United States Patent

[11] 3,627,306

[72] Inventor **Hans Affupper**
56 Wuppertal-Barmen, Gosenburg, 100, Germany

[21] Appl. No. **865,256**
[22] Filed **Oct. 10, 1969**
[45] Patented **Dec. 14, 1971**
[32] Priority **Oct. 12, 1968**
[33] **Germany**
[31] **P 18 02 889.2**

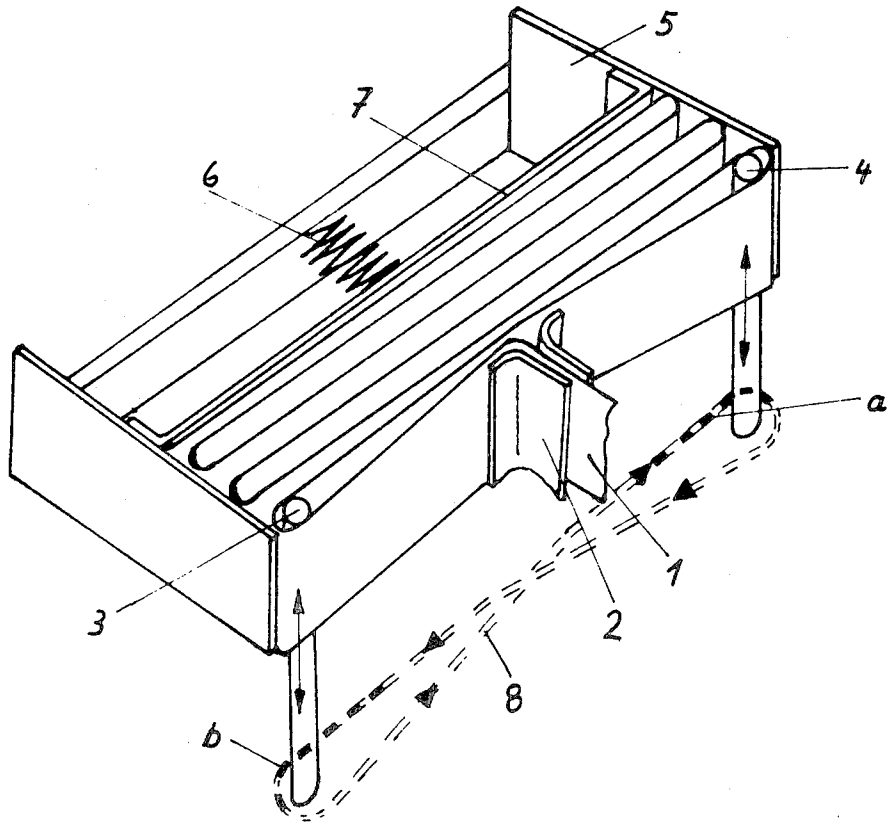
[54] **METHOD AND APPARATUS FOR FOLDING AND PACKAGING BANDS OF MATERIAL**
5 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** ..... **270/79**, 270/61 F
[51] **Int. Cl.** **B65h 45/107**, B65h 45/20
[50] **Field of Search** ..... 270/30, 39, 52.5, 61 F, 73, 79, 83, 85

[56] **References Cited**
UNITED STATES PATENTS
3,195,883 7/1965 Southwell et al. 270/79

Primary Examiner—Robert W. Michell
Assistant Examiner—R. P. Dyer
Attorney—Allison C. Collard

ABSTRACT: A method and apparatus for the zigzag folding and packaging of continuous bands of materials such as textiles wherein a feed nozzle is moved between at least two spaced-apart and generally parallel winding pins along several types of paths while the pins are selectively retracted along their axes to permit the band of material, which is dispensed from a feed nozzle to span across the pins.



PATENTED DEC 14 1971

3,627,306

SHEET 1 OF 5

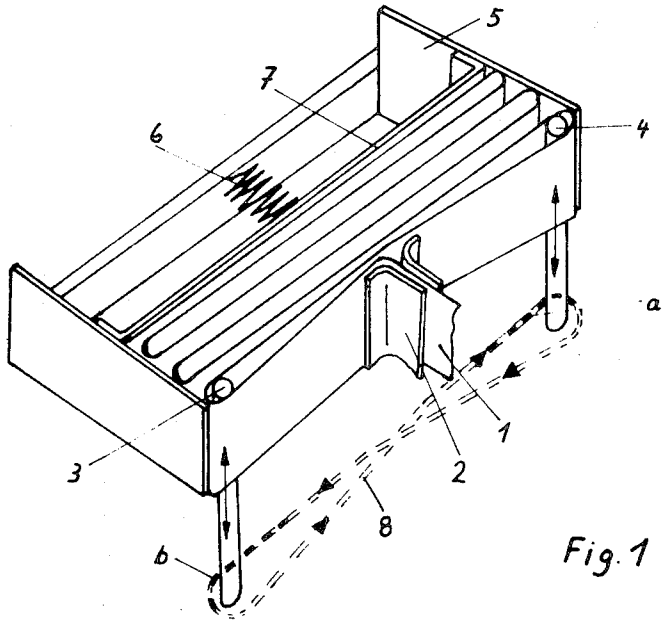


Fig. 1

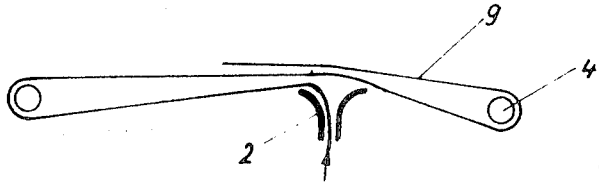


Fig. 2

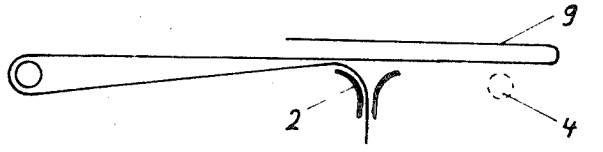


Fig. 3

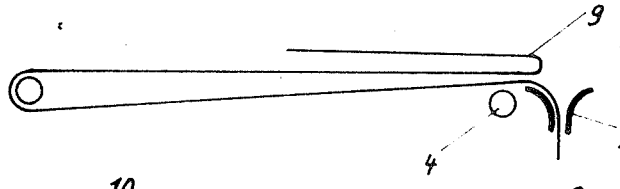


Fig. 4

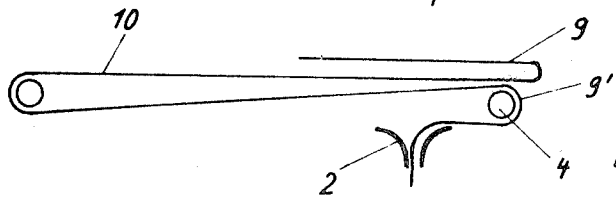


Fig. 5

INVENTOR
HANS AFFÚPPER

BY: Allison C. Collard

Attorney

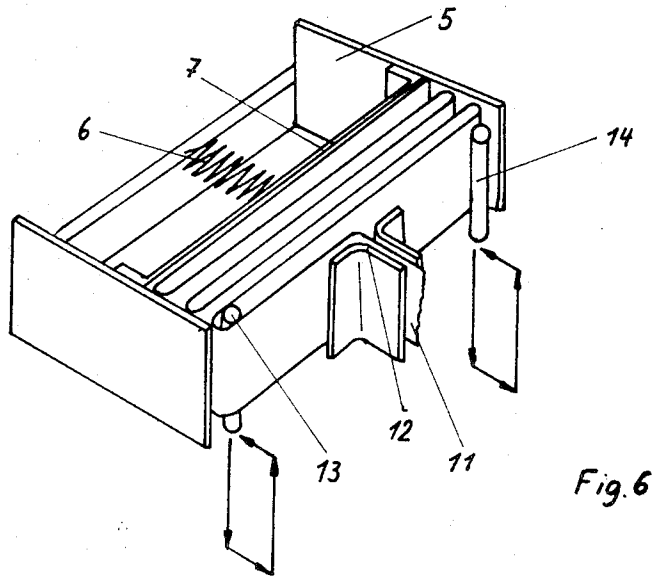


Fig. 6

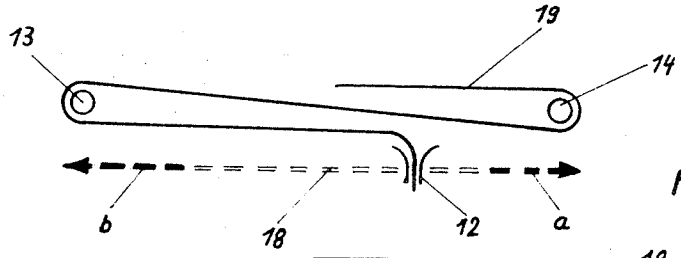


Fig. 7

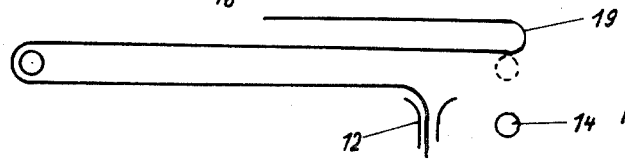


Fig. 8

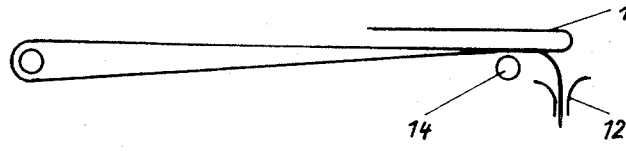


Fig. 9

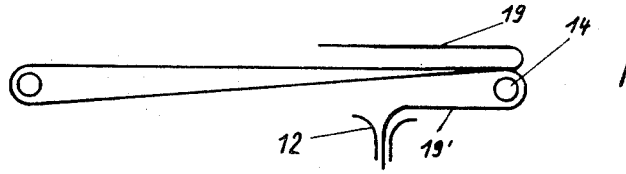


Fig. 10

INVENTOR
HANS AFFUPPER

BY: Allen C Ballard

Attorney

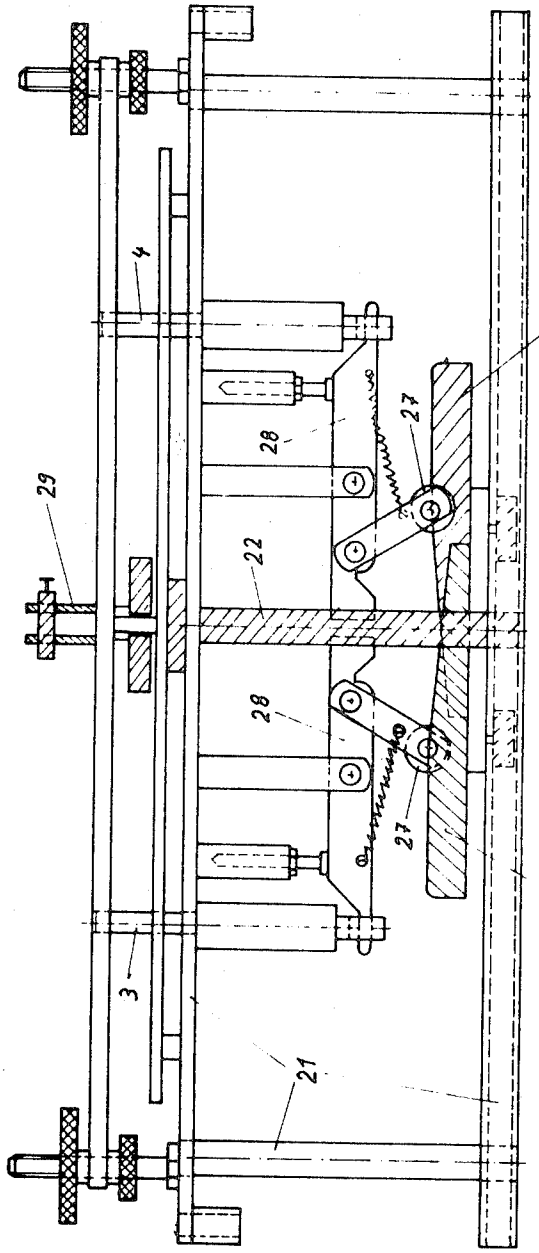


Fig. 11

INVENTOR:
HANS AFFUPPER

BY:

Attorney

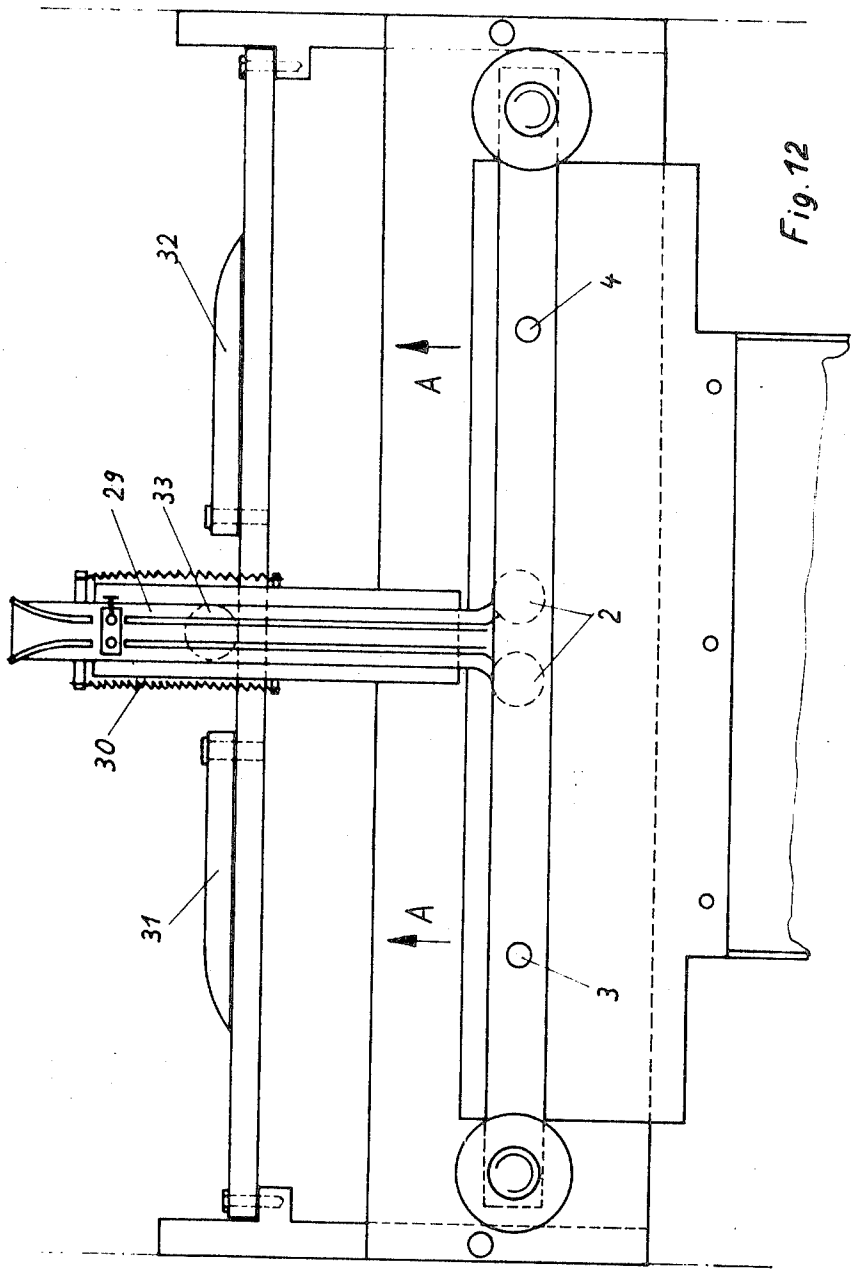


Fig. 12

INVENTOR:
HANS AFFUPPER

BY: Allin C. Pollard

Attorney

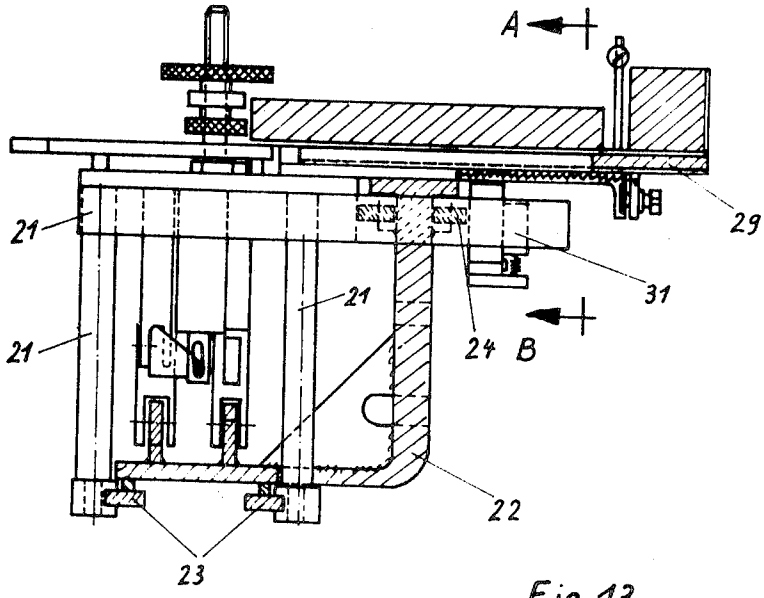


Fig. 13

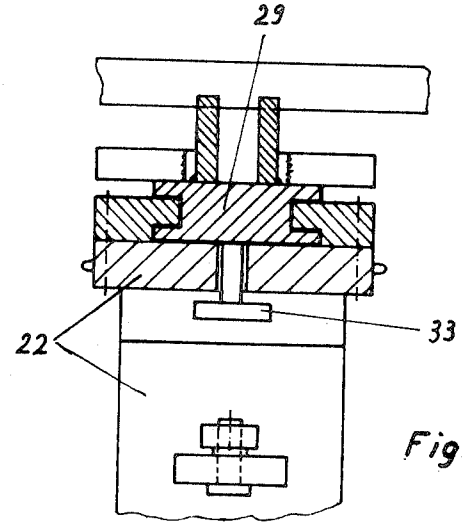


Fig. 14

INVENTOR:
HANS AFFUPPER
BY:
Attorney

METHOD AND APPARATUS FOR FOLDING AND PACKAGING BANDS OF MATERIAL

This invention relates to a technique for folding and packaging a continuously fed band in a zigzag manner.

It is well known in the art to provide processes whereby bands are packaged in zigzag fashion or in a meander fold, in cartons or the like. In this manner, appreciably larger band lengths can be packaged to economize space to a greater extent than is feasible in the binding of bands into rolls.

Also known to the art are machines for the zigzag folding of bands or tapes (German Pat. No. 457,159, and German Pat. No. 635,180), wherein the band is fed from the top (from above) in a vertical direction. Mounted horizontally to the right and to the left of the travelling band are horizontally oriented folding knives which in each instance, with the aid of an oppositely directed rectangular movement with a horizontal movement component, folds the vertically incoming band to form horizontally placed zigzag folds. In the case of the machine according to German Pat. No. 457,159, the two folding knives are simultaneously shifted in the horizontal direction to one side or the other. The fold which is disposed last, is not fixed at its reversal point while the next fold is formed, so that the last fold to be formed is able to rebound again. In the device according to German Pat. No. 635,180, the knife which happens to be at the lower end remains lodged as a fold fixer in the last fold formed, long enough for the folding knife which is lodged above it to stretch the next cross segment of the band. The lower folding knife is then retracted, moved upward, over the other folding knife, and then moved inward over the other folding knife, forming another band fold or pleat. Where the mode of operation is as described, the folding knives also provide a barrier to hinder the rebound of the last fold or pleat to be formed. A fundamental drawback however, where this mode of functioning is pursued, is the fact that in each instance, the band is folded over only during the inward travel of the folding knives, while "idle periods," with regard to the forming of folds, occur during the outward travel of the folding knives. Since the idle periods, that is, the outward movement of the folding knives, are identical in duration to the operating periods, that is, the inward movement of the folding knives, the latter machine is operative for only half its service time in the work of producing folds.

This drawback also occurs in the case of another familiar device (Pat. application M 76 420 VIIIa/8) in the case of which in lieu of two folding knives performing a quadrangular movement, provision is made for two swivel arms which are alternately swiveled from one side to the other side towards the incoming band and in conjunction with blocking pins which are thrust into the given, last formed loop to fix the last folds on their reversal points, laying the band in the form of a zigzag. In this embodiment also, one swinging arm can be swung inward only when the other swinging arm has been swiveled previously outward executing an outward "idle movement."

There is also a conventional device for the automatic tying of a web of paper which is folded together in a zigzag manner (German Pat. No. 611,694), in the case of which the web of paper is supplied with the aid of a mouthpiece which travels to and fro in accordance with the length of the zigzag. The mouthpiece is here provided with a special device since the paper web is periodically wrinkled to one side or the other, so that the fold, provided with a permanent wrinkle, is deposited on a stack. By means of catches which act in a timed manner, the fold which has been last deposited is fixed to the stack so that the latter does not rebound any longer when the mouthpiece or nozzle performs a to-and-fro movement. This familiar machine is characterized by the fundamental advantage in that during the to-and-fro movement of the supply feed nozzle, no idle periods intervene while folds are laid. However, this conventional machine is capable of being employed only in the case of webs of material which can be provided with a permanent wrinkle, such as, for example, paper webs but not for textile bands.

An object of the invention is to provide a technique for the zigzag folding and packaging of a continuously fed, flexible band, particularly a textile band which makes it feasible to have a high operating speed while preventing the occurrence of idle periods. The technique pursuant to the invention resides in the fact that the incoming bank or web is wound with the aid of a supply nozzle which travels perpendicular to the direction of the main feed in a to-and-fro movement, about winding pins which are parallel and spaced apart from each other. These winding pins with each sensing movement of the supply nozzle and oriented towards same, are retracted in their axial direction and return following the outward passage of the supply nozzle to their winding position, so that the pins act on the main surface of the last band section to be spanned, with the main surface facing the direction of the principal supply. Due to the steadily to-and-fro movement of the supply nozzle, the band is laid in uninterrupted folds so that the winding pins in each instance work in their upper position as winding cores to be encompassed, and in the case of the retracted winding pin, the fold which was last to be formed thereon is shifted from the supply nozzle to the output end of the device.

In order to loop the winding pins, it is required to have, in addition to the to-and-fro motion of the supply nozzle, a perpendicular relative movement between the winding pins and the supply or feed nozzle. Pursuant to the invention, this can be attained by running the feed nozzle along a level, generally octagonal path about the winding pins, so that the winding pins travel up and down, perpendicular to the web level. As an alternate version, the relative movement can also be brought about by having the feed nozzle travel to and fro along a rectilinear path, and by having the winding pins travel with a translatory movement along a quadrangular or circular path, first in the direction of the pin axis, secondly, in an opposite axial direction, and finally in the principal web feed direction.

To implement the technique of the invention, a device is provided having an oblong mount, wherein close to the lengthwise ends is lodged one of the winding pins, each in a manner permitting it to travel up and down, piloted by means of a driven carriage which travels to and fro in the mounting in the lengthwise direction. The carriage piloting is performed via cam plates with the upward and downward movement of the pins and supports a band feed channel oriented crosswise towards the frame mount, the channel being mounted at the height of the upper position of the winding pins.

According to one embodiment, the nozzle of the feed channel projects as far as the plane which is defined by the winding pins, the winding pins being capable of moving only in the direction of their up and down axes. The feed channel is lodged longitudinally perpendicular to the plane which is defined by the winding pins, in a manner which is mobile on the carriage, and is piloted in such a manner in its longitudinal movement by the curved pieces mounted on the frame mount that the nozzle describes an octagonal path about the winding pins.

As an alternate version, the feed channel can also be rigidly secured to the carriage. The carriage is capable of being displaceable to and fro along a rectilinear path in the frame. The winding pins can then elude along a translatory quadrangular or circular path. The nozzle travels outward, and immediately connects in the principal band feed direction with the band segment which is, in each instance, spanned across from the nozzle.

Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanying drawings which disclose the embodiments of the invention. It is to be understood, however, that the drawings are designed for the purposes of illustration only, and not as a definition of the limits of the invention.

In the drawings, wherein similar reference characters denote similar elements throughout the several views:

FIGS. 1–5 represent in each case, a schematic drawing of a technique pursuant to the invention;

FIGS. 6–10 each show a schematic representation of a second embodiment pursuant to the invention;

FIGS. 11–14 show a device for the implementation of the invention described in FIGS. 1–5, whereby FIG. 11 is a view of the device showing the rear or output end of the device;

FIG. 12 is a plan view of the device;

FIG. 13 is a lateral view of the device; and

FIG. 14 is a cross-sectional view taken along section A–B of FIG. 13.

Referring to FIG. 1, there is shown a band 1 running in the horizontal direction, the band issuing from a feed nozzle 2. The band is lodged first about a left winding pin 3 and then about a right winding pin 4. The output of the band, which is disposed zigzagwise inside of a U-shaped trough 5, is secured at its end to a plate 7. FIG. 1 illustrates an intermediate state during the operation of the device wherein the feed nozzle is to be found precisely in the center between winding pins 3 and 4. Feed nozzle 2 is continuously guided about along an octagonal path, as shown in dotted line path 8 about winding pins 3 and 4. Winding pins 3 and 4 are mounted so as to be capable of an up-and-down movement in their bearings and are synchronized with the to-and-fro movement of feed nozzle 2 that they are retracted from the path of travel of feed nozzle 2 when the latter makes a circumventing run behind the pins during its outward movement. Thus, as shown in FIG. 1, feed nozzle 2 is found on band segment *b* and winding pin 4 is retracted upward or downward. When feed nozzle 2 is positioned on band segment *b*, winding pin 3 is retracted.

FIGS. 1–5 show five stages in the making of a fold or pleat. In FIG. 1, feed nozzle 2, proceeding from the anterior side of winding pin 3, after reaching the center, continues its run to the rear end of pin 4, as in FIG. 2. As soon as nozzle 2 reaches path segment *a*, winding pin 4 performs an eluding movement in its axial direction, whereupon the fold last to be formed is pressed back from feed nozzle 2 to the output end of the device, (FIG. 3). Feed nozzle 2, as seen in the plan view, then travels past retracted winding pin 4, whereupon winding pin 4 returns again into its winding position (FIG. 4). On the further travel of nozzle 2 which is oriented forward and again inward, winding pin 4 is looped about by the band, producing a new fold 9'. Feed nozzle 2 then runs to winding pin 3 wherein the most recently formed fold 10 is pressed back and the formation of a new fold, are repeated in a similar manner.

FIGS. 6–10 illustrate a modified technique and device for the placement of a band 11 in the form of zigzag folds. Contrary to FIGS. 1–5, feed nozzle 12 is moved back and forth along a rectilinear path (broken line 18 in FIG. 7) along the anterior side of pins 13, 14. As the nozzle performs each outward stroke, winding pins 13 and 14 run along a quadrangular path before the anterior main surface of the band has been spanned. Winding pins 13 and 14 are piloted in such a manner that winding pin 14 is moved downward when nozzle 12 is positioned in section *a* when executing its outward movement. Winding pin 13 is retracted when nozzle 12 is positioned in path section *b* on its opposite outward path. Otherwise, the operative stages of FIGS. 6–10 correspond to the operating stages of FIGS. 1–5. When nozzle 12 travels further to the right from its position as shown in FIG. 6, reaching the path segment *a*, winding pin 14 is run downward, out of loop 19, the last one formed (FIG. 8), whereupon feed nozzle 12 travels outward past the winding pin. Winding pin 14, during the quadrangular movement as shown in FIG. 6, is then guided upwardly, so that it presses back the last band section which was spanned transversely (FIG. 9). Upon the ensuing inward movement of nozzle 12, winding pin 14 is again encompassed by the band (FIG. 10) while it forms another fold 19'.

FIGS. 11–14 show in detail a device for the implementation of the technique of FIGS. 1–5. The device consists of a lengthwise frame 21 and bears a carriage capable of performing a to-and-fro movement as it is guided over rollers 23 and 24. For greater clarity of observation, the parts which travel to and fro with the carriage in FIGS. 11 and 13, are provided with a hachure. In frame mount 21 are furthermore lodged two winding pins, 3 and 4, capable of travelling up and down. The carriage supports curved members 25 and 26 which in conjunction with the scanning rollers 27 and rockers 28, pilot the up and down movement of pins 3 and 4 in the sequence shown in FIGS. 1–5.

At the level of the upper working position of winding pins 3 and 4, carriage 22 supports a feed channel 29 disposed perpendicular to the plane defined by the winding pins. Feed nozzle 2 projects as far as the rear of the plane defined by winding pins 3 and 4. Feed channel 29 is lodged on carriage 22 so that it can be displaced in the lengthwise direction against the force of tension springs 30, to permit feed nozzle 2 to be retracted as far as the front of the plane which is defined by winding pins 3 and 4. The movement of feed channel 29 is piloted with the aid of curved parts 31 and 32 which are mounted on the frame mount, in conjunction of takeup roller 33 which is secured to the feed channel.

Curved parts 31 and 32 are pivotably mounted in such a manner so that guide roller 33 runs past the curved parts when the carriage performs an outward movement. In performing an inward movement, roller 33 again runs onto curved parts 31, or 32, so that nozzle 2 is retracted so far in the direction of arrow A that the nozzle 2 runs past the front side of winding pins 3 or 4 on the return travel of the carriage, and describes a loop about each given winding pin. As nozzle 2 performs a movement, a superposition takes place of the to-and-fro movement of carriage 22, and the to-and-fro movement of feed channel 29 which is transverse to it, so that nozzle 2 is looped about winding pins 3 and 4 on the nearly octagonal resultant path.

While only a few embodiments of the present invention have been shown and described, it will be understood that many changes and modifications may be made thereunto without departing from the spirit and scope of the invention.

What is claimed is:

1. A device for the zigzag folding and packaging of continuous bands of materials, such as textiles, comprising;

at least two spaced-apart and generally parallel winding pins "around which the material being folded is disposed."

mounting means for permitting said winding pins to move upwardly and downwardly along their axes,

band feed channel means disposed on said mounting means level with the winding position of said pins, and

cam plates coupled to said winding pins for guiding said winding pins upwardly and downwardly and for guiding said band feed channel means transversely with respect to said spaced-apart pins.

2. The device as recited in claim 1 wherein said band feed channel means includes a feed nozzle for movement in the plane defined by said winding pins, said feed channel means disposed for longitudinal movement perpendicular to the plane defined by said winding pins, and means coupled to said channel means for guiding said nozzle along a substantially octagonal path around said winding pins.

3. The device as recited in claim 2 wherein said channel coupling guiding means comprises curved members secured to said mounting means and coupled to said channel means.

4. A method for zigzag folding and packaging of continuous bands of materials, such as textiles, comprising the steps of:

moving a feed nozzle between at least two spaced-apart and generally parallel winding pins "around which the material being folded is disposed," said nozzle moving along a path generally perpendicular to the feed direction and defining a level, generally octagonal path around said winding pins,

retracting selectively said winding pins from their winding position downwardly along their axes parallel to the plane of the band of material in response to the output movement of said feed nozzle, and

returning selectively said winding pins to their winding position upwardly along their axes parallel to the plane of the band of material following the outward passage of said feed nozzle, so that said pins engage the principal surface of the band of material which is the last to be dispensed from said feed nozzle and spanned across said pins, with the principal surface facing the principal feed direction of the band of material.

5. A method for the zigzag folding and packaging of continuous bands of material, such as textiles, comprising the steps of:

moving a feed nozzle between at least two spaced-apart and generally parallel winding pins "around which the material being folded is disposed," said nozzle moving along a path generally perpendicular to the feed direction and defining a rectilinear path between said winding pins,

retracting selectively said winding pins from their winding position downwardly along their axes in response to the outward movement of said feed nozzle,

moving said winding pins opposite the feed direction of the band of material,

moving said winding pins upwardly along their axes, and

returning selectively said winding pins to their winding position by moving said pins in the feed direction of the band of material thereby completing a quadrangular path, following the outward passage of said feed nozzle so that said pins engage the principal surface of the band of material which is the last to be dispensed from said feed nozzle and spanned across said pins, with the principal surface facing the principal feed direction of band of material.

* * * * *