United States Patent [19]

Terry

[11] **3,837,138**

[45] **Sept. 24, 1974**

[54] **METHOD AND APPARATUS FOR COMPRESSING MATERIAL AND ENCLOSING THE SAME IN A PLASTIC FILM**

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[22] Filed: **Feb. 23, 1973**

[21] Appl. No.: **335,412**

[52] **U.S. Cl.**..... **53/24,** 53/124 A, 53/124 C, 53/124 E, 53/124 CC, 53/182

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

[58] **Field of Search**.... 53/24, 124 A, 124 C, 124 D, 53/124 E, 124 CC, 182, 372

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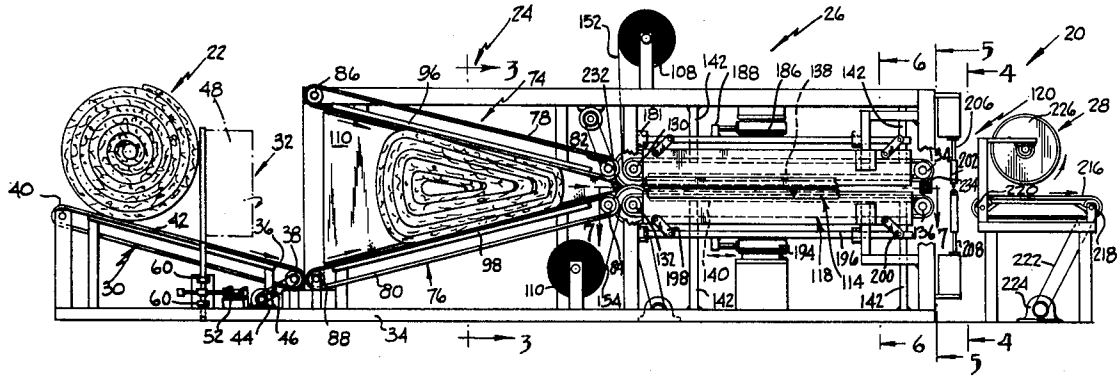
Primary Examiner—Travis S. McGehee

Attorney, Agent, or Firm—John A. McKinney; Robert M. Krone; John D. Lister

[57] **ABSTRACT**

A method and apparatus, for individually packaging units of a compressible material, compress the material and then enclose the material within a plastic film. The unit of the compressible material, e.g., a batt of insulation, is introduced between a pair of converging conveyors whereby opposing surfaces of the conveyors apply compressive forces to major faces of the compressible material to compress the material to the desired degree. After the material is compressed to the desired degree, it is introduced between a pair of continuous sheets of plastic film. The material is located between the sheets so that lateral edge portions and transverse portions of the sheets extend beyond the peripheral edges of the compressed material. The lateral edge portions and transverse portions are then heat sealed together to enclose the units of compressed material. This operation successively packages a number of individual units with the heat sealing operation for the transverse portions of the sheets simultaneously sealing the trailing transverse portions of the sheets for one unit, sealing the leading transverse portions of the sheets for another unit and reducing the integrity of the sheets at the juncture between these transverse portions to such an extent that the sheets enclosing the units of material can be separated.

19 Claims, 13 Drawing Figures



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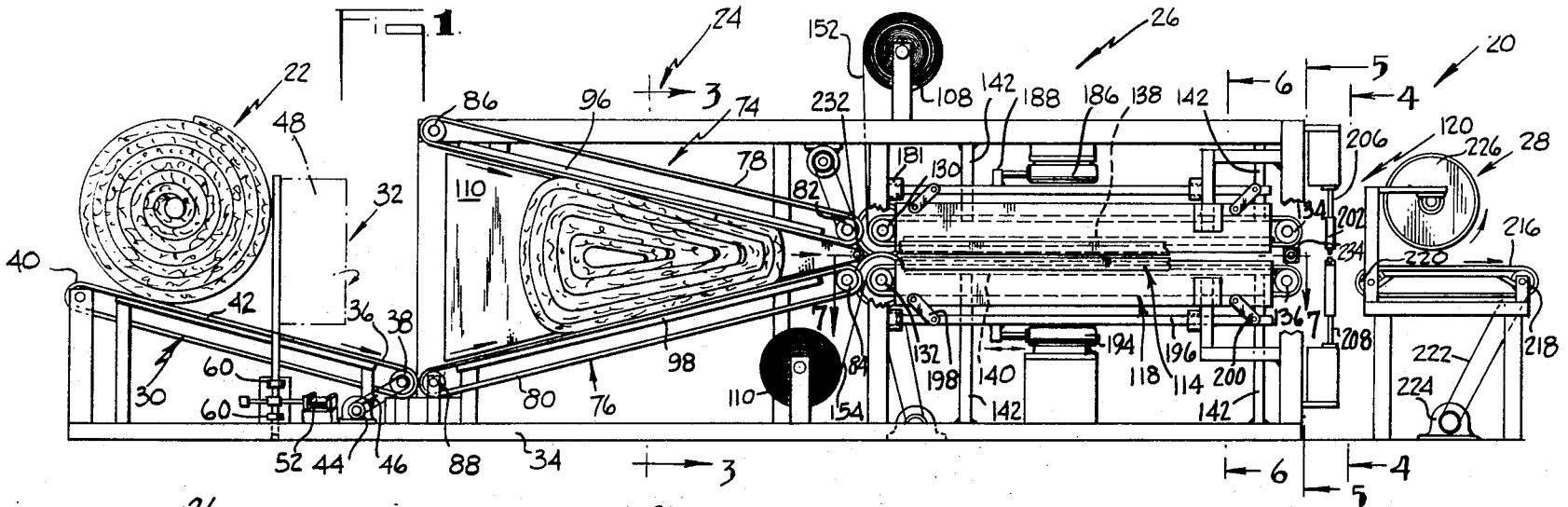

Fig. 1.

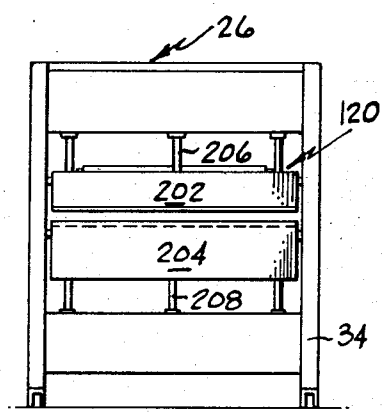

Fig. 4.

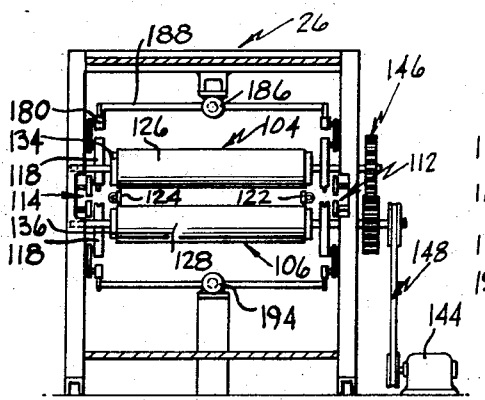

Fig. 5.

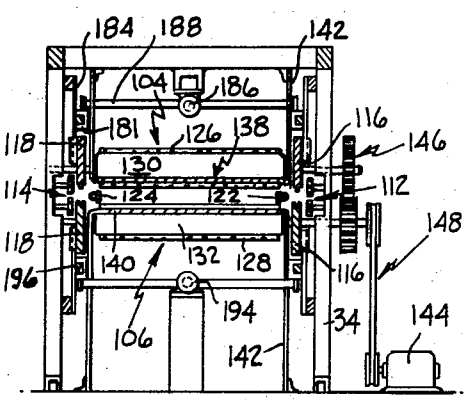

Fig. 6.

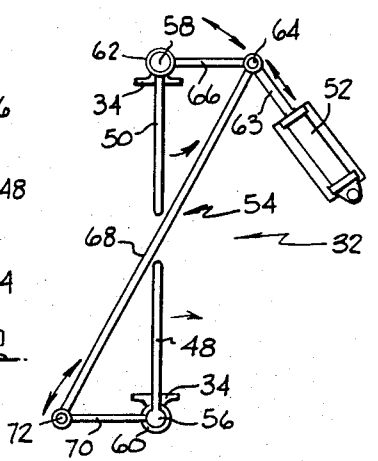

Fig. 2.

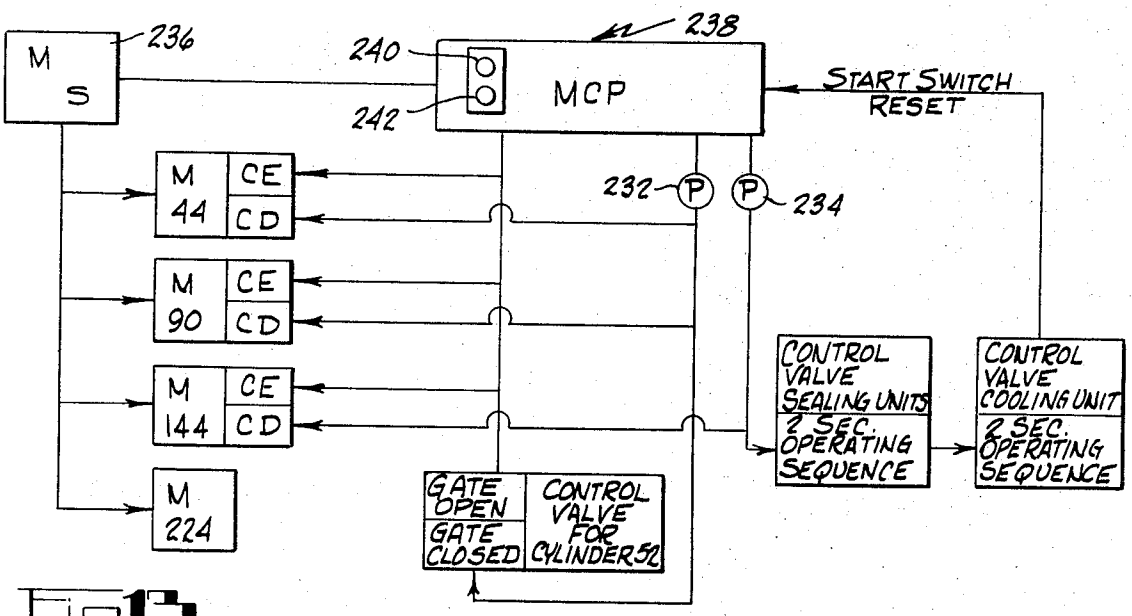

Fig. 1

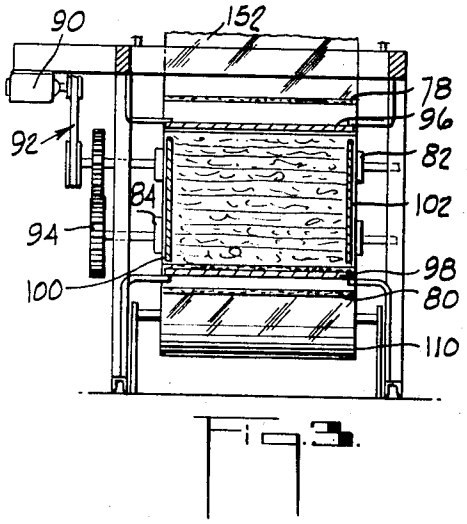

Fig. 3

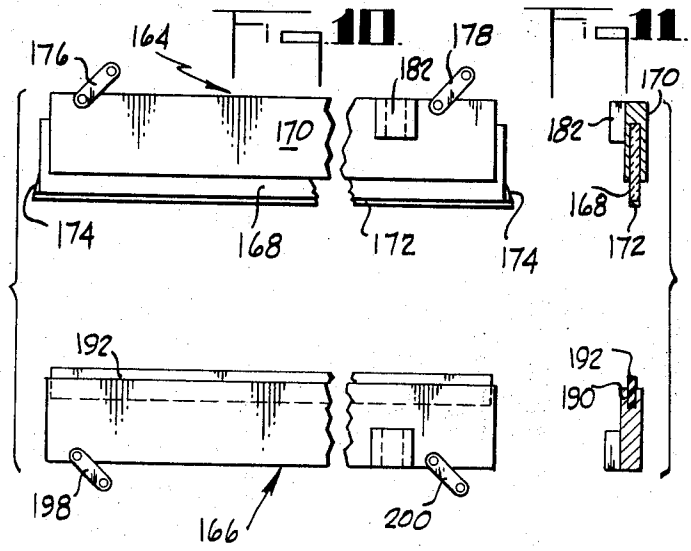

Fig. 10

Fig. 11

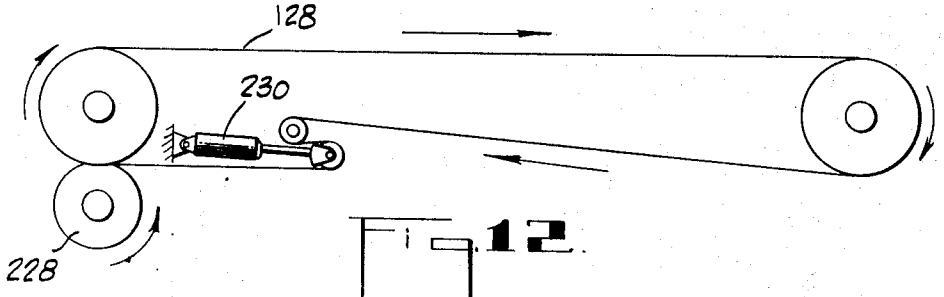

Fig. 12

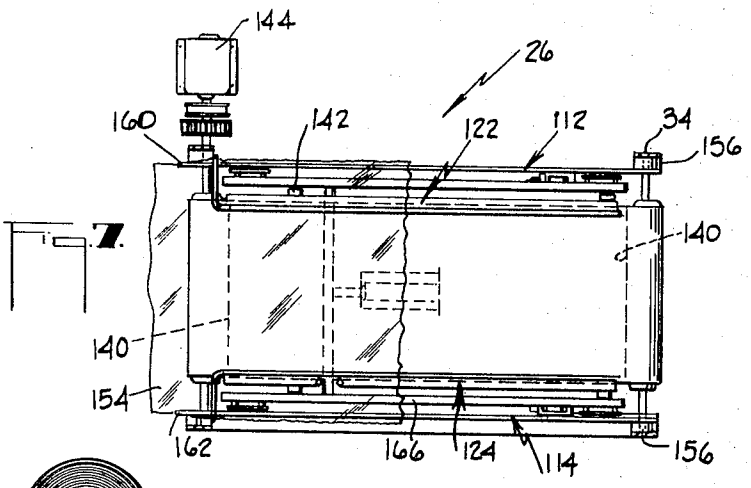
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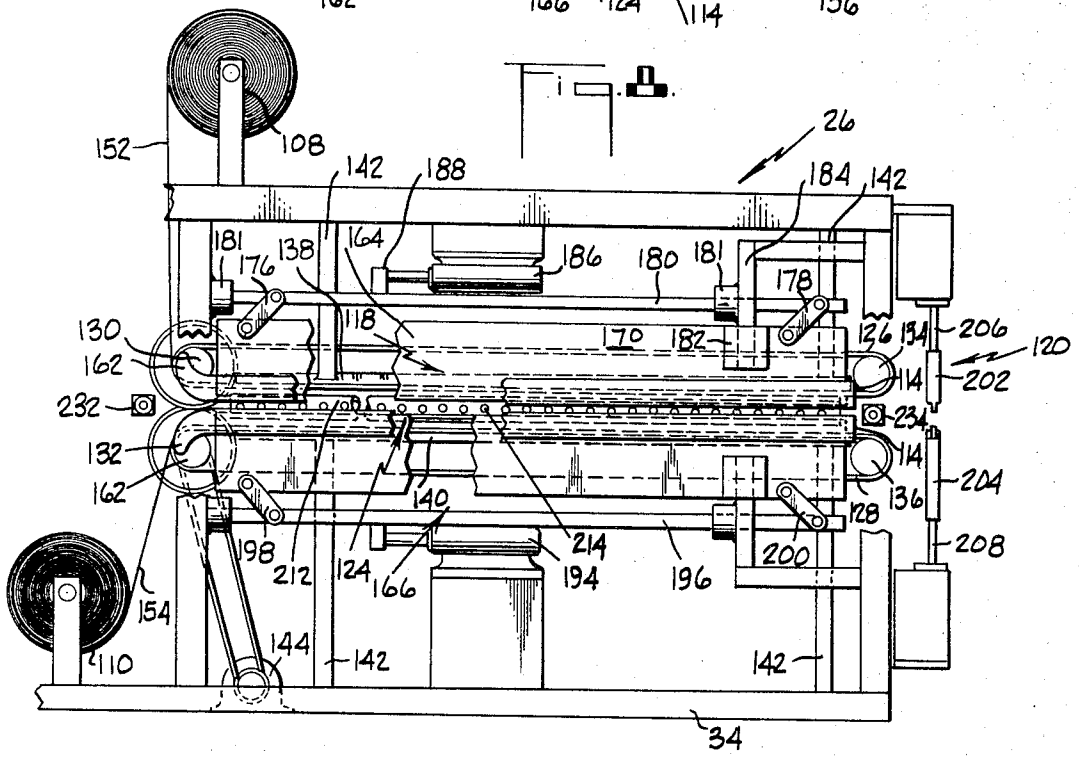
FIG. 7.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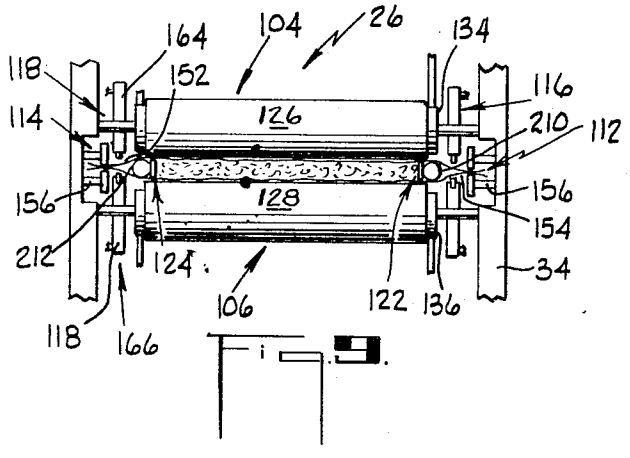
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FIG. 8.

METHOD AND APPARATUS FOR COMPRESSING MATERIAL AND ENCLOSING THE SAME IN A PLASTIC FILM

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for packaging compressible material and in particular to a method and apparatus for individually compressing a material and enclosing the material while in a compressed state within a plastic film.

Previous methods utilized to package compressible material, such as fiber glass batts or other high volume material, involved compressing the material, placing a bag or packaging enclosure over a funnel and pushing or ramming the material to be packaged through the funnel into the bag or enclosure. This method is time consuming, increasing labor costs, and deforms the material in all three dimensions thereby spoiling its visual appearance.

BRIEF SUMMARY OF THE INVENTION

Consequently, it is an object of the present invention to provide a method and apparatus for packaging compressible material which provides a higher and more uniform compression while maintaining a cleaner appearance and saving both time and labor. While this method and apparatus are adapted to be used with fiber glass insulation batts or felts, the method and apparatus can also be used with compressible vegetation such as cotton, hay or straw or when any material of a large volume or low density must be condensed to facilitate packaging.

It is a further object of the present invention to provide a method and apparatus for packaging a compressible material wherein the need for a preformed plastic film or craft paper tube is eliminated.

Accordingly, the present invention comprises a method and apparatus for individually packaging the units of a compressible material wherein a plurality of units are successivley compressed between a pair of converging conveyor belts which apply compressive forces to major faces of the compressible material. While in the compressed state, the units of compressible material are successivley interposed between sheets of a plastic film which extend over the major faces of the units and have lateral edge portions, leading transverse portions and trailing transverse portions associated with and extending beyond peripheral edges of the units when the units are interposed between the sheets. The lateral edge portions, the leading transverse portions and the trailing transverse portions of the sheets associated with each unit are heat sealed to enclose the compressed material within the plastic film. In this operation, the leading transverse portions of the sheets associated with one of the units are heat sealed at the same time the trailing transverse portions of the sheets associated with the preceding unit are heat sealed. The heating of the leading transverse portions associated with the one unit and the trailing transverse portions associated with the preceding unit is such that the integrity of the sheets along a line corresponding to the juncture of the leading and trailing transverse portions is greatly reduced. The separation of the sheets is effected along this line to separate the preceding packaged unit from the partially packaged unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view, with portions broken away, diagramatically illustrating the apparatus of the present invention;

FIG. **2** is a plan view of a gate assembly of the present invention with the conveyor omitted to better illustrate the linkage of the gate assembly.

FIG. **3** is a cross-sectional view of the apparatus of the present invention taken substantially along lines **3—3** of FIG. **1**;

FIG. **4** is a cross-sectional view of the apparatus of the present invention taken substantially along lines **4—4** of FIG. **1**;

FIG. **5** is an elevational end view of the apparatus of the present invention taken substantially along lines **5—5** of FIG. **1**;

FIG. **6** is a cross-sectional view of the apparatus taken substantially along lines **6—6** of FIG. **1**;

FIG. **7** is a plan view of the sealing station of the apparatus of the present invention taken substantially along lines **7—7** of FIG. **1**;

FIG. **8** is an enlarged fragmentary side elevational view of a portion of the sealing station to better illustrate the components of the sealing station and their relative positions;

FIG. **9** is an enlarged cross-sectional view through the sealing station of the present invention to better illustrate the arrangement of the components of this section;

FIG. **10** is a side elevational view of a heater unit and anvil of the apparatus of the present invention;

FIG. **11** is a cross-sectional view of a heater unit and anvil of the apparatus of the present invention;

FIG. **12** is a side view of an alternate conveyor belt drive for the apparatus of the present invention; and

FIG. **13** is a block diagram illustrating one form of conventional control system for the apparatus of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The method and apparatus of the present invention are adapted to package units of a compressible material in individual packages formed from sheets of a plastic film while the individual units are in a compressed state. After the packaging operation is completed, the plastic film retains the package material in its compressed state until the product is unpackaged. The term unit, as utilized in this Application, means a single item or a group of items which constitute a desired grouping for packaging purposes. In other words, a unit can refer to a single batt or a plurality of batts grouped together as a unit for packaging purposes. As indicated above, while the method and apparatus of the present invention are specifically adapted for use in the packaging of fiber glass insulation, the method and apparatus can be utilized to package other compressible materials such as cotton, hay, straw or any material of a large volume and low density which must be condensed to facilitate economical packaging, shipment and storage.

As best illustrated in FIG. **1** an apparatus **20** of the present invention comprises a loading station **22**, a compressing station **24**, a sealing and parting station **26** and a parting conveyor station **28**.

The loading station **22** comprises an inclined conveyor **30** and a gate assembly **32** which are both

mounted on a frame 34 of the apparatus. The conveyor 30 includes an endless conveyor belt 36 which is trained about a drive roll 38 and an idler roll 40. These rolls are rotatably mounted on the frame 34 in a conventional manner and rotate about horizontal axes. The upper run of the conveyor belt 36 rests on a major face of a support or backing plate 42 which is welded or otherwise secured to the apparatus frame 34. In this way the support plate 42 provides the required support for a unit of material on the conveyor belt as the conveyor belt 36 carries the unit from the loading station 22 to the compressing station 24. The inclination of the conveyor 30 downward from idler roll 40 to drive roll 38 which is adjacent the compressing station 24 facilitates the delivery of the unit of material from the loading station to the compressing station. The conveyor belt 36 is driven by a motor 44 through a conventional magnetic clutch, drive belt and sheave assembly 46.

As best shown in FIGS. 1 and 2, the gate assembly 32 includes a pair of gates 48 and 50 mounted on the frame 34, the gates are coupled together and to a pneumatic cylinder 52 through linkage 54. The gates 48 and 50 each include a vertical shaft 56 and 58, respectively. These shafts are each rotatably mounted in a pair of bearings 60 and 62 that are anchored to the frame 34. The shafts 56 and 58 are free to rotate about a vertical axis and thus the gates 48 and 50 are free to pivot about the same vertical axis.

The pneumatic cylinder 52 is a double acting piston and cylinder assembly which has one end pivotally mounted on the frame 34. An outer extremity of its piston rod 63 is pivotally coupled to a lower end of a shaft 64 of the linkage 54. The shaft 64 is a vertically extending shaft located at an extremity of an arm 66 extending radially outward from and affixed to the shaft 58 of the gate 50. A tie rod 68 is pivotally secured to an upper end of the shaft 64 and connects the arm 66 with an arm 70 of the gate 48. The arm 70 extends radially outward from and is affixed to the shaft 56 of the gate 48. The arm 70 has a vertically extending shaft 72 at its outer extremity and the tie rod 68 is pivotally mounted on the shaft 72. As can be readily seen in FIG. 2 when the piston rod of the cylinder 52 is extended, the gate 50 is rotated in a counterclockwise direction and the gate 48 is rotated in the clockwise direction to thereby swing the gates open and allow the unit of material being packaged to pass through the gates to the compressing station.

The compressing station 24 includes a pair of conveyors 74 and 76. As best shown in FIGS. 1 and 3, these conveyors include endless conveyor belts 78 and 80 which are trained about drive rolls 82 and 84 and idler rolls 86 and 88. The drive rolls and idler rolls 82, 84, 86 and 88 are rotatably supported in conventional bearing assemblies carried by frame 34. The drive roll 82 is driven by a motor 90 through a conventional magnetic clutch, drive belt and sheave assembly 92. The drive roll 84 is driven by sprocket assemblies 94 mounted on shafts of the drive rolls 82 and 84. With this arrangement the conveyor belts 78 and 80 run at the same speed with the lower run of the upper conveyor belt and the upper run of the lower conveyor belt moving in the same direction toward the sealing and parting station 26. The conveyors 74 and 76 are each provided with support or backing plates 96 and 98 respectively which back up the opposing runs of conveyor belts 78 and 80 and lend the needed support to the belts for the compressing operation. The backing plates 96 and 98 are welded or otherwise affixed to support members mounted on the frame 34.

As will be noted from FIG. 1, the lower run of the conveyor belt 78 and the upper run of the conveyor belt 80 converge toward each other in the direction of travel of the belts 78 and 80 on these runs. While the angle of inclination of the conveyor belts relative to a horizontal plane can vary, an inclination for each of about 12° to the horizontal has been found to be satisfactory. A pair of triangular shaped plates 100 and 102 are located adjacent the lateral edges of the conveyor belts 78 and 80. The triangular plates cooperate with the conveyor belts to enclose the material being compressed and to prevent the material from expanding outward beyond the edges of the conveyor belts during its compression. With this arrangement as the unit of material to be compressed passes from the loading station to the compressing station, the material is gripped between the conveyor belts 78 and 80 and is carried toward the converging ends of the conveyors 74 and 76. As the material travels toward the converging ends of the conveyors, it becomes more and more compressed until it is compressed to the desired degree. The desired degree of compression can be regulated by adjusting the spacing between the opposing runs of the conveyor belts 78 and 80 at their discharge ends where they introduce a unit of compressed material into the sealing and parting station 26.

The sealing and parting station 26 includes upper and lower conveyors 104 and 106; plastic sheet rolls 108 and 110; facing sheet guides 112 and 114; sealing units 116 and 118; sealing and parting unit 120; and material guides and seam coolers 122 and 124.

The conveyors 104 and 106 are identical in construction. Each conveyor comprises an endless conveyor belt 126 and 128, the conveyor belts are trained about drive rolls 130 and 132 and idler rolls 134 and 136. The belts run horizontally between the drive rolls and the idler rolls with the lower run of the upper conveyor 126 and the upper run of the lower conveyor 128 being spaced so as to maintain a unit of compressed material in the sealing and parting station at the desired degree of compression. The lower run of the upper conveyor belt and the upper run of the lower conveyor belt are each provided with backing plates 138 and 140 respectively to provide the necessary reinforcement for the belts along these runs so that the material sandwiched between the belts will remain compressed. As best shown in FIGS. 7 to 9 the backing plates are affixed to the frame 34 by support brackets 142. The surfaces of the backing plates 138 and 140 that are in contact with the conveyor belts can be highly polished or Teflon coated to facilitate the movement of the conveyor belts over these plates.

Both the upper and lower conveyor are driven by a motor 144 which is coupled to drive sprockets 146 of drive rolls 130 and 132 through a conventional magnetic clutch, drive belt and sheave assembly 148. With this drive arrangement, both conveyors are driven at the same speed with the opposing runs which sandwich the units of material therebetween being parallel and running in the same direction.

The supply rolls 108 and 110 supply the sheets 152 and 154 of plastic film, e.g., a 3 mil thick film, utilized to package the units of material. The supply rolls are rotatably mounted on the frame 34 and the continuous

sheets of plastic film **152** and **154** are fed from these rolls between the opposing runs of conveyor belts **126** and **128** whereby units of material coming from the compressing station and being introduced into the sealing and parting station are interposed between the plastic sheets **152** and **154.** The guide rails **112** and **114** of the station are affixed to the frame **34** by brackets **156** and are located on either side of the conveyor belts **126** and **128.** The guide rails guide the sheets from the leading end of the sealing station to the trailing end of the sealing station. Adjacent longitudinal edges of these guide rails, which are positioned about one-quarter of an inch apart, engage lateral edges of the sheets **152** and **154** to retain them in the proper position for the sealing operation and to keep the sheets out of contact with the sealing units **116** and **118** prior to the sealing operation. Forward ends **160** and **162** of the guide rails **112** and **114** are rounded to facilitate the entry of the sheets **152** and **154** between the guide rails.

Just inward of the guide rails and outward of the conveyor belts **126** and **128** are the sealing units **116** and **118.** The sealing units are identical in construction and the actuation of these sealing units is identical. Consequently, only sealing unit **118** will be discussed in detail. Sealing unit **118** comprises an upper heater unit **164** and a lower anvil **166.** The heater unit comprises an insulating plate **168** having a low thermal conductivity, good dielectric strength, and a high melting point. This plate is sandwiched between and affixed to two legs of a channel shaped metal plate **170.** A wire or metal ribbon **172** of suitable electrical resistance is suspended along a lower edge of the electrical insulating plate **168.** The amount of current and consequently the heat produced in the wire or ribbon **172** is controlled through a transformer and rheostat connected to the wire or ribbon. The current is regulated so that the heat produced is sufficient to melt the plastic film and effect the seal between the sheets **152** and **154.** To compensate for thermal expansion of the wire or ribbon **172,** springs **174** are provided at each end of the insulating plate **168.** The wire or ribbon **172** is connected to the transformer and rheostat through these springs.

The channel shaped metal plate **170** is supported by a pair of links **176** and **178** which in turn are supported by a bar **180.** The bar is slideably mounted in a pair of channels **181** which restrict the movement of the bar to a horizontal direction. The links **176** and **178** are pivotally secured to the bar **180** and the plate **170** so that the links can pivot relative to these two members. When the heater unit is in a retracted position the pivot points of the links are not vertically aligned whereby movement between the bar **180** and the heater unit **118** to bring the pivot points into vertical alignment forces the heater unit **118** away from the bar. A channel shaped member **182** with the channel extending in a vertical direction is welded or otherwise affixed to the outer surface of plate **170.** A vertically extending bar **184** of the frame **34** is slideably received within this channel. With this arrangement, horizontal movement of the heater unit **164** is prevented and the unit can only move in a vertical direction. A pneumatic cylinder **186** is coupled to the bar **180** and a similar bar for the heater unit of sealing unit **116** by a cross-bar **188.** When the cylinder **186** is actuated to extend its piston rod and thereby slide bar **180** in a direction to bring the pivot points of links **176** and **178** into vertical alignment, the heater unit **164** is forced downward and into contact with the facing sheet **152.** The anvil **166** which is forced upward in the like manner contacts the facing sheet **154** to clamp the sheets between the heater unit and the anvil.

The anvil **166** comprises a length of metal plate which has a groove **190** extending longitudinally in its upper edge. A strip **192** of rubber or other suitable material is mounted in the groove **190** and extends the full length of the groove. The purpose of this strip of rubber is to compensate for mis-alignment between the anvil and heater unit and to insulate the metal of the anvil both thermally and electrically from the wire or ribbon **172** of the heater unit.

The anvil mounting is a mirror image of the heater unit mounting and operates in the same manner whereby extension of a piston rod associated with a pneumatic cylinder **194** causes a bar **196** to slide horizontally to bring the pivot points of a pair of links **198** and **200** into vertical alignment whereby the anvil is forced upward into contact with the lower facing sheet **154.** The total vertical movement of both the heater unit **164** and the anvil **166** is about one inch between their retracted positions and their sealing positions.

The sealing and parting unit **120** is located at the end of the sealing and parting station adjacent the parting conveyor station **28.** As best shown in FIGS. **1** and **4,** the unit comprises an upper heater unit **202** and a lower anvil **204.** Each of these units is connected to double acting pneumatic piston and cylinder assemblies **206** and **208.** The assemblies **206** and **208** both extend and retract the units relative to each other to bring them into contact during the sealing and parting operation and to retract them several inches, e.g., **7** or **8** inches, out of contact with the sheets **152** and **154** between the sealing and parting operations to permit passage of partially packaged units from the sealing and parting station **26** to the parting conveyor station **28.** The heater unit **202** and the anvil **204** are constructed in the same manner as the heater units and anvils which seal the lateral edges of the plastic sheets. Consequently, they will not be redescribed in detail. While these units can extend the entire width of sheets **152** and **154** to effect a complete seal along the transverse seams, the length of these units can be such that a complete seal is not made entirely across the width of sheets **152** and **154** for reasons that will be explained hereinafter.

The sealing station is also provided with a pair of guide plates **122** and **124** which extend longitudinally through the sealing and parting stations adjacent the lateral edges of the conveyor belts **126** and **128.** These plates are welded or otherwise affixed to the frame **34** at the end of the sealing station adjacent the compressing station and extend between the opposing faces of the conveyor belts **126** and **128** to prevent the units of compressed material in the station from coming between the sealing units **116** and **118.**

On the outside of the guide plates **122** and **124** are a pair of tubular members **210** and **212.** These tubular members are welded or otherwise affixed to the outer surfaces of the guides **122** and **124.** These tubular members are connected to a source of pressurized air (not shown) at the end of the station adjacent the compressing station and are provided with a row of outwardly facing apertures **214** which are located to direct air from the tubes out toward the area between the sealing units **116** and **118** to effect the cooling of the

sealed edges of the sheets **152** and **154.** This is necessary in order to assure that the heat seal between the edges of the sheets **152** and **154** has cooled enough to withstand the forces exerted on the sheets by the compressed material within the sheets when the packaged material is discharged from the sealing unit. If the seams are not cooled in this manner to allow the plastic to solidify and bond the sheets together, the time required for the plastic to solidify would greatly prolong the packaging operation.

The parting conveyor station **28** is located adjacent and downstream from the parting and sealing unit **120.** The parting conveyor station **28** comprises a conveyor belt **216** trained over a drive roll **218** and an idler roll **220.** These rolls are rotatably mounted on the frame **34** with the conveyor belt runs, intermediate the rolls, extending in a horizontal direction. The drive roll **218** is driven through a conventional sheave and drive belt assembly **222** which is driven by a motor **224.** The parting conveyor can also be provided with a roll **226** which is rotatably mounted on the frame **34** just above the upper run of the conveyor belt **216.** The roll **226** cooperates with the upper run of the conveyor belt **216** to sandwich the packaged insulation therebetween and create a higher frictional force so that the pull exerted by the parting conveyor on a package in the parting conveyor station to part the package from the succeeding package in the sealing and parting station will be sufficient to effect the parting between the packaged material on the parting conveyor and the partially packaged material within the sealing station.

As mentioned above, the sealing and parting unit **120** seals and lowers the integrity of the sheets **152** and **154** for a major transverse extent of the sheets. However, in one preferred embodiment, the heating unit **202** and anvil **204** of the unit do not extend the entire width of the sheets thereby leaving the leading and trailing edges of a packaged unit unsealed at the corners. This is done to permit recompression of the packaged units which expand somewhat upon exiting from the sealing station due to the extra sheet material required between the material guides **122** and **124** and the sealing units **116** and **118** along the lateral edges. Generally a plurality of these packaged units are recompressed and packaged in a larger container. If the openings were not left at the corners, the air could not be expelled from the individual packages to recompress the units of material. While this is one way of forming the packages, if no recompression is desired, the seal effected by the sealing and parting unit **120** can extend entirely across the leading and trailing edges of the packages.

FIG. **12** discloses a somewhat modified form of the present invention. In the sealing station **26,** it may be desirable to provide conveyor belts **126** and **128** which are Teflon coated rather than coating the backing plates with Teflon. In this event, an internal drive roll would not be as effective due to slippage between the belt and the drive roll. Consequently, as shown in FIG. **12** an external drive roll is utilized to effect the drive of the lower conveyor belt. In practice the upper or lower belt passes between an internal idler roll which is substituted for drive roll **130** or **132** and an external drive roll **228** whereby the conveyor belt **126** or **128** is gripped between the two rolls and driven. As also shown in FIG. **12,** the conveyor belts used in the loading station, compressing station, sealing station and parting conveyor station can be provided with conventional take-up assemblies such as assembly **230** to maintain proper tension in the conveyor belt.

While other types of control systems can be used to operate the apparatus of the present invention, one form of control system for the apparatus of the present invention is illustrated in FIG. **13.** In that control system, a first photo-electric cell, limit switch or similar mechanical device **232** is located intermediate the compressing station **24** and the sealing and parting station **26.** A second photo-electric cell, limit switch or similar mechanical device **234** is located at one end of the sealing and parting station **26** adjacent but inward of the sealing and parting unit **120.** These devices are provided to detect the presence of units of material being compressed and to initiate control of the packaging operation.

In addition to the photo-electric cells the control system includes a master switch **236** and a conventional control panel **238.** The master switch controls the power to the motors **44, 90, 144** and **224** which run continuously when the master switch is turned on. The master switch also provides power to the control panel which, through the photo-electric cells **232** and **234,** the electromagnetic clutches associated with the motors **44, 90** and **144,** and control valves associated with the gate assembly **32,** the sealing units **116** and **118,** the sealing and parting unit **120** and the material guide and seam coolers **122** and **124,** controls the packaging operation.

The control panel **238** is provided with a start switch **240** to commence a packaging cycle which then normally proceeds automatically until complete and a stop switch **242** which can be actuated to stop a packaging cycle and reset the start switch which otherwise is locked out until a packaging cycle is complete.

A packaging cycle will now be described. With the master switch turned on and motors **44, 90, 144,** and **224** running, a unit of compressible material is placed on conveyor **30** of the loading station and is held in place by the gate assembly **32.** The start switch **240** is actuated thereby engaging the magnetic clutches for motors **44, 90** and **144.** With these clutches engaged the conveyors of the loading station **22,** the compressing station **24** and the sealing and parting station start to run with all of the conveyors operating at the same speed. Simultaneously, a pneumatic control valve, which controls the pneumatic cylinder **52** of the gate assembly, is actuated to pressurize and vent the pneumatic cylinder **52** so as to open gates **48** and **50** of the gate assembly. As a result a partially packaged unit of material is discharged from the sealing and parting station **26** into the parting conveyor station **28,** a compressed unit of material is discharged from the compressing station **24** into the sealing and parting station **26,** and the unit of material placed in the loading station is discharged from the loading station **22** into the compressing station **24.**

The unit of material now in the compressing station **24** is carried toward the converging ends of conveyors **74** and **76** and is compressed to the desired degree, e.g., a 36 inch diameter unit of insulation is compressed to dimensions of about 3 inches thick by 54 inches long with the width of the unit remaining substantially unchanged. As a leading edge of the unit of material now in the compressing station starts to pass from the compressing station into the sealing and parting station **26,** the beam of photo-electric cell **232** is broken. This ac-

tuates the control panel to disengage the electromagnetic clutches associated with the motors **44** and **90** thereby bringing the conveyors of the loading station and the compressing station to a halt. At the same time, the pneumatic control valve, which controls the pneumatic cylinder **52** of the gate assembly **32,** is actuated to pressurize and vent the pneumatic cylinder **52** so as to close the gates **48** and **50** of the gate assembly. With the gates **48** and **50** closed another unit of material can be loaded.

The unit of material now in the sealing and parting station **26** is interposed or sandwiched between the continuous plastic sheets **152** and **154** as it enters the sealing and parting station. As the unit of material proceeds through the sealing and parting station it is gripped between conveyors **104** and **106.** The conveyors **104** and **106** not only retain the unit in a compressed state and carry it through the station but they also draw the plastic sheets, which are held between the unit of material and the conveyors, from the rolls **108** and **110.** As the sheets **152** and **154** and the unit are moving through the station, the guide rails **112** and **114** guide the sheets and keep them out of contact with the sealing units **116** and **118.** At the same time the guides **122** and **124** prevent edges of the unit of material from coming between the sealing units **116** and **118.**

When a leading edge of the unit of material in the sealing and parting station approaches the sealing and parting unit **120,** it cuts the beam of photoelectric cell **234.** This actuates the control panel to disengage the electro-magnetic clutch associated with the motor **144** thereby bringing the conveyors of the sealing and parting station to a halt. At the same time, the pneumatic control valve for the pneumatic cylinders **186** and **194** of the sealing units and the pneumatic cylinders **206** and **208** of the sealing and parting unit **120** are pressurized and vented to bring the heater and anvil units of the sealing units and the sealing and parting unit into contact with the sheets **152** and **154.** The heat generated by the heater units melts the plastic sheets whereby lateral seams are formed by sealing units **116** and **118** and transverse seams are formed by sealing and parting unit **120.** It should be noted that the sealing and parting unit not only forms a leading transverse seam for the package of the unit of material in the sealing and parting station **26** but also a trailing transverse seam for the package of the unit of material in the parting conveyor station. In addition the sealing and parting unit **120** so weakens the plastic sheets along a juncture of the leading and trailing transverse seams that the completely enclosed package in the parting conveyor station is separated and moved away from the partially packaged unit of material in the sealing and parting station.

After a pre-determined interval, e.g., **2** seconds the sealing units **116** and **118** plus the sealing and parting unit **120** are retracted. At this point the control valve for the seam coolers **210** and **112** is actuated to supply pressurized air or another cooling fluid to these units. The cooling fluid is directed from these coolers onto the melted plastic of sheets **152** and **154** which form the lateral seams for the package for a predetermined period of time, e.g., **2** seconds until the seams are cooled. The valve is then automatically actuated to stop the fluid and the start switch is reset. Another packaging cycle can now be started.

What is claimed is:

1. A method of packaging compressible material comprising:

a. compressing a compressible material by applying compressive forces to major faces of the compressible material;

b. retaining the compressible material in a compressed state,

c. interposing the compressible material in the compressed state between sheets of plastic film which extend over the major faces of the compressible material and have lateral edge portions, leading transverse portions and trailing transverse portions extending beyond peripheral edges of the compressible material,

d. sealing the lateral edge portions and the leading transverse portions of the sheets together to partially enclose the compressible material within the sheets and leave the trailing transverse portions open;

e. moving the partially enclosed material in a direction parallel to the lateral edge portions for a distance about the length of said lateral edge portions, and

f. sealing the trailing transverse portions after the partially enclosed material has been moved to complete the enclosure of the material.

2. The method of packaging compressible material as defined in claim **1** and further comprising:

a. heat sealing the lateral edge portions and transverse portions of the sheets together.

3. A method of packaging compressible material comprising:

a. successively compressing a plurality of units of a compressible material by applying compressive forces to major faces of the units;

b. successively retaining the units of the compressible material in a compressed state;

c. successively interposing the units of the compressible material between sheets of plastic film which extend over the major faces of the units and have lateral edge portions, a leading transverse portion and a trailing transverse portion extending beyond peripheral edges of the units and associated with individual units when the units are interposed between the sheets; and

d. successively sealing the lateral edge portions while means is located between the lateral edge portions and lateral edges of the units to prevent the units from extending into the regions of the lateral edge portions and successively sealing transverse portions of the sheets about the individual units to enclose the units of the compressible material within the sheets.

4. The method of packaging a compressible material as defined in claim **3** and further comprising:

a. successively sealing the lateral edge portions and the leading transverse portion of the sheets associated with one of the units as the trailing transverse portion of the sheets associated with an immediately preceding unit is being sealed.

5. The method of packaging a compressible material as defined in claim **4** and further comprising:

a. heat sealing the edge portions and transverse portions of the sheets associated with the units.

6. The method of packaging a compressible material as defined in claim 5 and further comprising:
a. heating the leading transverse portion associated with the one unit and the trailing transverse portion associated with the immediately preceding unit to the extent that the integrity of the sheets along a line corresponding to the juncture of the leading and trailing transverse portions is greatly reduced, and
b. effecting separation of the sheets at this juncture to separate the preceding unit which is packaged from the one unit which is partially packaged.

7. The method of packaging a compressible material as defined in claim 3 and further comprising:
a. heat sealing the edge portions and the transverse portions of the sheets associated with the units.

8. An apparatus for packaging units of a compressible material comprising:
a. compressing means for compressing a unit of compressible material by applying compressive forces to major faces of the unit of compressible material and maintaining the unit of compressible material in a compressed state;
b. interposing means for interposing the unit of compressible material while in the compressed state between sheets of plastic film and for locating the unit of compressible material between the sheets so that lateral edge portions and transverse portions of the sheets extend beyond peripheral edges of the unit of compressible material;
c. sealing means for sealing lateral and transverse portions of the sheets together to enclose the compressible material within the sheets; and
d. means located between the lateral sealing means and the compressible material to prevent the compressible material from extending into the regions of the lateral edge portions of the sheets as the lateral edge portions are sealed.

9. The apparatus for packaging units of a compressible material as defined in claim 8 wherein:
a. said sealing means is heat sealing means.

10. The apparatus for packaging units of a compressible material as defined in claim 9 wherein:
a cooling means is provided for cooling the lateral portions of the sheets after the lateral portions have been heat sealed.

11. The apparatus for packaging units of a compressible material as defined in claim 9 wherein:
a. the transverse heat sealing means heats the plastic sheets to a point where the integrity of the sheets is diminished along a transverse line where the transverse heat sealing is being effected, and
b. parting means is provided for separating said sheets along the transverse line.

12. The apparatus for packaging units of a compressible material as defined in claim 8 wherein:
a. said compressing means includes a pair of converging conveyors, said conveyors having opposing surfaces which converge toward each other in the direction of movement of the conveyors from an inlet end to a discharge end of compressing means.

13. The apparatus for packaging units of a compressible material as defined in claim 8 wherein:
a. said interposing means includes a pair of parallel conveyors, said conveyors having opposing surfaces adapted to grip major faces of the unit of compressible material, said opposed surfaces being substantially parallel and moving in the same direction, and said interposing means having an inlet end adjacent a discharge end of the compressing means, and
b. said interposing includes means for feeding a first sheet between said unit of material and one of the opposing surfaces and for feeding a second sheet between said unit of material and the other of the opposing surfaces.

14. The method of packaging compressible material as defined in claim 1 wherein:
the lateral edge portions are sealed while means is located between the lateral edge portions and lateral edges of the material to prevent the material from extending into the regions of the lateral edge portions while the lateral edge portions are being sealed.

15. The method of packaging compressible material as defined in claim 14 wherein
the lateral edge portions and the transverse portions are heat sealed and air is directed onto the lateral edge portions to help speed solidification of the lateral edge portions after heat has been applied to the lateral edge portions during the heat sealing.

16. The method of packaging compressible material as defined in claim 1 comprising:
repeating steps (a) through (f) of claim 1 for successive units of the compressible material.

17. The method of packaging compressible material as defined in claim 1 wherein:
the sealing is effected for the major extent of the lateral edge portions and the transverse portions with the portions having unsealed sections to permit air to pass into and out of the package.

18. The method of packaging compressible material as defined in claim 3 wherein:
the sealing is effected for the major extent o the lateral edge portions and the transverse portions leaving unsealed sections to permit air to pass into and out of the package.

19. The apparatus for packaging units of a compressible material as defined in claim 8 wherein:
the sealing means comprises transverse sealing of means for simultaneously sealing leading transverse portions of the sheets which are associated with one unit and trailing transverse portions of the sheets which are associated with an immediately preceding unit and lateral sealing means for sealing the lateral portions of the sheets associated with the one unit.

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