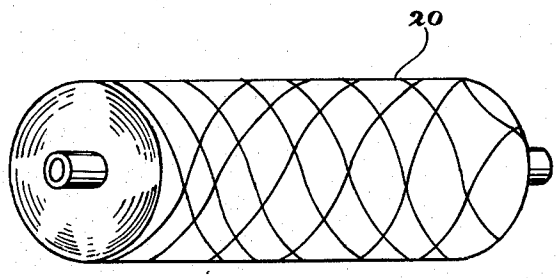
Aug. 2, 1960 E. G. GUENTHER ET AL 2,947,242

TOW BALING APPARATUS

Filed July 20, 1955 4 Sheets-Sheet 1



PRIOR ART

Fig. 1

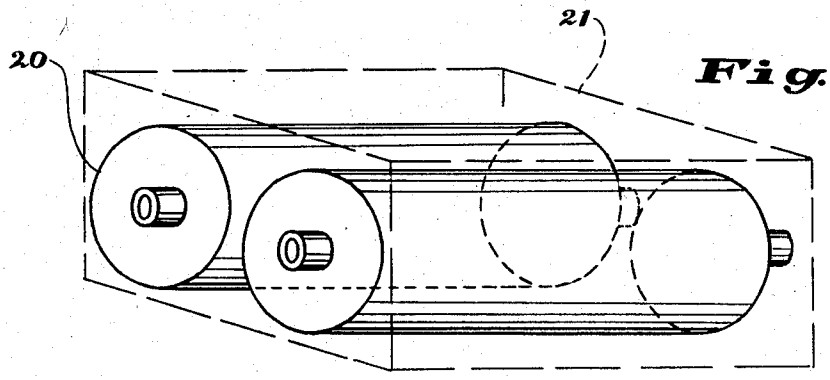


Fig. 2

PRIOR ART

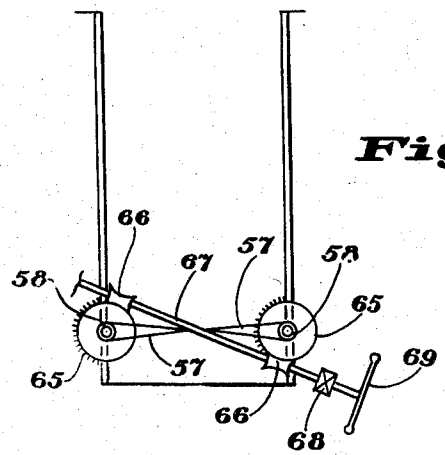


Fig. 9

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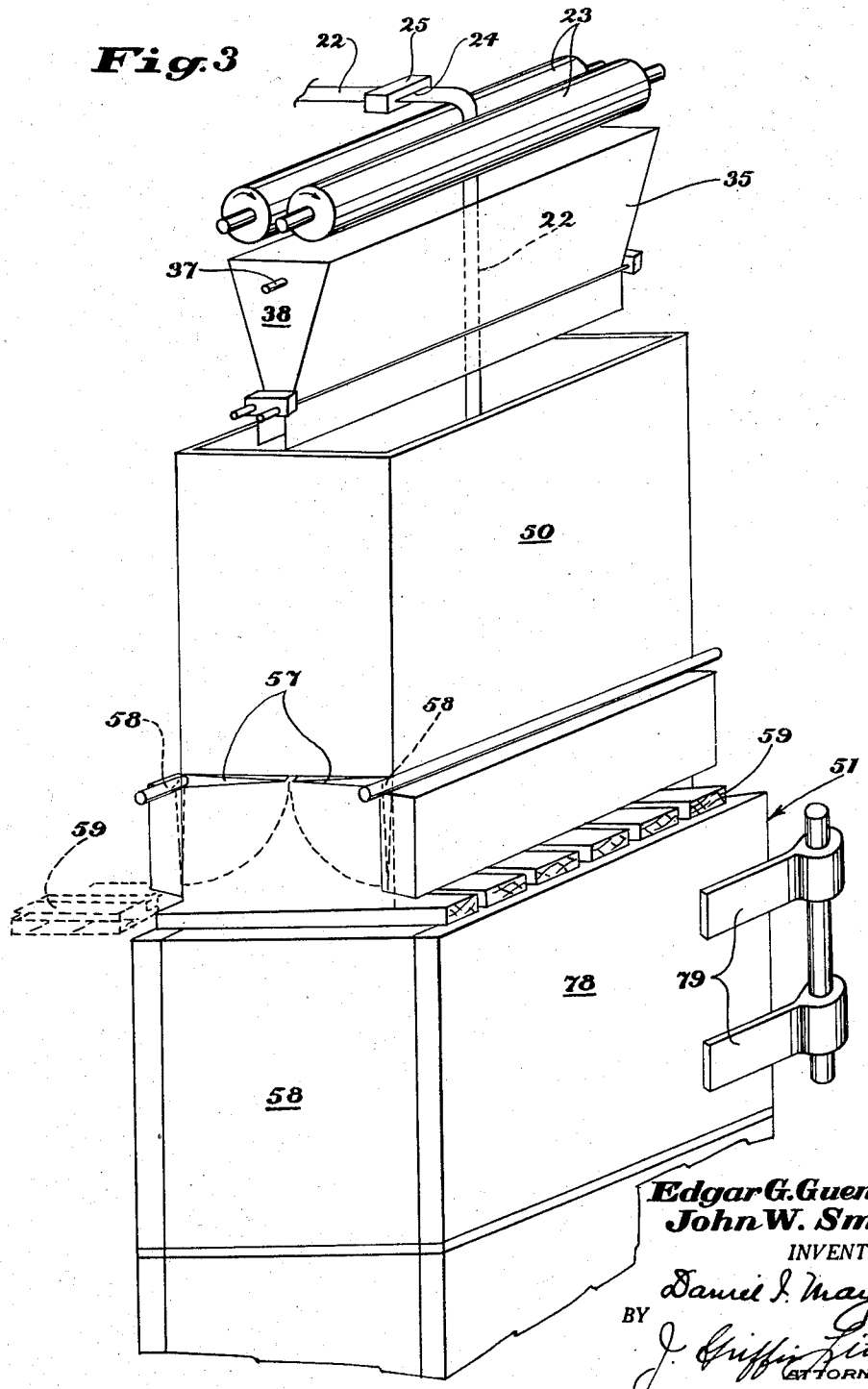
BY Daniel I. Wayne,
J. Griffin Little
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TOW BALING APPARATUS

Filed July 20, 1955 4 Sheets-Sheet 2

Fig. 3



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TOW BALING APPARATUS

Filed July 20, 1955 4 Sheets-Sheet 3

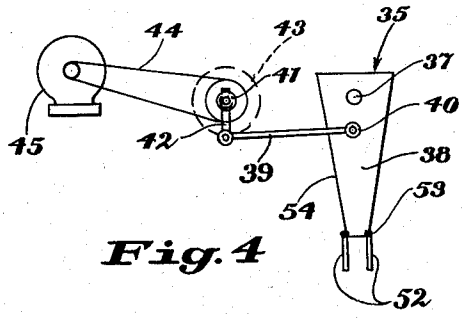
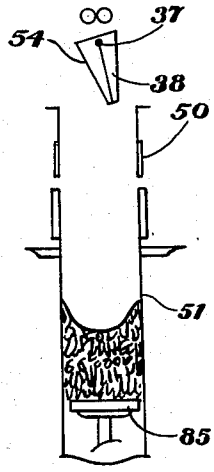


Fig. 4

Fig. 6



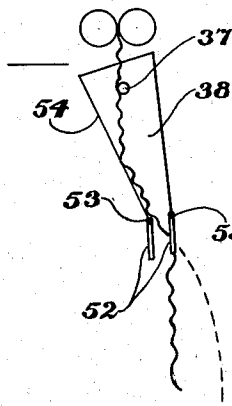


Fig. 5

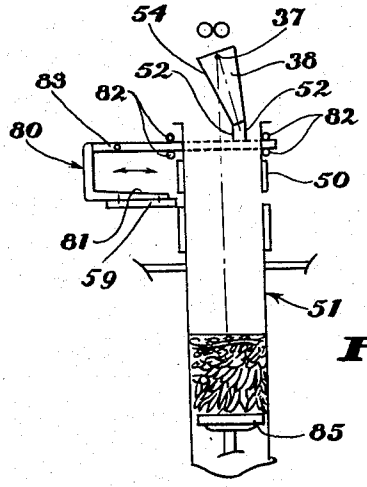


Fig. 7

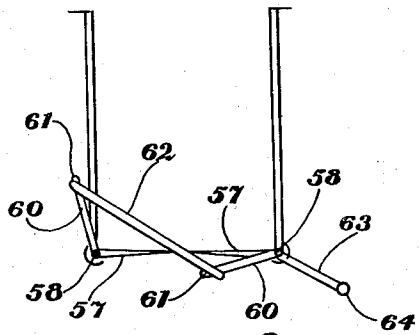


Fig. 8

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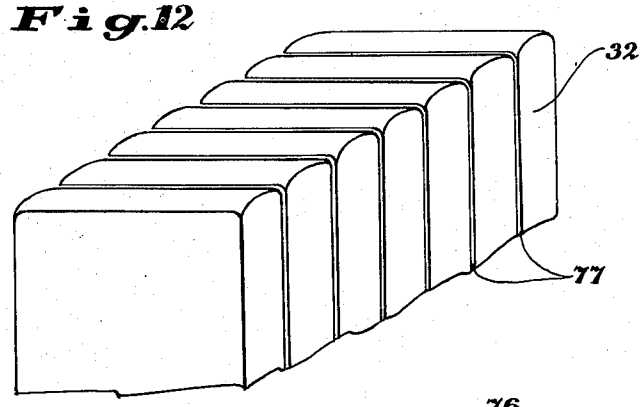
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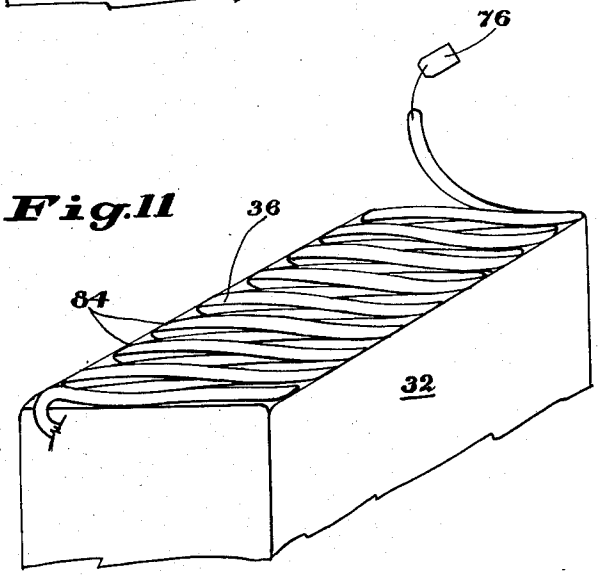
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TOW BALING APPARATUS

Filed July 20, 1955 4 Sheets-Sheet 4

Fig. 12





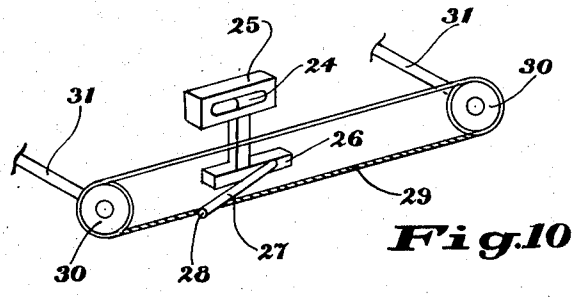


Fig. 10

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United States Patent Office 2,947,242 Patented Aug. 2, 1960

2,947,242

TOW BALING APPARATUS

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Filed July 20, 1955, Ser. No. 523,270

3 Claims. (Cl. 100—80)

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.

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 connected, 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 bale 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 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 traverse 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 an adjacent layer. 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 in the hold-up bin while previously formed layers are being pressed in an 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 tow 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 open 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 bales 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, an 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 of 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 to 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. A mechanism for forming a high density tow bale comprising, in combination, means to feed a tow continuously, a tow guide positioned ahead of said feed means, means to reciprocate said guide in one direction to traverse said tow along said feed means, a spreader means positioned below said feed means to receive the tow delivered therefrom, means to rock said spreader means angularly in a direction normal to the reciprocating means and cooperating therewith to impart a dual movement to said tow to lay the latter in superimposed layers of a definite pattern, a hold-up bin positioned below said spreader means to receive the layers, means to hold said layers in said hold-up bin, means on said spreader means to direct said tow in a definite relation to said hold-up bin irrespective of the position of the spreader means, a press positioned below said hold-up bin to receive said layers and to press the latter into a compact bale, and means to release said holding means to allow the layers to fall from said hold-up bin to said press.

2. A mechanism for forming a high density tow bale comprising, in combination, means to feed a tow continuously, a tow guide positioned ahead of said feed means, means to reciprocate said guide in one direction to traverse said tow along said feed means, a spreader means positioned below said feed means to receive the tow delivered therefrom, means to rock said spreader means angularly in a direction normal to the reciprocating means and cooperating therewith to impart a dual movement to said tow to lay the latter in superimposed layers of a definite pattern, a hold-up bin positioned below said spreader means to receive a layers, means to hold said layers in said hold-up bin, a pair of freely swinging depending lips on said spreader means to direct the tow from said spreader means to said hold-up bin always in vertical direction regardless of the angular position of said spreader means above said hold-up bin, a press positioned below said hold-up bin to receive said layers and to press the latter into a compact bale, and means to release said holding means to allow the layers to fall from said hold-up bin to said press said superimposed layers of definite pattern permitting the tow to be pulled from said bale at low tension and without tangling.

3. A mechanism for forming a high density tow bale comprising, in combination, means to feed a tow continuously, a tow guide positioned ahead of said feed means, means to reciprocate said guide relative to said feed means and in a direction of the length of said bale, a spreader bin positioned below said feed means and adapted to receive the reciprocating tow therefrom, means to rock said bin angularly in a direction of the width of said bale, said bin cooperating with said reciprocating means to lay said tow substantially without tension and in superimposed non-meshing layers having a zigzag pattern extending the length and width of the bale, a hold-up bin positioned below said spreader bin to receive the layers, freely swinging depending lips on said spreader bin to cause said tow always to be delivered in a vertical direction from said spreader bin irrespective of the angular position of the latter, movable doors at the bottom of said hold-up bin to retain said layers therein, a press positioned below said hold-up bin to receive the layers therefrom and to compress said layers into a compact high density bale, and means to release said holding means to permit said layers to fall by gravity from said hold-up bin to said press, said layers permitting the tow to be withdrawn continuously from said bale in a continuous strand under low tension and without tangling the tow.

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CERTIFICATION OF CORRECTION

Patent No. 2,947,242 August 2, 1960

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 grant, line 1, name of first inventor, for "Edgar G. Gunther" read -- Edgar G. Guenther --; in the drawings, Sheet 2, Fig. 3, the arrow which illustrates the direction of rotation of the right-hand 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 1, line 28, for "connected" read -- concerned --; column 3, line 38, for "with an adjacent layer" read -- with adjacent layers --; column 6, line 12, for "a layers" read -- the layers --.

Signed and sealed this 18th day of April 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents