

June 25, 1968

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3,389,534

MACHINE FOR MAKING CUSHIONING PACKAGING MATERIAL OR THE LIKE

Filed Sept. 16, 1965

5 Sheets-Sheet 1

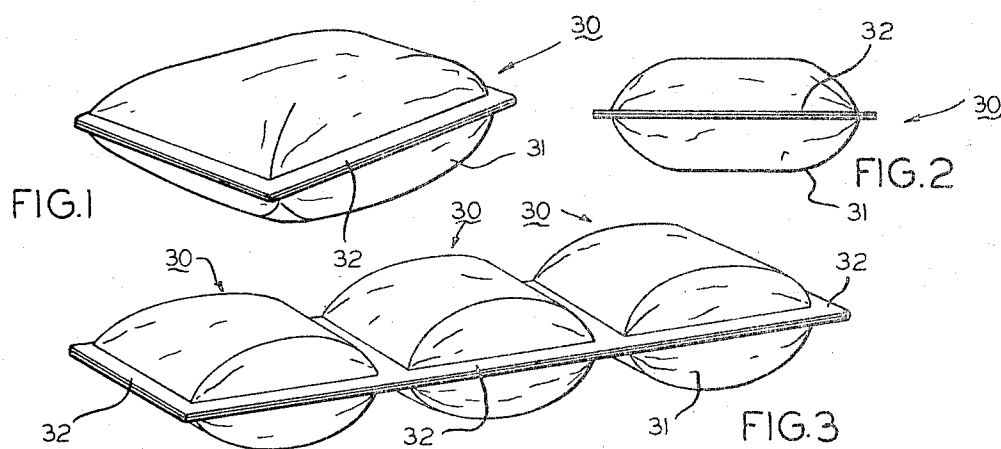


FIG. 4

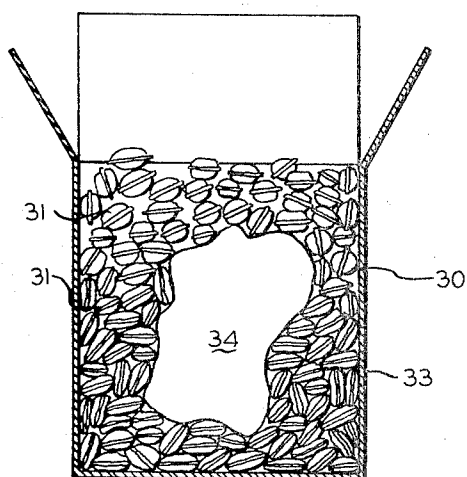


FIG. 5

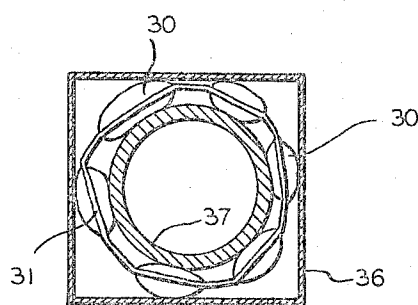


FIG. 6

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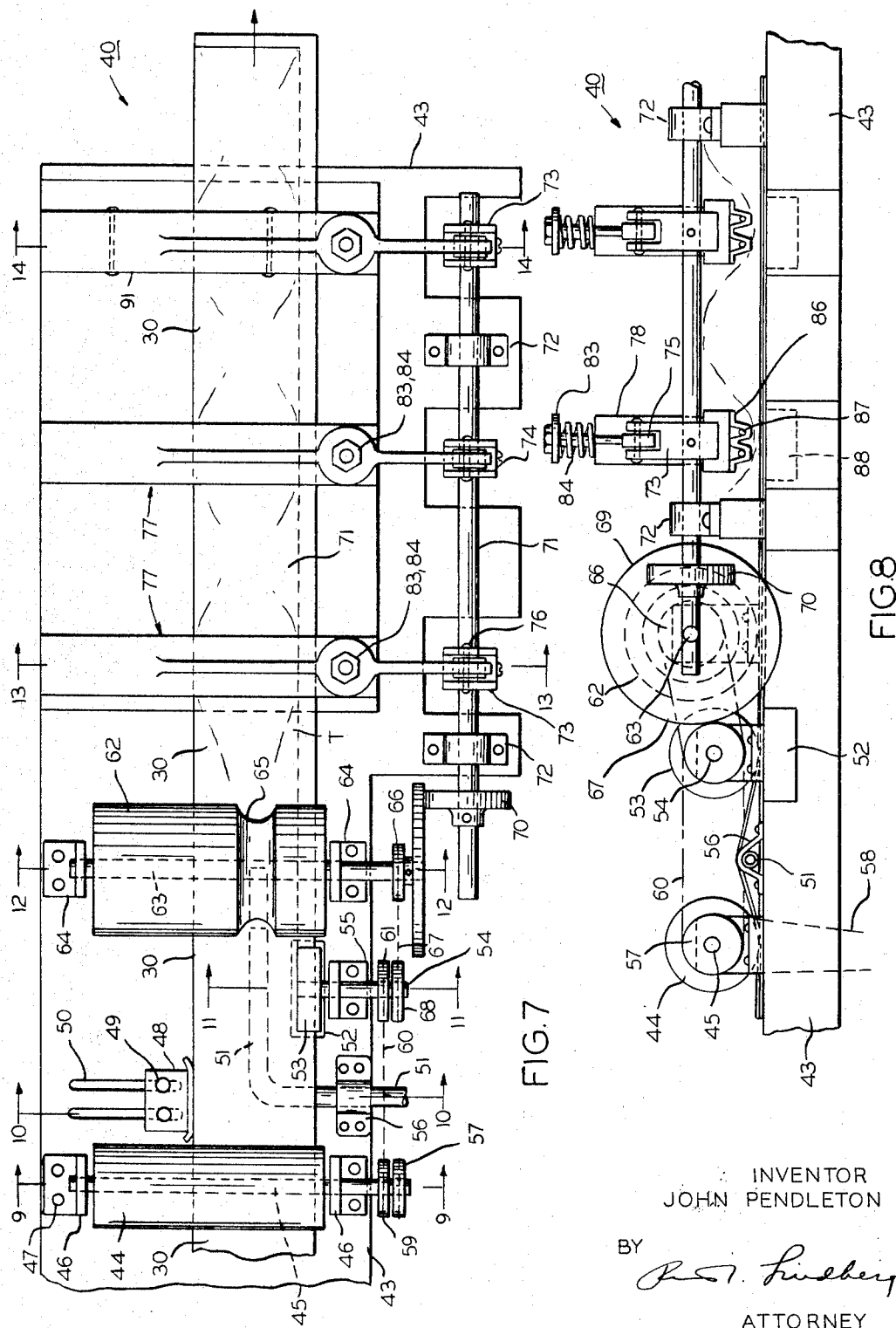
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

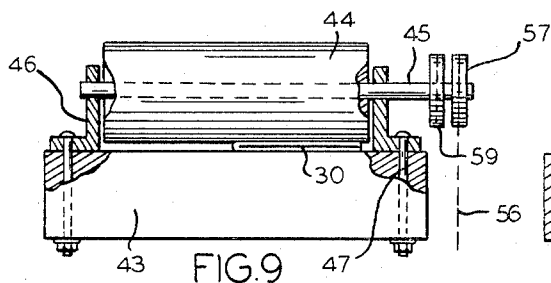


FIG. 9

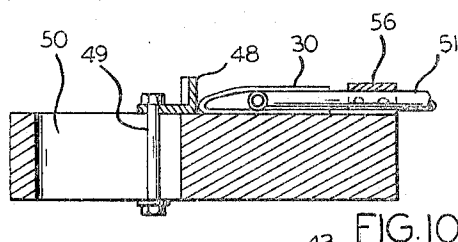


FIG. 10

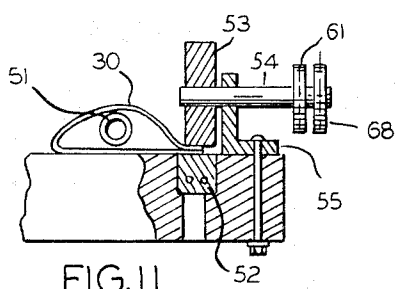


FIG. 11

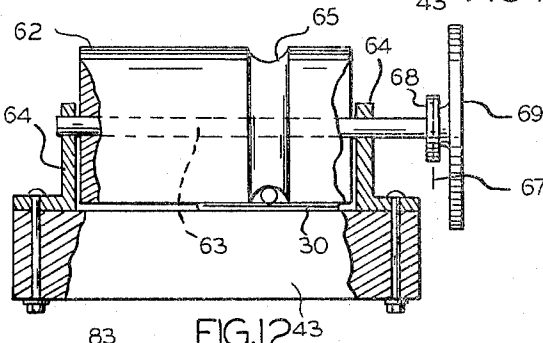


FIG. 12

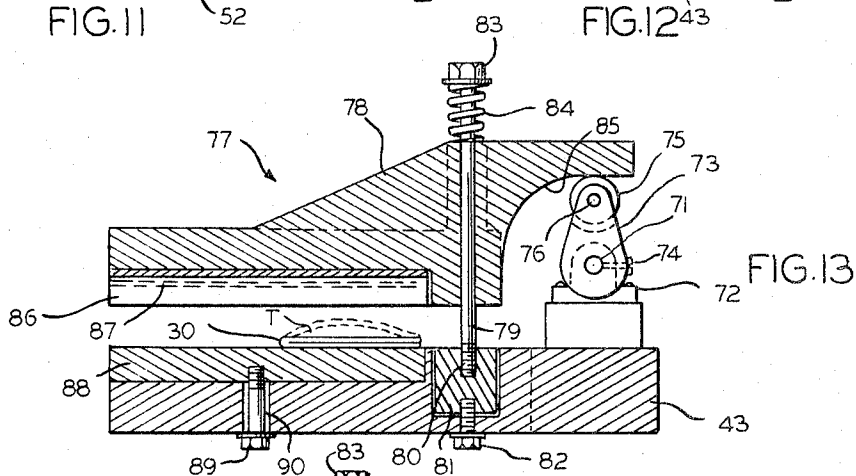


FIG. 13

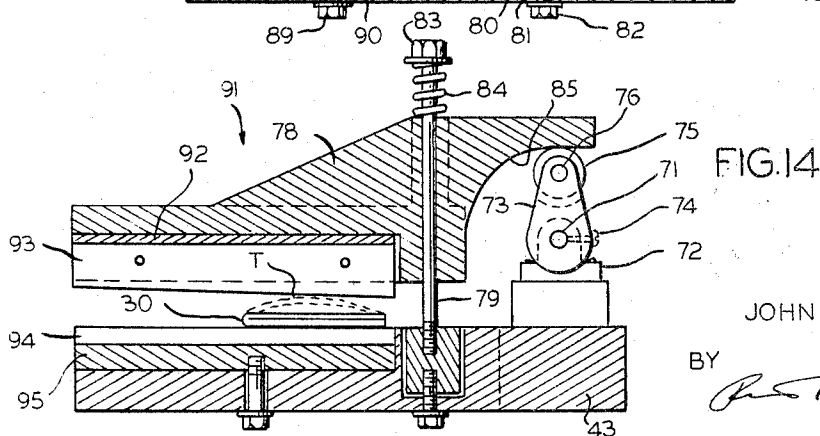


FIG. 14

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MACHINE FOR MAKING CUSHIONING PACKAGING MATERIAL OR THE LIKE

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5 Sheets-Sheet 4

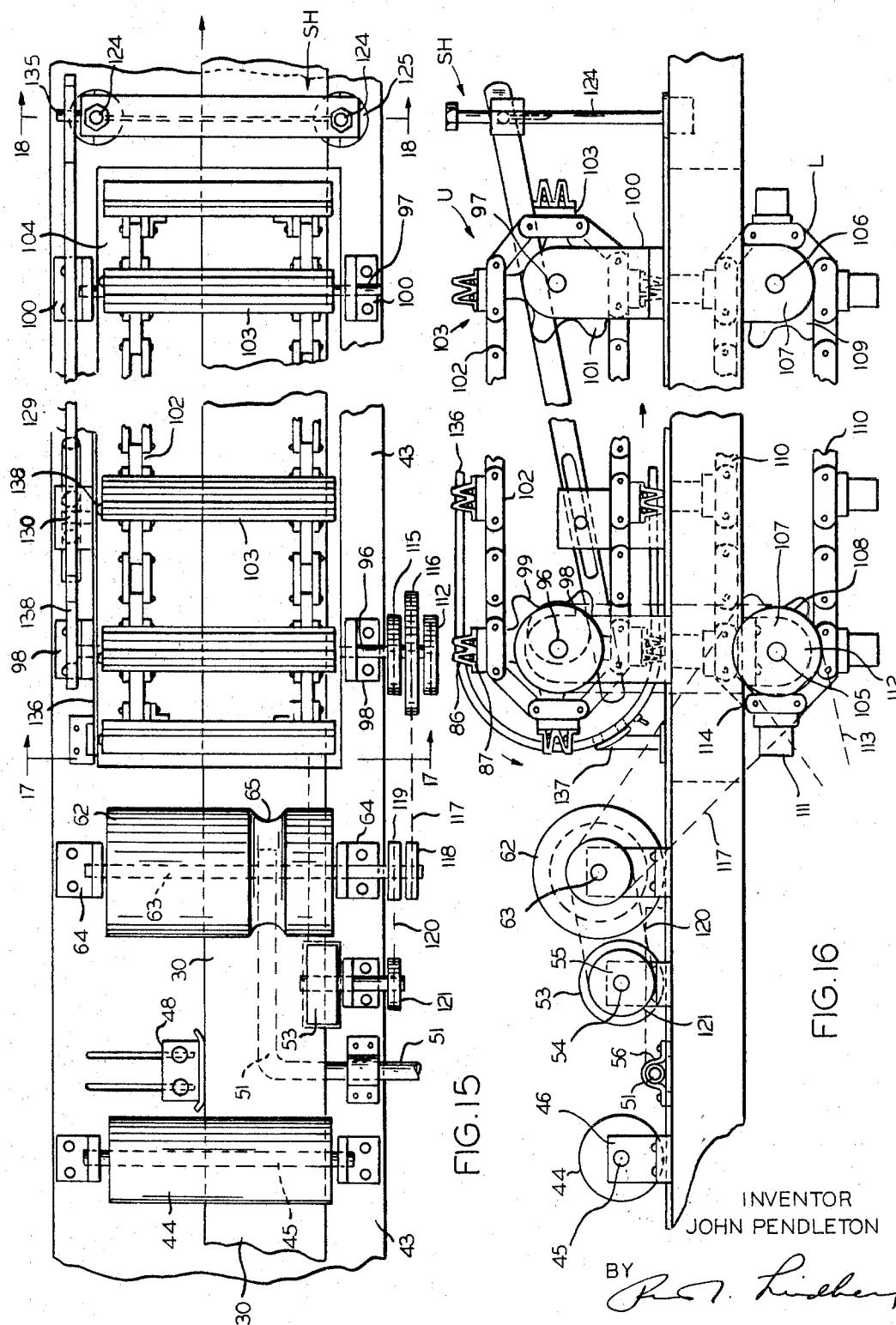


FIG. 15

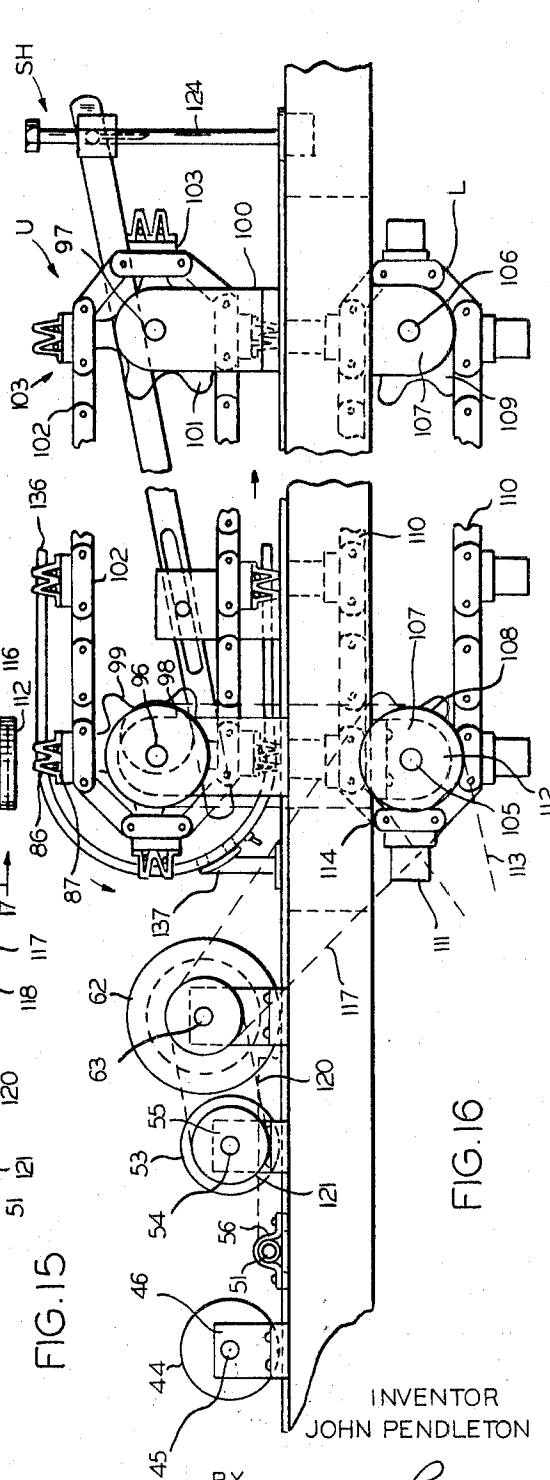


FIG. 16

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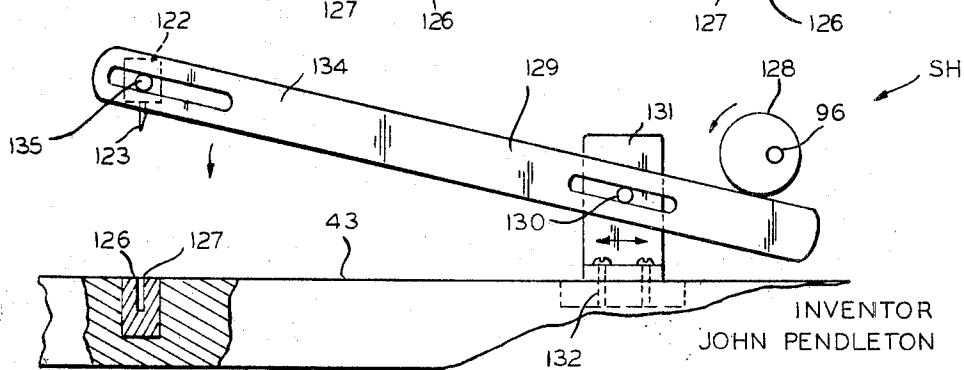
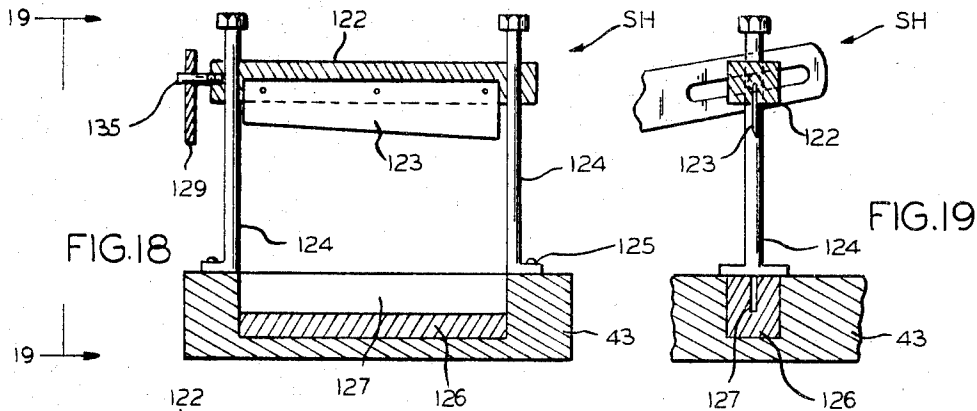
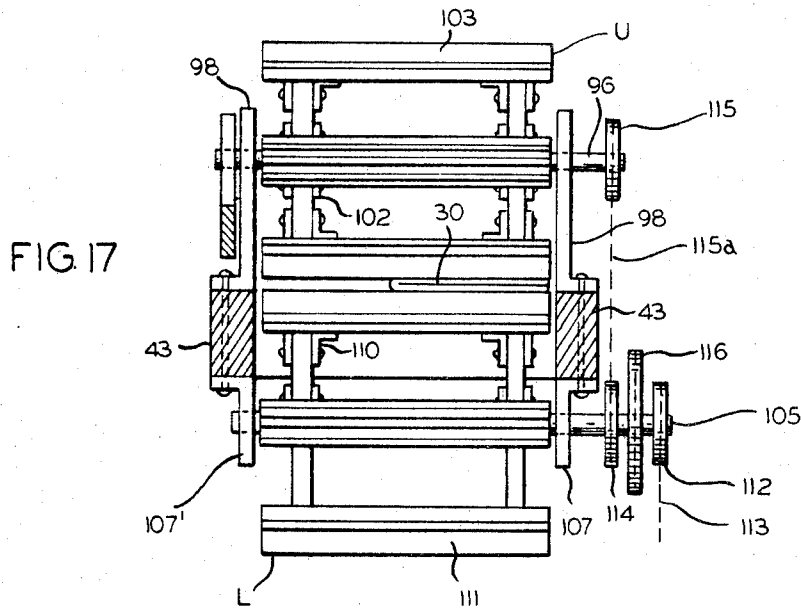
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5 Sheets-Sheet 5



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MACHINE FOR MAKING CUSHIONING PACK- AGING MATERIAL OR THE LIKE

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2 Claims. (Cl. 53—180)

ABSTRACT OF THE DISCLOSURE

A machine for making a strip of connected capsules containing a strip of connected capsules containing occluded air, whereby the strip may be used for dunnage, or severed into discrete capsules for dunnage use, said machine being characterized by structure for readily varying the length of the capsules of such strip, and for severing the strip into discrete capsules.

This invention relates to machines for making a continuous strip of a formed material suitable for isolating a packaged article from the sides, top and bottom of its enclosure, and more particularly to a machine for acting on a moving web of heat sealable material to form a strip containing discrete inflated capsules therein.

In the packaging of frangible materials it is desirable to surround the material with cushioning material. The use of excelsior or shredded paper is oftentimes objected to by both the shipping source and by the purchaser. It is a prime object of this invention to provide a machine for making a continuous web containing discrete capsules of occluded air, the web being capable of being wound about the shipment to cushion the same in its shipping container.

Another object is to provide apparatus acting on a moving web of sheet material to form thereon discrete capsules containing occluded air, the web being made from a material preferably capable of heat sealing and having good resistance to bursting loads when the discrete capsules of the so formed web are employed as a packing material.

Another object is to provide structure for severing the web of discrete capsules as desired, so that the cushioning web may contain a single discrete capsule or a desired number in a longer web thereof.

Still another object is to introduce a current of air between two contiguous web portions so as to cause one of such web portions to distend with respect to the other, and to seal the web portion together predetermined distances apart to provide a web having a series of capsules of occluded air.

Other and further objects of the invention will be apparent from a study of the following specification taken with the drawings which together describe and illustrate a preferred embodiment of the invention and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings hereof, and such other embodiments are intended to be reserved especially as they fall within the scope of the subjoined claims.

In the drawings:

FIG. 1 is a perspective view of a discrete cushion element or inflated capsule constructed by the machine according to the present invention;

FIG. 2 is a side elevation view thereof;

FIG. 3 is a perspective view of a strip of such cushion elements;

FIG. 4 is a perspective view showing the folding of a web of sheet material prior to forming the inflated capsules;

FIG. 5 shows the manner in which single cushioning elements or capsules may be distributed about a frangible object to isolate the same from the walls of a container;

FIG. 6 shows the manner in which a strip of cushioning elements may be wound about an object to isolate the same from the walls of a container;

FIG. 7 is a plan view of a machine according to the present invention for making the cushioning elements of FIGS. 1 to 3 inclusive;

FIG. 8 is a front elevation view of a portion of the machine seen in FIG. 7;

FIG. 9 is a vertical fragmentary cross-sectional view of the feed roller assembly taken along the line 9—9 of FIG. 7 looking in the direction of the arrows;

FIG. 10 is a cross-sectional view taken along the line 10—10 of FIG. 7 looking in the direction of the arrows;

FIG. 11 is a vertical cross-sectional view taken along the line 11—11 of FIG. 7 looking in the direction of the arrows;

FIG. 12 is a section taken along the line 12—12 of FIG. 7 looking in the direction of the arrows;

FIG. 13 is a vertical cross-section taken along the line 13—13 of FIG. 7 showing details of sealing mechanism;

FIG. 14 is a section taken along the line 14—14 of FIG. 7 showing details of shearing mechanism;

FIG. 15 is a plan view of a modified form of structure according to the present invention;

FIG. 16 is a front view thereof;

FIG. 17 is a cross-sectional view taken along the line 17—17 in FIG. 15;

FIG. 18 is a cross-sectional view taken along the line 18—18 in FIG. 15 showing details of shearing structure;

FIG. 19 is a view looking in the direction of the arrows 19—19 of FIG. 18; and

FIG. 20 is a side view showing details of mechanism for operating the shearing structure seen in FIGS. 18 and 19.

Referring now to the drawings, the reference numeral 30 denotes generally a flexible capsule containing occluded air and formed of films of pliable material such as polyethylene, cellulose acetate or the like. As seen in FIG. 4 the capsules may be made by folding a strip 31 lengthwise of itself, and heat-sealed along marginal portions 32 as seen in FIGS. 1 and 2. While the sealing operation is carried on, and as will be shown as this description proceeds, a current of air is introduced into the envelope formed during the manufacturing process to inflate such envelope, all prior to the final sealing.

By referring to FIG. 5, the inflated capsules are shown within a walled container 33, and surround a frangible article of irregular shape, in such a fashion that the discrete capsules 30 effectively isolate the frangible article 34 from the walls of container 33 and provide positive protection against breakage.

A modified application is shown in FIG. 6 wherein a container 36 houses a fragile article 37, and in which the capsules 30 are attached to one another as shown in FIG. 3, and are wound around the article 37 for its protection.

Structure is provided for producing the capsules 30 both as a strand thereof as seen in FIG. 3, or as discrete capsules as seen in FIGS. 1 and 2, and referring now particularly to FIGS. 7 to 14 such structure is referred to by the reference numeral 40 and includes a base 43 which may be mounted on any convenient structure, not shown, for moving structure 40 as desired. As seen in FIGS. 7 and 8 particularly, the structure 40 consists of a feed roller 44 adapted to advance folded strip 31 lengthwise of base 43.

Feed roller 44 is mounted on a shaft 45 turning in bearing standards 46 held to base 43 by screws 47.

Sheet material 31 is guided along the base 43, by a slidably adjustable guide member 48 secured by bolts 49, adjusted in their position in slots 50, see also FIG. 8.

Structure is provided for introducing a current of air into the folded sheet material 31 as it moves along the base 43, and to this end a tube 51 extends between the upper and lower elements thereof, see FIGS. 10 and 11. The open edges of the folded sheet 31 pass over a heated sealing pad 52, imbedded in the surface of base 43 as shown, and beneath a sealing roller 53 mounted on a shaft 54. A bearing standard 55 supports the roller 53, and the pressure of the wheel 53 on the heat energized pad 52 causes the sheet material 31 to fuse and to form the material 30 into a moving tube T. Tube 51 is held in position to base 43 by a clamp 56, and is connected to an air or gas supply (not shown).

Shaft 45 has a drive sprocket 57 fast thereto, and chain 58 is trained between sprocket 57 and any suitable prime mover, not shown. Shaft 45 also has sprocket 59 fast thereon to drive chain 60, trained about sprocket 61 fast on the shaft 54 to drive sealing roller 53.

Tube T is arranged to extend beneath a groove 65 in a roller 62 contacting the moving tube just described. Roller 62 is mounted on a shaft 63 supported in bearing standards 64. Tube 51 thereby conducts the air in such a fashion as to fill a tubular structure T formed by the folded and sealed sheet 31.

Shaft 63 has a sprocket 66 fast thereon, and a chain 67 trained between sprocket 66 on shaft 63 and sprocket 68 on shaft 54 drives roller 62 in proper timed relationship to the movement of folded and sealed sheet 31. Contact roller 62 is preferably covered with resilient material incapable of sticking to the folded and sealed sheet 31.

Structure is provided for sealing the tube T transversely thereof to give a resulting configuration to the tube T as seen in FIG. 3 after the tube T leaves the base 43 at the end of its travel on base 43. Such structure is capable of adjustment to provide a capsule 30 which varies in its lengthwise dimension.

The structure for sealing the tube T also cooperates with structure for severing the sealed tube along the transverse seals to provide a discrete capsule 30 as seen in FIGS. 1 and 2. In the absence of the severing structure the machine according to the present invention produces a long strip of connected capsules as seen in FIG. 3 which can be wound about a frangible object as seen in FIG. 6.

To the foregoing ends a pair of sealing arms, each referred to by reference numeral 77, see also FIG. 13, are disposed in overlying relationship to the base 43 and extend transversely thereof. Sealing arms 77 each consist of a top member 78 slidably supported on a guide rod 79, having lower threaded ends 80 threaded into a slidable support block 81 held in a desired position of adjustment by a clamping screw 82. The upper ends of the guide rods 79 are provided with a washer and nut assembly 83, and a compression spring 84 is held between assembly 83 and top member 78 to urge the latter into contact with a cam roller 75 as it revolves on a shaft 71. Roller 75 contacts a radial surface 85 on the lower face of each top member 78, as seen in FIG. 13.

A sealing element 86, see FIG. 13, is provided on the lower surface of each top member 78. Sealing element 86 has a resistance coil 87 connected to a temperature controlled thermostat, not shown. Base 43 has an anvil 88 therein, it being coated with a resilient material incapable of clinging to the tube T when the same is having heat applied thereto by sealing element 86. Anvil 88 is held in position by a screw 89 mounted in a slot 90 in plate 43.

Structure is provided for imparting movement of the sealing arms 77 toward and away from the tube T to form the transverse seal therein. Shaft 63 is accordingly provided with a friction drive disc 69 drivably connected

to a driven friction disc 70. The latter is fast onto a shaft 71, but is adjusted longitudinally thereon to vary the drive ratio between drive disc 69 and driven disc 70 according to the distance of disc 70 from the turning center of drive disc 69. Shaft 71 is journaled in bearing supports 72 located on base 43. Shaft 71 supports a pair of cams 73 which are fast thereon but longitudinally adjustable with respect thereto by means of set screws 74. Cams 73 are provided with cam rollers 75 supported on cams 73 on pin shafts 76, see FIGS. 13 and 14. As the cams 73 revolve with shaft 71, rollers 75 contact a surface 85 on the top member 78, causing the latter to have vertical reciprocating movement, and the sealing elements thereon move into contact with tube T and make a transverse seal therein, and to move away therefrom upon completion thereof.

The second of the two sealing arms 77 reinforces the seal made by the first sealing arm 77.

Mechanism is provided for severing, if desired, the tube T along the transverse seals made as just described to provide a discrete inflated capsule as seen in FIG. 1. To this end a severing device 91 is provided, and as seen in FIG. 14, such severing device is very similar to the sealing device 77 and consists of top member 78 slidably mounted on a vertical guide rod 79. Top member 78 is actuated by the roller 75 mounted on cam 73, but instead is provided with a lower insert 92 having a shearing blade 93 mounted thereon. Shearing blade 93 is in alignment with a groove 94 in a stationary shear member 95 recessed in the base 43.

It should be noted that the driven disc 70 can be adjusted with respect to driving disc 69 to determine the period of actuation of the transverse sealing arms 77 and the shear 91. Also, by suitably adjusting the position of arms 77 and shear 91 and their actuating cams 73 the length of a discrete capsule 30 may be adjusted within limits, depending also upon the speed at which tube T is moved with respect to base 43.

Referring now to FIGS. 15 and 16, there is shown a modified form of the invention in which the transverse sealing is achieved by upper and lower endless strands, the upper endless strands supporting transversely extending heat sealing members, and the lower endless strands supporting transversely extending anvil members in moving register with the heat sealing members with the moving tube therebetween.

Parts common to structure described with reference to FIGS. 7 to 14 are denoted by the same reference numeral.

Referring now to said figures the material forming the inflated capsules 30 moves lengthwise of the base 43 in the forming operations, and may be folded on itself as seen in FIG. 4, or may consist of a pair of sheets, one superimposed on the other. In the movement lengthwise of base 43 the sheet material is first moved beneath the roller 44.

The sheet material is guided past adjustable guide member 48 for movement beneath roller 62 which has a groove 65 to accommodate tube 51 extending between the two sheets for introducing a current of air to form a tube T in the sheet material.

The open edge of the sheet material is sealed by sealing roller 53. As with the previous embodiment, roller 53 is in alignment with the heating pad 52 therebeneath to fuse the outer or open edges of the sheet material. If folded sheet material is used, only one sealing roller 53 and heating pad 52 are required, and if the material comprises a pair of strips, two heat sealing rollers 53 and heating pads 52 will be required.

Structure for sealing the tube T transversely thereof at defined intervals so as to encapsulate air therein consists of lower and upper endless flights which engage the tube T therebetween. As will be described the flights carry cooperating sealing elements for forming said transverse

seals. Upper flight U is supported for movement on a pair of shafts 96 and 97 extending laterally across base 43. Shaft 96 is supported in the bearing standards 98 and a pair of spaced sprockets 99 are fast thereon. Shaft 97 is likewise journaled in spaced bearing standards 100 resting on base 43 and a pair of sprockets 101 are mounted thereon.

Sprockets 99 and 101 each have sprocket chains 102 trained therebetween, and transversely extending equally spaced sealing elements 103 are attached to the chains 102 in any convenient manner.

Lower flight L is supported for movement on a pair of spaced lower shafts 105 and 106 held in bearing standards 107 and 107' depending from the underside of the base 43. Shaft 105 has a pair of spaced sprockets 108 fast thereon, and shaft 106 also has a pair of spaced sprockets 109. Sprockets 108 and 109 have endless sprocket chains 110 trained therebetween, and the chains 110 support transversely extending equally spaced coated elements 111, these moving in register with the sealing elements of the upper flight U, with the sheet material therebetween.

Shaft 105 is driven by a sprocket 112 having a sprocket chain 113 leading from a motor driven speed-reducer (not shown). Shaft 105 also has a sprocket 114 thereon, and a sprocket 115 fast on shaft 96 is connected by a sprocket chain 115A to drive shafts 96 and 105 at the same speed.

Shaft 105 has a sprocket 116 fast thereto and running with a sprocket chain 117 to drive a sprocket 118 fast on the shaft 63 of roller 62. A sprocket 119 drives shaft 54 supporting the roller 53 by a sprocket chain 120 trained between sprocket 119 and its sprocket 121 fast on the shaft 54.

Structure is provided for shearing a strip of capsules as seen in FIG. 3 into discrete capsules as seen in FIG. 1, and to this end the driving mechanism described is adapted to operate a shearing assembly denoted generally by the reference character SH, see also FIGS. 18 to 20. Shear SH consists of a vertically movable shear member 122, having a shearing blade 123 extending downward therefrom. Shear member 122 is guided vertically in a pair of guide rods 124 attached at 125 to the top of the base 43. A slotted anvil 126 for shearing blade has a slot 127 therein in direct alignment with the blade 123.

Shearing assembly SH is actuated by an eccentric 128 secured to the shaft 96, and eccentric 128 contacts a shear actuating arm 129 pivotally supported on a pin 130 extending from a standard 131 secured to base 43 by bolts 132.

The shear actuating arm end of 129 remote from eccentric 128 is provided with a slot 134 and a pin 135 extending from movable shear member 122 extends into slot 134.

The sealing elements 103 are energized by a contact member 136 attached to the base 43 at 137, and the

resistance coils 87 in the sealing elements 103 have contacts shown as 138, see FIG. 15 for engagement with the contact member 136 connected to a current supply.

From the above description it is believed evident that some new and useful improvements in mechanism for making cushioning packaging material have been provided. Although I have shown some specific embodiments of the invention, I am fully cognizant of the fact that many changes may be made in the form, shape and configuration of the parts and their arrangement without effecting their operativeness, and I reserve the right to make such changes as I may deem convenient without departing from the spirit of my invention as defined by the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. In a machine for making a strip of connected capsules containing occluded air, a base including means for moving continuously a pair of strips one superimposed over the other lengthwise of said base, means for introducing a current of air between said superimposed strips, a roller having a relieved portion therein, said air introducing means extending between said superimposed strips while the same are being advanced beneath said roller and into said relieved portion, sealing means disposed between the point where said air introducing means enters between said superimposed strips and said roller whereby the sealed strip moving beyond said roller is in the form of an inflated tube, means for sealing said inflated tube at regular intervals transversely thereof, the improvement in said machine for varying the length of a capsule containing said occluded air which comprises a friction drive disc driven by said means for driving said pair of strips, a frictionally driven disc driven from said drive disc and a shaft driven by said frictionally driven disc for operating said sealing means, means for adjusting the position of said frictionally driven disc on said shaft so as to vary the relative speed between said drive disc and said driven disc, and means for adjusting the position of said sealing means with respect to said shaft in accordance with the length of such capsule.

2. The invention according to claim 1 wherein severing means are operated by said shaft, and means are provided for adjusting the position of said severing means in accordance with the length of a discrete capsule severed from said strip.

References Cited

UNITED STATES PATENTS

3,001,340	9/1961	Gosman	53—28
3,001,348	9/1961	Rado	53—182
3,009,298	11/1961	Gerlach	53—22
3,229,442	1/1966	Gram	53—28

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