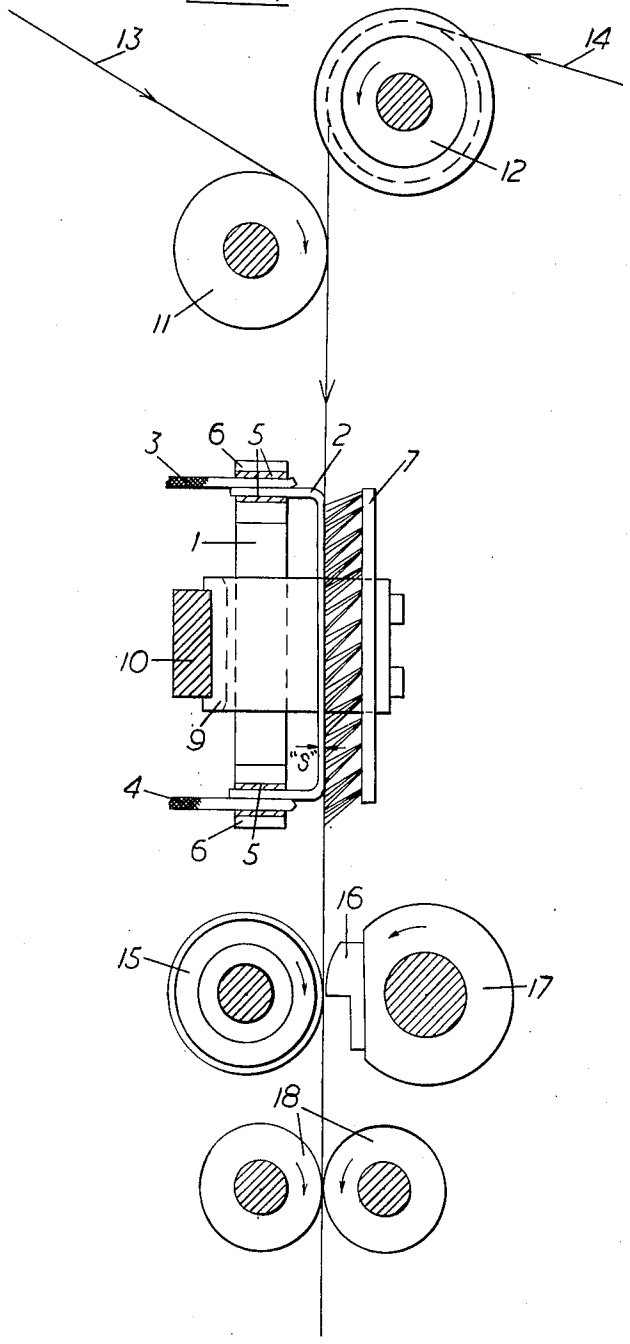
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PACKAGING MACHINES

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FIG. 1.

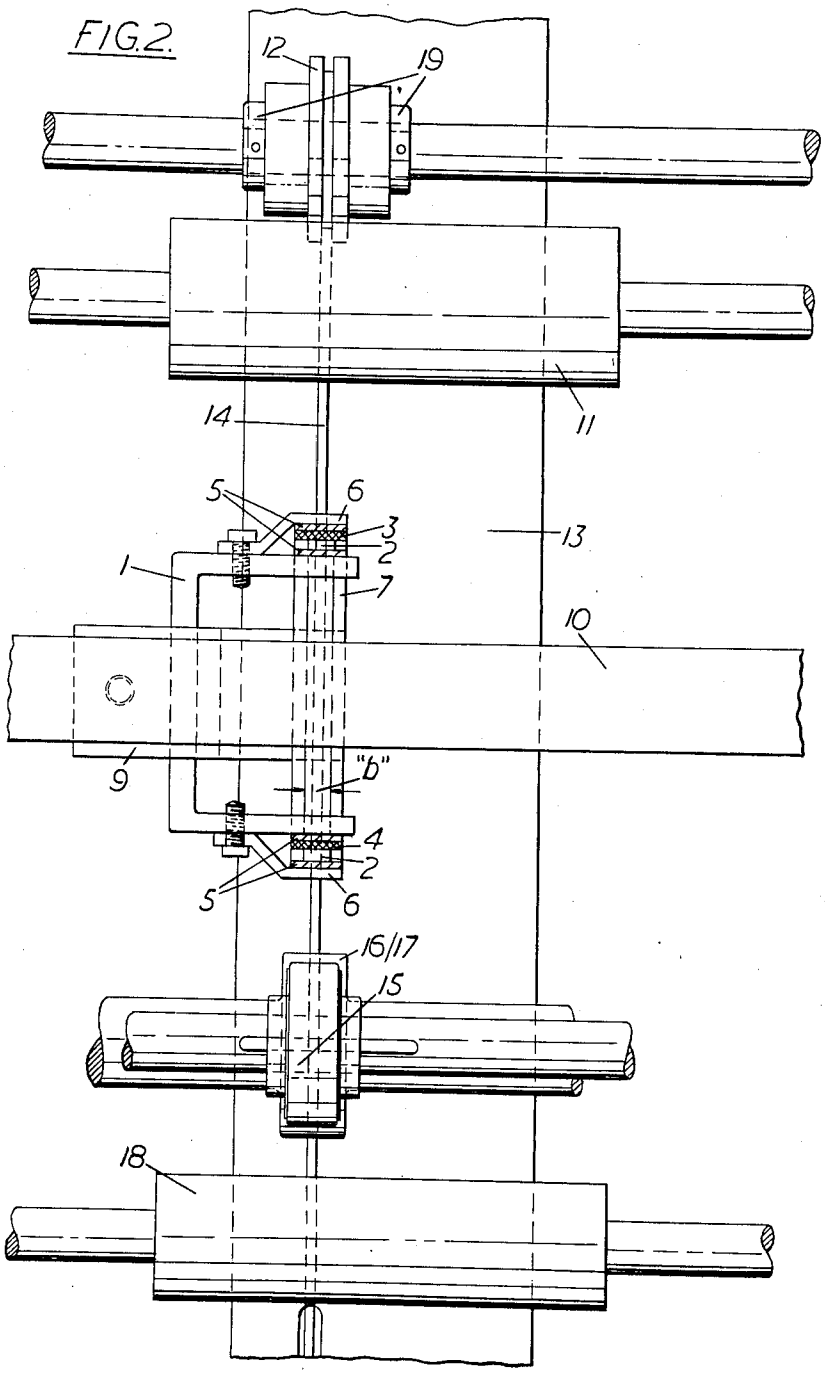


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FIG. 2.



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FIG. 3.

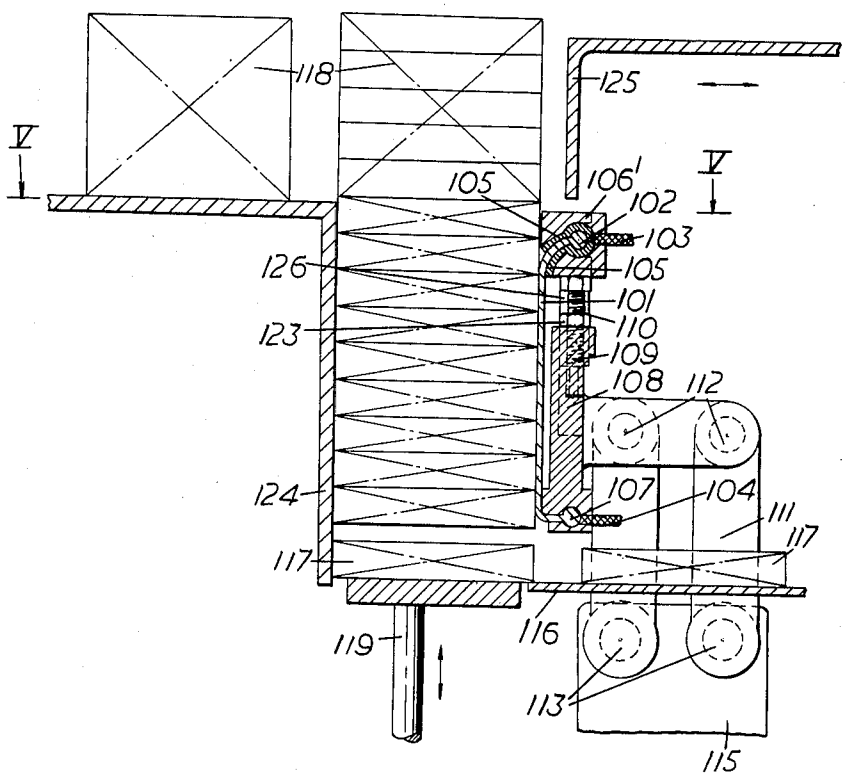
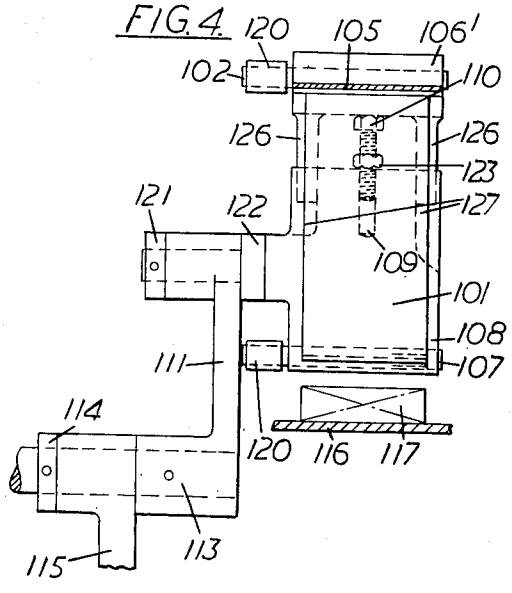


FIG. 4.



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FIG.5.

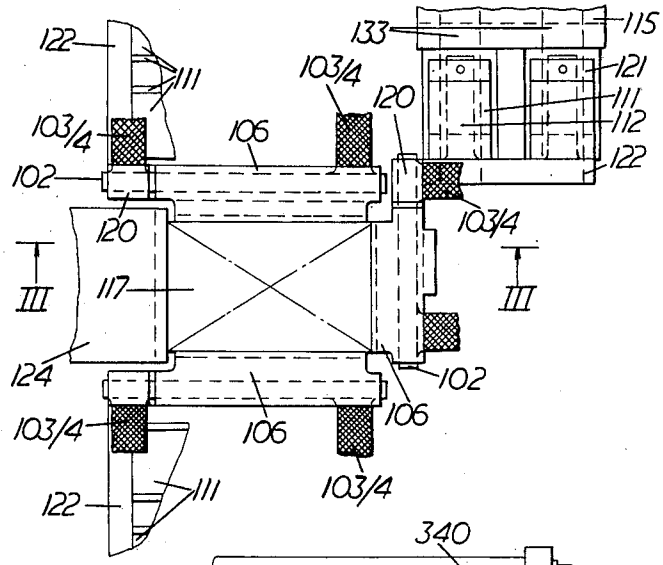
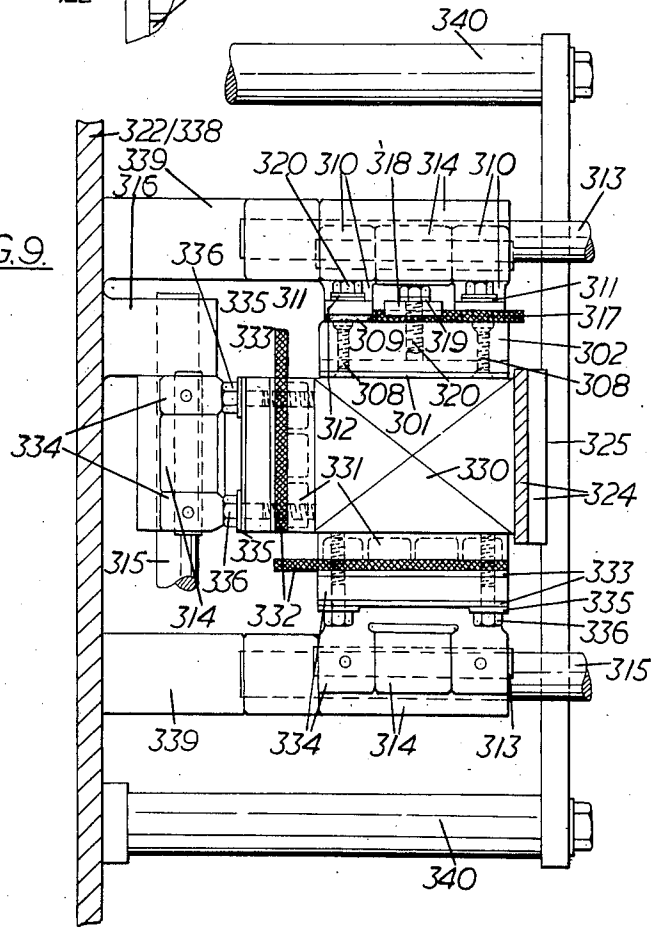
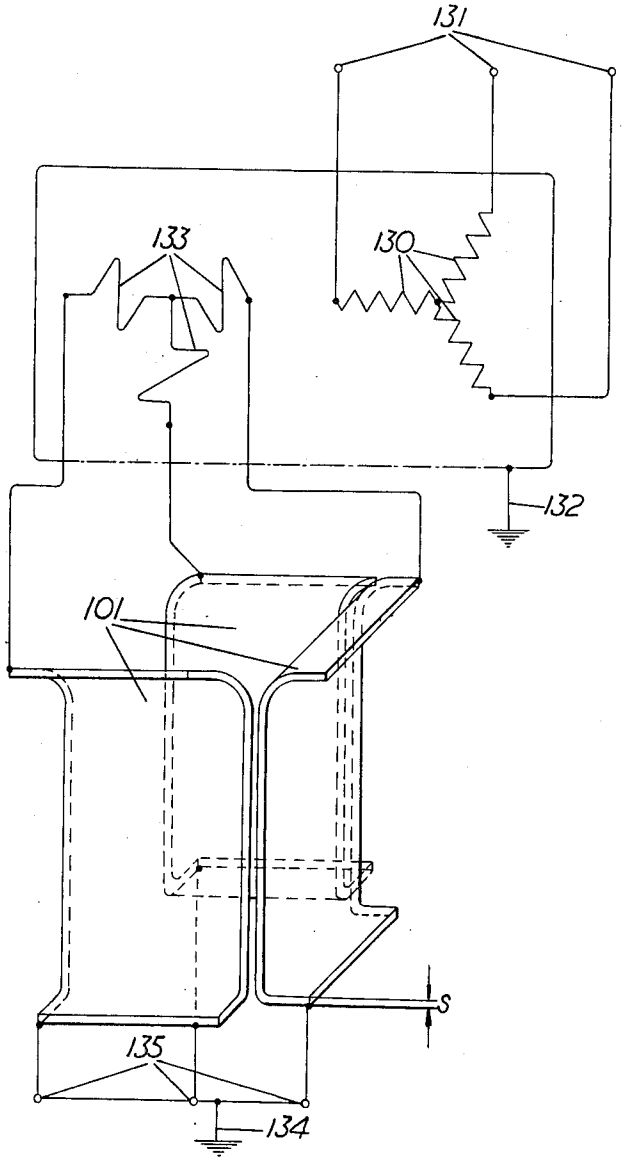


FIG.9.



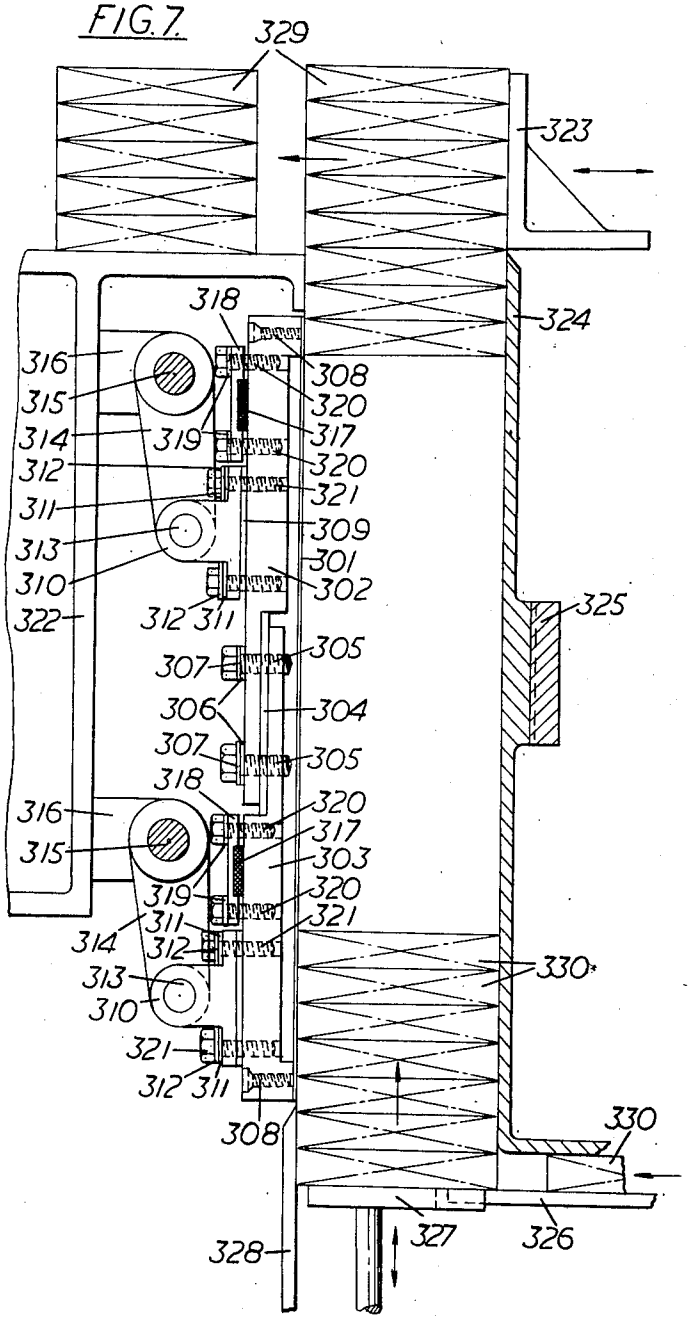
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FIG.6.



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FIG. 7.

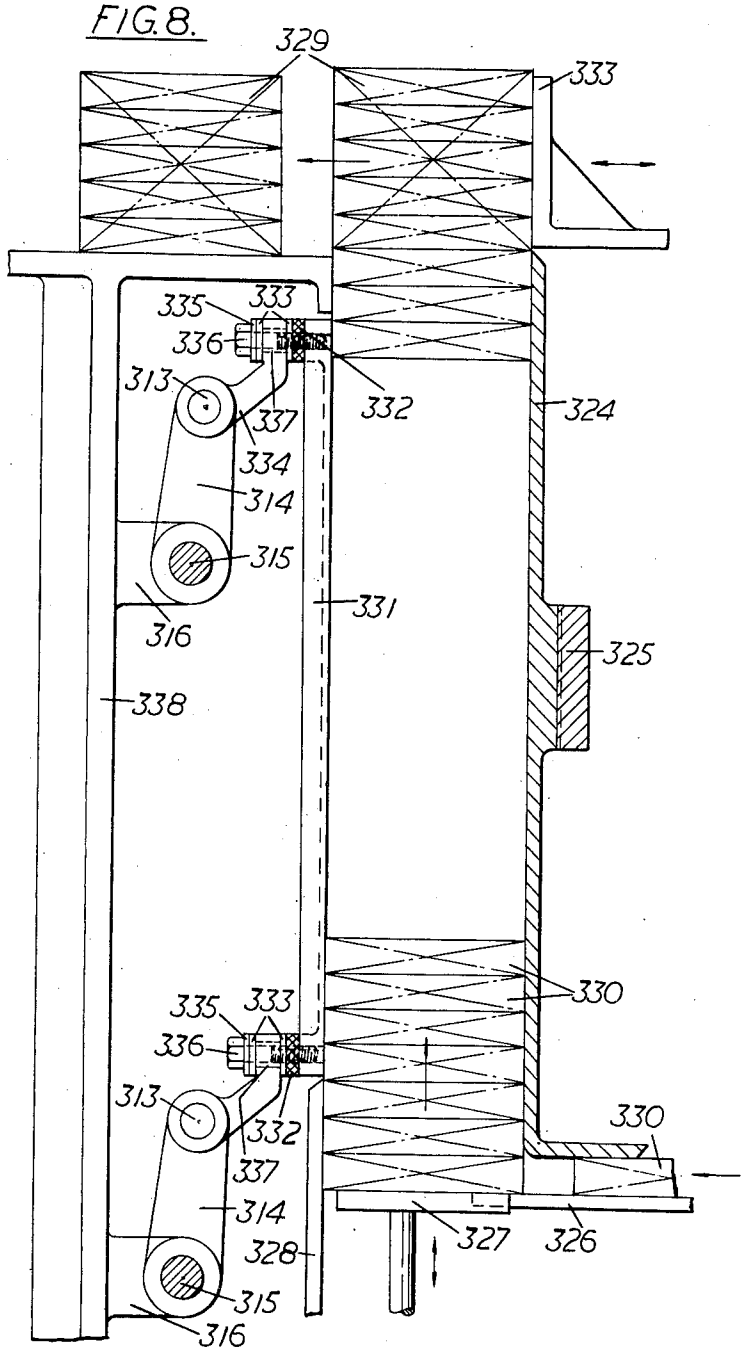


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FIG. 8.



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FIG. 10.

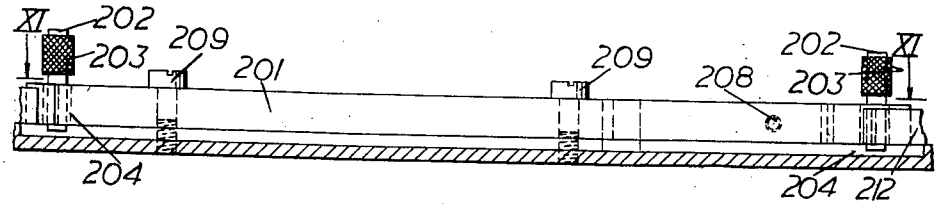


FIG. 11.

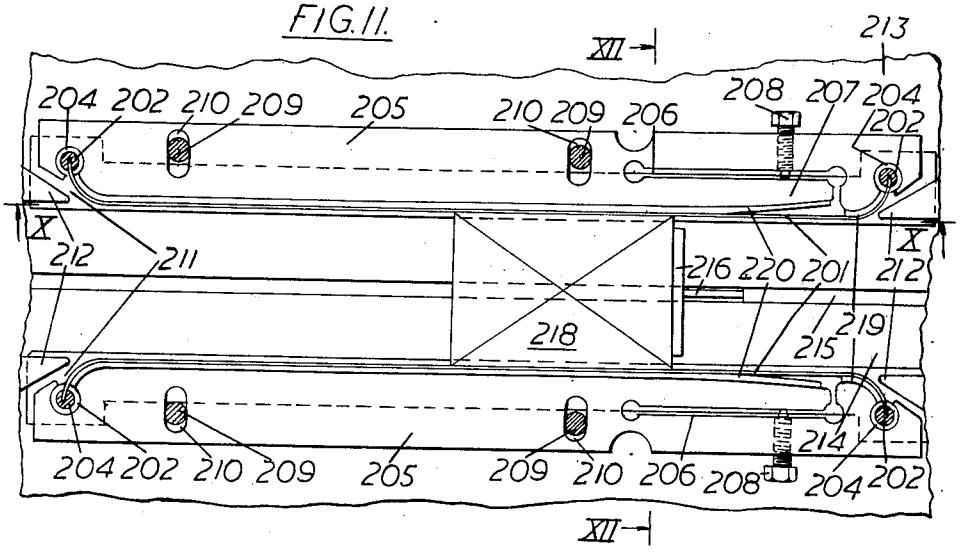
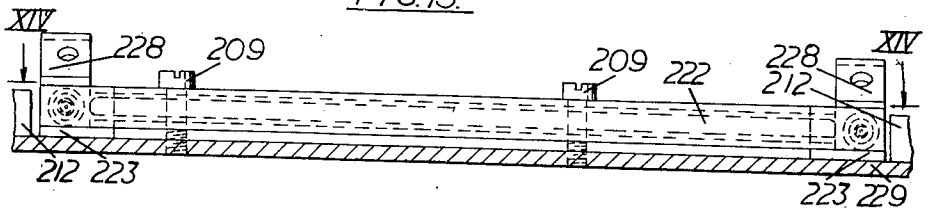


FIG. 13.



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FIG. 14.

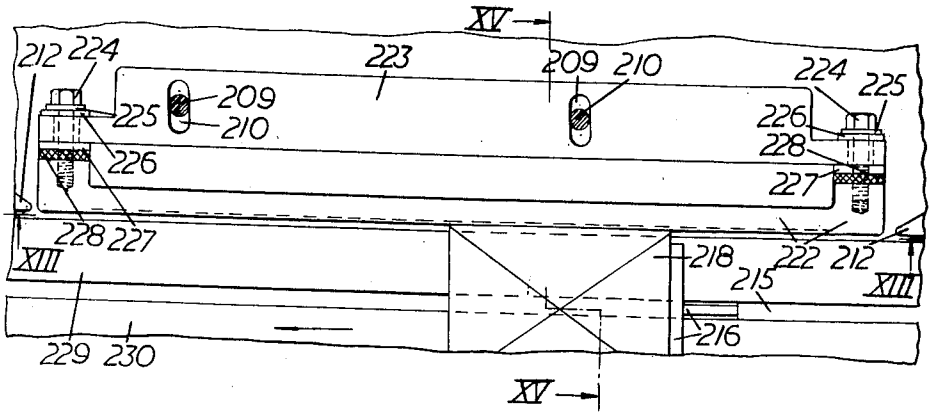


FIG. 12.

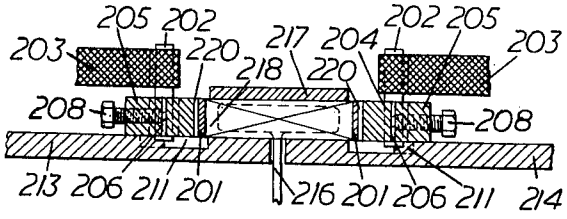
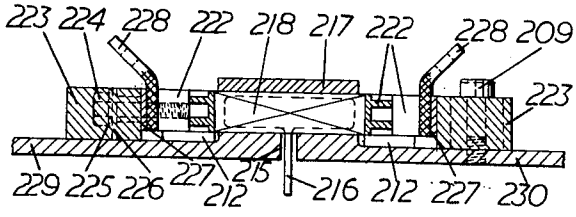


FIG. 15.



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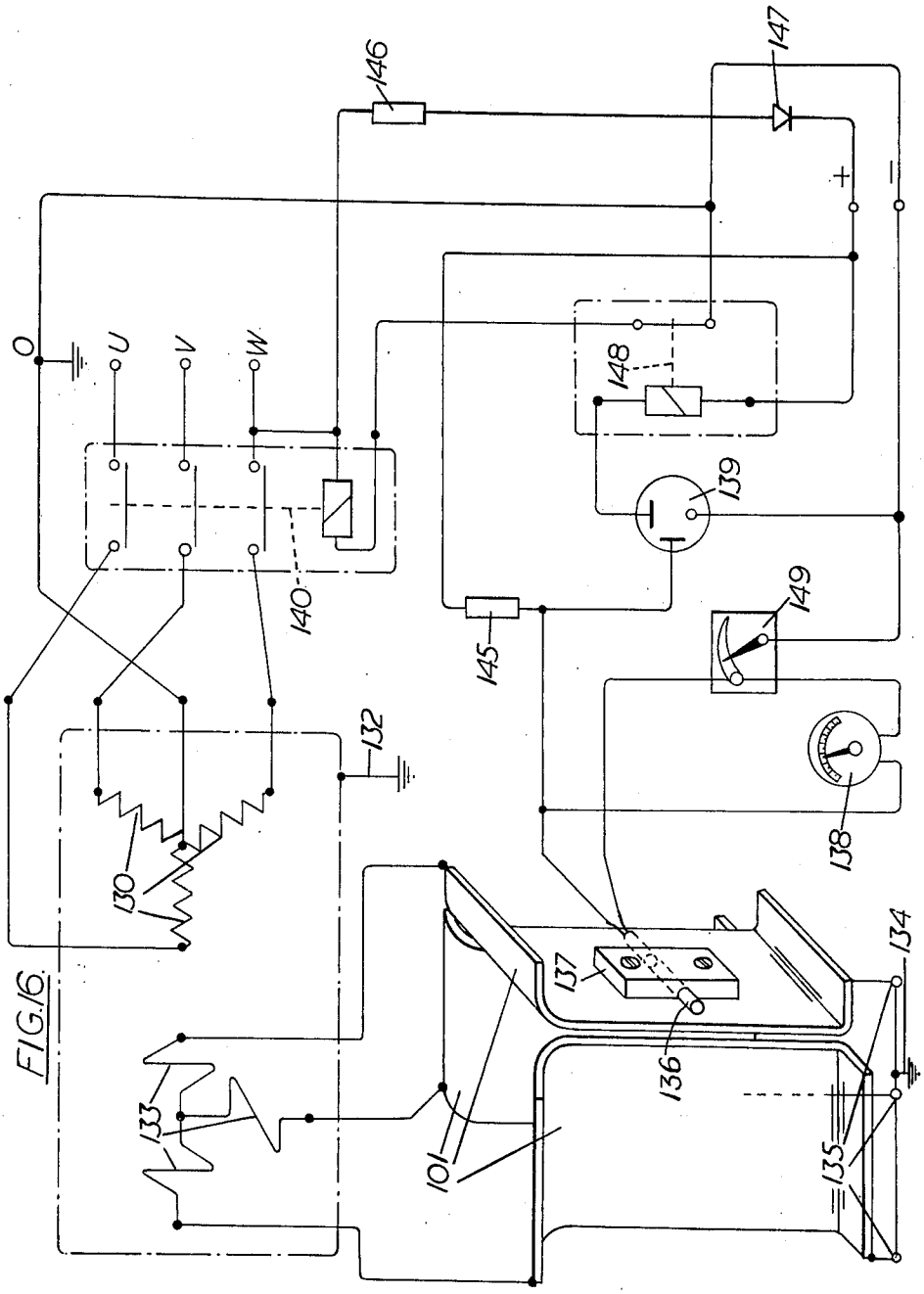


FIG. 16.

United States Patent Office 3,236,027 Patented Feb. 22, 1966

3,236,027

PACKAGING MACHINES

Alfred Schmermund, 62 Kornerstrasse, Gevelsberg, Westphalia, Germany

Filed May 8, 1961, Ser. No. 108,423
1 Claim. (Cl. 53—388)

The invention relates to packaging machines, wherein articles are enveloped in wrapping material and overlapping portions of the wrapping material are glued together. On high-speed packaging machines the portions glued together are usually heated to accelerate drying of the glue.

For this purpose walls of guide channels, of guide chutes or similar guide passages for the wrapped articles are provided with electric heating bodies positioned against wall surfaces outside the channels, chutes or the like, so that such walls are heated throughout.

Such arrangements are expensive in use, liable to disturbances and have also disadvantages caused by the construction of the heating bodies. A heating body usually comprises electric resistance wires wound on mica plates, resistance wires of adjacent mica plates being insulated from each other by additional mica plates, the assembly of mica plates and wires being encased in a metal box internally covered with asbestos or ceramic insulating material. The insulation acts as an electric insulation and as a thermal insulation, so that in use a high temperature exists within the heating body; moreover heat created within the body cannot easily reach the outside thereof. Thus, a high temperature has to be maintained within a heating body to enable the heating body to transmit a sufficient amount of heat to the walls to be heated. Consequently, the resistance wires are liable to fuse and have often to be replaced, which necessitates maintaining a stock of heating wires, so as to be able speedily to replace a wire which has become faulty.

Furthermore, the heating body has a high thermal inertia. Initially, a considerable time is required for heating before sufficient heat is given off by the heating body. The heating body reacts only slowly, and with a considerable delay, to variations of an electric heating current, which are due to an automatic heat control arrangement. If for any reason the packaging machine stops it is necessary to separate the heated walls of the channels, chutes or the like from the packaging material since otherwise the packaging material may become scorched or burnt. The separation has to be effected automatically and means therefore are expensive .

It is an object of the present invention to provide a packaging machine wherein thermal inertia effects due to the presence of insulating material are virtually eliminated. The heating members are of simple and inexpensive construction and a minimum of heat is taken up in the interior volume of walls and the like of the machine.

It is a further object of the invention to provide such a machine in which heat is applied substantially solely to surfaces effective for bonding the packaging material, tear strips or the like.

Yet another object of the invention is to provide a machine in which heating surfaces are heated electrically at safe, low voltages, whereby the provision of insulating material may be reduced to a minimum.

It is a further object to provide a packaging machine wherein the temperature of heating surfaces may be maintained at a value such that packaging material is unharmed by remaining in contact therewith should the machine be stopped for any reason, while the electric power consumption is also and consequently kept low.

A feature of the invention consists in a packaging machine comprising a guide passage having a wall or wall

portion of electrically conducting material, means being provided for feeding an electric current to said wall or wall portion for heating the same, further means being provided for ensuring mechanical contact between said wall or wall portion and wrapping material to heat the same.

According to another feature of the invention the electrically conducting material may be in the shape of a tape. Means may be provided for tensioning the tape. The tensioning means may comprise a tensioning screw co-operating with a holder for the tape and arranged for displacing said holder when said screw is turned.

Alternatively, the electrically conducting material may be in the shape of a profiled metal bar.

According to further features of the invention a thermostatic device may be provided and arranged for sensing the temperature of the electrically conducting material and for automatically controlling the electric current in dependance on the sensed temperature. Means may be provided for temporarily increasing the electric current on starting the machine so as to reduce the time required for heating the electrically conducting material to a desired temperature. The increasing means may comprise a time-delay switch.

Since the electrically conducting material makes mechanical contact with enveloping wrapping material to be heated, an electric current of high sensitivity but low voltage may be fed to the conducting material. The voltage may be so low that it is electrically safe to touch the conducting material while the current is flowing therein. Since the conducting material is in mechanical contact with the wrapping material, the temperature of the conducting material may in most cases be kept below 200° C. and may in exceptional cases reach 200° C., or, at the most 250° C. At such temperature the conducting material if made of a suitable metal or metal alloy does not oxidise or fuse. Owing to the low voltage the electric insulation of the conducting material may be kept to a minimum. In order to save electric energy, the conducting material may be heat insulated at its parts remote from the wall or wall portion to be heated. It has been found that in some cases 50 watt may be sufficient. The heat transmitted from the electrically conducting material to the enveloping wrapping material may not only be used for drying a glue or other adhesive, but may alternatively be used for heat sealing the wrapping material if a suitable wrapping material is used.

To make the invention clearly understood reference will now be made to the accompanying drawings, which are given by way of example and in which:

FIG. 1 illustrates a side view of an arrangement for heating heat-sealable wrapping material whereby to attach a tear-strip thereto;

FIG. 2 illustrates a front view of the arrangement of FIG. 1;

FIG. 3 illustrates a section along the line III—III of FIG. 5 of a part of a packaging machine comprising means for heating a guide channel for wrapped articles;

FIG. 4 illustrates a side view corresponding to FIG. 3;

FIG. 5 illustrates a section along the line V—V of FIG. 3;

FIG. 6 is an electric circuit diagram of the arrangement of FIGS. 3, 4 and 5;

FIG. 7 illustrates a modified arrangement;

FIG. 8 illustrates another modified arrangement;

FIG. 9 illustrates a further modified arrangement;

FIG. 10 illustrates a section along the line X—X of FIG. 11 of a further modification;

FIG. 11 illustrates a section along the line XI—XI of FIG. 10;

FIG. 12 illustrates a section along the line XII—XII of FIG. 11;

FIG. 13 illustrates a section along the line XIII—XIII of FIG. 14 of a still further embodiment;

FIG. 14 illustrates a section along the line XIV—XIV of FIG. 13;

FIG. 15 illustrates a section along the line XV—XV of FIG. 14; and

FIG. 16 illustrates a circuit diagram.

By means of the arrangement of FIGS. 1 and 2, a narrow tear strip **14** is fixed to a wider web **13** made of cellulosic or other heat-sealable material.

The arrangement comprises a heating bar **2** of a thickness *s* and a width *b*. The bar **2** is attached to, but insulated from, a U-shaped holder **1** which in turn is fixed to a transverse rod **10** mounted on a support **9**. Heating current is fed to the bar **2** by means of conductors **3** and **4**, which preferably are made of flexible copper beads, the conductors **3** and **4** being insulated by insulators **5**, and electrically connected to the bar **2** by clamps **6**. In front of the bar **2** a brush **7** is provided which is fixed to the rod **10**.

The end of each tear strip **14** is cut into shape by a cutting device **15**, **16**, **17** known per se. Feed rollers **18** feed the web **13** and the tear strip **14** from bobbins (not shown) across guide rollers **11** and **12** through the arrangement.

The heating bar **2** is preferably made of a chromium alloy and is electrically heated from a mains by means of a transformer. A thermostatic device (not shown) maintains the temperature of the bar **2** at a required value.

The bar **2** is heated to the required temperature only along its part of thickness *s* and width *b* where the cross-section *a* x *b* is small, whereas its temperature is not essentially increased beyond room temperature along its parts of larger cross-section where in addition any heat is quickly conducted away.

When the machine stops and the feed of the web **13** and tear strip **14** is interrupted, a simple relay (not shown) interrupts or reduces the heating current circuit so that the web **13** and tear strip **14** are not overheated while arrested. When the machine is re-started, the heating current circuit is closed again so that the required temperature of the bar **2** is restored. If desired, an additional time-relay may be provided for temporarily increasing the heating current and thereby reducing the time required for the bar **2** to reach its required temperature.

In FIGS. 3 to 6 a heating arrangement is illustrated, which may be used in packaging machines and which comprises a guide channel at the end of a feed table **116** for wrapped articles, walls of the guide channel being heated at regions where glued seams are present in a wrapping enveloping an article. The walls of the guide channels are usually so arranged that wrapped articles can travel through the channel with lateral play so as not to impede movement of the articles by unavoidable slight differences in their dimensions. On the other hand, if packed articles are moved through a vertical channel the articles are held therein by brushes or other resilient means so as to prevent the articles from dropping down when not supported.

FIGS. 3 to 5 illustrate a vertical guide channel formed between a channel wall **124** and three further channel walls **106**. A push member **119** is provided, which is vertically reciprocatable, for pushing a wrapped article **117**, for example a box of cigarettes, which arrives at the end of the horizontal feed table **116**, upwards into the guide channel. A second push member **125**, which is horizontally reciprocatable, is provided for laterally moving an assembly **118** of a plurality of wrapped articles out of the guide channel onto a horizontal guide plate. The channle walls **106** are movably held by the levers **111** forming parallelogram-guides and which are mounted by means of spindles **113** on a frame **115**. The levers **111** carry the channel walls **106** by means of spindles **112** and rods **122**. The channel walls **106** serve to heat the articles **117**, and each wall **106** comprises a tensionable metallic heating tape **101**, which is fixed to holders **106'** and **108** by means of cylindrically thickened end portions **102** and **107**, the portion **102** and the adjacent tape being provided with insulating layers **105**. If desired, the thickened portion **107** could be similarly insulated. Each holder **108** is provided with a bar **122** journalled to two parallel levers **111**. Each holder **106'** is displaceably mounted in the respective holder **108**, and the heating tape **101** can be tensioned by screw means comprising a nut **123** on a screw-threaded spindle **110** carrying a holder **106'** and engaging a bore in the holder **108** against a shoulder of which the nut **123** bears. A lead **104** connects each thickened portion **107** to a terminal **135** connected to earth **134** (see FIG. 6). A lead **103** connects each thickened portion **102** to a secondary winding **133** of a transformer, the primary winding **130** of which is connected at **131** to a mains supply. The transformer is a low voltage transformer supplying at its secondary winding **133** a heavy current at a low voltage.

The arrangement operates in the following manner:

The vertically reciprocatable push member **119** pushes individual articles **117**, for example cigarette boxes, which arrive from the feed table **116** upwards into the vertical guide channel between the walls **124** and **106**. An assembly **118** of articles at the upper end of the guide channel is pushed by the second push member **125** on to a horizontal guide plate. On each upwards movement of an article **117** by the push member **119** the three movable channel walls **106** are forced to move somewhat outwards so that the articles can move upwards without substantial friction, the walls **106** being held in their initial positions by spring means (not shown). Electric current flows through the tapes **101** forming portions of the walls **106** and heats said tapes, the heat being directly transmitted from the tapes to the articles sliding therealong, so that any glue of the wrapping material is dried during the passage of the articles through the guide channel.

Many modifications are possible.

For example, as illustrated in FIG. 7, the heating walls of the guide chute each may comprise a heating tape **301** which at its end is fixed to ends, remote from each other, of two bars **302** and **303** which are insulated from each other by a layer **304** of insulating material and insulating washers **306**, and are connected together by screws **305** and nuts **307**. The screws **305** pass through elongated holes in the bar **302** so that after loosening the screw connection the bars **302** and **303** are displaceable relatively to each other for tensioning the heating tape **301**. The bars **302** and **303** are carried by bearings **310** on parallel levers **314** and are insulated therefrom by insulating material **309**, **312** and **311**. The levers **314** are pivotally mounted on pivot shafts **315** of holders **316** of a frame **322**. The levers **314** are movable by means known per se.

Whereas the heating walls each formed by the heating tape **301** are movable, a well **324** of the guide chute is fixed in position and is not heatable. The wall **324** is fixed to a bar **325** which in turn is fixed on bars of the frame **322**, the bar being analogous to the bars **340** of the embodiment of FIG. 9. Electric heating current is fed to the bars **302** and **303** and thence to the tape **301** by means of conductors **317**.

A push member **327** is vertically reciprocatable for pushing articles **330** arriving at the end of a feed table **326** through the chute. A second push member **323**, which is horizontally reciprocatable, removes an assembly **329** from the chute as its upper end.

With the embodiment of FIG. 7, the movable heating walls of the chute may be arranged for exerting a substantial pressure on articles **330** travelling through the chute so that not only glue of the wrapping is dried under heat, but the articles, for example cigarette boxes, are pressed into rectangular shape.

In the arrangement of FIG. 8, which is generally similar to that of FIG. 7, a heating wall **331** is rigid and, as

is visible in FIG. 9, has U-shaped recesses for reducing the cross section. The wall **331** is preferably made of an electrically conducting metal alloy to form an electric heating resistance, the wall **331** being mechanically sufficiently resistant and is corrosion resistant. The heating walls **331** are insulated by insulating material **333**, **337** and attached to arms **334** mounted on pivot shafts **313** of of levers **314**. The shafts **313** are fixed to holders **318** of a frame **338**. Current is fed by conductors **332**.

In the embodiment of FIG. 9 a chute is provided having a rigid, not heatable wall **324** analogous to the wall **324** of FIG. 7 or 8, a heatable wall **301** analogous to the wall **301** of FIG. 7 and two heatable walls **331** analogous to the wall **331** of FIG. 8. Since FIG. 9 illustrates a section perpendicular to the sections of FIGS. 7 and 8 further details of the walls **301** of FIG. 7 and **331** of FIG. 8 are recognizable from FIG. 9.

The embodiments of FIGS. 10 to 15 comprise heating arrangements suitable for heating glued, welded or otherwise sealed lateral portions of a wrapped article.

The arrangement of FIGS. 10 to 12 comprises thin tensionable heating tapes. A guide passage for articles **218** is formed by heating tapes **201** and a feed table having two portions **213** and **214** to which, by means of screws **209**, holders **205** for the heating tapes **201** are fixed, onto to each of said portions. Each holder **205** carries one heating tape **201**, which has thickened ends **202** each mounted in a slotted tube **204** of insulating material. Each heating tape **201** is made of electrically conducting, sufficiently heat resisting material. At its side remote from articles to be heated, the tape **201** carries a layer **220** of insulating material. Each holder **205** has a slot **206** enabling tensioning its tape **201** by means of a screw **208**. Electric current is fed to the tape **201** by means of conductors **203**. Lateral guide rails **212** are provided for guiding the articles **218** to the heating tapes. Push members **216** move articles **218** through the heating arrangement. A lid **217** covers the top of articles **218**.

The arrangement of FIGS. 13, 14 and 15 comprises heating bars **222** of a cross section visible in FIG. 15. A guide passage comprises a feed table having two portions **229** and **230** along which articles **218** are moved by a push member **216**. One heating bar **222** is provided at each side of the articles to form, together with the feed table a guide passage. Each heating bar **222** is insulated by insulating material **226** and **227** from, and is attached to, holding bars **223** by means of screws **224**, the holding bars **223** being fixed by screws **210** engaging elongated holes **209** of the bars **223** to the feed table portions **229** and **230**. Electric current is fed through conductors **228**. Lateral guide rails **212** are provided for guiding the articles **218** to the heating bars.

In operation of the embodiments of FIGS. 10 to 15, a heavy current of low voltage is fed to the heating tapes or heating bars which are quickly heated to a desired temperature and transmit heat by direct contact quickly and effectively to the articles to be heated.

By providing heat sensitive devices at suitable places of the heating tapes or bars, for example at their sides remote from the articles to be heated, the heat can be controlled by suitable control means acting, for example, on the current flowing through the primary winding of a transformer linking the tapes or bars to an electric mains.

A circuit diagram comprising a heat sensitive device is shown in FIG. 16, in which the reference numerals **101**, **130**, **133**, **134** and **135** indicate the same parts as the corresponding reference numerals of FIG. 6. An electromagnetically operable switch **140** lies in a mains supply circuit for an electric current having three phases U, V, W for energizing the primary windings **130** of a three phase transformer, the secondary windings **133** being connected to three wall portions **101** to be heated. An earthed wire is indicated by **0**. A heat sensitive resistor **136** is

placed against one of the walls **101** so as to be heated by said wall, the resistor **136** being held in position by a heat insulating holder **137**. The heat sensitive resistor **136** lies in series with a variable resistor **149** and both resistors **136** and **149** lie in the control circuit of a cold cathode tube **139**. A voltmeter **138** lies across the resistor **136**. A biasing potential is applied to the control circuit of the tube **139** through a resistor **145**. An electromagnet **148**, the contacts of which are normally open, lies in the anode circuit of the tube **139**, and is arranged for operating the switch **140**. An anode resistor **146** and a rectifier **147** also lie in the anode circuit of the tube **139**. The tube **139** is ignited at a predetermined voltage on the control electrode of the said tube. As long as the voltage on the control grid is below the predetermined voltage the tube **139** is not ignited; it is ignited when the voltage on the control grid is equal or higher than the predetermined voltage, which for example may be 80 volts. When the tube **139** ignites, the electromagnet **148** is energized and closes its contacts, whereby the switch **140** is operated and energizes the transformer windings **130** causing the wall portions **101** to be heated by the transformer windings **133**. The resistor **136** is heated and its resistance reduced, so that the voltage on the control electrode of the tube **139** is decreased and the tube **139** quenched. The electromagnet **148** relapses and causes the switch **140** to open. The walls **101** cool down, causing the resistor **136** to cool down. Thereby its resistance increases until the tube **139** is re-ignited and so on. Thus, the temperature of the walls **101** oscillates between two limits which may be narrow. The mean temperature about which the temperature of the walls **101** oscillates is settable by means of the variable resistor **149** since the heat sensitive resistor **136** and the resistor **149** together constitute a potential divider. The variable resistor **149** may be calibrated in temperature values, corresponding to mean temperatures about which the wall temperature oscillates. The voltmeter measures the voltage drop across the heat sensitive resistor **136** which is proportional to the instantaneous wall temperature. Again, the voltmeter **138** may be calibrated in temperature voltages.

I claim:

In a packaging machine, a plurality of substantially vertically extending walls disposed adjacent each other to form a guide channel chute therebetween, a plunger adapted to move wrapped packages upwardly in said channel and between said walls along said channel chute, a first heated rigid wall having a substantially planar flat surface facing toward said guide channel chute, a second wall having a cross section consisting of a plurality of U shape recesses with said recesses to form a substantially flat planar surface facing toward said chute, said second wall being made of electric resistant material, and means to feed electric current directly to said second wall, two other walls with substantially flat planar surfaces facing toward said chute, and means for moving at least two of said walls toward an oppositely disposed wall, whereby said packages can be heat sealed as they are moved through said chute.

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TRAVIS S. McGEHEE, *Primary Examiner.*

ROBERT A. LEIGHEY, FRANK E. BAILEY,

Examiners.