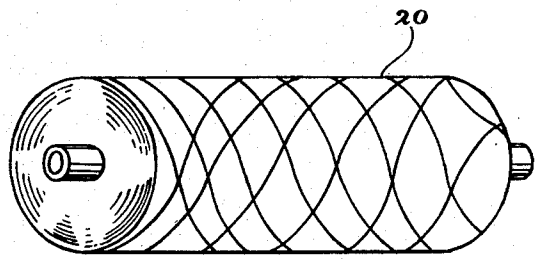
Aug. 2, 1960 E. G. GUENTHER ET AL 2,947,241

TOW BALING METHOD

Original Filed July 20, 1955 4 Sheets-Sheet 1



PRIOR ART

Fig. 1

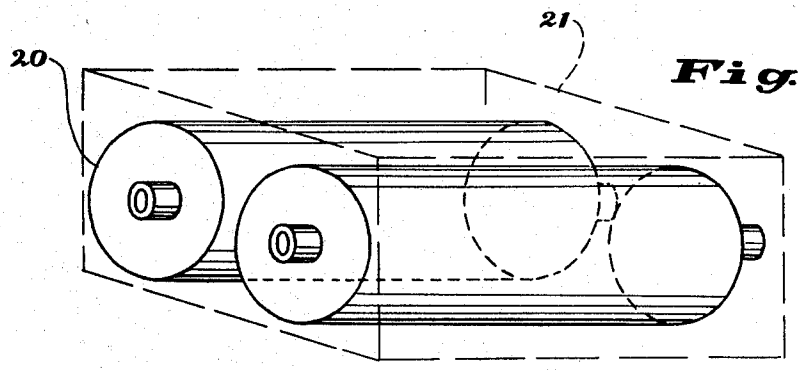


Fig. 2

PRIOR ART

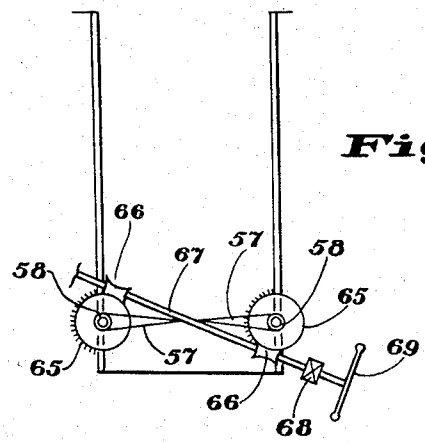


Fig. 9

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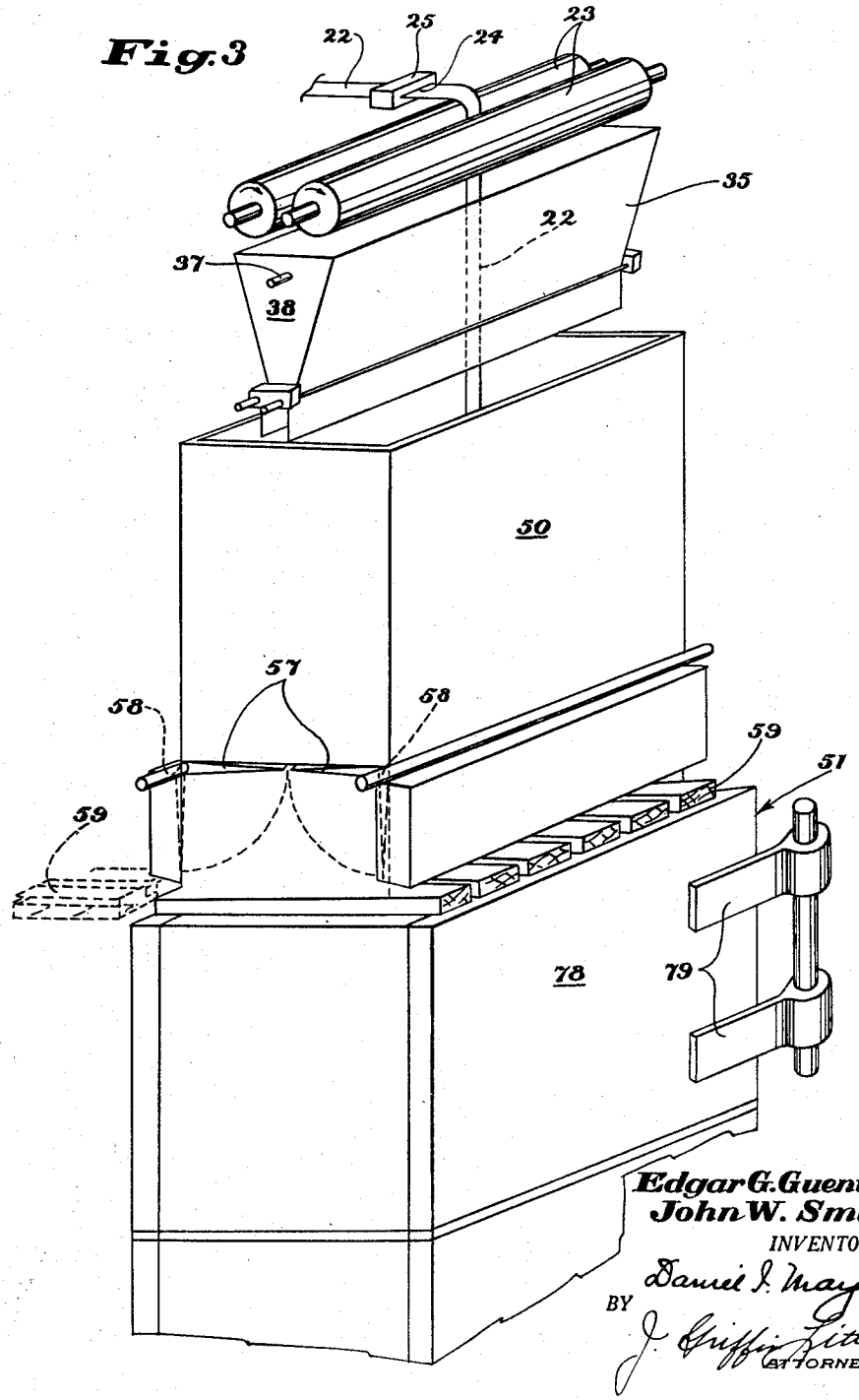
Fig. 3



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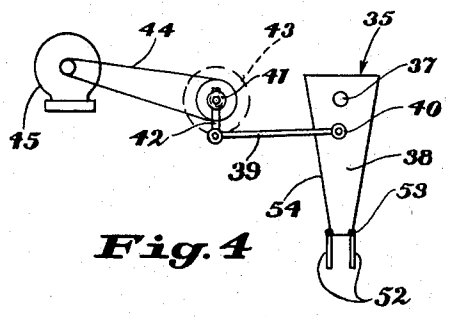
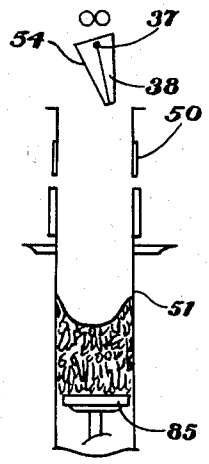


Fig. 4

Fig. 6



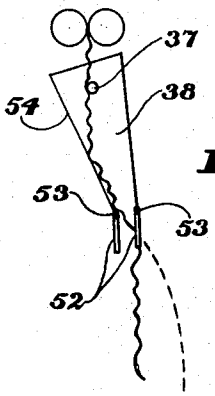


Fig. 5

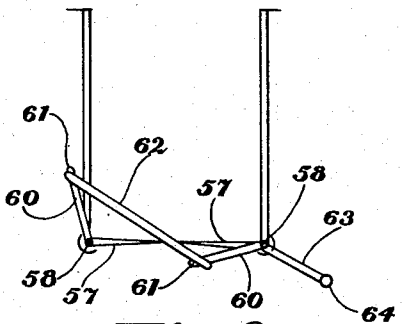


Fig. 8

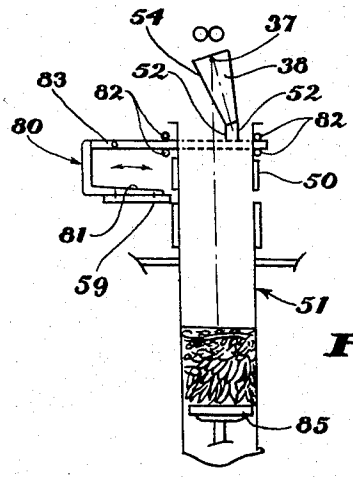


Fig. 7

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TOW BALING METHOD

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Fig. 12

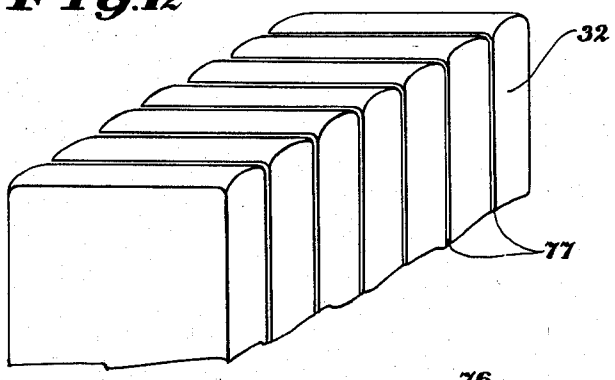
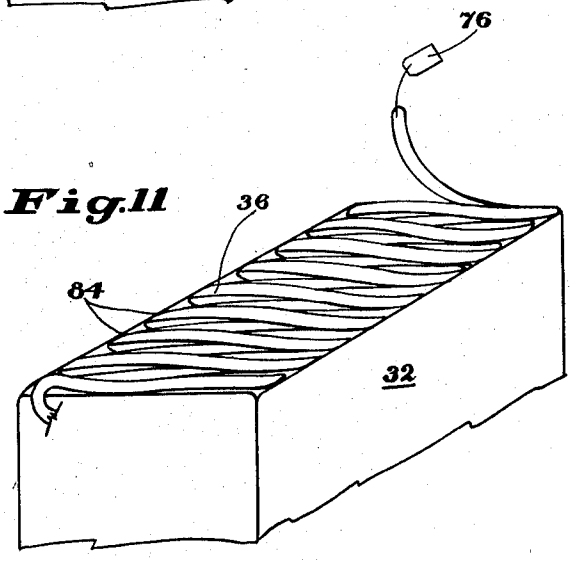


Fig. 11



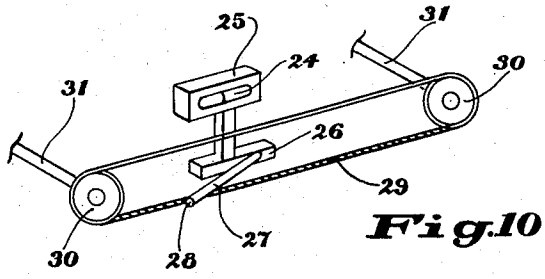


Fig. 10

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2,947,241

TOW BALING METHOD

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Original application July 20, 1955, Ser. No. 523,270. Divided and this application Jan. 4, 1957, Ser. No. 632,479

4 Claims. (Cl. 100—39)

The present invention relates to the packaging and using of yarn, and more particularly to the packaging of artificial yarn of the continuous filament types that are formed into tow to which a crimp has been added. This is a division of the applicants' copending application 523,270, filed July 20, 1955.

In the trade the word "tow" describes a product comprised of several ends of continuous filaments brought together to form a ropelike mass. The size of the tow is usually from 25,000 to 2,000,000 denier. In the process of manufacturing tow, a crimp is usually imparted to the tow. This crimp is formed in such a manner as to cause the tow to conform to a ribbon shape of rectangular cross-section, e.g. 1/32" x 2" for 100,000 denier.

The method of packaging, with which the present invention is concerned may be best described as baling. The general idea is to direct the tow into a conventional baling press in such a manner as to form a square prism package or bale acceptable as a supply package for subsequent tow usage.

The present invention has as its principal object the provision of a new and improved tow bale and a mechanism for the formation thereof.

Yet another object of the invention is the provision of a baled tow in which the tow is packaged under zero tension so that there is no change in the crimp of the tow.

Still another object of the invention is an arrangement by which the tow is traversed in its passage to the baler to provide a uniform pattern in tow bales so that the tow may be withdrawn from the bale under low tension and without tangling.

And yet another object of the invention is the provision of a high density tow bale.

And another object of the invention is the provision of a tow bale in which the tow can be drawn from the bale without the use of creals or mandrels.

And still another object of the invention is the formation of a baled tow in which twist is not added to the tow during packaging or withdrawing.

A further object of the invention is the provision of an arrangement which permits continuous flow of the tow yet allowing intermittent operation of the baling press to bale layers of tow into a high density bale. During the pressing-out operation the continuously moving tow is stored in properly arranged layers ready to be delivered to the press at the completion of the previous pressing-out operation.

And a still further object of the invention is the provision of a novel means to secure the tow pattern in the bale.

Finally, another object of the invention is the provision of a bale-forming mechanism which is simple in structure, comprises few parts of rugged design, easy to operate and highly effective in use.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a ball warped arrangement of winding tow used prior to the present invention;

Fig. 2 shows a cardboard container in which the ball warp of Fig. 1 was positioned for shipping or delivering, prior to the present invention;

Fig. 3 is a general perspective view of the apparatus of the present invention for feeding the tow to secure the desired pattern in the bale, and baling the patterned tow;

Fig. 4 is a side elevation view of the spreader bin, and the mechanism for oscillating the latter.

Fig. 5 is a side view of the spreader bin showing the location of the freely movable depending deflector lips, and the manner in which the latter deflect the tow;

Fig. 6 shows how the tow will be laid unevenly in the press without the use of the deflecting lips of the spreader bin, the hold-up doors being omitted on the hold-up bin for the purpose of clarity;

Fig. 7 shows an evenly laid tow in the press when the deflecting lips are used on the spreader bin, the hold-up doors being omitted for the purpose of clarity;

Fig 8 shows one arrangement for operating the holding doors at the bottom of the hold-up bin;

Fig. 9 shows a modified arrangement for operating the hold-up doors for the hold-up bin;

Fig. 10 shows the means for traversing the tow in the direction of the length of the bale or in the direction of the axes of the feed rolls;

Fig. 11 shows the pattern of one layer, the top layer, of the tow in the tow bale and illustrates the ease with which the tow may be withdrawn from the bale under low tension without tangling, the left end of the layer being connected to the underlying layer, while the right end of the layer has a tag connected thereto to facilitate finding the free end of the tow in the bale; and

Fig. 12 is a partial view of a completed tow bale.

Similar reference numerals throughout the various views indicate the same parts.

Fig. 1 of the drawings shows a ball warp arrangement **20** for winding tow or similar yarn, prior to the present invention; while Fig. 2 shows a cardboard container **21** in which a pair of ball warps were packaged for shipping. The density of the ball warp is 9.35 pounds per cubic foot. In order to form a more compact package, the tow bale of the present invention was developed. This bale arrangement has a density of 28.4 pounds per cubic foot. It is thus seen that the baled tow permits the storing and/or shipping of approximately 200% more tow in any given area. Also, the packaging and labor costs are reduced considerably in the case of a baled tow.

The essential features of the present invention include: (1) the feed rolls with the tow transverse mechanism; (2) the spreader bin with its freely swinging deflector lips; (3) the hold-up bin with its rockable or movable trap doors; (4) the conventional baling press, all of which parts will be later more fully discussed.

Referring now to Fig. 3, the tow **22**, in the form of a ribbon, is drawn from a previous processing unit by means of a pair of rotating draw or feed rolls **23**. Just ahead of the rolls, the tow **22** passes through a slot **24** in a traversing guide **25**. The latter is rigidly connected to a slide **26**, see Fig. 10, which is suitably mounted in slide ways, not shown. As is apparent from Fig. 10, the reciprocating motion in the direction of the axes of rolls **23** is imparted to slide **26** by means of a link **27**, one end **28** of which is connected to an endless chain **29**. The latter passes over a pair of spaced sprockets **30**, each of which is rigidly connected to shaft **31**, at least one of which is rotated by means not shown. The sprockets **30** are spaced from each other to obtain the

desired traverse distance for the guides **24**, namely, the length of the tow bale **32**, see Fig. 12.

As the tow **22** is discharged from the nip of the draw rolls **23**, the tow falls into a downwardly tapered spreader bin, generally indicated by the numeral **35**. Due to the reciprocation of the guide **25** the tow will be discharged or laid in folds along the length of the bin **35**, or to the right and left as viewed in Fig. 3. Thus, the guide **25** will serve to distribute the tow lengthwise of the bin **35**. However, to provide the desired lay or pattern of the successive superimposed layers **36**, see Fig. 11, of the tow in the bale **32**, it is necessary also to move or reciprocate the tow **22** in a direction normal to that provided by the reciprocating guide **25**. To secure this result, the spreader bin **35** is mounted for rocking or pivoting movement about a pair of aligned shafts **37** which project laterally from the opposite end walls **38** of the bin **35**. The supporting means for the shafts **37** are not shown, but may be of any suitable construction and does not form a part of the present invention. Thus, the guide **25** reciprocates the tow in a direction parallel to the axes of the rolls **23**, while the rocking of bin **25** reciprocates the tow in a direction normal to the roll axes. This dual movement of the tow serves to lay the latter in reversing folds, as shown at **36** in Fig. 11. The rocking of the spreader bin **35** about shafts **37** is obtained by means of a link **39**, one end **40** of which is pivotally connected to an end wall **38** of the bin **35** below shaft **37**. The other end of link **39** is rotated about point **41** by a crank **42** of a gear reducer **43** driven by a belt **44** from a motor **45**. The above mechanism serves to rock bin **35** about 15° each side of its vertical position.

Thus, the reciprocation of guide **25** and the rocking of the bin **35** imparts a zigzag motion to the tow as the latter is discharged from the bin **35** so that the tow will be distributed in superimposed layers **36**, each of which lies substantially in a plane and is in no way interlaced or intermeshed with adjacent layers. This arrangement permits easy and ready withdrawal of the tow from the bale at low tension and without tangling.

The tow is discharged from the bin **35** and is laid in the above-described pattern in a stationary hold-up bin **50**. The successive layers **36** are built up on the hold-up bin while previously formed layers are being pressed in a hydraulic press, generally indicated by the numeral **51**, and later to be more fully described. The hold-up bin **50** thus serves to collect the layers **36** of the tow, and also enables the latter to be fed continuously yet permits intermittent operation of the press **51** to bale the tow.

As the tow is discharged into the hold-up bin **50**, it is desirable to have the layers arranged in flat relation, as shown in Fig. 7, rather than in concave relation as shown in Fig. 6. To obtain more positive control over the tow lay, the spreader bin **35** is provided with a pair of spaced vertical lips **52** which swing freely about bearing **53**. The lips **52** are free to rotate about bearing **53** so the lips will always hang vertically as shown in Fig. 5, irrespective of the angular position of the bin **35**. Referring to Fig. 5 it is seen that when the bin **35** is in its extreme displaced position, the tow **22** discharged from rolls **23** slides down the left inclined side **54** of the bin **35** and is then deflected downward vertically by the lips **52**, as shown in the solid lines of Fig. 5. This arrangement gives the desired pattern to the lay as illustrated in Fig. 7. However, if the lips **52** are not used, the tow path would assume the position shown in the dotted lines of Fig. 5 and would provide the pattern lay as shown in Fig. 6. This latter condition inevitably results in trapped ends as the high side periodically falls inward.

The two layers accumulate in the hold-up bin **50** while the previous group is being baled in the press **51**. In order to enable the tow layers to accumulate in bin **50**, the bottom of the bin is closed by a pair of trap doors **57** hinged at **58** on the bottom of bin **50**, as clearly illustrated in Figs. 3, 8 and 9. When the previously baled package **32** is removed from the press **51**, the upper platen **59** of the press is moved to the dotted position, Fig. 3, by means to be later described. This movement of the platen **59** opens the top of the press **51**. The doors **57** are then moved to their open or dotted position, shown in Fig. 3, allowing the laid layers in the hold-up bin to fall into the press **51**. At this time sufficient tow has not been accumulated to form the desired size bale. However, the tow continues to be discharged from the spreader bin **35** and falls through the hold-up bin **50** and builds up in the previously described layer patterns **36** in the press **51** until the desired bale weight has accumulated in the press **51**. At that time the doors **57** are again moved to closed position to cut off further supply of the tow to the press **51**, and the tow layers then start to accumulate in the hold-up bin **50**. Thus, the latter provides a temporary storage for the accumulation of the tow while the previous bale of tow is being baled in the press, after which the doors **57** are opened and the tow is delivered directly to press **51**.

The doors **57** may be opened and closed by any suitable mechanism; for example, Fig. 8 shows an arrangement in which each hinged connection **58** has secured thereto one end of a lever **60** the free end of which is pivotally connected at **61** to a crosslink **62**. One of the hinges **58** also has secured thereto an operating lever **63**, the free end of which is provided with an operating handle **64**. It will be apparent from an inspection of Fig. 8 that an upward movement of the handle **64** and lever **63** will rock both hinges in the proper direction to swing the doors **57** downward from their closed position, shown in the solid lines of Figs. 3 and 8, to their open position shown by the dotted lines in Fig. 3.

Another mechanism for operating the doors **57** is shown in Fig. 9, in which each hinge **58** carries a worm gear **65** which meshes with a worm **66** carried by shaft **67** supported in bearing **68**. The shaft **67** carries an operating wheel **69**. By rotating the latter, the hinges **58** may be rocked in the proper direction to open and close the doors **57**.

When the upper platen **59** is moved to the dotted position, Fig. 3, the tow is fed directly to the press **51**. After the required amount of tow has been accumulated in press **51**, the platen **59** is then moved to its full line position shown in Fig. 3, and the new bale started in the hold-up bin **50**. The tow extending between the bin **50** and the press **51** is cut, and each end is placed in its respective bale. However, the end in the press has attached thereto an identifying tag **76** to facilitate ready and easy location of the free end of the tow in the bale, when the latter is opened by the user. After the free end is tagged, and placed in the bale in the press, a hydraulic piston **85** at the bottom of the press is moved upward and cooperates with the stationary platen **59** to compress the tow layers to form the high density bale. The latter, as is common practice, is enclosed in any suitable wrapper which is placed in the press prior to the opening of doors **57**. However, as this feature forms no part of the invention, details thereof are not deemed necessary. Also, as is common practice with baled materials, the bale may have a plurality of metal reenforcing bands **77** which also do not form a part of the present invention. After the bale has been pressed to the proper size in the press, a door **78** hinged at **79** is opened and the pressed bale removed. The proper bale covering is then placed in the press and the platen **59** withdrawn and the doors **57** opened to discharge the accumulated laid layers in bin **50** into the press **51** for the next baling operation.

The platen **59** may be arranged in the manner illustrated in Fig. 7, which shows the platen fastened by suitable fastening means to the lower member **81** of a U-shaped yoke **80** which is mounted so that it is free to move in the direction indicated by the arrows in Fig. 7. Four anti-friction rollers **82** support the upper member **83** of the yoke **80** to permit the yoke to be moved

by hand power. A similar arrangement, not shown, is connected to the opposite ends of the platen 59.

Thus, the tow has imparted thereto a dual reciprocating motion which serves to lay the tow in a zigzag pattern or layers in the hold-up bin 50, the tow strip being folded upon itself, at the edges of the bale, as shown at 84, Fig. 11. After the previous baling operation has been completed, the accumulated layers in hold-up bin 50 are dropped into the press 51, and the laying operation continues until the proper bale weight has been accumulated in press 51. The tow in the press is then compressed to form the baled tow 32, see Fig. 12. The various layers 36 lie substantially in separate planes and are not intermeshed or interengaged with adjacent layers. On the contrary, the layers, even of the compressed bale, are in laminated relation so that when each layer is uncovered it may be easily and readily removed with very little tension and without tangling. The various layers are connected at their ends to adjacent layers, the top and bottom layers each of course having only one end connected to an adjacent layer. The free end of the tow in the top layer is provided with an identification tag of facilitate locating the free end when the bale is opened. The described mechanism for forming the layers enables the tow to be packaged under zero tension and without causing any change in the tow crimp. Also, the arrangement of the layers in laminated form permits the tow to be withdrawn easily and readily from the bale in a continuous strand under low tension and without tangling.

The present invention thus provides a new and improved baled tow, and the mechanism for building up the bale. Furthermore, the tow is fed continuously while the baling operation is intermittent, means being provided to store a portion of the baled material during a pressing-out operation. The mechanism for forming the bales is simple, easy to operate, rugged and highly effective in use.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. Therefore, this application is not to be limited to the precise details described herein, but is intended to cover all variations and modifications thereof falling within the scope of the appended claims.

What we claim and desire to secure by Letters Patent of the United States is:

1. The method of baling tow comprising, feeding a strand of tow continuously, collecting the tow in superimposed loose layers of uniform pattern at one position until a portion only of a bale of loose layers has accumulated at said one position, transferring the accumulated portion of loose layers as a unit to a compressing point, laying additional loose layers on said portion at said point until a predetermined amount of tow has been accumulated at said point, then compressing the predetermined amount into a bale at said point while simultaneously collecting succeeding lengths of said tow in loose layers at said one position to form a succeeding bale portion.

2. The method of baling tow comprising, the steps of continuously feeding a strand of tow while imparting a dual horizontal movement to the tow as it is fed so as to lay the tow in superposed loose layers of uniform pattern, accumulating at a first position a quantity of said superposed loose layers sufficient to form only a portion of a bale; transferring said portion of a bale to a second position, continuing the feed and dual movement of said tow to said second position during and after transfer of the bale portion until a predetermined amount of tow has been accumulated at said second position, then transferring the feed of tow back to said first position after cutting the same, between said positions, and compressing the predetermined amount of two deposited at said second position into a finished bale.

3. The method of baling tow comprising the steps of continuously feeding a strand of tow vertically downward while imparting a dual horizontal movement to the tow as it is fed vertically so as to lay the tow in superposed loose layers of uniform pattern, accumulating a quantity of said superposed loose layers to form only a portion of a bale at a first position arranged in vertical alignment with the fed tow, transferring said portion of a bale to a second position arranged below and vertically aligned with said first position, continuing the vertical feed and dual movement of said tow to said second position during and after the transfer of the bale portion until a predetermined amount of tow has been accumulated at said second position, then transferring the feed of tow back to said first position, cutting the strand between said positions, and finally compressing the predetermined amount of tow deposited at said second position to form a finished compressed bale.

4. Bale packaging method for continuous filament tow comprising the steps of continuously feeding the tow to a lay pattern forming area, moving the tow continuously as a strand running downwardly from the pattern forming area by gravity, while simultaneously continuously changing the position of the longitudinal axis of the downwardly moving tow by compound oscillation of the point of discharge of the tow from the pattern forming area, thereby establishing a bale lay pattern, presenting a stationary, substantially horizontal, temporary supporting surface for reception of the downwardly moving tow in the lay pattern in a position above a baling area, bringing the downwardly moving tow to rest in the lay pattern on said temporary supporting surface, and, by the continued feeding of tow in the lay pattern to said temporary supporting surface, accumulating thereon superposed loose layers of the tow, thereby forming a portion of a bale resting on said supporting surface, removing the temporary surface from its tow supporting position and away from the accumulated bale portion, thereby dropping such accumulated portion by gravity, presenting a stationary, substantially horizontal, permanent supporting surface for reception of the dropped portion in the baling area, continuing the accumulation of tow in the desired lay pattern in superimposed loose layers during and after the drop of the accumulated portion to the permanent support, until a predetermined amount of tow, sufficient for a full bale, has been accumulated, thereupon discontinuing the movement of additional tow to the tow accumulated in the baling area by severing the tow at a point adjacent the surface of the tow accumulation and directing the thus-formed new length of downwardly moving tow to said temporary supporting surface above the baling area, and compressing and baling the accumulated full bale amount in the baling area while continuing the downward movement of the new length of tow to said temporary support above the baling area.

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UNITED STATES PATENT OFFICE

CERTIFICATION OF CORRECTION

August 2, 1960

Patent No. 2,947,241

Edgar G. Guenther et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the drawings, Sheet 2, in Fig. 3, the arrow which illustrates the direction of rotation of the right-hand (as one views the drawing) roll of the pair of feed rolls 23 should show rotation in a counterclockwise direction rather than a clockwise direction; in the printed specification, column 2, line 53, for "transverse" read -- traverse --; column 3, line 70, and column 6, line 2, for "two", each occurrence read -- tow --.

Signed and sealed this 25th day of April 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents