrapped package upwardly through a first folding station at which stationary folders engage with the projecting top of the wrapping material and folds it downwardly against the associated end of the stack. During the elevation of the package, glue is applied at selected zones of the projecting sides of the wrapping material. When the package reaches its uppermost point of travel on the elevator, the top of the package is gripped by a plunger; and, thereafter, the elevator descends along with the plunger and the interposed gripped package. The partially wrapped package is then transported through a second stationary folding station at which stationary folders engage the laterally projecting bottom of the wrapping material and folds it upwardly over the associated end of the stack. The gripped package is lowered further while on the elevator through a third stationary folding station at which folders operating in tandem fold the laterally projecting sides of the wrapping material over the ends of the stack and the previously folded top and bottom projections of the wrapping material. The previously applied glue serves to maintain the folded end flaps in this folded condition. Thereafter, the completely wrapped package is discharged from the machine.

10 Claims, 13 Drawing Figures





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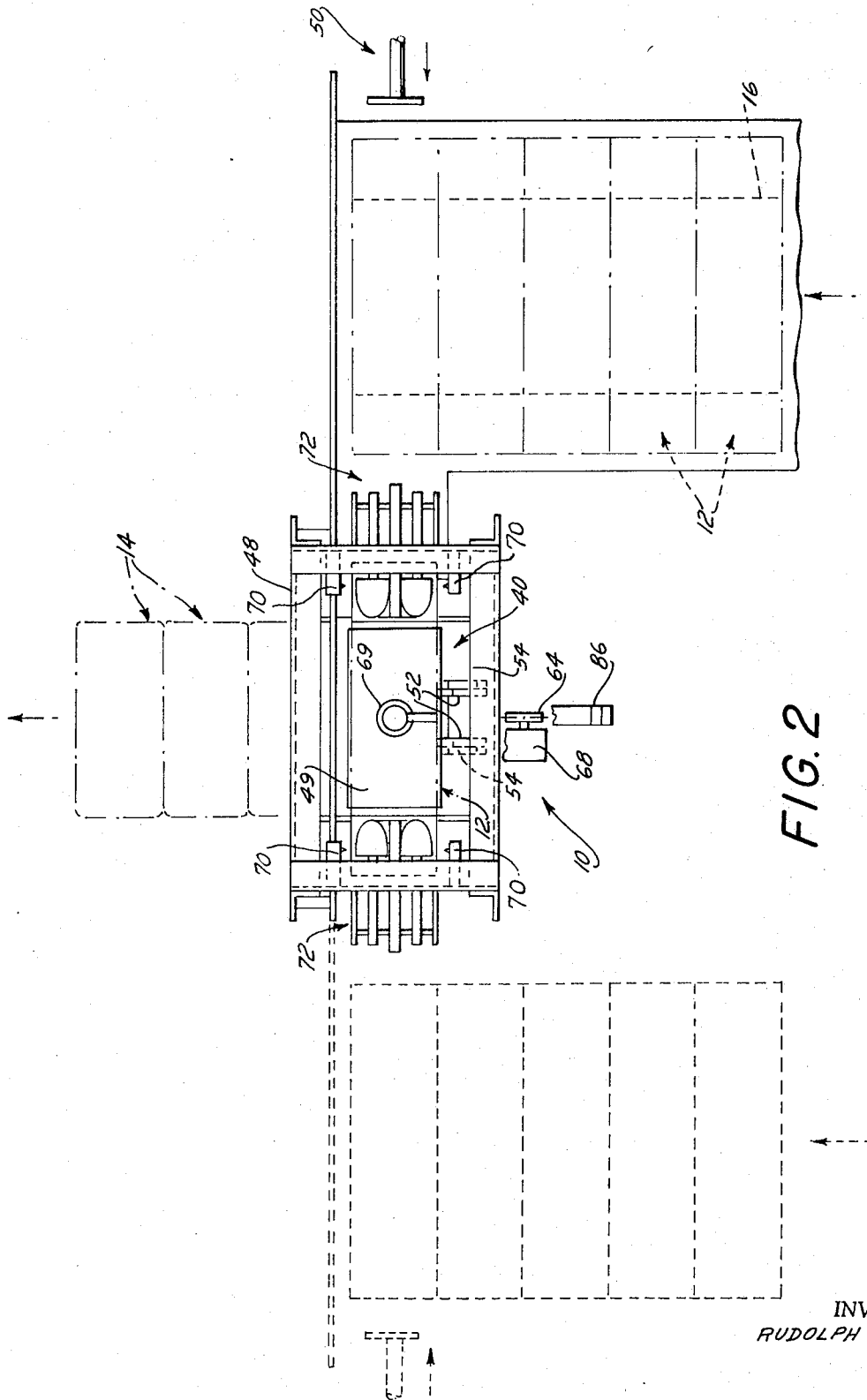
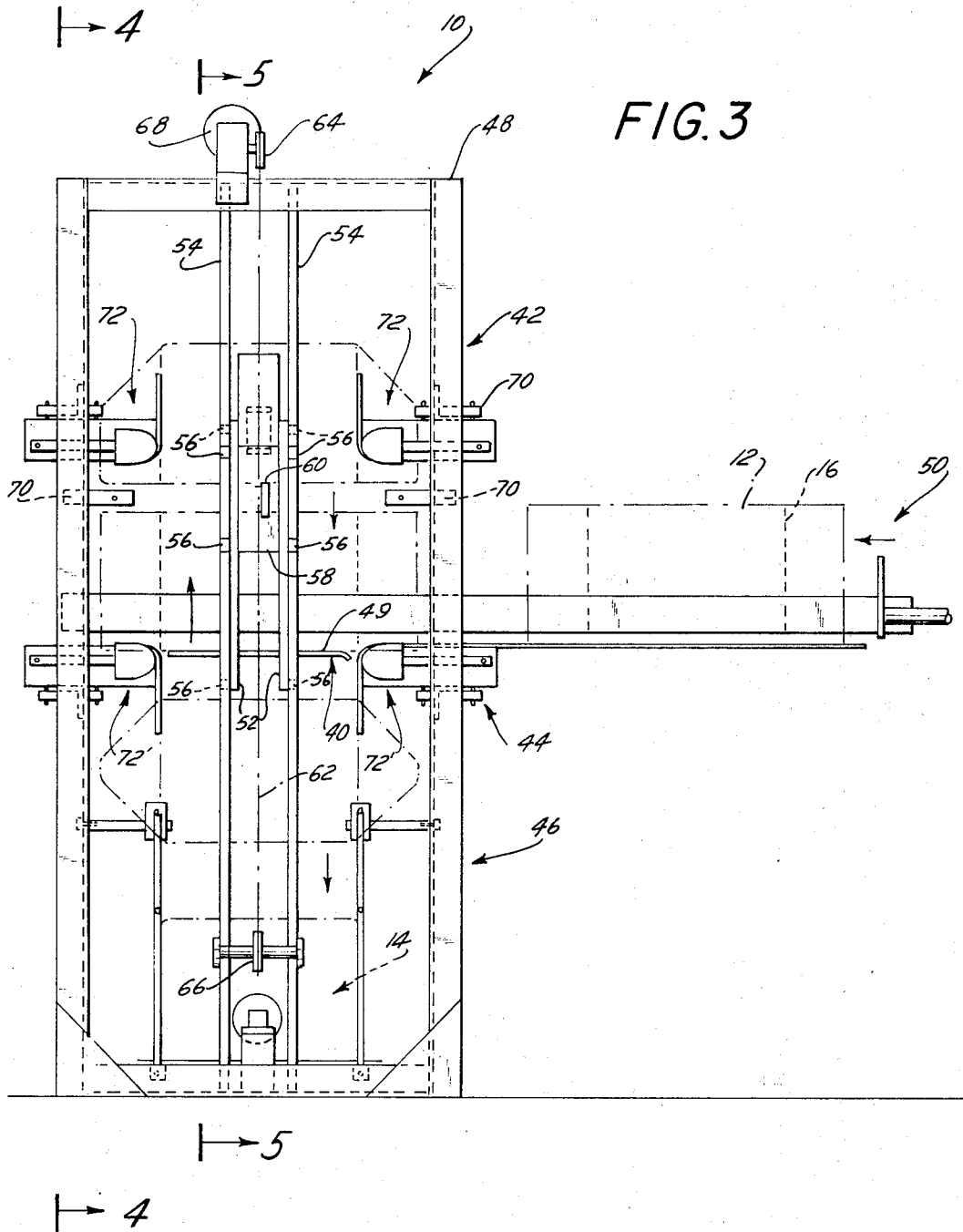


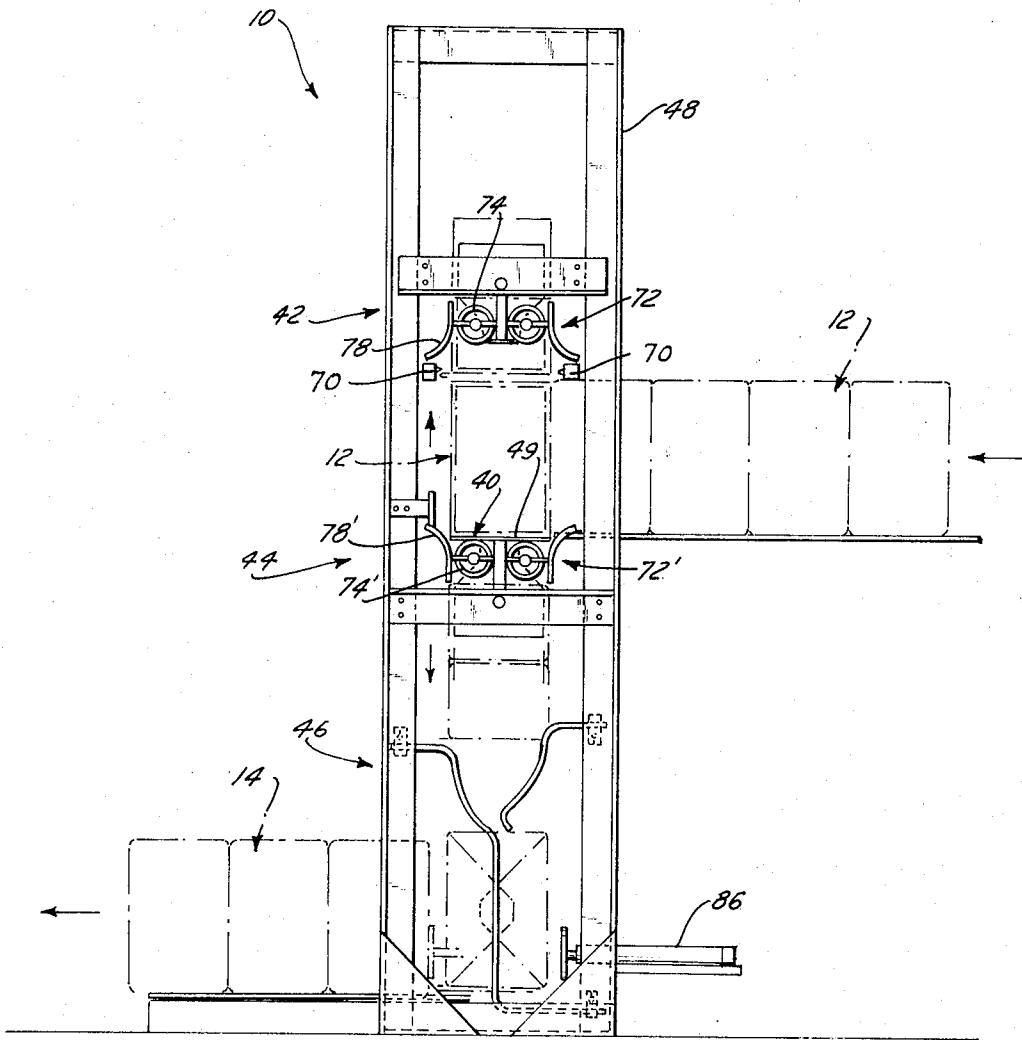
FIG. 2

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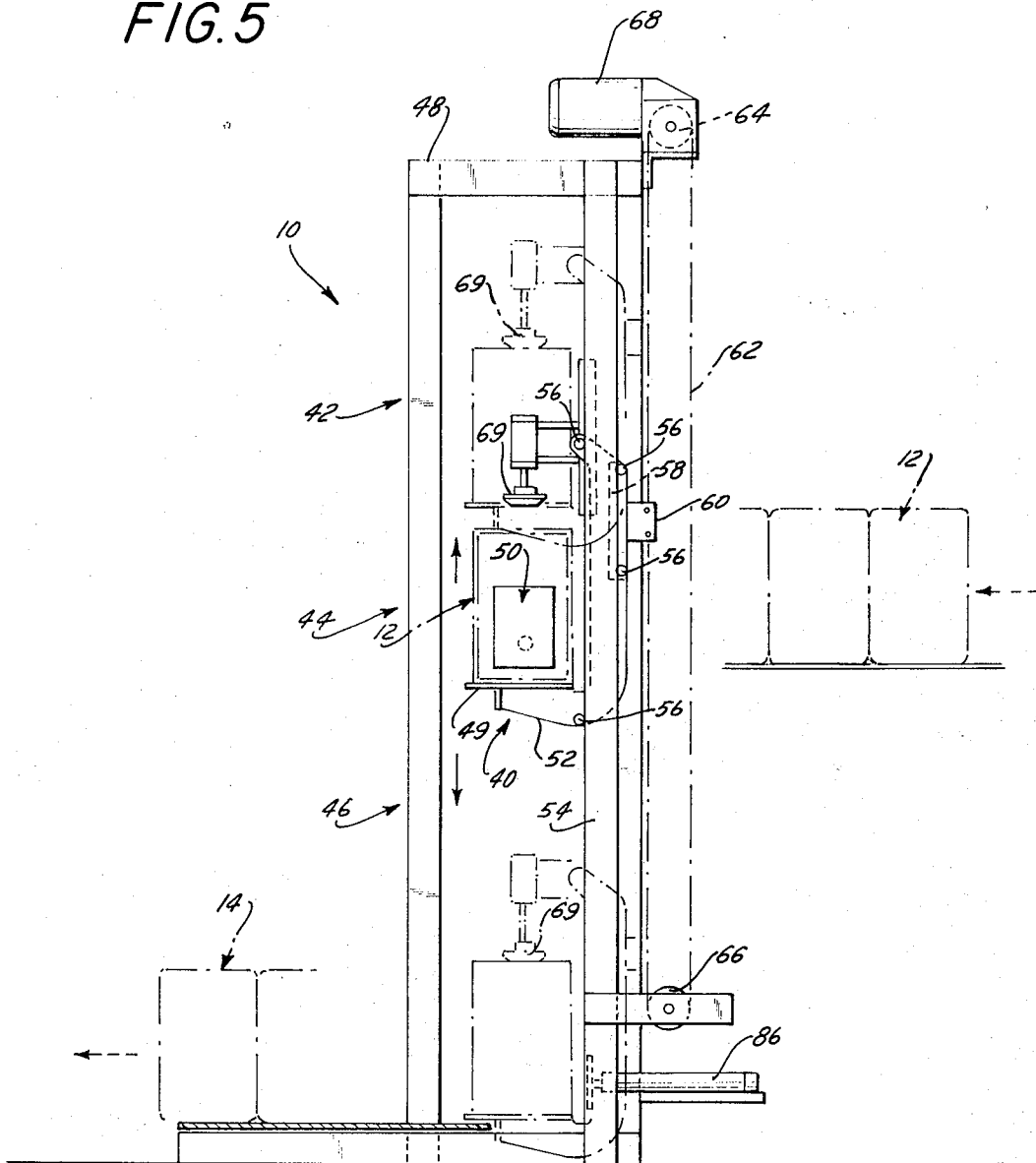
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FIG. 4



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FIG. 5



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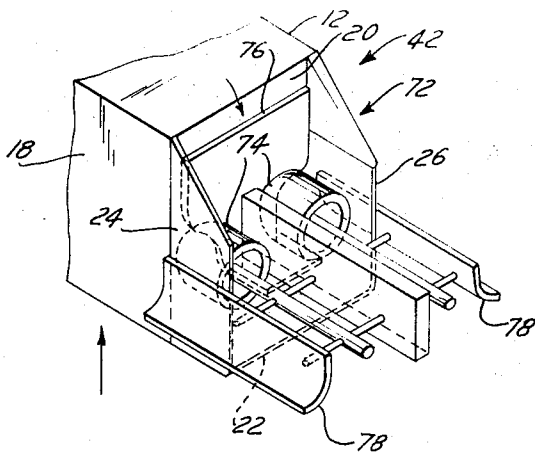


FIG. 6

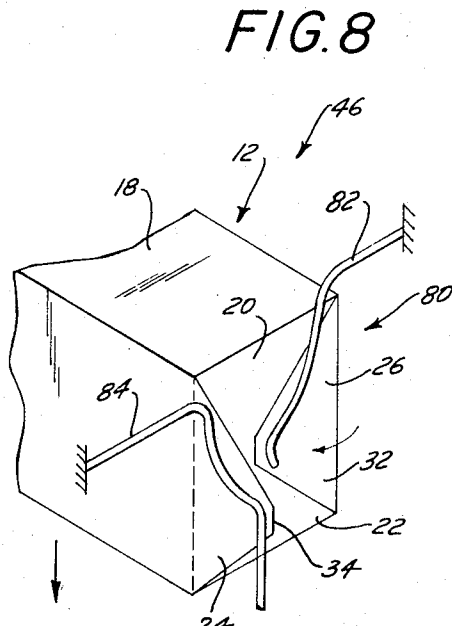


FIG. 8

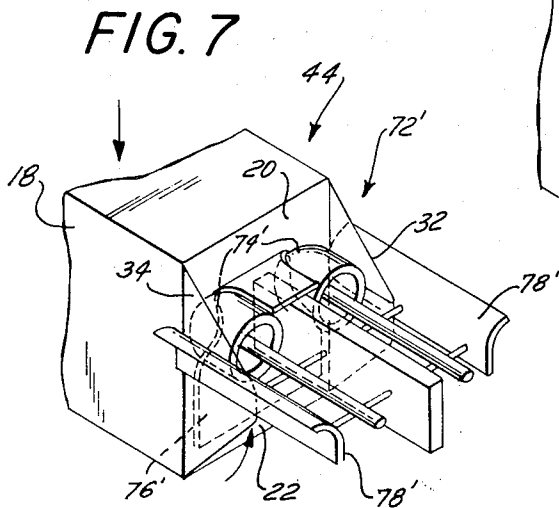


FIG. 7

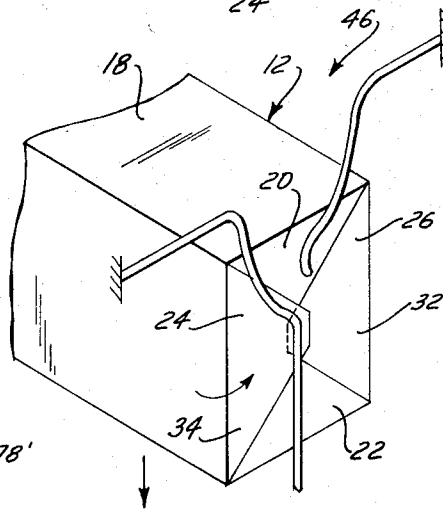


FIG. 9

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END FOLDING MACHINE

BACKGROUND OF THE INVENTION

Within the recent past, successful apparatus and techniques have been developed for providing compact and compressed bundles of paper bags and the like for shipment and storage. These compressed bundles are banded thereafter generally by a wrapping material.

CROSS-REFERENCE TO RELATED APPLICATIONS

Bundling and banding equipment of the foregoing type has been disclosed in commonly assigned U.S. letters Patent application Ser. No. 718,292 filed Feb. 19, 1968, now U.S. Pat. No. 3,550,349 granted Dec. 19, 1970 and United States letters Patent application Ser. No. 6188 filed Jan. 27, 1970, now U.S. Pat. No. 3,619,976 granted Nov. 6, 1971.

SUMMARY OF THE INVENTION

A principal object of this invention is to permit apparatus of the foregoing type to band the compressed bundle or stack of paper bags and the like with a wrapping material of longer length which extends or projects beyond the ends of the stack so that the bundle or package may be completely wrapped with the wrapping material and, towards this end, end flap folding apparatus, which is automatic, efficient and inexpensive to construct and operate, is advantageously provided.

Another object of this invention is to provide an end flap folding mechanism which may be coupled to the discharge end of bundling and banding equipment of the foregoing type and which will satisfy the needs and demands of the trade for complete automation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1(a) through 1(e) are diagrammatic perspective views showing the sequence of steps through which a package is subjected in completing the wrapping thereof in accordance with this invention.

FIG. 2 is a top plan view of a wrapper folding apparatus of this invention having a package inlet station and discharge station with a companion inlet station should the need arise, being shown in phantom;

FIG. 3 is a front elevational view thereof;

FIG. 4 is an end elevational view thereof looking in the direction of the arrows of line 4-4 of FIG. 3;

FIG. 5 is a sectional view taken along the line 5-5 of FIG. 3;

FIG. 6 is a fragmentary perspective view of one of the top end folding mechanisms;

FIG. 7 is a fragmentary perspective view of one of the bottom end folding mechanisms;

FIG. 8 is a fragmentary perspective view of one of the end flap folding mechanisms and the end flaps of the package being partially folded; and

FIG. 9 is a similar view with the end flaps being completely folded.

DESCRIPTION OF THE PREFERRED EMBODIMENT

GENERAL DESCRIPTION

In the drawings, the end flap folding machine 10 operates on a partially wrapped or banded package 12 in a manner depicted in FIG. 1 to form a completely wrapped package 14. The article to be wrapped may be

the compressed and compacted bundle or stack 16 of paper bags, envelopes or the like, or for that matter any other article of a rectangular or six-sided nature. Initially, the partially wrapped package 12 is presented to the end flap folding machine 10 with a wrapping material 18 banded about the bundle 16 with the wrapping material projecting beyond the ends of the bundle as shown in FIG. 1a. The thusly formed projecting ends of the wrapping material 16 will include a top 20, bottom 22 and sides 24 and 26. The partially wrapped package 12 is elevated and before it reaches the first folding station represented by FIG. 1b an interrupted glue pattern 28 is applied to side 24 and a continuous elongated glue pattern 30 is applied to side 26. At the first folding station the opposed tops 20 are folded downwardly and against the associated end of the stack 16. Thereafter, the partially wrapped package is lowered to the second folding station at which the opposed bottoms 22 are folded upwardly and against the associated end of the stack 16. As a result of this folding step, opposed laterally projecting side flaps 32 and 34 are formed. The partially wrapped package is lowered even further to a third folding station at which the side flap 32 is initially folded inwardly and secured against the associated surfaces of the top 20 and bottom 22 by the interposed adhesive and thereafter, as shown in FIG. 13, the side flap 34 is folded inwardly and secured to the associated surfaces of the top 20 and bottom 22 as well as the other side flap 32 by the interposed adhesive.

ELEVATOR

An elevator 40 operates to move the partially wrapped package 12 through the mentioned three folding stations 42, 44 and 46 all conveniently mounted by the machine frame 48. The elevator includes platform 49 on which the partially wrapped packages 12 are placed by the conveying mechanism 50 which may assume any one of many conventional forms or configurations. In this connection, this conveying mechanism 50 may also serve to receive the partially wrapped packages 12 coming from the bundling and banding equipment disclosed in the aforementioned patent and application. The platform 49 is supported by a pair of arms 52 which ride between and in close proximity with the respective vertically extending plates 54 forming part of the frame 48. Rollers 56 placed as shown serve to guide the path of movement of the arms 52 along the plates 54. Extending between arms 52 is a plate 58 from which laterally extends a plate 60 which is secured to the chain 62 mounted on sprocket wheel 64 and 66. Wheel 64 is driven by a reversible motor 68. When the motor is turning in one direction, the elevator is raised and when it is reversed the elevator will descend. Obviously, limit switches can be employed for such purposes that may be tripped at the desired uppermost and lowermost point of travel of the elevator 40. The arms 52 also advantageously mount a motor actuated clamp 69 which engages with the top of the partially wrapped package 12 when the elevator is descending and while the package passes through the folding stations 44 and 46.

TOP FOLDING STATION

The elevator 48 may be actuated either automatically or manually when the partially wrapped package 12 is placed on the platform 49 to elevate this package upwardly through the initial folding station 42 at which

the tops 20 are folded downwardly against the ends of the stack 16. During this traverse, suitably arranged and actuated paste applicators 70 may apply the paste patterns 28 and 30 to the sides 24 and 26, respectively, of the wrapping material 18. The top folding station includes a pair of opposed and substantially identical folders 72 which will be similarly numbered. The folders 72 are suitably mounted on the frame 48 and include a pair of substantially hemispherical ploughs 74 which together with the interposed plate 76 cooperate in folding top 20 downwardly and against the end of the stack 16 (see FIG. 6). In order to assure this folding action and the proper formation of the desired creases, the arcuate guide plates 78 may be employed. When this folding action has occurred, the movement or elevation of the elevator 40 ceases as for example by having a limit switch tripped to reverse the motor 68. At this time, the clamp 69 may be similarly actuated to render the partially wrapped package 12 substantially immovable during its descent.

BOTTOM FOLDING STATION

The elevator descends with the clamped partially folded package 12 thereon until the bottom folding station 44 is encountered at which opposed substantially identical bottom folders 72' are encountered. These folders operate to fold bottom 22 of the wrapping material 18 upwardly against the associated end of the stack 16. These folders 72' are substantially identical with top folder 72 and, for this reason, the details thereof will not be described at this juncture and like parts will be similarly numbered with accompanying primes.

SIDE FLAP FOLDERS

The elevator 40 together with the clamped partially wrapped package 12 is lowered further to the side flap folding station 46 having opposed substantially identical folders 80 mounted on the frame 48. These folders include a folding bar 82 which operates to fold side flap 32 over the associated surfaces of the top 20 and bottom 22. These parts are secured to one another by means of the applied paste pattern 30. Another folding bar 84 serves to fold the other side flap 34 upon the associated surfaces of the top 20 and bottom 22 as well as the other flap 32. The applied paste pattern 28 secures these parts together.

When the elevator 40 and completely wrapped package 14 reach the lowermost point of travel, the clamp 69 is released and a plunger 86 is actuated to cooperate in discharging the package 14 and remove it from the machine. Once again, the release of the clamp 69 and the actuation of the plunger 86 may be initiated as a result of the actuation of a microswitch. Similarly, the motor 68 may be reversed to raise the elevator 40 to its initial starting position at which it may receive another partially wrapped package 12. Thereafter, the end flap folding operation is repeated.

Thus, the several aforementioned objects and advantages are most effectively attained, particularly through the employment of relatively few moving parts and folders that are essentially stationary. In certain installations, one or more of these stationary folders may have to be replaced by a folder of a movable variety without departing from the spirit of this invention. Although a single preferred embodiment has been disclosed and described in detail herein, it should be understood that

this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

I claim:

1. Wrapper folding apparatus for the completion of the wrapping of a wrapper material about an article such as a stack of paper bags or the like to form a wrapped package comprising an end flap folding mechanism for folding projecting ends of tubular wrapper material partially formed about the article to be wrapped so that part of the wrapper material projects beyond at least one of the opposed ends of the partially wrapped article, the end flap folding mechanism including:

transport means for transporting the partially wrapped articles to an elevator station;

a frame;

an elevator mounted on said frame at said elevator station;

means for moving the elevator and the partially wrapped article thereon in a first vertical direction to a first folding station;

a first stationary folder on the frame at the first folding station for folding one of the horizontally projecting parts of the projecting ends of the wrapper material into engagement with the associated end of the article;

means for moving the elevator and the partially wrapped article thereon in a second vertical direction to a second folding station;

a second stationary folder on the frame at the second station for folding the other of the horizontally projecting parts of the projecting ends of the wrapper material into engagement with the associated end of the article;

means for moving the elevator and the partially wrapped article thereon in a vertical direction away from the first and second stations through a third folding station;

and third stationary folding means on the frame at the third station for folding vertically projecting parts of the projecting ends of the wrapper material to complete the folding of the end flap.

2. The invention in accordance with claim 1 wherein the wrapper material projects beyond both ends of the partially wrapped article, two of the first stationary folders are at the first folding station operable on the respective projecting ends of the partially wrapped article and two of the second stationary folders are at the second folding station operable on the respective projecting ends of the partially wrapped article.

3. The invention in accordance with claim 2 wherein each of the folders of the first and second stations are substantially the same.

4. The invention in accordance with claim 3 wherein each of the folders includes a pair of horizontally spaced substantially hemispherically shaped stationary ploughs and a vertical plate interposed between the ploughs, said ploughs and said plate adapted to engage with horizontally projecting parts of the wrapper material to fold such parts.

5. The invention in accordance with claim 1 wherein a glue applicator is on said frame and applies glue to the outer vertically disposed parts of the projecting ends of the wrapping material prior to moving of the partially wrapped article to the first folding station.

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6. The invention in accordance with claim 1 wherein the third stationary folding means includes a leading stationary folding bar for folding inwardly a first vertically projecting part of the projecting ends of the wrapper material over the folded horizontal parts of the wrapping material and associated end of the article and a trailing stationary folding bar for folding inwardly other vertically projecting parts of the projecting ends of the wrapper material and associated end of the article and the first vertically projecting part of the projecting ends of the wrapper material.

7. The invention in accordance with claim 1 wherein discharge means is provided for moving the completely wrapped article in a horizontal direction after the third folding station.

8. The invention in accordance with claim 1 wherein plunger means is actuatable after the partially wrapped article passes the first folding station to engage with horizontally disposed surfaces of the partially wrapped article, and the plunger means cooperates with the elevator in moving the partially wrapped article from the first station through the second and third stations.

9. The method of completing the folding of a wrapping material about a partially wrapped article such as a stack of paper bags or the like wherein the partially wrapped article has part of the wrapper material projecting beyond the opposed ends of the article, comprising:

elevating the partially wrapped article in an upward

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vertical direction; while said partially wrapped article is being elevated, passing it through a stationary first folding station where stationary folders fold upper parts of the projecting ends of the wrapper material downwardly over the associated ends of the article;

lowering the partially wrapped article in a downward vertical direction;

while said partially wrapped article is being lowered, passing it through a stationary second folding station where stationary folders fold lower parts of the projecting ends of the wrapper material upwardly over the associated ends of the article;

lowering the partially wrapped article further past the second folding station and in a downward vertical direction;

while said partially wrapped article is being lowered, passing it through a stationary third folding station where stationary folders fold vertically projecting parts of the projecting ends of the wrapper material over the associated ends of the article to complete the folding of the end flap.

10. The invention in accordance with claim 9 wherein adhesive is applied to the vertical projecting parts of the projecting ends of the wrapper material while the partially wrapped article is being elevated to the first folding station to cooperate in securing the completed flap over the associated end of the article.

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