June 16, 1953 A. M. DONOFRIO 2,641,881

PACKAGING EQUIPMENT

Filed Dec. 4, 1946 2 Sheets-Sheet 1

FIG. 1

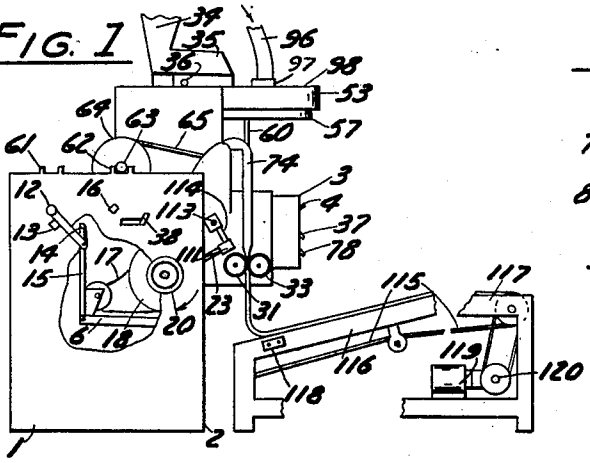


FIG. 2

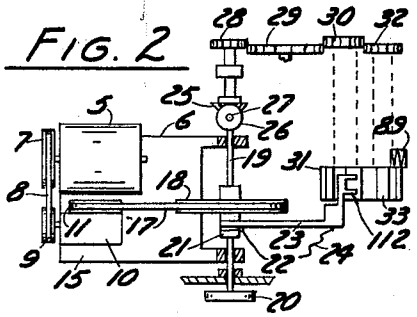


FIG. 3

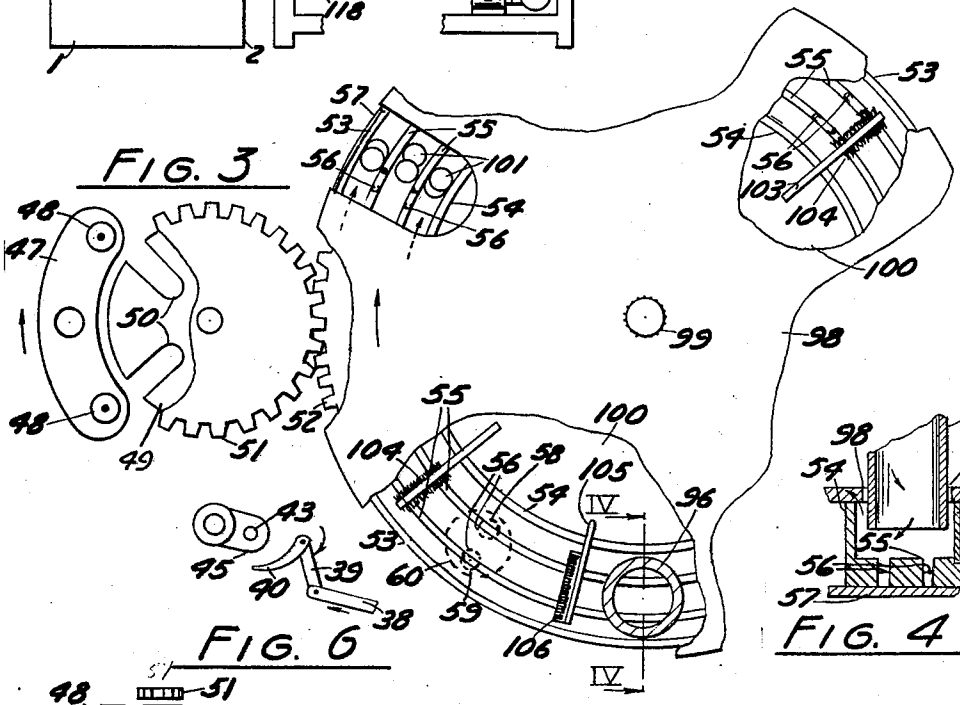


FIG. 6

FIG. 4

FIG. 5

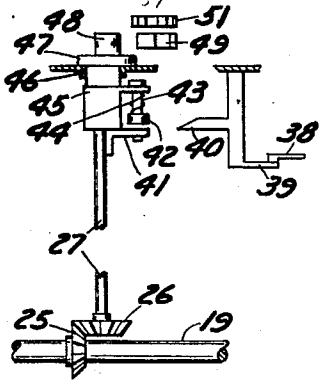
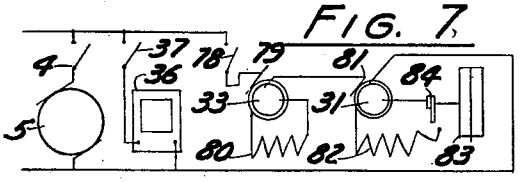


FIG. 7



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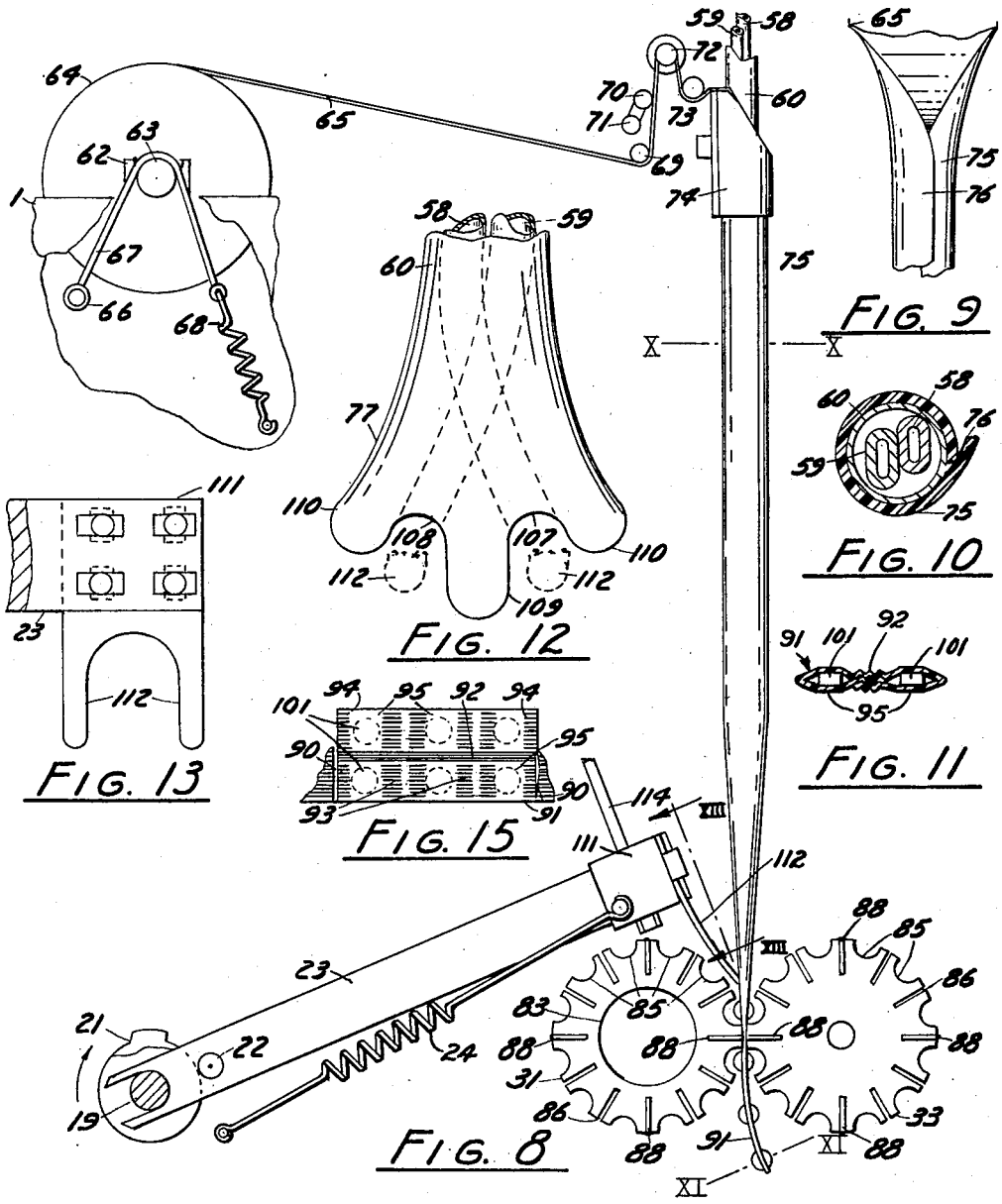
By

Attorney

June 16, 1953 A. M. DONOFRIO 2,641,881

PACKAGING EQUIPMENT

Filed Dec. 4, 1946 2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,641,881

PACKAGING EQUIPMENT

Alfonso M. Donofrio, Toledo, Ohio, assignor, by mesne assignments, to McKay-Davis Chemical Corporation, Toledo, Ohio, a corporation of Ohio

Application December 4, 1946, Serial No. 713,861

3 Claims. (Cl. 53—86)

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This invention relates to equipment for forming packages from sheet packaging material which is shaped and sealed around units of the commodity to be packaged in a continuous operation.

The invention is particularly designed to control the delivery of the commodity units by timing their release from a bulk supply into means which guides the units into position to be immediately enveloped by the packaging material, such as cellophane or the like, which is then sealed about the units.

The principal object of the invention is to provide strip packaging equipment in which the units of commodity are in contact with a minimum number of machine elements and are handled individually only one time, thus reducing sharply the possibilities of contamination and the likelihood of waste.

Referring to the drawings:

Fig. 1 is a somewhat diagrammatic view in elevation, with parts broken away, of a machine embodying the invention which is designed for the packaging of units of commodity such as pills and tablets.

Fig. 2 is a schematic plan view of a power transmission for the machine shown in Fig. 1.

Fig. 3 is a plan view, on a larger scale, of commodity feeding mechanism incorporated in the machine shown in Fig. 1.

Fig. 4 is a detail view in section taken substantially on the line IV—IV of Fig. 3.

Fig. 5 is a side view of the clutch connection drive between the general transmission shown in Fig. 2 and the commodity feeding mechanism shown in Fig. 3, the clutch actuator being shown at one side, to avoid obscuring the clutch proper.

Fig. 6 is a plan view of the clutch release in position to disconnect the tablet feeding transmission.

Fig. 7 is a wiring diagram of electrical features of the machine shown in Fig. 1.

Fig. 8 is a partially diagrammatic view in side elevation of a mechanism for forming and feeding packaging material.

Fig. 9 is a fragmentary detailed view taken from the upper right side of Fig. 8.

Fig. 10 is an enlarged section view, taken on the line X—X of Fig. 8.

Fig. 11 is an enlarged sectional view taken on the line XI—XI of Fig. 8.

Fig. 12 is an enlarged view of the lower open end of commodity guide means.

Fig. 13 is a fragmentary detailed view of portions of the mechanism taken from the position indicated by the line XIII—XIII of Fig. 8.

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Fig. 14 is a fragmentary detailed view of a portion of one of the sealing rolls.

Fig. 15 is a view in elevation of a completed group of packages.

A general housing 1 at its work delivery side 2 carries a switch box 3 (Fig. 1). A switch 4 in the box 3 controls a motor 5 (Fig. 2) which is mounted on a pivoted deck 6. The motor 5 has a pulley 7 in which is engaged a belt 8 which also is engaged in a pulley 9 mounted on the input shaft of a speed reduction device 10. The speed reduction device has a power output shaft on which is mounted a pulley 11. A control handle 12 is mounted on the exterior of the housing 1. The travel of the handle 12 in a counterclockwise direction is limited by a stop 13 at a point such that an associated arm 14 is carried beyond dead center position for a depending link 15 extending between the arm 14 and the deck 6. Upon moving the handle 12 away from the stop 13 and to a stop 16 the weight of the motor 5 and the speed device 10 swings the deck 6 downwardly tightening a belt 17 engaged with the pulley 11 and with a pulley 18 which is mounted on a main drive shaft 19 (Fig. 2).

The drive shaft 19 is journalled in the housing 1 with one end protruding therefrom. A handwheel 20 is mounted on the outer end of the shaft 19 and is adapted for manual operation of the working parts. A cam 21, which is pinned on the shaft 19, has a raised surface which engages a roller 22 mounted on a forked arm 23. The arm 23 has a bifurcated lower end which loosely embraces the shaft 19 and is maintained in position by the tension of a helical spring 24 (Fig. 8).

A bevel pinion 25 on the shaft 19 is in mesh with a similar pinion 26 pinned on the lower end of a vertically extending shaft 27 (Fig. 7). On the end of the shaft 19 remote from the handwheel 20 there is fixed a pinion 28 (Fig. 2) which is in mesh with an idler gear 29 in turn meshed with a gear 30 mounted on the shaft of a crimping roll 31. The gear 30 is in mesh with a gear 32 for a companion crimping roll 33.

A commodity supply hopper 34 (Fig. 1) empties into a chute 35 equipped with a vibratory feeding device 36 which is under the control of a switch 37 mounted on the switch box 3.

A control handle 38 which extends out of the housing 1 is connected to an arm 39 (Figs. 5 and 6) on a swinging wedge cam 40 which can be moved above an arm 41 mounted on the vertical shaft 27. A collar 42 is mounted by a pin 43 to slide upwardly against the resistance of a helical spring 44, in an arm of a sleeve 45 which is loosely journalled on the shaft 27. The collar

42 normally engages the arm 41 but when the handle 38 is moved inwardly, the collar 42 rides up on the cam 40 and clears the arm 41 on its subsequent revolutions with the shaft 27. Thus, though the shaft 27 may continue to rotate, the sleeve 45 stops.

The sleeve 45 extends upwardly through a bearing 46 in the housing 1 and mounts on its upper end a rotatable two-armed driving element 47 of a Geneva movement, the element 47 having a pair of drive rollers 48. When the handle 38 is pulled, the wedge cam 40 is moved away from the path of the collar 42 and the spring 44 thrusts the pin 43 downwardly through the arm of the sleeve 45. The lower end of the pin 43 is then in line with the arm 41 and is picked up by the arm 41 on the next rotation of the shaft 27. When the drive is disengaged by the operation of the cam 40 in lifting the collar 42 and pin 43, the driving element 47 is stopped with its rollers 48 clear of a radially notched follower element 49 of the Geneva movement. Upon re-engagement, the driving element 47 is rotated and its rollers 48 successively engage in notches 50 of the follower element 49, rotating the follower element 90 degrees for each rotation of the shaft 27.

A gear 51 which is pinned to the element 49 is in mesh with a ring gear 52 on the upper surface of which are cut a pair of concentric flanges 53 and 54 which form a trough. A pair of radially spaced grooves 55 are cut concentrically with the flanges 53 and 54 in the space between the flanges 53 and 54. Slots 56 (Figs. 3 and 4) are cut in the grooves 55 in radially aligned, circumferentially spaced pairs. A stationary horizontal plate 57 extends beneath and closely adjacent the ring gear 52 thus preventing any commodity from falling through the slots 56 except at a position immediately above the open upper ends of the two guide tubes 58 and 59 which extend through the plate 57 in the path of movement of the slots 56 at one of the stop positions of the gear 52. The guide tubes 58 and 59 extend vertically downwardly through a forming tube 60.

The housing 1 (Figs. 1 and 8) has seats 61 and 62 which provide bearings for the shafts 63 of one or more supply rolls 64 of the strip packaging material which may be, for example, a heat-sealable cellophane, wax paper or other relatively flexible heat-sealable sheet material. The flat strip stock has a take off reach 65 which is kept under tension by the action of a tensioning device comprising a pin 66 which serves as an anchor for a leather strap 67 passing over the shaft 63 and held under tension by a coil 68. The material then passes around a guide roll 69 and against the surface of a further tension control device consisting of a roller 70 mounted upon a pin 71 and then over a flanged directing roller 72 and beneath a further guiding roller 73. The material then passes over the upper end of a forming device 74 which curls the lateral edges of the material inwardly around the forming tube 60 overlapping and forming a tube 75 with an overlapped centrally located portion 76. The lowermost end of the forming tube 60 is flattened and may be slightly flared (Fig. 12) so that as the packaging material slides off the lower end of the forming tube 60 it is flattened into a generally ovaloid cross section.

The crimping rolls 31 and 33 are electrically heated through a circuit controlled by a switch 78 (Fig. 7) which is electrically connected by a slip ring connection 79 to an electric heater 80 within the crimping roll 33 and through a similar slip ring connection 81 to an electric heater 82 within the crimping roll 31. The heaters 80 and 82 are under the control of a thermostat 83 which is mounted in the roll 31 and which controls a switch 84 in circuit with the heaters.

Each of the crimping rolls 31 and 33 is provided with two circumferentially extending, axially spaced series of pockets 85 (Figs. 8 and 14). Between successive ones of the pockets 85 are axially extending slots 86 cut through circumferentially extending corrugations 87 which cover the peripheries of the crimping rolls between successive ones of the pockets 85 and between adjacent series of the pockets 85. The corrugations 87 cover the entire peripheries of the rolls 31 except for the slots 86 and the pockets 85. The slots may be provided with blades 88 which may be placed selectively therein and which are shown as being in position in every third one of the slots 86. Means 89 (Fig. 2) are provided for holding the two crimping rolls 31 and 33 against each other with their corrugations intermeshed and with the coacting pairs of pockets on the two rolls in registry.

Packages 91 are formed by the action of the crimping rolls 31 and 33 drawing the tube shaped packaging material 75 off the lower end of the forming tube 60. The blades 88 pinch the packaging material transversely as indicated by the reference character 90 in Fig. 15 in order to facilitate a separation of groups of individual commodity containing envelopes corresponding to the pairs of coacting pockets 85.

The package 91 in its finally formed condition has a longitudinally extending corrugated area 92 which crimps and seals the overlap 76 as a seam and serves as a center partition between adjacent individual envelopes of the package. Transversely extending crimped and sealed areas 93 extend between successive envelopes of an individual package 91 and end seals 94, which are similar thereto, close the ends of the envelopes adjacent the pinched areas 90. The continuous rotation of the crimping rollers 91 and 93 causes a continuous steady pull upon the flattened tube of packaging material 64 and, consequently, a continuous production of adjacent pairs of individually sealed envelopes. This tension created by the continuously rotating crimping rolls 31 and 33 serves both to pull the packaging material off the forming roll 60 and to unroll it from its stock roller. The machine illustrated in the drawings is so geared that at twenty revolutions per minute of the crimping rolls 31 and 33, 480 individual envelopes are formed, making 80 individual packages each having six envelopes.

Individual units of commodity are supplied from the supply hopper 34 as needed by operation of the vibratory feeder 36 and are freed of dust and broken particles by a blast of air entering from a duct 96 through a port 97 cut in a stationary cover plate 98 which extends over the top of the flanged and grooved ring gear 52. The plate 98 is held stationary by a knurled thumb screw 99 secured to a stationary center piece 100 concentric with the gear 52. In the embodiment of the invention shown in the drawings, the commodity supply is indicated as being in the form of tablets 101 which tumble from the end of the chute 35 through an opening 102 in the plate 98 and fall upon the surface of the ring gear 52 in the trough between its flanges 53 and 54. Several radially extending arms 103 are mounted on the center piece 100 and support brushes 104, the bristles of which extend downwardly and wipe

along the surface of the trough between the flanges 53 and 54 to wipe the tablets into the grooves 55 so that they will lodge in the slots 56.

In order to prevent doubling up of the tablets 101 in the slots 56, a stationary arm 105, also secured to the center piece 100, has a stiff scraper 106 which rides the bottom of the trough between the flanges 53 and 54 and is located just ahead of the open upper ends of the tablet guide tubes 58 and 59 (Fig. 3). The blast of air serves to clean away dust and particles of broken tablets and the scraper 106 effectively prevents more than one tablet from lodging in any one of the slots 56 so that only one tablet at a time is released into the open upper end of one of the guide tubes 58 or 59 as the case might be. As shown in Fig. 12 the guide tubes 58 and 59 may be bent in order to slow up the descent of the tablets 101 therethrough to the lower open outlet ports 107 and 108 respectively of the two commodity guide tubes 58 and 59. The outlet ports 107 and 108 are located at the lower end of the material forming tube 60 exiting therefrom in the flared portion of the tube between a center tongue 109 and side ears 110 which may be formed thereon.

The timing relationship between the Geneva movement comprising the element 47 and the notched wheel 49 and the rotation of the crimping rolls 31, 33 is such that a pair of the slots 56 each of which contains a tablet 101 arrives in position above the open upper ends of the commodity guide tubes 58 and 59 just subsequent to the sealing of one of the transverse sealed areas 93 preceding two pairs of cooperating pockets 85, so that the tablets 101 falling through the commodity guide tubes 58 and 59 will pass out of the lower ports 108, 109 between the converging layers of the flattened tube of packaging material in registry with the pockets 85 of the two crimping rollers 31 and 33.

In order to prevent the tablets 101 from being worked upwardly by the tension on the converging opposed layers of the flattened tube 75 of packaging material, the bifurcated arm 23 (Fig. 8) is equipped with a head 111 on which is mounted a downwardly extending pair of spring fingers 112. The spring fingers 112 are spaced to correspond with the axial spacing of the series of pockets 85 and are located immediately beneath the ports 107 and 108. The rotation of the cam 21 is so synchronized with the crimping rollers 31 and 33 and with the operation of the Geneva movement, that the fingers 112 are forced against the exterior of the packaging material immediately after the passage therethrough of a pair of tablets 101. The arm 23 is supported from a pivot 113 by a rod 114. The thrust created by the raised surface of the cam 21 thus crowds the two opposed layers of packaging material toward each other above each pair of tablets 101 tending thus to urge the tablets downwardly and thus to clear them from the following edges of the pockets 85 and to prevent their being crushed between the corrugations 87 which form the succeeding ones of the transverse sealed areas 93. Although this crowding in of the packaging material layers also tends to close the packaging material beneath the lower ports 107 and 108 this closing action, of course, has no effect upon the operation of the device because succeeding tablets 101 are not released into the open upper end of the commodity guide tubes 58 and 59 until after the next transverse crimped area 93 has been formed by which time, of course, the tension spring 24 has withdrawn the arm 23 and its fingers 112 from any contact with the packaging material. By virtue of the fact that the fingers 112 act to crowd the tablets downwardly from the exterior of the packaging material, the only handling of the tablets which occurs takes place within the tablet selection device comprising the intermittently rotated ring gear 52 and its associated mechanism. Once the tablets have been wiped into the slots 56, which invariably occurs well prior to their arriving over the open upper ends of the commodity guide tubes 58 and 59, the subsequent operation in handling the tablets 101 depends solely upon timing of the mechanism parts and the action of gravity dropping the tablets down the commodity guide tubes.

As illustrated in Fig. 1 the continuous strip of completed packages 91 may fall upon a conveyor belt 115 and be carried thereby up a riser 116 to a table 117 along the sides of which workers may be stationed to separate the individual packages of six envelopes (under the circumstances shown) into groups of packages for assembly into cartons or boxes. A switch 118 may be provided to control a motor 119 which drives the conveyor 115 through a transmission 120 at a speed preferably slightly in advance of the lineal speed of the continuous strip of packages 91.

What is claimed and it is desired to secure by Letters Patent is:

1. A machine for producing continuous strip packages comprising, in combination, a pair of coacting, heated, sealing rollers, each of said rollers having at least one peripherally extending series of spaced pockets and peripheral crimping areas between adjacent edges of said pockets, a power source for rotating said rollers with their peripheries in engagement and the pockets in registry, means for feeding a continuous supply of heat-sealable sheet packaging material in opposed spaced layers into the converging space between said rollers, a vertically extending commodity delivery tube for each of said series of pockets, said tube having an open upper end and a flattened open lower end, the lower end of said tube extending between the opposed layers of said packaging material in the converging space between said rollers and in line with the associated series of pockets, means for releasing units of commodity into the open upper end of said delivery tube at spaced intervals of time in synchronism with the rotation of said rollers whereby each unit of commodity is delivered by said tube into the space between such layers of packaging material in registry with a pair of pockets, intermittently operated means exteriorly of said packaging material for crowding each unit of commodity downwardly snugly between such layers of packaging material and away from the edges of the pockets, and power transmission means between said power source, said commodity releasing means and said intermittent means for synchronous driving thereof.

2. A machine for producing continuous strip packages comprising, in combination, a pair of coacting heated sealing rollers, each of said rollers having at least one peripherally extending series of spaced pockets and crimping areas extending axially between successive pockets and circumferentially there-adjacent means for rotatably mounting said rollers with their peripheries in engagement with the crimping areas thereon and pockets therein being, respectively, in registry, means for feeding a continuous supply

of heat-sealable sheet packaging material in opposed spaced layers into the converging space between said rollers, a vertically extending commodity delivery tube for each of said series of pockets, said tube having an open upper end and a flattened open lower end, the lower end of said tube extending between the opposed layers of said packaging material in the converging space between said rollers and in line with the associated series of pockets, means for releasing units of commodity into the open upper end of said delivery tube at spaced intervals of time in synchronism with the rotation of said rollers whereby each unit of commodity is delivered by said tube into the space between such layers of packaging material in registry with a pair of pockets immediately subsequent to the engagement of the preceding axial crimping areas, intermittently operated means located exteriorly of said packaging material and having portions movable against the exterior of said material for crowding the opposed spaced layers thereof together for urging the units of commodity downwardly away from the following edges of the associated pockets, a power source and transmission means between said power source, said rollers, said commodity releasing means and said intermittently operated means for synchronous driving thereof.

3. A machine for producing continuous strip packages comprising, in combination, a pair of coacting heated sealing rollers, each of said rollers having a plurality of axially spaced, peripherally extending, series of spaced pockets and crimping areas extending axially between successive pockets and circumferentially between said axially spaced series of pockets, means for rotatably mounting said rollers with their peripheries in engagement with the crimping areas thereon and pockets therein being, respectively, in registry, means for feeding a continuous supply of heat-sealable sheet packaging material in opposed spaced layers into the converging space between said rollers, a vertically extending commodity

delivery tube for each of said series of pockets, said tube having an open upper end and a flattened open lower end, the lower end of said tube extending between the opposed layers of said packaging material in the converging space between said rollers and in line with the associated series of pockets, means for simultaneously releasing units of commodity into the open upper ends of said delivery tubes at spaced intervals of time in synchronism with the rotation of said rollers whereby each unit of comodity is delivered by said tube into the space between such layers of packaging material in registry with an associated pair of pockets immediately subsequent to the engagement of the preceding axial crimping areas, intermittently operated means located exteriorly of said packaging material and having portions movable against the exterior of said material for crowding the opposed spaced layers thereof together for urging the units of commodity downwardly away from the following edges of the associated pockets, a power source and transmission means between said power source, said rollers, said commodity releasing means and said intermittently operated means for synchronous driving thereof.

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