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Willis et al.

[11] **3,783,578**

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[54] **MATERIAL GUIDE MEMBERS FOR A COMPRESSING AND CONVEYING APPARATUS**

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[73] Assignee: **MSL Industries, Inc.**

[22] Filed: **Mar. 7, 1972**

[21] Appl. No.: **232,380**

Related U.S. Application Data

[62] Division of Ser. No. 844,348, July 24, 1969.

[52] **U.S. Cl.**..... **53/24,** 53/124 E, 53/124 CC, 53/125

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

[58] **Field of Search**..... 53/24, 124 E, 124 CC, 53/125

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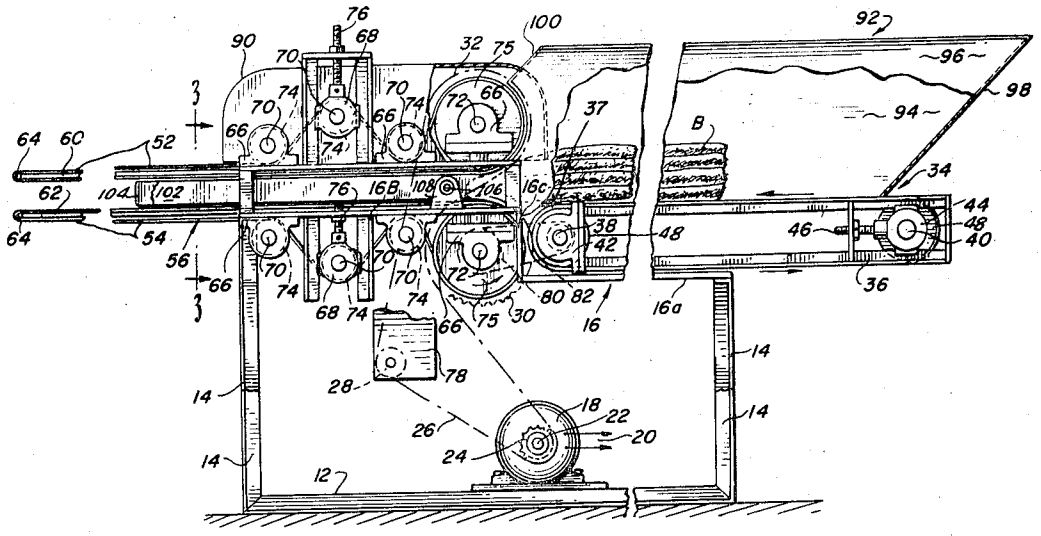
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Primary Examiner—Travis S. McGehee
Attorney—Herbert M. Adrian, Jr.

[57] **ABSTRACT**

An apparatus having aparallel, spaced apart belt conveyors and a hopper used in conjunction therewith and provided with a pair of flexible spaced apart material guide members positioned inwardly of and adjacent to the lateral edges of the belt conveyors to prevent material being conveyed by the conveyors from becoming entangled therewith.

1 Claim, 6 Drawing Figures



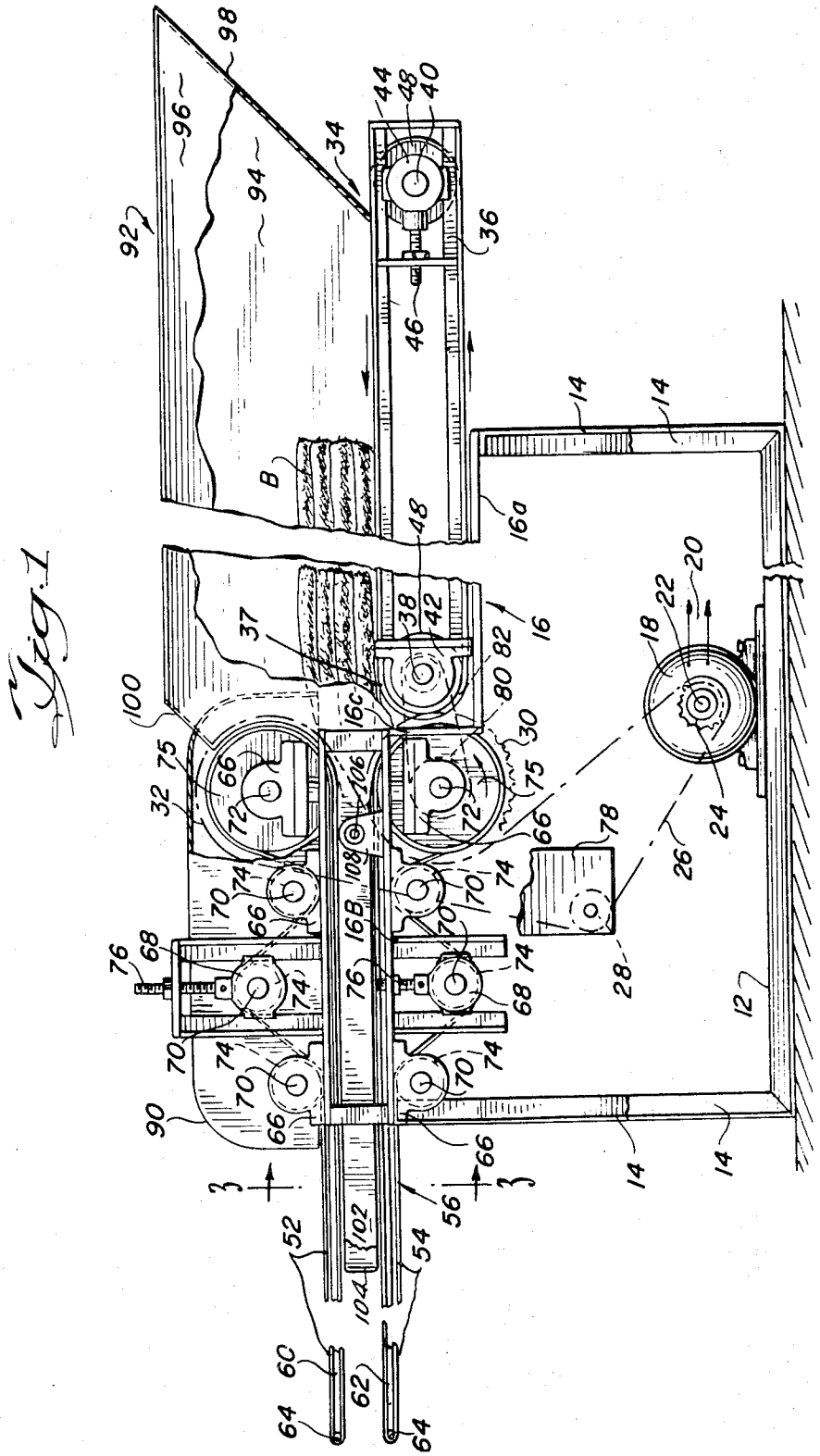


Fig. 1

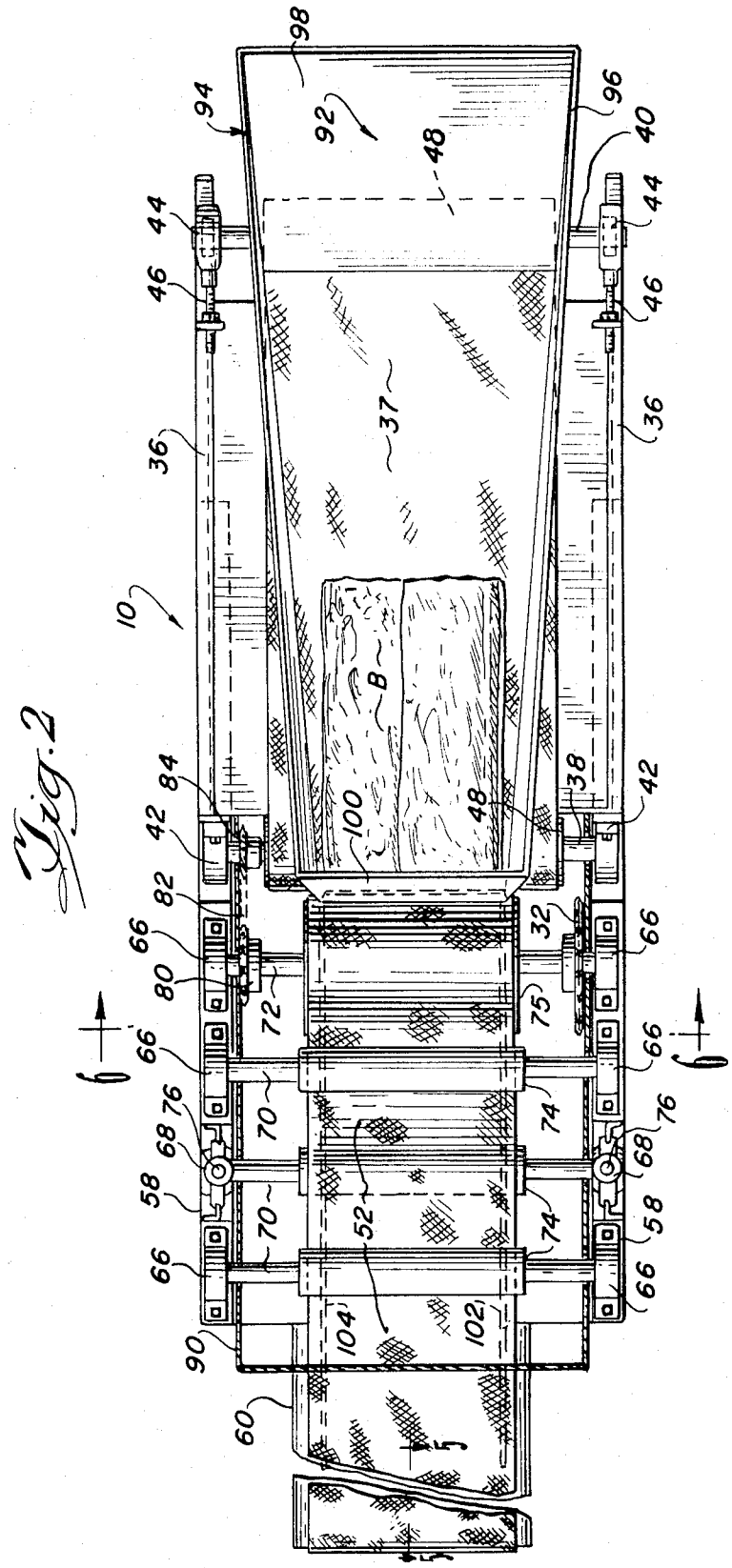

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Fig. 2

Fig. 3

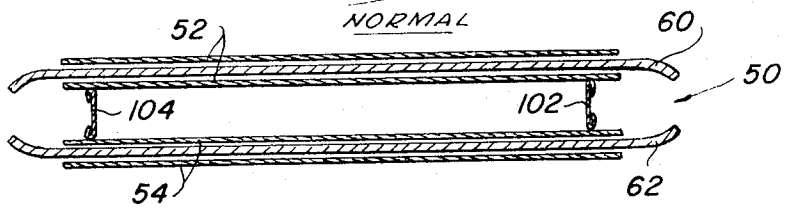


Fig. 4

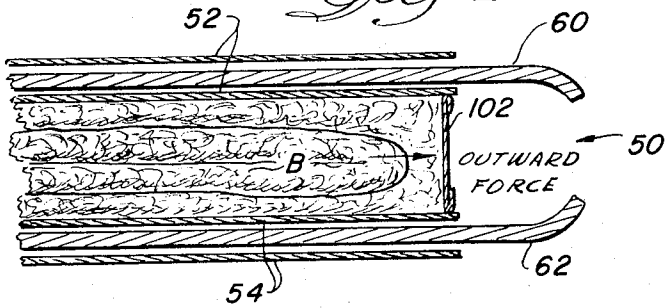


Fig. 5

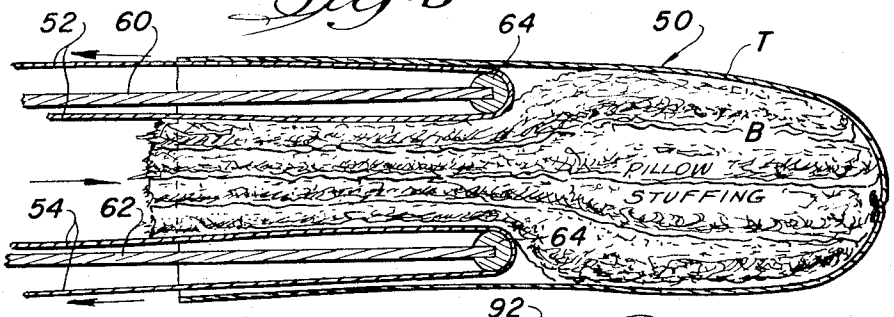
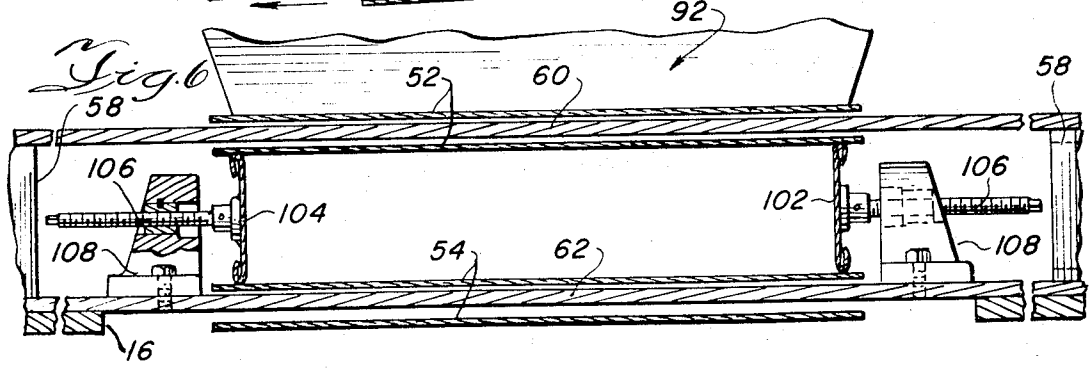


Fig. 6



MATERIAL GUIDE MEMBERS FOR A COMPRESSING AND CONVEYING APPARATUS

This is a division, of application Ser. No. 844,348, filed July 24, 1969.

This invention relates to a machine for temporarily compressing and conveying a resilient bat of fibrous material for placement in an envelope, or fabric tubing, and, particularly, concerns a material guide arrangement positioned between the belt conveyors for maintaining and constricting the material within the lateral width of the conveyor belts.

Heretofore, it has been a common practice when manufacturing pillows of various types and furniture cushions to place a resilient bat of fibrous material in the pillow ticking, or a fabric envelope, by conveying it through a chute-like arrangement of continuously driven belts. These belts temporarily compress the bat of resilient material in order to efficiently introduce it into the opened end of pillow ticking, or a fabric envelope, which is supported adjacent the outlet end of the belt conveyor. As this bat of resilient material is compressed between the belts, it expands outwardly toward the lateral edges of the belts. Occasionally, strands of the fibrous material have become tangled and wound around the various shafts, pulleys, and other related belt-supporting and driving mechanisms as the bat of material expands due to the compression. This has presented no appreciable problem in the past, since such pillows and cushions have been produced utilizing short stranded material.

Recently, the use of continuous filament material, or tow, has been utilized as pillow filler, or cushioning material, and unless provisions are made to confine the lateral expansion of this material within the belt conveyor mechanism, strands of this material may wind around bearing shafts, support shafts, or the like, which may cause buildup on the belt pulleys and thereby increase the tension on the conveyor belt. Because the synthetic filaments normally used are quite strong and do not readily break, such continuous strands of material will continue to wind around such drive mechanism and may clog the bearings, or cause damage to the driving shafts, which will require machine down time to clear this unwanted debris. Also, because of the nature of the bat and cohesiveness of the fibers, the catching of even a single filament quickly results in the dragging of additional filaments into the drive means with the accompanying destruction of the bat and shutdown of the machine.

In accordance with the present invention, there is provided a pair of material guide members which constrict and retain the lateral expansion of the bats of continuous filament tow as it is conveyed and compressed between a pair of opposed belt conveyors from an inlet and to an output end and thereby substantially eliminate the possibility of strands of the continuous filament material winding around the belt-supporting and driving shafts, and related mechanism.

Other features and advantages of this invention will become apparent by reference to the accompanying drawings and the following descriptions of certain preferred embodiments thereof, wherein:

FIG. 1 is a side elevational view of the machine embodying the invention with parts broken away;

FIG. 2 is a top plan view of the machine shown in FIG. 1;

FIG. 3 is a transverse sectional view of the belt conveyor assembly taken on lines 3—3 of FIG. 1 and shows the material guide members;

FIG. 4 is an enlarged fragmentary transverse sectional view of the conveyor assembly shown in FIG. 3 with the conveyor guide members illustrated in a second position;

FIG. 5 is an enlarged fragmentary, longitudinal sectional view of the conveyor assembly taken generally on line 5—5 of FIG. 2 and showing the conveyor assembly introducing a bat of material into an envelope and thereby stripping the assembled product from the conveyor assembly; and

FIG. 6 is an enlarged transverse sectional view of the conveyor assembly taken on line 6—6 of FIG. 2 with certain parts removed.

In practicing this invention, continuous filament tow made up of synthetic yarn material may be fed from a supply source in a crimped, deregistered, bulked mass of continuous filament strands which cascade into a collection area. The machine operator rolls this material into a low-density bat until a predetermined amount, determined generally by weight, is accumulated. At this time, the resilient bat of material is severed from the supply source by any suitable means, for example, a heated wire which is passed through the rope-like mass of tow. The bat is then placed in a hopper which is supported by the machine frame and comes to rest upon a continuously moving endless belt conveyor positioned at the hopper bottom. This bat is then transported to an inlet end of a belt conveyor assembly comprising a pair of spaced apart, endless belts. The belt conveyor assembly forms generally a continuously moving chute arrangement which temporarily reduces the vertical height of the bat by compressing the resilient bat of continuous filament tow introduced therein by the first-mentioned conveyor, with a substantial lack of permanent compression, and combines the bat between the inward opposed faces of the belt surfaces and a pair of spaced apart material constricting guide members positioned adjacent the lateral edges of the belt. These guide members restrain any outward expansion of the compressed bat and thereby retain all fibers within the lateral width of the belt. These driven belts convey the bat to the opposite end thereof under compression, where it is ejected from the conveyor assembly and inserted into the open end of an envelope or fabric tubing which is supported at the outlet end of the conveyor assembly. The envelope, or fabric tubing, is loosely positioned over the outlet end of the conveyor assembly and encircles the conveyors. Due to the direction of movement of the outwardly facing reaches of the belt, the envelope is maintained in position and as the bat is ejected from the belts, it is immediately inserted into the envelope and by this operation, the assembled product is stripped off from the conveyor outlet end. When the bat is completely released from the belt assembly, it re-expands within the envelope to provide a low-density, resilient cushion, or pillow.

Referring particularly to the drawings, and particularly FIGS. 1 and 2, it will be noted that there is a frame 10 which comprises a rectangular base 12 and four upstanding leg members 14, all of which are constructed of conventional channel members, or the like. At the upper end of legs 14, there is provided a flat, bilevel support platform 16 which is secured to the upper ends

of the legs **14** and supports the material conveyor assemblies discussed hereinafter. The support platform **16** comprises a lower section **16***a* and an upper section **16***b*, which are joined intermediate the ends thereof by a vertical section **16***c*.

A driving motor **18** is supported on the rectangular base **12** and is connected to any suitable source of electrical power **20.** The output shaft **22** of the motor **18** has secured thereto a driving sprocket **24.** The driving sprocket **24** drives a conventional roller chain **26** about an idler sprocket **28,** and driven sprockets **30** and **32,** which power the conveyor assemblies, as will be discussed hereinafter.

Supported on the lower portion **16***a* of the support platform **16** is a belt conveyor assembly **34,** which comprises a pair of side frames **36,** and a conveyor belt **37.** At the opposite ends of the side frames **36,** there are driven shafts **38** and **40** which extend between the side frames and are journaled at their opposite ends in fixed bearing supports **42** and adjustable bearing supports **44.** Supports **44** are movable by a conventional screw and nut arrangement **46** which is utilized to take up any slack in the belt **37** and to place the desired tension in the belt to insure its driving relationship with the belt pulleys, or rollers **48** secured to the respective shafts **40** and **38.** The internal surface of the belt **37** frictionally engages the outer periphery of the pulleys, or rollers **48** and thereby transmits the power received from the motor **18** through suitable drive means discussed hereinafter.

Located on the upper level or portion **16***b* of the support platform **16** is a conveyor assembly **50,** which comprises an upper belt conveyor **52** and a lower belt conveyor **54** (see FIG. **3**). The frame structure **56** for the horizontally spaced apart belt conveyors **52** and **54** includes side frame members **58** and vertically spaced apart flat plates **60** and **62,** all suitably welded together to provide a suitable supporting framework for the belt conveyors **52** and **54.** Welded at the outer ends of the spaced apart flat plate members **60** and **62** are a pair of transverse rods **64,** one welded to each end of the outer ends of the plates **60** and **62** to serve as a frictionless surface for the inside of belts **52** and **54** at the outlet end of the belt conveyors.

Intermediate the ends of the belt conveyors, the side frames **58** support a series of fixed bearing support members **66** and adjustable bearing support members **68.** These bearing support members have journaled therein transverse conveyor shafts **70** and **72** and each of the shafts **70** have secured thereon a pulley or roller member **74,** while shafts **72,** which are driven, as will be explained hereinafter, have a large pulley **75** secured thereto. The pulleys **74** and **75** frictionally engage the inner surface of the belts **52** and **54** to provide a frictional driving relationship therebetween and the adjustable bearing supports **68** are provided with a conventional screw and nut adjustment arrangement **76** to remove any slack from the belt and to provide the appropriate tension to insure the frictional engagement and driving relationship previously discussed.

The driven shafts **72** are directly connected to the previously discussed drive chain **26** by means of sprockets **30** and **32** secured in a coplanar relationship at one end of the respective shafts **72.** The driving chain **26** is engaged with the driving sprocket **24** and contacts on one side thereof sprocket **30** and wraps around on the opposite side of the chain sprocket **32** in order to provide a counter-rotating relationship between the sprockets to insure unidirectional movement of the inner surfaces of the belts **52** and **54.** The idler sprocket **28** is supported by depending frame member **78** which is secured by any suitable means to the frame structure **10** and is movable to tension the driving chain **26.**

It will be noted in FIG. **2** that at the opposite end of the upper driven shaft **72,** there is connected a sprocket **80** which is secured to the shaft and connected by means of a chain **82** to a sprocket **84,** which is secured in a coplanar relationship on the end of shaft **38** in order to transmit power to the belt conveyor **34** to cause the belt **37** to move in corresponding direction to belt **54.**

A hoodlike guard **90** is positioned over the upper conveyor assembly **52** and its drive components to protect the operator from contact with the bulk **52,** shafts **70** and **72,** and roller or pulley **74** and **75** and related chain drives **26** and **82.**

Positioned above the conveyor belt **37** is a material-receiving hopper **92,** which includes a pair of side plates **94** and **96,** a rear end wall **98,** and a front end wall **100.** The front end wall **100** is positioned above and adjacent the pulley **75** and extends from the upper edge of the hopper to the adjacent periphery of pulley **75.** The hopper is provided with an open top and bottom, thus exposing the upper surface of the continuously moving belt **37.**

In accordance with the present invention, it is important to prevent material received from the hopper from becoming entangled with the drive mechanisms, which could occur if the material is not retained inwardly of the outer edges of the belt conveyor. To this end, a pair of upstanding material guide members **102** and **104** are provided, which extend from the sidewalls **94** and **96** of the hopper **92** outwardly along the lateral edges of the belts **52** and **54.** These guide members, or material constricting guides **102** and **104** are positioned between the inner faces, or the opposed faces of belts **52** and **54** and within the lateral width of the belts adjacent the edges thereof. The guide members extend substantially along the length of the belt along the input end to a point intermediate the opposite end or the outlet end of the belt conveyors. It will be noted in FIG. **1** that they extend beyond the area where the drive shafts **72,** idler shaft **70** and their associated pulleys **74** and **75** and associated bearing structures **66** and **68** are located.

In the preferred embodiment, these guide members are continuations of the side plates **94** and **96** of the hopper **92.** However, it is within the scope of the invention that the side plates be additional members, either connected to the hopper **92,** or independently supported by other suitable means from the frame structure of the conveyor assembly **50.**

The guide members **102** and **104** are flexible and are adjustable inwardly toward the center of the belt conveyor assembly and away from the edges thereof by a screw and nut arrangement **106** supported from the platform **62** by support member **108,** as will be seen in FIG. **6.**

The continuous filament tow bat is shown in FIGS. **1, 2, 4,** and **5** and is indicated by the letter B. The envelope to which the temporaily compressed bat is inserted is shown in FIG. **5** and indicated by the letter T. In the

particular embodiment, the envelope is a pillow ticking and the bat shown is pillow filler.

It should be noted that the spaced apart frame members **60** and **62** of the conveyor assembly **50** are provided with rounded side edges to facilitate the receiving of the envelope T therearound, which loosely encircles the conveyor assembly during the operation of the machine. These rounded edge portions of the frame members **60** and **62** are shown in FIGS. **3** and **4** of the drawings.

The operation of the machine is as follows:

The motor **18** is energized through the suitable power source **20,** which causes chain **26** to be driven in a clockwise direction by rotation of shaft **22** and sprocket **24** secured thereto. The chain **26** in turn drives sprocket **32** on upper shaft **72** in a clockwise direction and drives the sprocket **30** on lower shaft **72** in a counterclockwise direction, which causes the inwardly facing surfaces of the opposed belt conveyors **52** and **54** to move toward the outer end of the conveyor assembly. Conversely, the outwardly facing surfaces of the belt conveyors **52** and **54** move toward the opposite end of the belt conveyors.

The driven rotation of the lower shaft **72** in turn causes rotation of sprocket **80** secured to one end thereof and through the chain **82** and the sprocket **84** secured to the end of shaft **38,** the belt conveyor **37** is moved in the direction shown in FIG. **1.** As will be apparent from FIG. **1,** the upper surfaces of belts **37** and **54** are substantially coplanar and in view of the previously described drive mechanism, these belt surfaces move in the same direction and therefore provide essentially a continuous moving conveyor.

With the machine operating as described, a fabric envelope T—in the present instance a pillow ticking—is positioned around the outer surface of the conveyor assemblies **52** and **54** and loosely encircles the outer reaches of the conveyor belts. In view of the fact that these outer facing reaches of the conveyor belts are moving toward the opposite end of the machine, they gently move the pillow ticking as far forward as possible and hold it there by a very light frictional contact with the inner surface of the pillow ticking.

With the machine in this condition, the material which is a continuous filament tow is fed from a supply source in a crimped, deregistered, bulked mass of continuous fibrous strands into a collection area. A predetermined amount of the bulked continuous filament product is formed into a low-density bat, as indicated by the numeral B in the shape and weight corresponding to the end cushion product. The measuring, shaping, and cutting of the low-density bat from the supply can be accomplished by any suitable means, for example, a heated wire which is passed through the continuous filament tow and is normally carried out automatically by apparatuses known in the art.

The operator then places the bat B into the hopper **92** and allows it to come to rest on the upper surface of the belt **37,** which is continuously moving, as previously described. The belt **37** moves the bat forwardly into the inlet end of the conveyor assembly **50** and the inner surfaces of belts **52** and **54.** The bat is further directed toward this inlet end of the conveyor assembly **50** by the sidewalls **94** and **96** of the hopper which, as seen in FIG. **2,** converge toward the throat area of the conveyor assembly.

As the bat enters the inlet of the conveyor assemblies and frictionally engages with the opposed faces of conveyors **52** and **54,** it is compressed and drawn into this moving chute-like arrangement between the material constricting guides **104** and **102,** as seen in FIGS. **1** and **2.** The bat moves through the conveyor assembly **50** and is restricted from any lateral expansion by means of the guides **102** and **104,** which are flexible, but are constructed and arranged to stay within the lateral width of the belts **52** and **54.** This positioning of the guides can be adjusted by means of the screw and nut arrangement shown in FIG. **6** and indicated by the numerals **106** and **108.**

As will be seen in FIGS. **3** and **4,** as the bat moves toward the opposite end of the conveyor assembly, there is an outward expansion force against the material constricting guides **102** and **104,** but by means of the limits of resiliency of the flexible guide members **102** and the adjustment of the screw and nut devices **106,** the expansion will be restricted within the lateral width of the belt. In view of this, none of the continuous filament fibers can be caught on shafts **70** and **72** and wound therearound.

The bat proceeds to the opposite end of the conveyor assembly and is guided thereby by means of the upper and lower surfaces of the belts **52** and **54** and the material constricting guides **102** and **104** until it reaches the outer end, at which time, it is ejected from the conveyor assembly and moves into the open end of the fabric envelope, or pillow ticking T. As the remainder of the bat is continuously pushed forwardly by the conveyor belt, it strips off the pillow ticking T while the bat is being ejected from the belts. As will be seen in FIG. **5,** the completed product is self-ejecting from the conveyor assembly and after the bat is completely introduced within the pillow ticking or envelope T, the material is released from the belt and expands within the envelope to provide a very low-density, resilient cushion or pillow product. At that point, all that is required is an operator, or an attendant to close the open end portion of the pillow ticking and the product is completed.

It will be readily recognized that while the present invention has particular applicability to synthetic continuous filaments, such as nylon, polyester cellulose acetate, cellulose triacetate, rayon acrylics, modacrylics, polyethylene, polypropylene, polyvinylchloride, and the like, bats of natural fibers and/or mixtures thereof with continuous or staple synthetic filaments can be used with correspondingly good results.

As many changes could be made to the above structures without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. For example, the material constricting or retaining guide members which restrict the expansion of the continuous filament tow within the width of the belt do not necessarily have to be contiguous with the hopper side members. Furthermore, the specific arrangement of driving the belts and conveying the material into the belt conveyor assembly is not necessarily required for a full appreciation of the improvement and the benefits gained from the material constricting guides used in combination with the belt conveyors. Furthermore, various other procedures embodying the principles disclosed in the foregoing may be suggested

to those skilled in the art. Accordingly, it is desired that the accompanying claims be accorded the broadest reasonable construction consistent with the language appearing therein and the prior art.

We claim:

1. A method for forming a cushioning structure comprising providing a soft, resilient, compressible fibrous bat of continuous synthetic filaments, conveying said bat to a continuously moving compression zone, compressing and reducing the vertical thickness of said bat and applying a lateral compressive force to said bat while simultaneously conveying said bat in its compressed condition to a discharge zone, covering the exterior of the conveying discharge zone with a fabric enclosure for the receipt of said compressed bat, expelling said compressed bat into said fabric enclosure while pushing said fabric enclosure off of said conveying discharge zone with the forwarding force of said bat as it is expelled into said fabric enclosure and releasing said applied vertical and lateral compressive forces to thereby form said cushioning structure.

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