May 16, 1967 L. TALALAY ETAL 3,319,394

APPARATUS FOR PACKAGING RESILIENT CELLULAR MATERIAL

Filed July 25, 1963 3 Sheets-Sheet 1

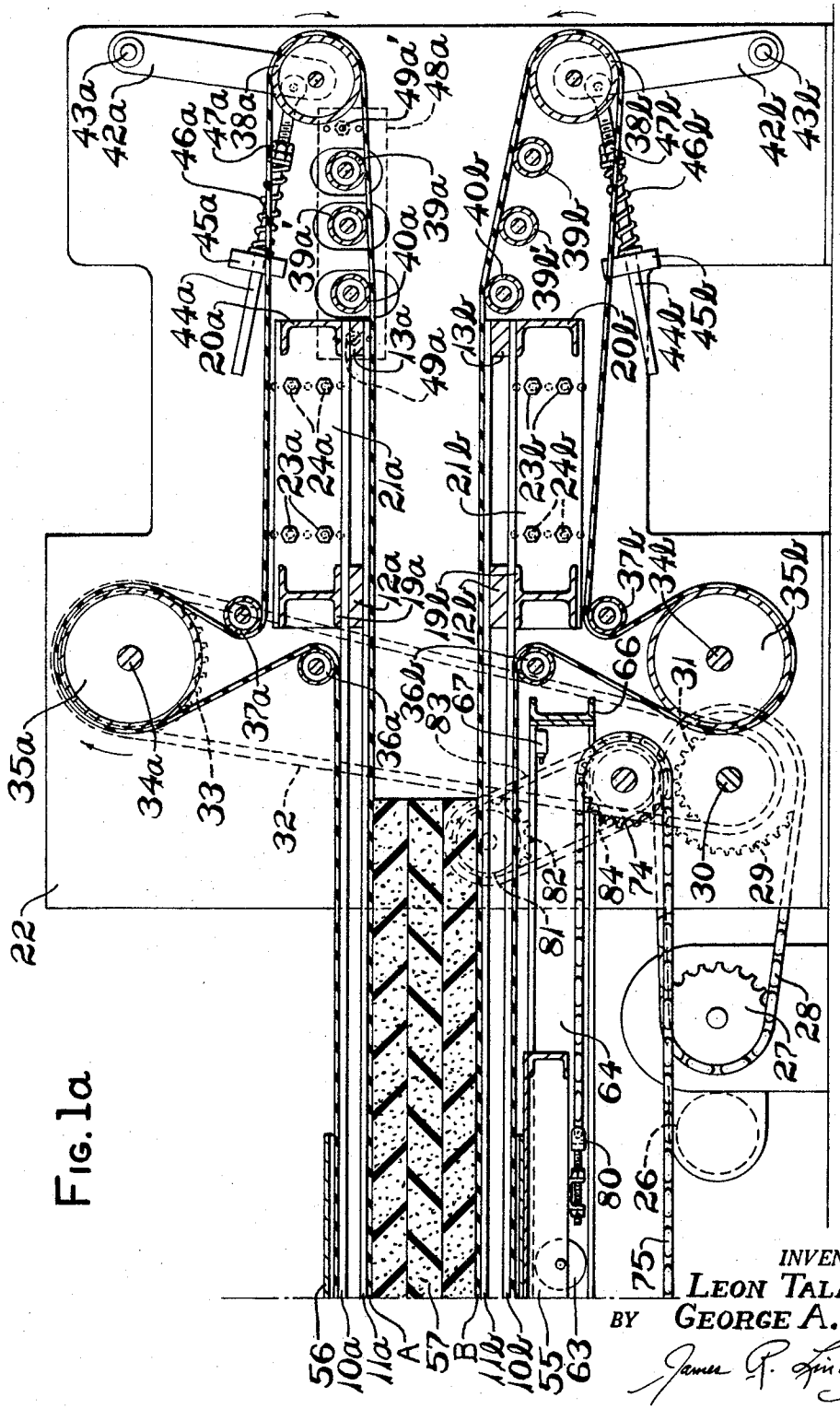


FIG. 1a

INVENTORS
LEON TALALAY
BY GEORGE A. SCOTT
James R. Lindsey
ATTY.

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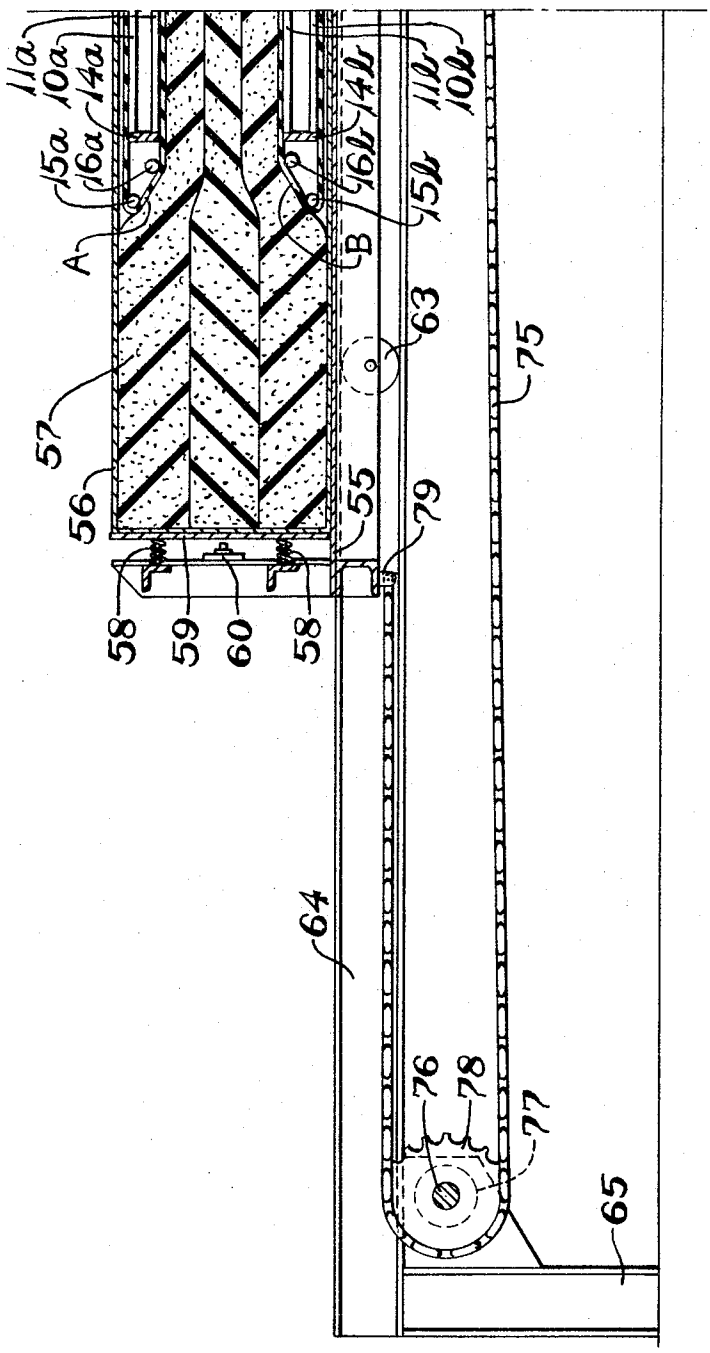


FIG. 1b

INVENTORS
LEON TALALAY
BY GEORGE A. SCOTT
James R. Lindsay
ATTY.

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APPARATUS FOR PACKAGING RESILIENT CELLULAR MATERIAL

Filed July 25, 1963 3 Sheets-Sheet 3

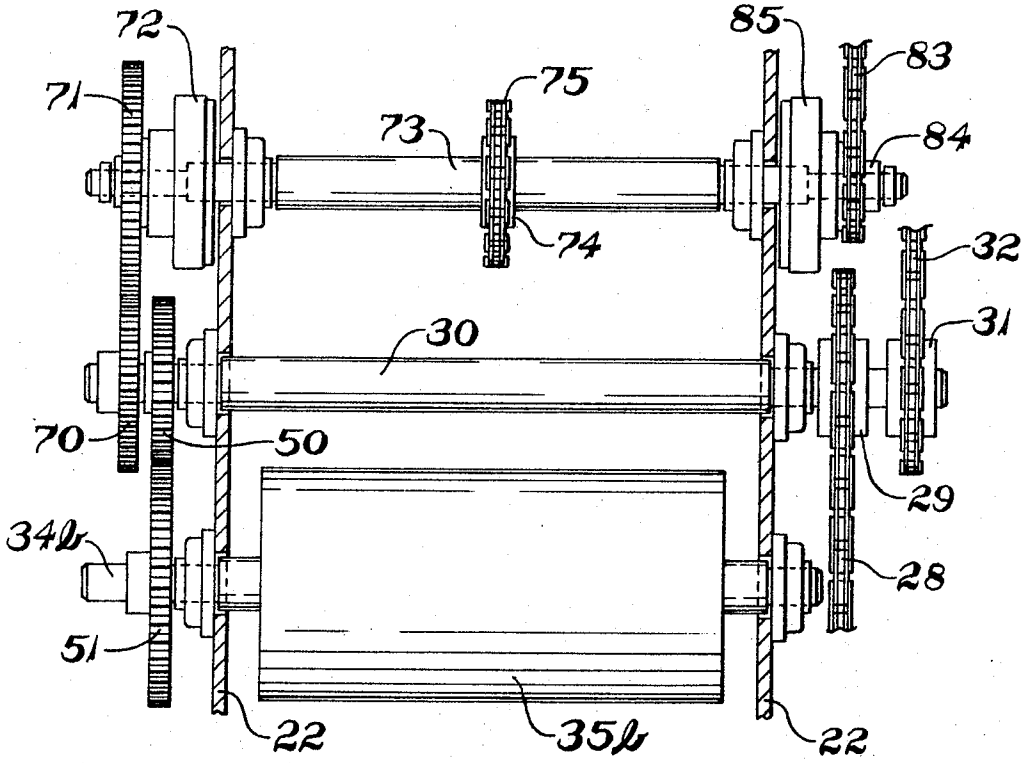


FIG. 3

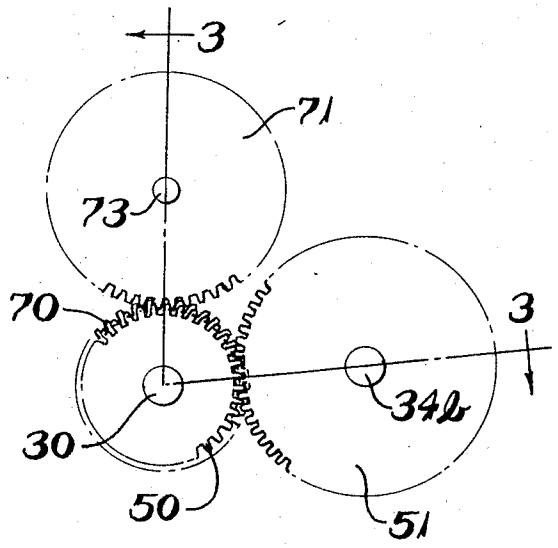


FIG. 2

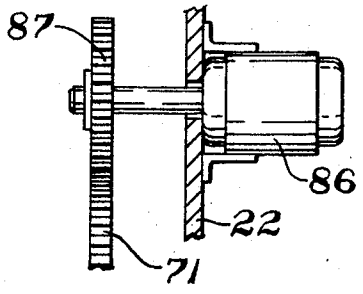


FIG. 4

INVENTORS
LEON TALALAY
BY GEORGE A. SCOTT
James R. Lindsay
ATTY.

United States Patent Office 3,319,394 Patented May 16, 1967

3,319,394

APPARATUS FOR PACKAGING RESILIENT CELLULAR MATERIAL

Leon Talalay, New Haven, and George A. Scott, Shelton, Conn., assignors to The B. F. Goodrich Company, New York, N.Y., a corporation of New York

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6 Claims. (Cl. 53—24)

This invention relates to packaging and, more particularly, pertains to apparatus for compressing and packaging resilient cellular material and to the process whereby said material is compressed and packaged.

Resilient cellular materials are being utilized more and more in cushioning as a replacement for such common stuffing materials as down, animal hair and cotton stuffing. In fact, the use of resilient cushioning materials such as foam rubber, polyurethane foam and vinyl chloride polymer foam has increased so greatly in recent years that these cellular materials account for a major proportion of the cushioning material used in furniture manufacture. The resilient cellular materials, intended for use by the furniture industry, commonly are supplied to the furniture manufacturer in the form of relatively large blocks or sheets of the cellular product. These are shipped to the furniture manufacturer using conventional modes of transportation, usually by railroad unless the distance that they are to be shipped is quite short in which case they are transported by truck.

Unfortunately, the cost of shipping these resilient cellular materials is comparatively high thereby increasing the cost of utilizing such materials in furniture constructions. The shipping rates charged for shipping cellular material are based upon the packaged density of the cellular product shipped, i.e., upon the weight per unit volume of the packaged resilient cellular material, the rate being higher the lower the packaged density of the cellular material being transported. To illustrate, a certain shipping rate is applicable if the packaged density of the cellular material is below, for example, two pounds per cubic foot while a somewhat lower rate would be in effect if the packaged density were between two and four pounds per cubic foot. An even lower rate would be charged if the packaged density were between four and six pounds per cubic foot and so on. The differences in the shipping rates for varying packaged densities of cellular materials are significant and involve substantial expense when large quantities of cellular materials are being shipped. Since the density of a cellular material can be increased by compressing the cellular structure into a smaller volume, it will be understood that the packaged density of a resilient cellular material will be increased and the shipping charge consequently reduced if the cellular material is packaged for shipment in a compressed condition. Actually, it has been found that for a given weight of a cellular material the cost of shipping the material can be reduced as much as one-third by reducing the volume of the material and packaging it in the compressed form in order to take advantage of the reduced shipping rate.

Thus, in accordance with the present invention, slabs or sheets of resilient cellular materials are compressed before being packaged and are packaged in this compressed form. A single block or slab of the resilient cellular material may be packaged by the process described herein or, if desired, two or more slabs of resilient cellular material can be stacked on top of each other and packaged in the manner described. In fact, the specific illustration of this invention contained herein describes the packaging of a stack consisting of three slabs of cellular material. While in the specific description of the invention a cardboard container is used for packaging the compressed slabs of cellular material, it will be understood

that any container which will maintain the compressed cellular material confined therein in its compressed form would be suitable. Thus, the container may be a wooden container, a rigid plastic container or even a paper or plastic film container.

The invention will be fully understood by referring to the following detailed description of a specific embodiment of this invention and to the drawings in which:

FIG. 1*a* and FIG. 1*b* together form a side elevational view in cross-section of apparatus within the scope of this invention;

FIG. 2 is a side elevational view of the gears used to drive the lower conveyor belt system and the carriage assembly of the apparatus shown in FIGS. 1*a* and 1*b*; and

FIG. 3 is a developed section on a line 3—3 of FIG. 2;

FIG. 4 is a fragmental section view of a motor and gearing that can be used as an alternative method of driving the carriage assembly.

Referring to the drawings, the apparatus for compressing and packaging the resilient cellular material comprises basically an upper conveyor belt assembly and a lower conveyor belt assembly which cooperate to compress the slabs of cellular material and advance the compressed material into the awaiting container positioned over the discharge ends of the conveyor assemblies, and a movable carriage which permits the container to be withdrawn at at uniform speed away from the conveyor assemblies as the container is filled.

The upper conveyor belt assembly is comprised of a series of parallel horizontal support members **10***a* and a series of parallel horizontal support members **11***a* disposed beneath the support members **10***a*, support members **10***a* and **11***a* being maintained spaced apart by spacers **12***a* and **13***a* at one end and by end plate **14***a* at the other end (the discharge end of the upper conveyor belt assembly). End plate **14***a* is provided with guide rolls **15***a* and **16***a* over which conveyor belt A travels. The discharge end of the upper conveyor belt assembly is unsupported while the other end of the conveyor system is supported at two positions by structural support beams **19***a* and **20***a*. To each end of structural support beams **19***a* and **20***a* is fastened a plate **21***a*, only one plate being shown in the drawings. Plates **21***a* are adjustable fastened to vertical housings **22**, **22** by nuts **23***a*, **23***a* and bolts **24***a*, **24***a*.

Conveyor belt A of the upper belt assembly is driven by an adjustable speed motor **26** through sprocket **27**, sprocket chain **28**, sprocket **29**, shaft **30**, sprocket **31**, sprocket chain **32**, sprocket **33**, shaft **34***a* to upper drive roll **35***a*. Bell A is maintained on a predetermined path by drive roll **35***a*, guide rolls **15***a*, **16***a*, **36***a*, **37***a* and adjustable guide rolls **38***a*, **39***a*, **39***a'* and **40***a*. Proper tension on the upper conveyor belt A is maintained through adjustable guide rolls **38***a*, which is mounted on a pivot arm **42***a* that is anchored to a pivot rod **43***a*. Connected to pivot arm **42***a* is a threaded rod **44***a* which passes through a mounted ring **45***a*. Threaded rod **44***a* is equipped with a compression spring **46***a* and a nut **47***a* which can be adjusted to control the degree of compression of spring **46***a*. The pivot arm **42***a*, threaded rod **44***a*, compression spring **46***a*, and nut **47***a* function as a system for absorbing shock imparted to the upper conveyor belt A.

The lower conveyor belt assembly is essentially the same as the upper conveyor belt assembly. Corresponding parts of the lower conveyor belt assembly are numbered the same as the upper conveyor belt assembly except that the letter of the number is changed from *a* to *b*.

The only significant difference between the two conveyor belt assemblies is the means of power transmission. The means by which the upper conveyor system is driven is explained above. The lower conveyor belt B is driven by adjustable speed motor **26** through sprocket **27**, sprock-

et chain 28, sprocket 29, shaft 30, spur gear 50, spur gear 51 to shaft 34*b* that holds the lower drive roll 35*b*. Spur gears 50 and 51 are selected so as to drive the lower conveyor belt B at the same rate of speed as that of the upper conveyor belt A.

Although not essential, it is desirable to have the conveyor belt assemblies converge toward each other for a short distance from the feed end of the apparatus toward the discharge end. This arrangement facilitates the feeding of the slabs of resilient cellular material into the apparatus and prevents undue distortion of the cellular material as it is fed, vertically compressed and initially conveyed. Thus, in the embodiment shown in the drawings it is seen that guide rolls 38*a*, 39*a*, 39*a'* and 40*a* of the upper conveyor belt assembly are positioned on an incline with respect to each other and guide rolls 38*b*, 39*b*, 39*b'* and 40*b* of the lower conveyor belt assembly are also positioned on an incline with respect to each other such that conveyor belt A converges toward conveyor belt B as it advances between guide roll 38*a* and guide roll 40*a* and conveyor belt B converges toward conveyor belt A as it advances between guide roll 38*b* and guide roll 40*b* and thereby forms a generally V-shaped trough into which the resilient cellular material is fed.

The carriage 55 supports container 56 which is used to package the cellular material 57. Mounted on the rear of carriage 55 by four compression springs 58, 58 (two of which are shown) is a backstop 59. The carriage 55 is provided with four wheels 63, 63 (two of which are shown). Wheels 63, 63 roll on two structural beams 64, 64 (one of which is shown) which form a parallel rail track. It will be understood that the two wheels 63, 63 on the left side of the apparatus will bear upon the structural beam 64 located on the left side of the apparatus while the two wheels 63, 63 on the right side of the apparatus will bear upon the structural beam 64 located on the right side of the apparatus. The two structural beams 64 are supported at one end by two vertical supports 65 (one of which is shown)and at the other end by cross-beam 66 which is supported by and between vertical housings 22, 22.

The carriage 55 can be driven by power supplied from variable speed motor 26, through sprocket 27, sprocket chain 28, sprocket 29, shaft 30, spur gear 70, spur gear 71, clutch 72, shaft 73, sprocket 74 to sprocket chain 75 which travels around sprocket 78 and connects to carriage 55 at positions 79 and 80. When compressed cellular material is being fed into the container 56, the carriage is driven backward (away from the conveyor belt systems) at a preset rate (as will be more fully explained hereinafter). When the carriage is being driven backward clutch 72 is engaged and clutch 85 is disengaged. The rate of backward motion of carriage 55 is regulated by the ratio of spur gears 70 and 71. To change this rate it is only necessary to change the gear ratio of spur gears 70 and 71.

Instead of utilizing power from motor 26 to drive carriage 55 rearwardly, a separate motor may be used. For example, a separate motor 86 (shown in FIG. 4) can be geared through gear 87 (shown in FIG. 4) to spur gear 71. Spur gear 70 then would be eliminated. The advantage realized in using a separate motor for driving carriage 55 rearwardly is that the degree of longitudinal compression of the cellular material obtained can be varied and controlled more readily. Thus, if the rate of rearward motion of carriage 55 from the conveyor systems is the same as the speed at which the cellular material is being advanced by the conveyor belts A and B, no longitudinal compression occurs. If on the other hand the rate of rearward motion of carriage 55 is less than the speed at which the cellular material is being advanced by the conveyor belts A and B, the cellular material will be moving into the container 56 at a greater lineal speed than the container 56 is being withdrawn rearwardly and the cellular material consequently will be compressed longitudinally. It will be understood that the slower the rate or rearward motion of the carriage 55 relative to the speed the cellular material is being advanced by the conveyors A and B, the greater will be the degree of longitudinal compression of the cellular material. The degree of longitudinal compression, therefore, can be increased by increasing the speed of advance of belts A and B (thereby increasing the rate of speed at which the cellular material 57 is being fed into the container 56) or by decreasing the rate at which carriage 55 is being withdrawn rearwardly away from the conveyor systems feeding cellular material 57 into container 56.

After the container 56 has been filled with compressed cellular material 57 and the packaged cellular material is removed from the carriage 55 and is replaced with an empty container, carriage 55 can be returned rapidly to a position to start the filling operation again by a return motor 81. In returning carriage 55 to the forwardly position, return motor 81 transmits power through sprocket 82, sprocket chain 83, sprocket 84, clutch 85, shaft 73 and sprocket 74 to sprocket chain 75 attached to carriage 55. Clutch 85 is engaged when carriage 55 is being returned to the forward loading position and clutch 72 is disengaged. By reversing the rotation of motor 81, the carriage 55 can be driven rapidly rearwardly.

If it is desired to stop the foam packaging at some intermediate stage of the operation such as that shown in the drawings, for instance, with the container 56 only partially filled with cellular material, some means must be provided for braking carriage 55, since when the power to the apparatus is shut off clutches 72 and 85 are disengaged and carriage 55 becomes "free-wheeling" and inasmuch as the cellular material in the container 56 is under longitudinal compression the carriage 55 will be forced rearwardly unless braked. Braking mechanism 77, therefore, is provided. The braking mechanism 77 is mounted on shaft 76 and is actuated when the current to the apparatus is shut off. It also can be actuated by a manually-operated switch.

The vertical distance between the bottom reach of the upper conveyor belt A and the top reach of the lower conveyor belt B can be adjusted as desired by raising or lowering one or both conveyors. For example, to lower the upper conveyor belt A it is only necessary to remove nuts 23*a*, 23*a* and bolts 24*a*, 24*a* to lower plate 21*a* and to reconnect it to vertical housings 22, 22 with nuts 23*a*, 23*a* and bolts 24*a*, 24*a*. As can be seen from the drawings, the lowering of plate 21*a* only lowers the arm portion of upper conveyor belt 25*a*, the upper drive roll 35*a* and fixed guide rolls 36*a* and 37*a* are not thereby lowered. Adjustable guide rolls 39*a*, 39*a'* and 40*a* are lowered or raised by lowering or raising plates 48*a*, 48*a* accomplished by removing nuts 49*a*, 49*a* and bolts 49*a'*, 49*a'* and raising or lowering plates 48*a*, 48*a* as the case may demand. Plates 48*a*, 48*a* and guide rolls 39*a*, 39*a'* and 40*a* then are secured in the new position by rebolting plates 48*a*, 48*a* to vertical housings 22, 22. When the upper conveyor belt assembly is lowered, adjustable guide roll 38*a* must be readjusted by loosening nut 47*a* and swinging guide roll 38*a* and pivot arm 42*a* to a position which maintains conveyor belt A taut. Nut 47*a* then is tightened.

The lower conveyor belt assembly may be raised or lowered in the same manner as the upper conveyor belt system except that no provision has been made in the embodiment shown for raising or lowering guide rolls 38*b*, 39*b*, 39*b'* and 40*b*.

The vertical distance between the bottom reach of the upper conveyor belt A and the top reach of the lower conveyor belt B normally is set so that as to just permit the arm-like extremities of the upper and lower conveyor belt assemblies to fit inside of the packaging container. The distance between the bottom reach of the upper conveyor belt A and the top reach of the lower

conveyor belt B determines the amount of vertical compression imparted to cellular material 57 as it is fed into container 56. Of course, the height of container 56 will determine the amount of vertical compression the cellular material will be under when packaged.

The only limitation to the width of cellular material that can be packaged by the apparatus shown is the restriction that the width of the cellular slab (or slabs) must not exceed widths of the upper and lower conveyor belts A and B.

After the vertical distance between the bottom reach of the upper conveyor belt A and the top reach of the lower conveyor belt B is set, carriage 55 supporting an appropriate packaging container 57 may now be positioned. The carriage normally is brought forward towards the conveyor belt assemblies until the arm-like extremities of the upper and lower conveyor belt assemblies extend almost completely into the packaging container. The conveyor belts now are started in motion, and the cellular material 57 is fed into the mouth of the conveyor belt assemblies between adjustable guide rolls 38*a* and 38*b*.

The cellular material 57 is carried between the lower reach of the upper conveyor belt A and the upper reach of the lower conveyor belt B toward the back of the packaging container. After the cellular material passes beyond guide rolls 15*a* and 15*b* it contacts the back of the packaging container 56. As more cellular material passes beyond guide rolls 15*a* and 15*b* pressure is exerted by the cellular material in the direction of the backstop 59 of carriage 55. This pressure actuates a push-button type switch 60 that is mounted on the vertical portion of carriage 55.

Push-button type switch 60 when actuated causes clutch 72 to become engaged. The engagement of clutch 72 causes carriage 55 to move in a backward direction away from the conveyor belt assemblies.

After the packaging container 56 is filled with the compressed cellular material, the carriage is stopped by manually actuating a stop switch (not shown) which disengages clutch 72. The packaged cellular material then is removed from the carriage and the container is sealed closed. An empty packaging container then is placed on carriage 55 in position for filling.

The carriage 55 is returned to the forward position by actuating a start switch (not shown) which engages clutch 85 and causes the carriage 55 to be driven forward by motor 81. The forward motion of carriage 55 is terminated either by manually tripping a stop switch or by switch 67 which is located on structural beam 64 and which is tripped by carriage 55 after having been advanced forward the necessary distance. When switch 67 is actuated clutch 85 is disengaged.

We claim:

1. Apparatus for packaging resilient cellular material which comprises:
   (a) means for compressing said cellular material vertically,
   (b) means for conveying said cellular material while in a vertically compressed state horizontally into a container of smaller dimension than that of said cellular material before being compressed, and
   (c) means for moving said container in the direction of advance of said cellular material and at a slower rate of speed than the speed of advance of said cellular material whereby said cellular material is compressed longitudinally as it is being inserted into said container.

2. Apparatus for packaging resilient cellular material which comprises:
   (a) a horizontally disposed conveyor belt system upon which said cellular material is conveyed,
   (b) a horizontally disposed conveyor belt system positioned above the first said conveyor belt system in spaced relationship thereto and extending in the same direction as the first said conveyor belt system,
   (c) means for advancing the conveyor belts of the two said conveyor belt systems in opposite directions so that the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system are moving in the same direction and can be used to convey and compress vertically cellular material conveyed therebetween,
   (d) means for adjusting the vertical spacing between the two said conveyor belt systems so that the spacing between the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system can be varied to change the amount of vertical compression imparted to said cellular material conveyed between the two said conveyor belts,
   (e) the two said conveyor belt systems being unsupported at the discharge ends thereof to allow a container for packaging said cellular material to be slipped over the discharge ends of the two said conveyor belt systems,
   (f) means for supporting said container when positioned over the said discharge ends of the said conveyor belt systems, and
   (g) means for moving said container in the direction of advance of said cellular material and at a slower rate of speed than the speed of advance of said cellular material whereby said cellular material is compressed longitudinally as it is being inserted into said container.

3. Apparatus for packaging resilient cellular material which comprises:
   (a) a horizontally disposed conveyor belt system upon which said cellular material is conveyed,
   (b) a horizontally disposed conveyor belt system positioned above the first said conveyor belt system in spaced relationship thereto and extending in the same direction as the first said conveyor belt system,
   (c) means for advancing the conveyor belts of the two said conveyor belt systems in opposite directions so that the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system are moving in the same direction and can be used to convey and compress vertically cellular material conveyed therebetween,
   (d) means for adjusting the vertical spacing between the two said conveyor belt systems so that the spacing between the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system can be varied to change the amount of vertical compression imparted to said cellular material conveyed between the two said conveyor belts,
   (e) said conveyor belts converging toward each other at the feed end of the apparatus to form a V-shaped trough at the feed end of the apparatus which facilitates the feeding of said cellular material between the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system,
   (f) the two said conveyor belt systems being unsupported at the discharge ends thereof to allow a container for packaging said cellular material to be slipped over the discharge ends of the two said conveyor belt systems,
   (g) means for supporting said container positioned over the said discharge ends of said conveyor belt system, and
   (h) means for moving said container in the direction of advance of said cellular material and at a slower rate of speed than the speed of advance of said cellular material whereby said cellular material is compressed longitudinally as it is being inserted into said container.

4. Apparatus for packaging resilient cellular material which comprises:

(a) a horizontally disposed conveyor belt system upon which said cellular material is conveyed,

(b) a horizontally disposed conveyor belt system positioned above the first said conveyor belt system in spaced relationship thereto and extending in the same direction as the first said conveyor belt system,

(c) means for advancing the conveyor belts of the two said conveyor belt systems in opposite directions so that the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system are moving in the same direction and can be used to convey and compress vertically cellular material conveyed therebetween,

(d) means for adjusting the vertical spacing between the two said conveyor belt systems so that the spacing between the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system can be varied to change the amount of vertical compression imparted to said cellular material conveyed between the two said conveyor belts,

(e) the two said conveyor belt systems being unsupported at the discharge ends thereof to allow a container for packaging said cellular material to be slipped over the discharge ends of the two said conveyor belt systems,

(f) carriage means mounted for movement along the direction of advance of said cellular material and adapted to support said container with the discharge ends of said conveyor belt systems extending into an open end of said container, and

(g) means for moving said carriage with said container supported thereon in the direction of advance of said cellular material when said cellular material is compressed against the closed end of said container and at a slower rate of speed than the speed of advance of said cellular material whereby said cellular material is compressed longitudinally as it is being inserted into said container.

5. A process for packaging resilient cellular material which comprises compressing said cellular material in a vertical direction, advancing said vertically compressed cellular material along a horizontal path and into an open container having smaller dimensions than those of the said cellular material in uncompressed form, moving said container along the path of advance of said cellular material and in the same direction as the said cellular material and at a slower rate of speed than the rate of advance of said cellular material whereby said cellular material will be compressed longitudinally as it is being inserted into said container, and closing said container.

6. Apparatus for packaging resilient cellular material which comprises:

(a) a horizontally disposed conveyor belt system upon which said cellular material is conveyed,

(b) a horizontally disposed conveyor belt system positioned above the first said conveyor belt system in spaced relationship thereto and extending in the same direction as the first said conveyor belt system,

(c) means for advancing the conveyor belts of the two said conveyor belt systems in opposite directions so that the top reach of the conveyor belt of the first said conveyor belt system and the bottom reach of the conveyor belt of the other said conveyor belt system are moving in the same direction and can be used to convey and compress vertically cellular material conveyed therebetween,

(d) the two said conveyor belt systems being unsupported at the discharge ends thereof to allow a container for packaging said cellular material to be slipped over the discharge ends of the two said conveyor belt systems,

(e) means for moving said container when positioned over the said discharge ends of the said conveyor belt systems in the slower rate of speed than the speed of advance of said cellular material whereby said cellular material is compressed longitudinally as it is being inserted into said container.

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TRAVIS S. McGEHEE, *Primary Examiner.*

FRANK E. BAILEY, T. E. CONDON, *Examiners.*

W. T. DIXSON, R. L. FARRIS, *Assistant Examiners.*