Nov. 4, 1969 C. J. WEST, JR 3,475,878

PACKAGING MACHINE

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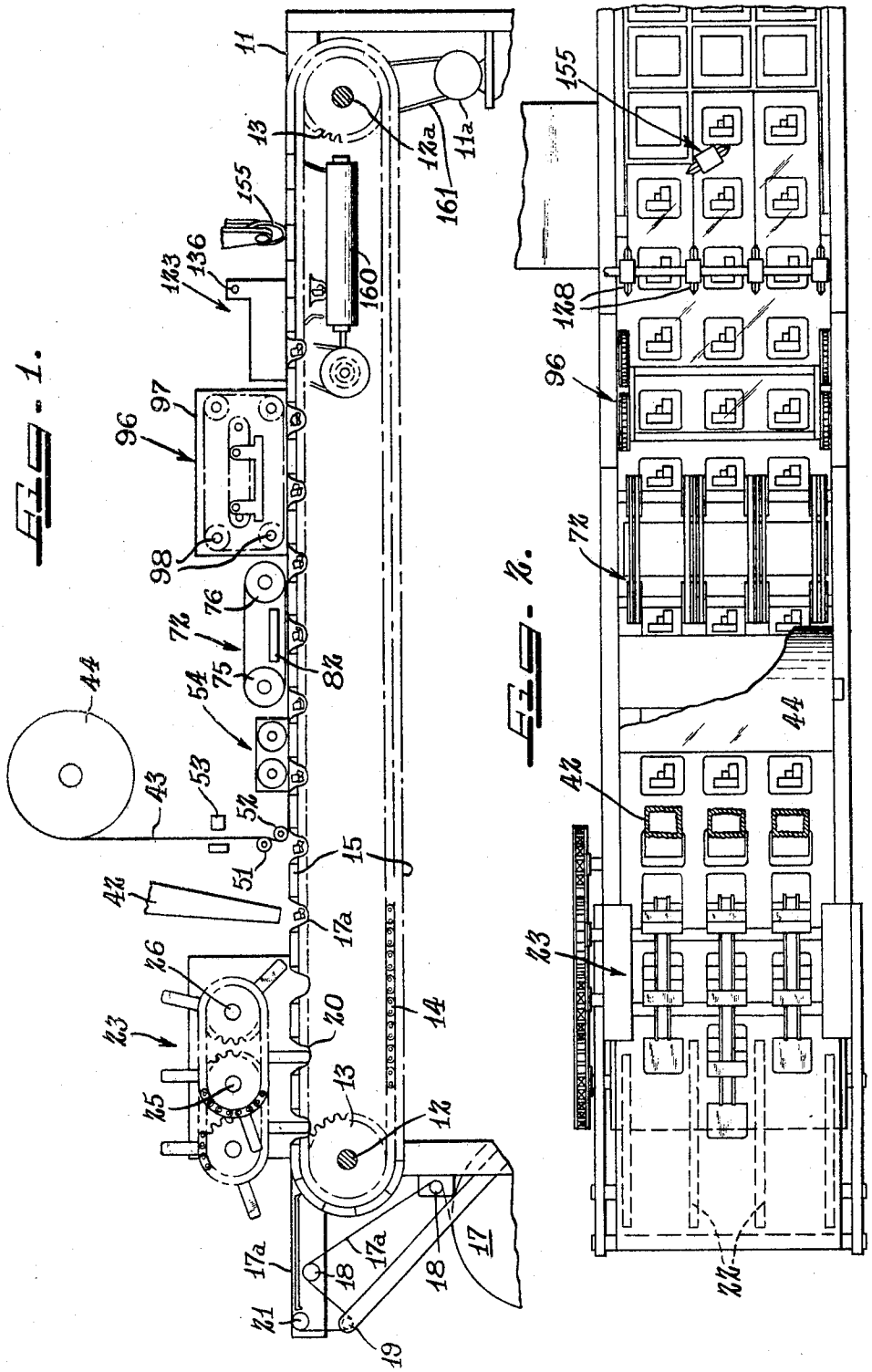

FIG. 1.

FIG. 2.

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PACKAGING MACHINE

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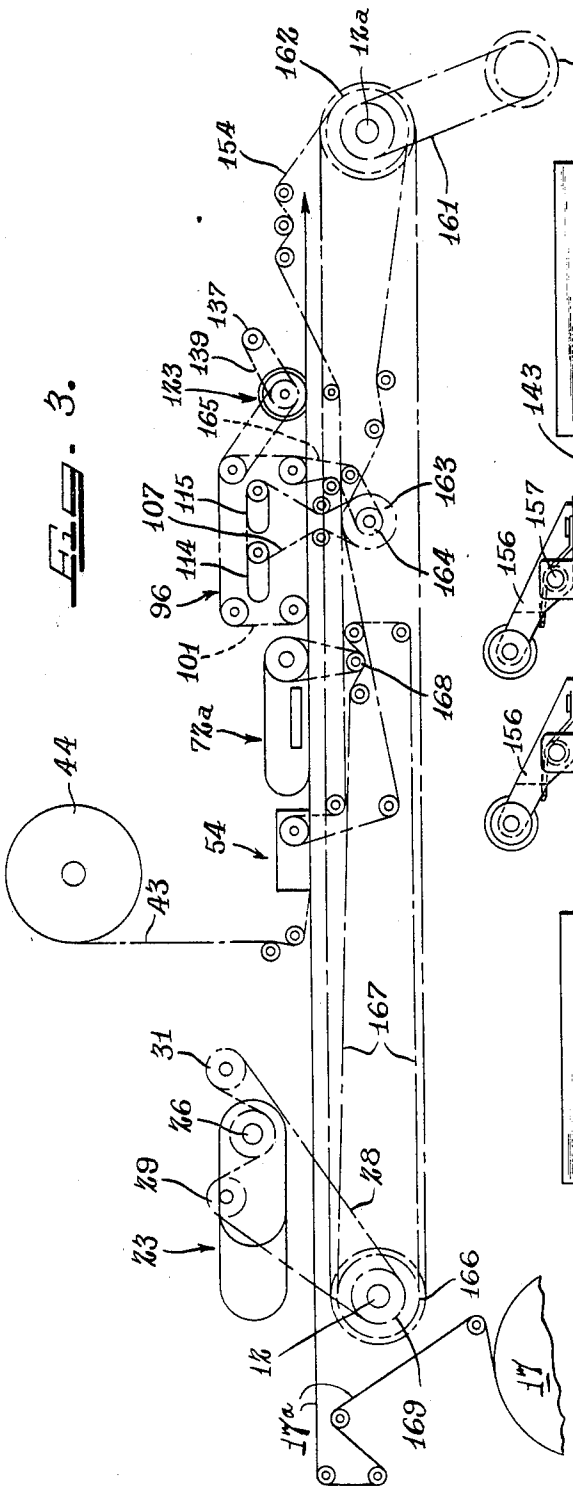

Fig. 3.

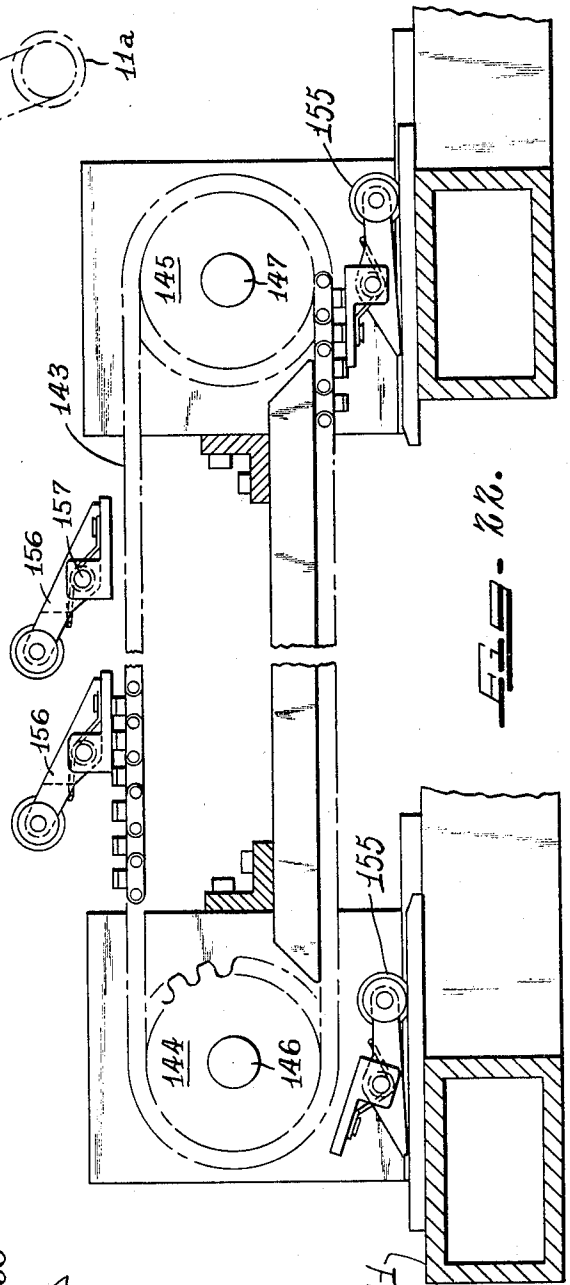

Fig. 12.

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PACKAGING MACHINE

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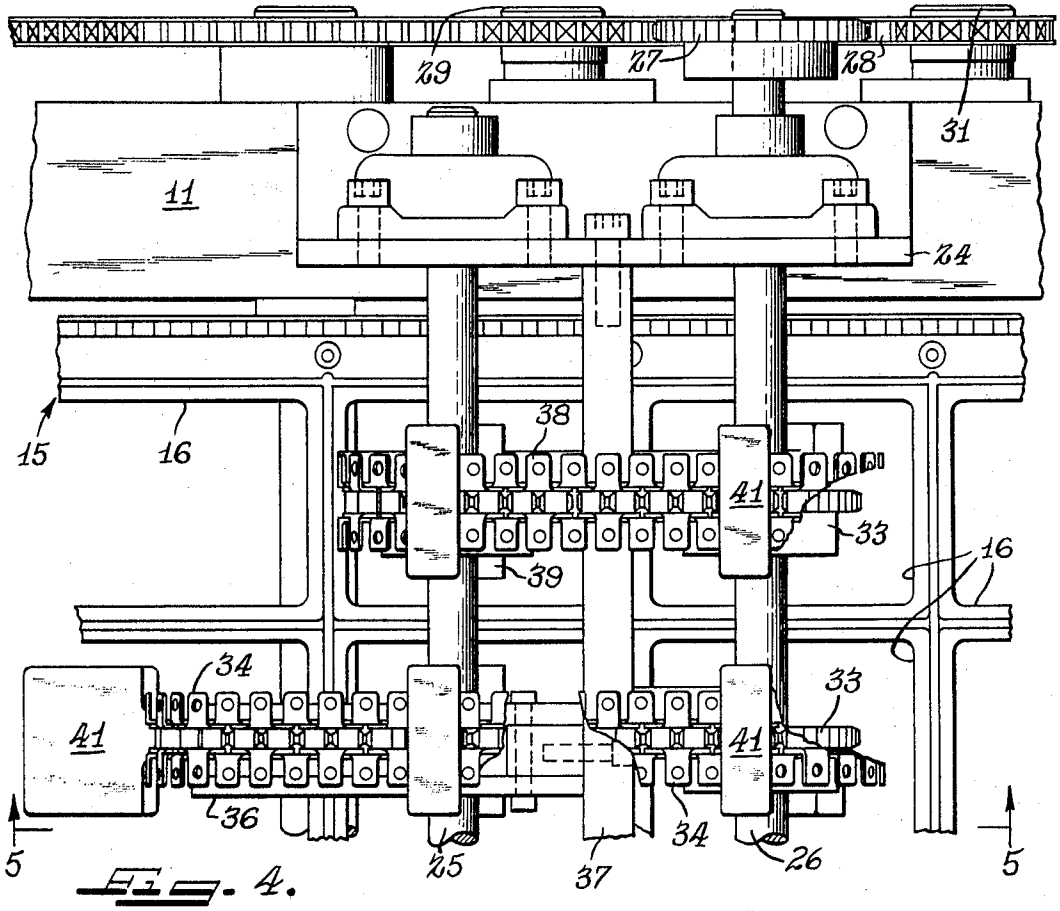

Fig. 4.

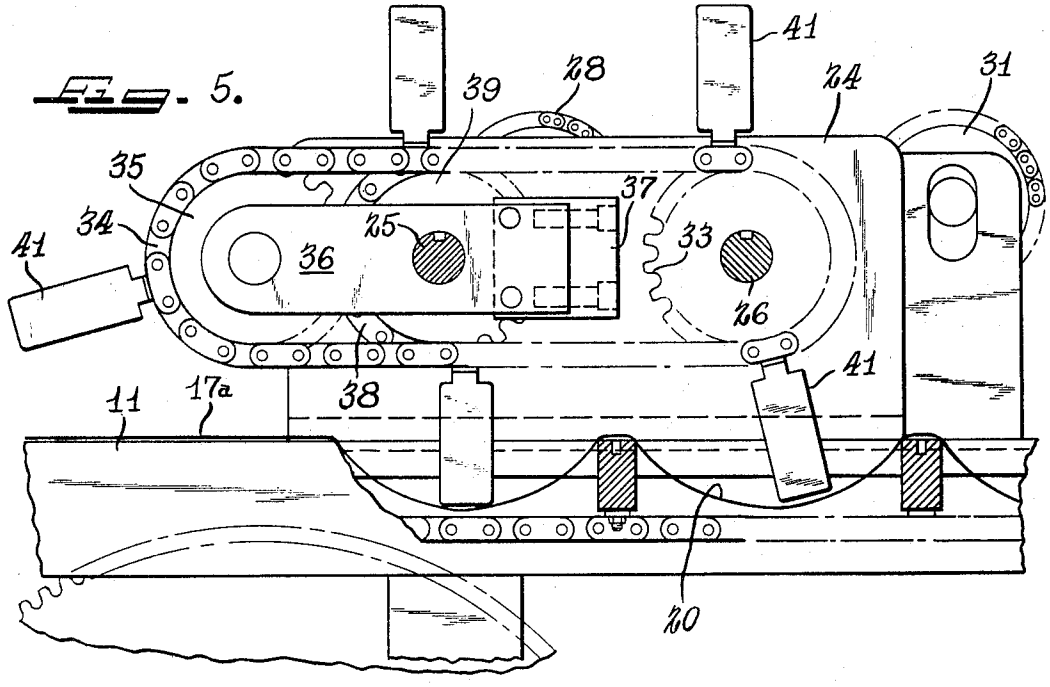

Fig. 5.

Fig. 6.

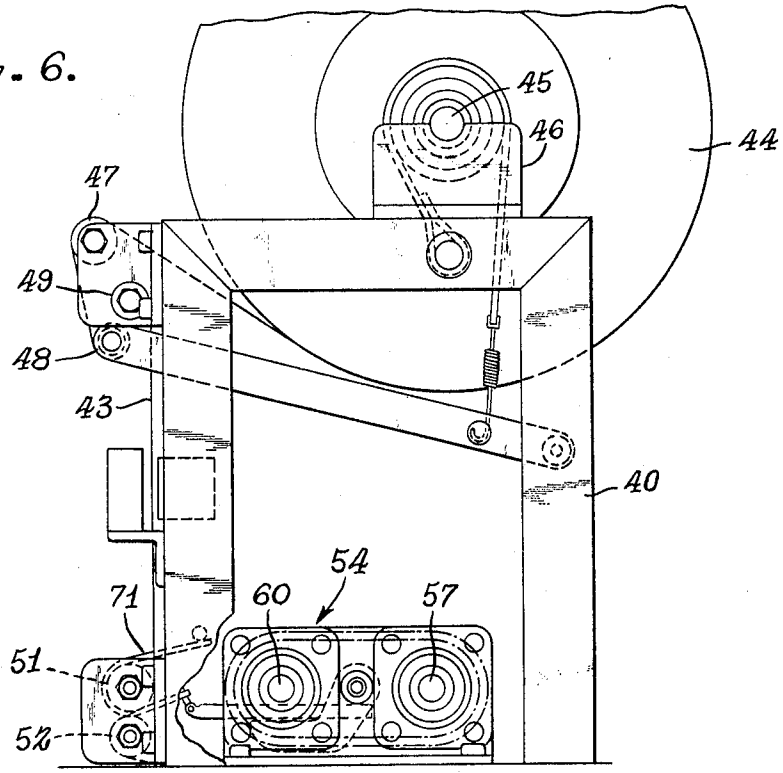
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Fig. 8.

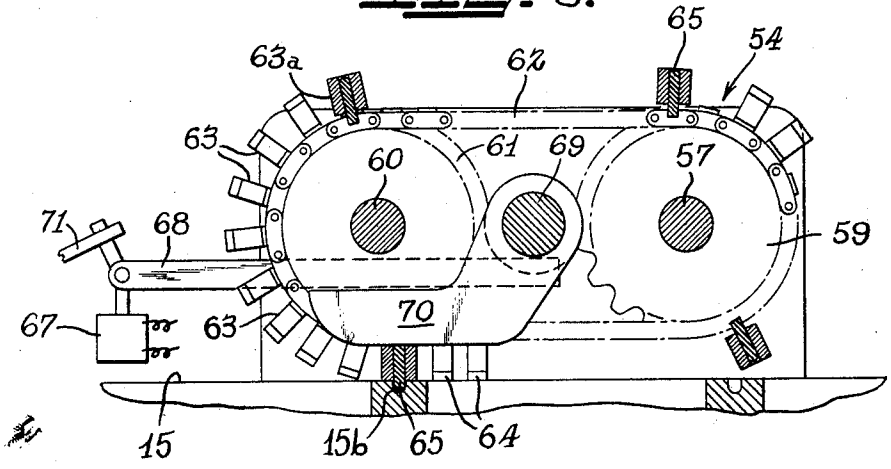
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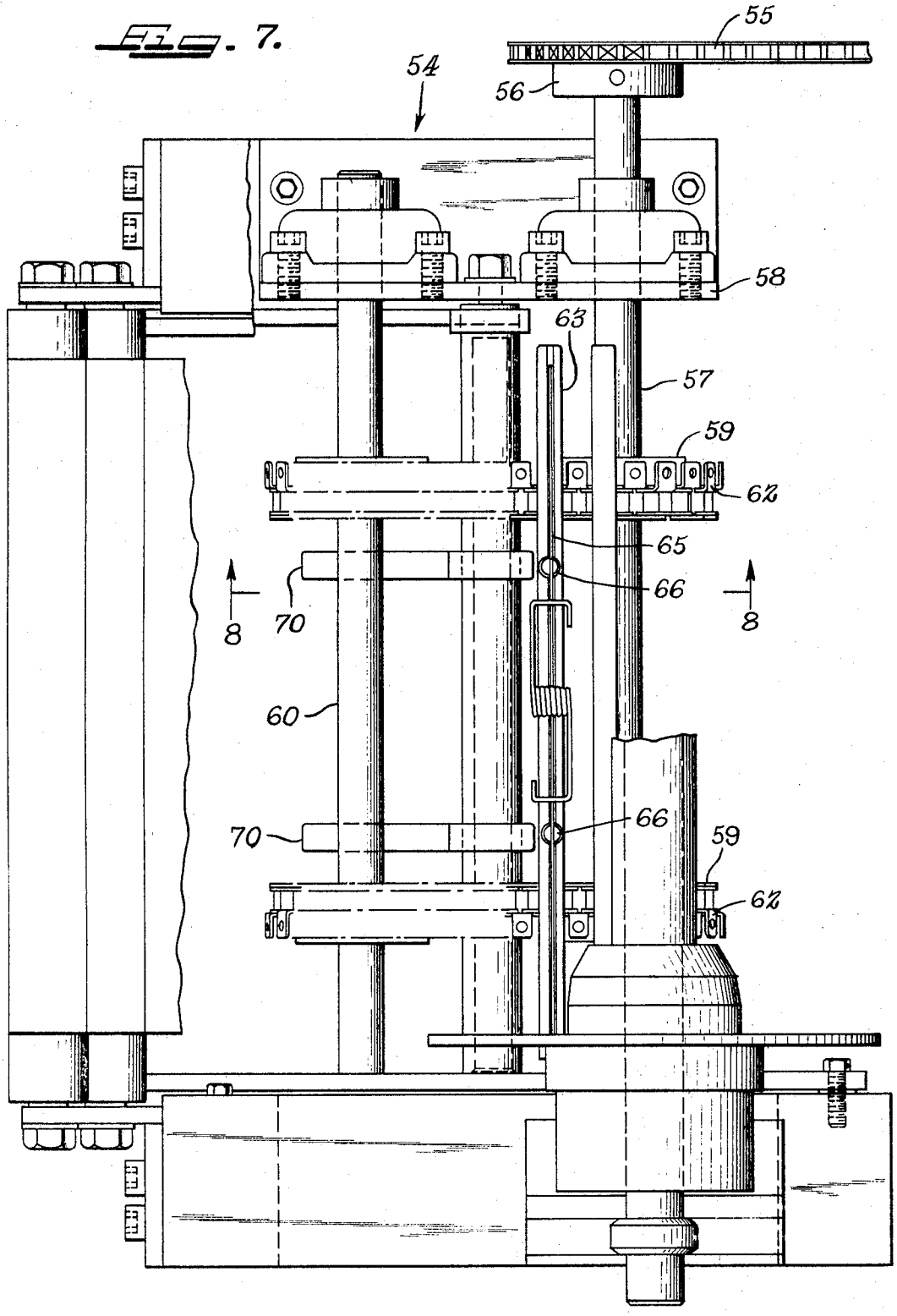
Fig. 7.



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PACKAGING MACHINE

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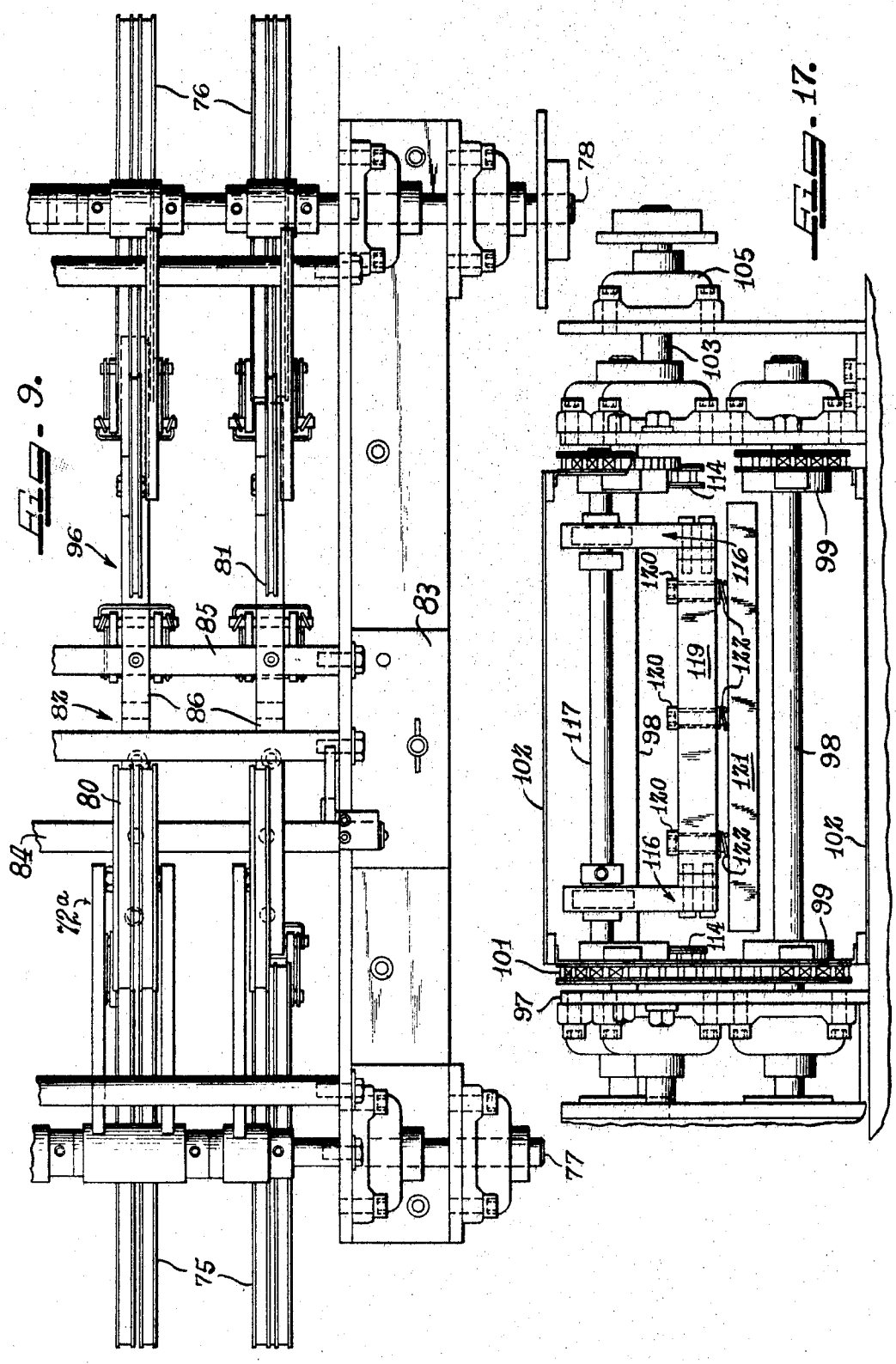

FIG. 9.

FIG. 17.

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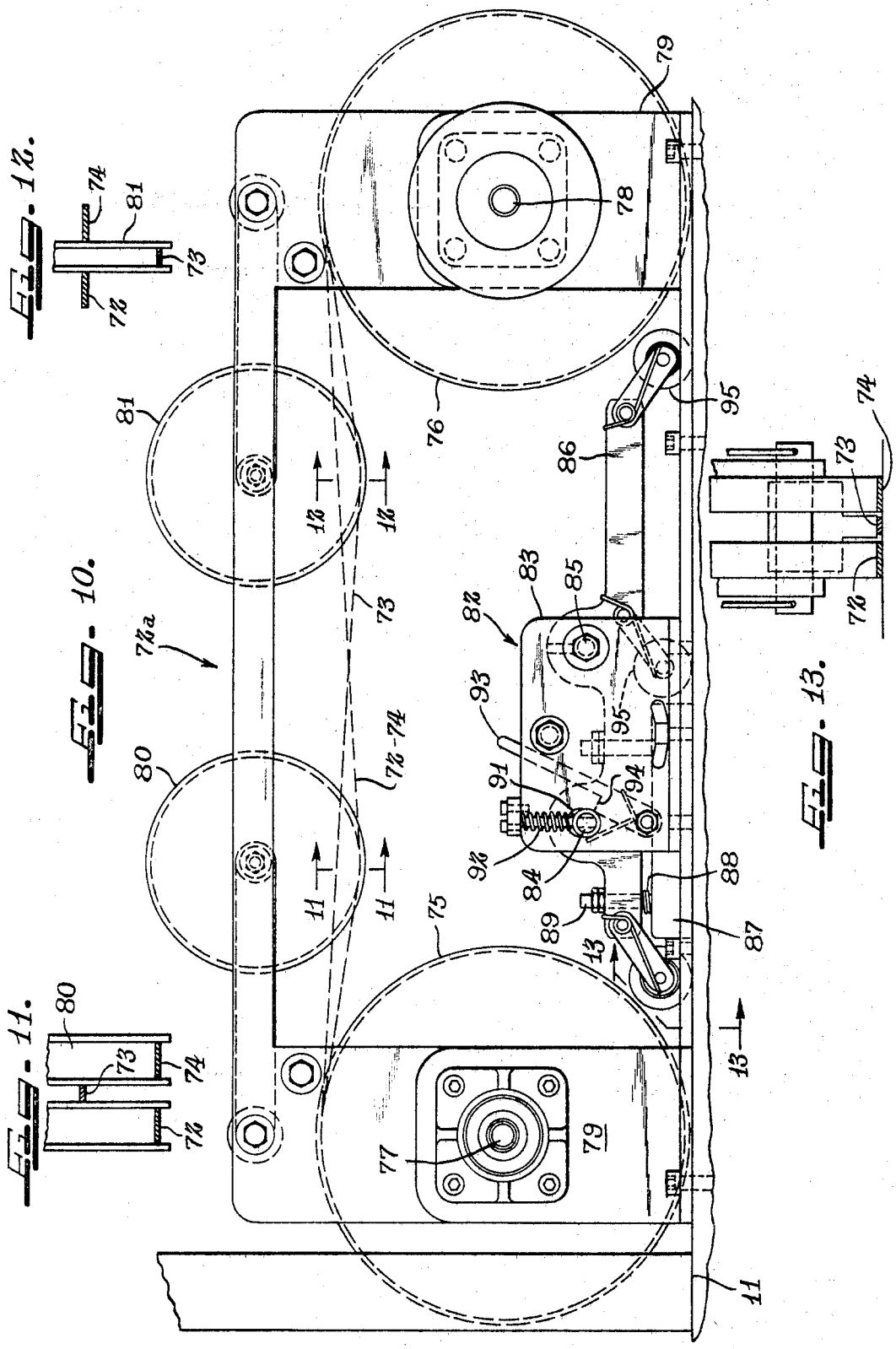

FIG. 12.

FIG. 10.

FIG. 13.

FIG. 11.

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PACKAGING MACHINE

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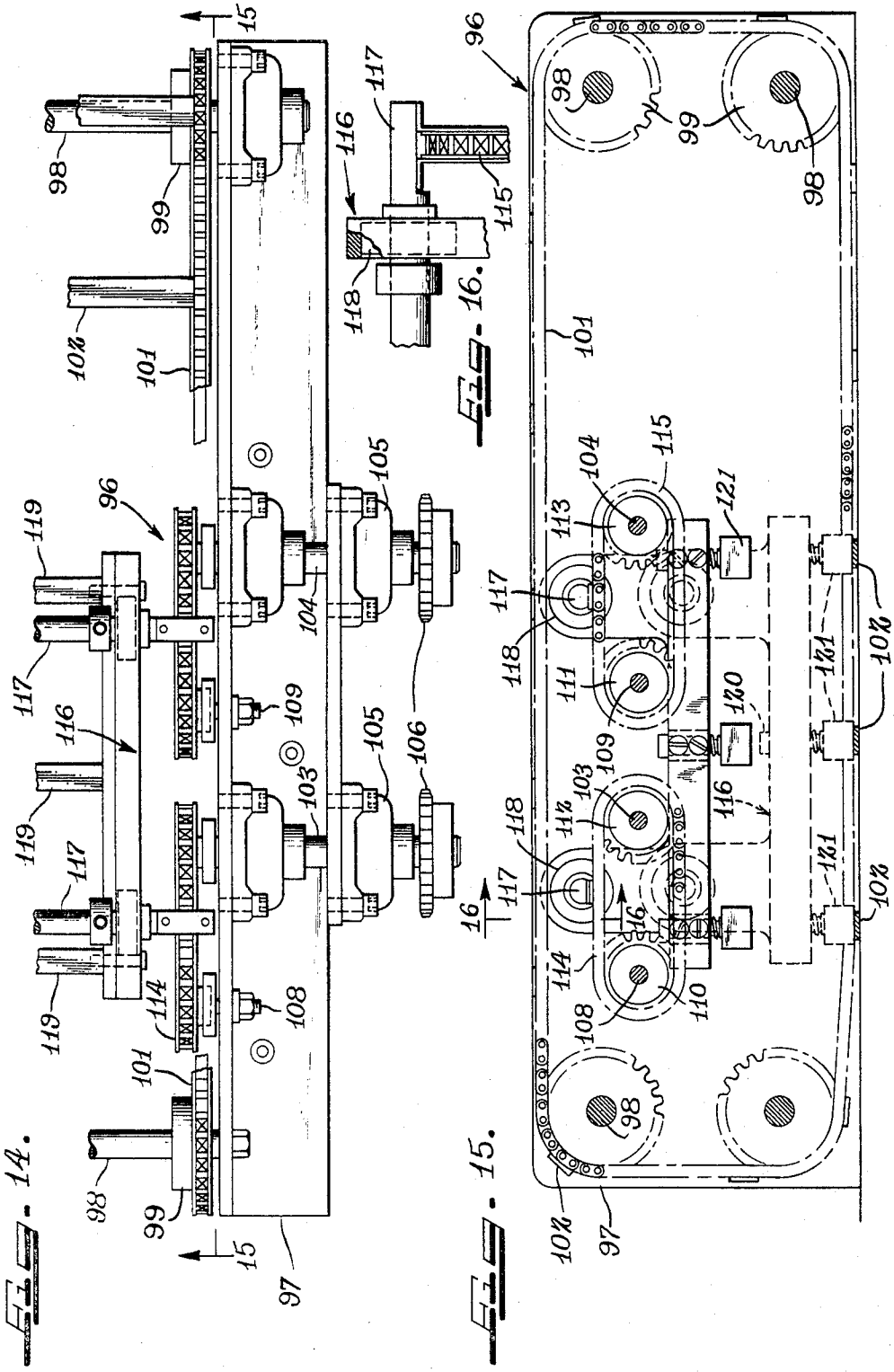

FIG. 14.

FIG. 15.

FIG. 16.

Fig. 18.

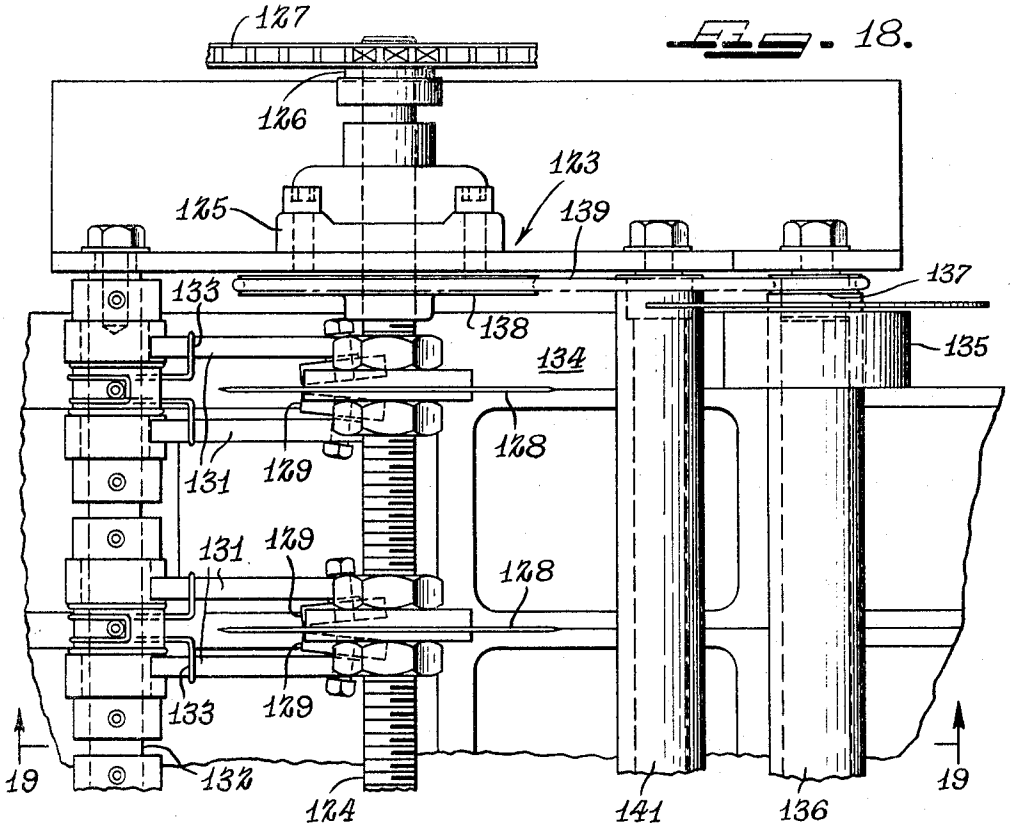
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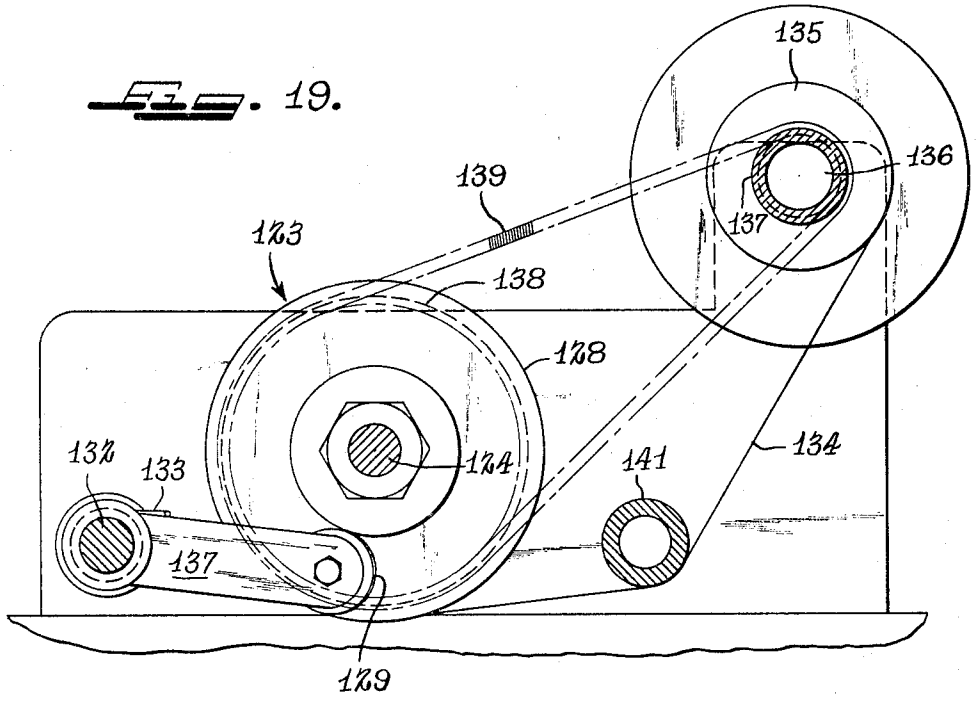
Fig. 19.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PACKAGING MACHINE

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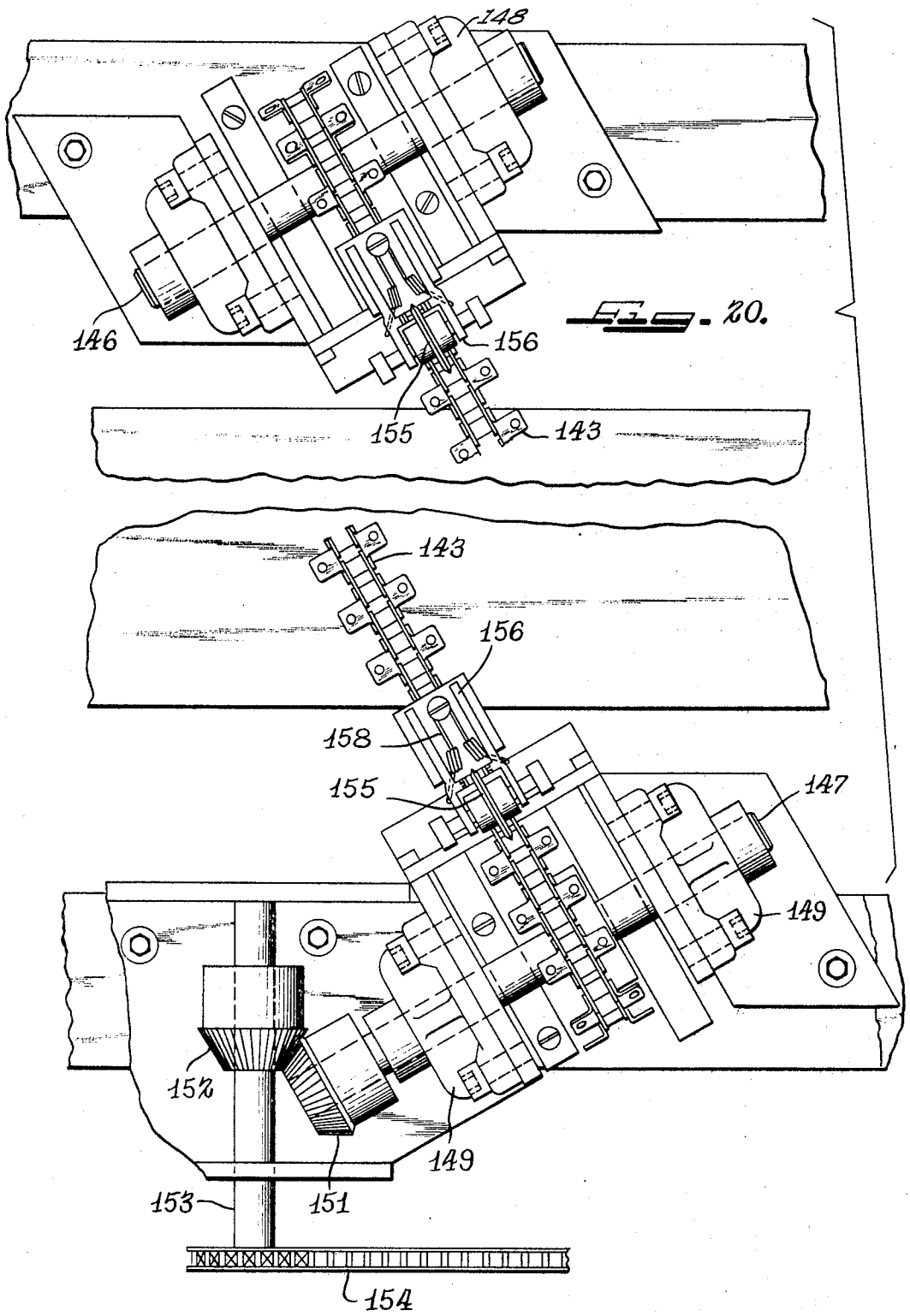

Fig. 20.

PACKAGING MACHINE

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Fig. 21.

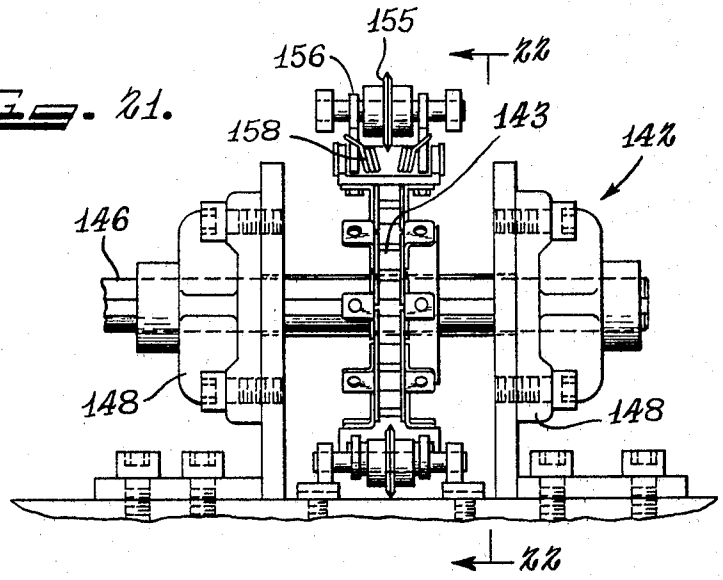
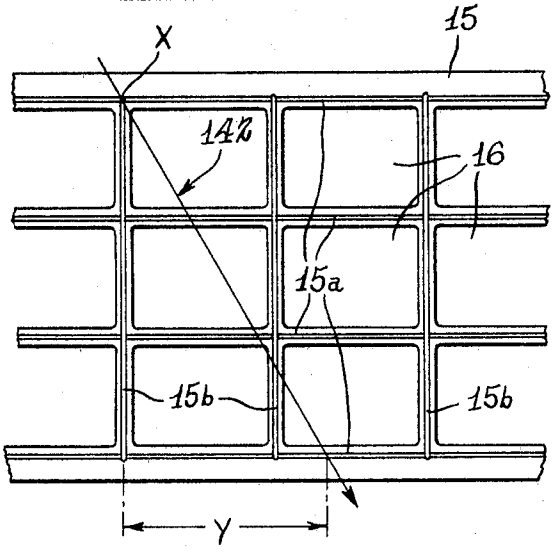


Fig. 23.



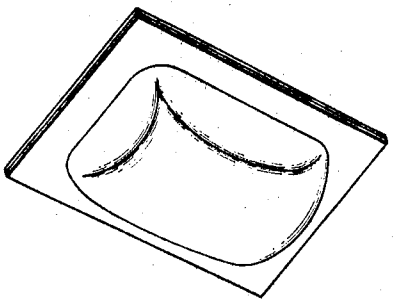
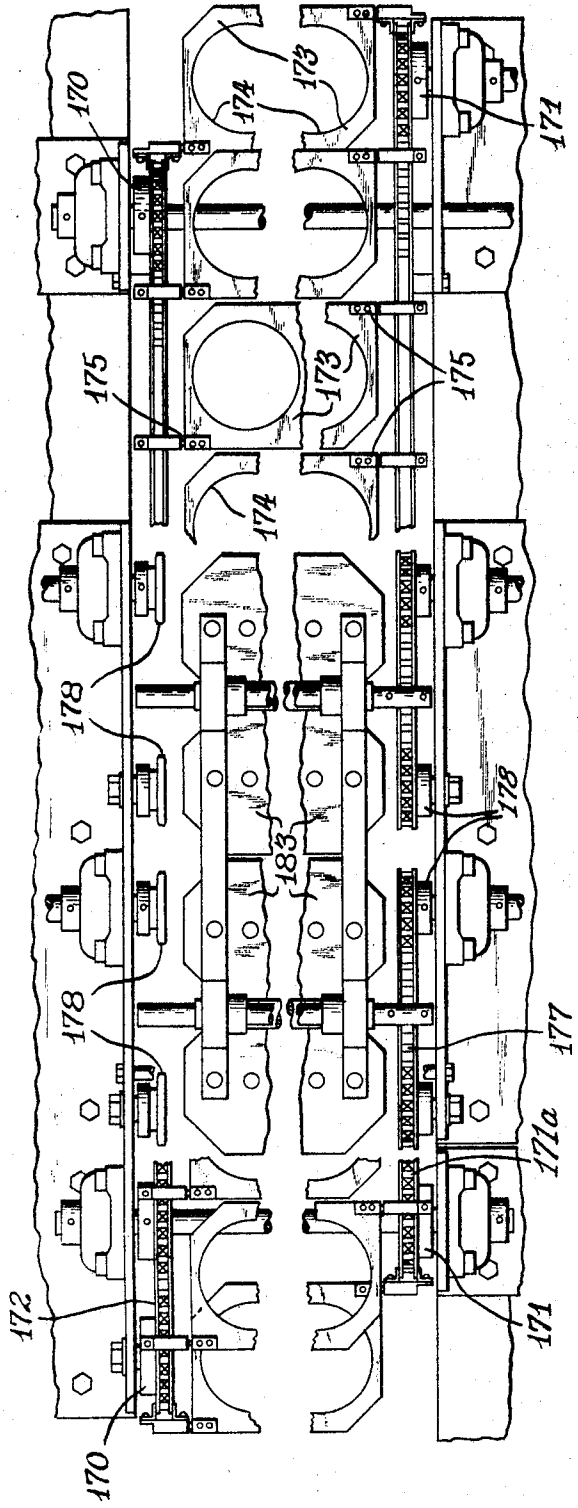


Fig. 24.

Fig. 25.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PACKAGING MACHINE

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Fig. 26.

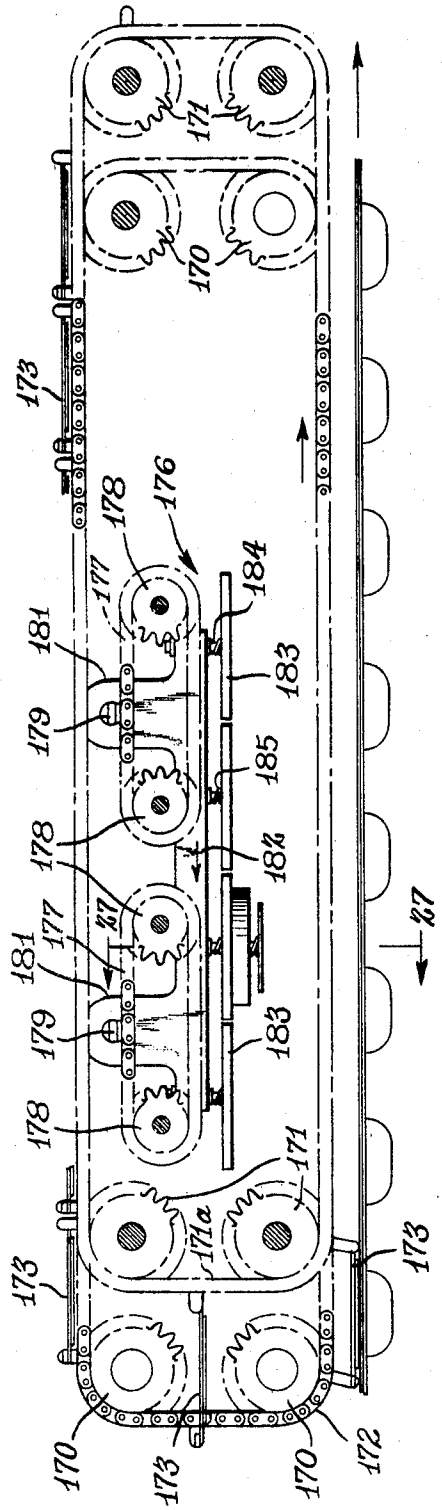
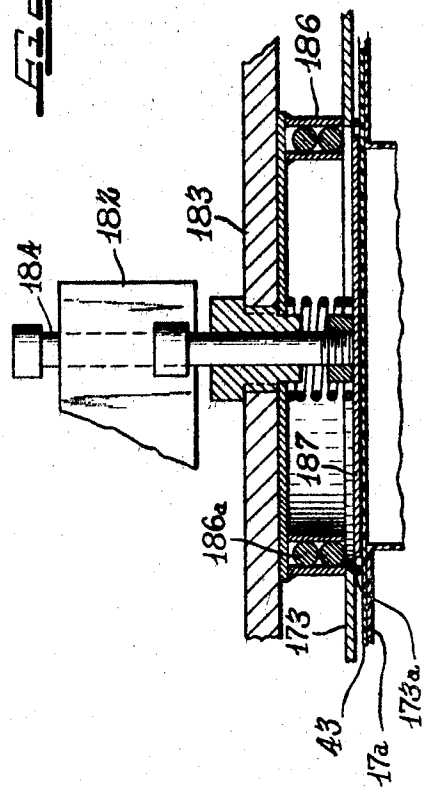


Fig. 27.



United States Patent Office 3,475,878 Patented Nov. 4, 1969

3,475,878

PACKAGING MACHINE

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Filed Oct. 22, 1965, Ser. No. 502,657
Int. Cl. B65b 47/04, 51/26, 61/08
U.S. Cl. 53—30 22 Claims

ABSTRACT OF THE DISCLOSURE

A packaging machine utilizing "soft" film, including means for successively forming pockets in the film and for preventing distortion of such pockets, filling the pockets, placing an overlay film in registration with the pocketed film, sealing the films one to the other to form packages, severing the film into longitudinal strips of packages and finally severing individual packages from said strips.

This invention relates to improvements in two-web packaging machines. More particularly the invention relates to the novel combination and assembly of a machine especially adapted for the use of "soft" thermoplastic film in the formation of packages containing items of various sizes and configurations.

More specifically, the machine includes a driven endless conveyor having openings or recesses formed therein and into which select areas of the soft film of thermoplastic material arranged thereon are pushed so as to form longitudinal and lateral rows of merchandise receiving pockets therein. Owing to the soft nature of the film and the fact that several rows of pockets are formed over the width of the film, novel means is provided for forming select pockets initially and subsequently forming other pockets while retaining the means forming the initially produced pockets in place in such pockets. Following the formation of the several rows of longitudinally and laterally aligned pockets, the pocketed film is advanced beneath a filling station and subsequently thereto, a second or overlay film is disposed over the now filled pockets.

The two films advance in unison beneath novel means provided to insure proper registration of the overlay film in the event it bears printed matter, and the two films then advance as a unit beneath novel heat sealing means which performs longitudinal seals in the areas between and laterally outside the longitudinal rows of filled pockets. Continued advance of the now partially sealed films through the machine carries them beneath transverse sealers which function to seal the webs of the film material one to the other between the longiudinally spaced rows of pockets whereupon the film is carried beneath longitudinal slitters and then to a novel transverse slitter so as to separate each sealed package one from the other. The sealed separated packages then fall upon a conveyor so as to be carried away from the machine. In an alternate structure herein disclosed, the sealing is accomplished by single means.

The operation of the machine produces packages having any required depth and of uniform size from soft film without the use of any vacuum or heat for softening the film, and the sealed areas are uniformly sealed hermetically irrespectively of any wrinkles which may be present in the film having the pockets formed therein. The formed packages have uniformity of appearance.

It is therefore an object of the invention to provide a novelly constructed machine for forming and filling packages comprised of "soft" film.

Another object is to provide, in a machine of the character described, novel means for forming a series of pockets in soft film.

Another object is to provide novel means for heat sealing two soft films one to the other.

Another object is to provide a novel mounting for heaters adapting them to intermittently engage and advance a predetermined distance with overlay films passing therebeneath.

Another object is to provide novel means to compensate for non-register of a pre-printed top film relative to an underlying "pocketed" film.

Another object is to provide novel means for holding and spreading film sections as they are severed from a single sheet assembly.

Another object is to provide a novel method of forming a series of pockets in a film of packaging material.

Another object is to provide a novel method for sealing two films of packaging material one to the other as they advance through a packaging machine.

Another object is to provide novel means for producing soft film packages having greater depth and interior capacity than heretofore possible.

Another object is to provide apparatus for producing soft film packages having uniform improved appearance.

Another object is to provide, in a packaging machine, novel common means for heat sealing the entire perimeter of the packages in a single operation.

Another object is to provide apparatus of the character referred to which is very efficient in its operation, entirely automatic in operation, capable of high speed operation and production, and easy to maintain serviceable.

The structure by means of which the above noted and other objects and advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings, showing preferred illustrative embodiments of the invention, in which:

FIG. 1 is a side elevational view of the packaging apparatus, illustrating the assembly in a diagramatical assembly.

FIG. 2 is a top plan view of the apparatus shown in FIG. 1.

FIG. 3 is a schematic view showing the common drive connections between components of the apparatus.

FIG. 4 is a fragmentary plan view of the pocket forming mechanism.

FIG. 5 is a vertical sectional view of the pocket forming mechanism, as viewed substantially along line 5—5 of FIG. 4.

FIG. 6 is a fragmentary side elevational view of the mounting and feed system for the overlay film.

FIG. 7 is a top plan view of the mechanism operable to insure proper register of the overlay film with pockets formed in the bottom film.

FIG. 8 is a detail sectional view taken on line 8—8 of FIG. 7.

FIG. 9 is a fragmentary plan view of the longitudinal heater mechanism.

FIG. 10 is a side elevational view of the heater mechanism shown in FIG. 9.

FIG. 11 is a detail sectional view taken on line 11—11 of FIG. 10.

FIG. 12 is a detail sectional view taken on line 12—12 of FIG. 10.

FIG. 13 is a detail sectional view showing the heater frame, taken on line 13—13 of FIG. 10.

FIG. 14 is a plan view of the transverse heater mechanism, showing one side only.

FIG. 15 is a vertical sectional view of the FIG. 14 mechanism, taken substantially on line 15—15 of FIG. 14.

FIG. 16 is a detail sectional view taken on line **16—16** of FIG. 15.

FIG. 17 is an end elevational view of the transverse heater mechanism shown in FIGS. 14 and 15.

FIG. 18 is a fragmentary plan view of the longitudinal slicer mechanism.

FIG. 19 is a detail vertical sectional view of the longitudinal slicer, taken substantially on line **19—19** of FIG. 18.

FIG. 20 is a plan view of the transverse cutter, showing the intermediate portion thereof broken away.

FIG. 21 is an end elevational view of the cutter shown in FIG. 20.

FIG. 22 is a vertical sectional view showing a fragment of the transverse cutter in elevation, taken substantially along line **22—22** of FIG. 21, and showing the conveyor associated with it.

FIG. 23 is a schematic view illustrating the path travelled by the transverse cutter, and showing the conveyor associated with it, but omitting the film packages.

FIG. 24 is a perspective view of a substantially square package formed by the disclosed structure.

FIG. 25 is a fragmentary plan view of a modified form of heat sealer.

FIG. 26 is a side elevational view of the heat sealer mechanism shown in FIG. 25.

FIG. 27 is a detail sectional view taken substantially on line **27—27** of FIG. 26.

Referring to the machine as a whole, as shown in FIGS. 1 and 2, said machine comprises an elongated built up frame structure **11** having at opposite ends thereof transverse shafts **12**, **12***a* each carrying sprockets **13** over which are trained endless chains **14** supporting an endless conveyor **15** which is firmly attached to said chains. The endless conveyor **15** is in effect a belt having a width substantially bridging the area between the sides of the frame and, it is, in this embodiment, formed with three parallel rows of substantially square holes **16** that are uniformly spaced apart longitudinally and laterally. The conveyor is perhaps best illustrated in FIG. 23 where it will be observed that it has a series of longitudinal grooves **15***a* and transverse grooves **15***b* in its top surface located on the side margins and one in each space between adjacent holes **16** for purposes to be described presently. The upper run of the conveyor extends in a horizontal plane and it is driven by a motor **11***a* that is common to all components of the machine.

PACKAGE FILM FEED

Mounted on one end of the frame **11**, below the plane of conveyor **15** (left hand end as shown in FIG. 1) there is mounted for free rotation a roll **17** of soft web film. Although any suitable means may be provided to tension the film web **17***a*, the web leaving the roll preferably is trained over a pair of idler rollers **18**, then over a dancer roller **19** and finally over a third idler roller **21** which is disposed substantially in the plane of the top surface of conveyor **15**, whereupon the film web **17***a* is laid over the conveyor **15** so as to travel therewith. The dancer roller is associated with suitable brake means acting on the roll to prevent unwanted unwinding when the machine is brought to a stop and to maintain the web tensioned. This brake means is substantially duplicated in structure to be described later. The film web **17***a* is advanced over a series of forming rails **22** (FIG. 2) arranged on the frame structure to overlie the conveyor in the areas between the rows of holes therein and extend inwardly a short distance from the feed end of the machine. The web is essentially detached from the conveyor but is movable in unison therewith by the forming assembly now to be described.

POCKET FORMING ASSEMBLY

The forming assembly, generally indicated at **23** in FIGS. 1 and 2, is best illustrated in FIGS. 4 and 5. It is mounted in upstanding end brackets **24** secured to frame **11**. These brackets constitute bearing means for a pair of shafts **25**, **26** which bridge the frame structure above the conveyor **15**. The shaft **26** carries on its outermost end a sprocket **27** that nests in a drive chain **28** (FIG. 3) that is trained over a pair of idler sprockets **29**, **31** and thence down around a drive sprocket **169** mounted firmly on conveyor shaft **12**. Upon reference to FIG. 5, it will be observed that the idler sprocket **31** is mounted for vertical adjustment so as to compensate for wear and to synchronize the forming assembly drive with the rate of speed of the conveyor.

The shaft **26** carries three separate sprockets **33** (two shown in FIG. 4) firmly thereon and spaced apart so as to register one on the longitudinal axis of each row of holes **16** in the underlying conveyor **15**. The center sprocket **33** mounts an endless chain assembly **34** which is trained also over a sprocket **35** journalled for free rotation on the free end of an arm **36** mounted securely at its other end on a cross bar **37** bridging and secured firmly to the bearing brackets **24**. The two outside sprockets **33** on said shaft **26** (one shown in FIG. 4) each mounts a like endless chain assembly **38** which are trained respectively over sprockets **39** mounted for free rotation on a shaft **25**. It will thus be noted that the two outside chain assemblies **38** are of length less than the length of chain assembly **34** by an amount equal to the center spacing between adjacent holes **16** in the conveyor **15**.

Each chain assembly **34–38** carries spaced therealong a plurality of plungers or shoes **41** that extend outwardly therefrom. During machine operation these plungers are designed to successively enter the succession of holes **16** as the conveyor passes therebeneath. This is accomplished by spacing them apart on the chains distances equal to the center spacing of each hole. Now, as the conveyor **15**, having the film web **17***a* laid thereover, advances beneath the assembly **23**, the plungers **41** successively engage the film and push it down into the aligned conveyor holes so as to form merchandise pockets **20**. Since soft film is used, it is essential, to prevent a formed pocket from pulling out during formation of a successive pocket in the same row or one spaced laterally therefrom, that the center row of pockets be formed first, and while still being held by the forming plungers **41**, the pockets on each side thereof are formed. This sequence of pocket formation is accomplished by the herein disclosed forming assembly because, as shown, the chain-plunger assembly **34–41** at the center engages the film first and forms a center row of pockets. As the conveyor, film and said chain-plunger assembly advance in unison, the two side chain-plunger assemblies **38–41** are brought into engagement with the film to form the pockets in the side or outside rows. During this side pocket formation the effective plunger **41** on the center chain-plunger assembly **34–41** has remained in the pocket just formed. Thus, all material required to form the pockets in the side rows of pockets is drawn from the side areas of the film **17***a* without disturbing or deforming the center line of pockets. The outside chain-assemblies also are each of sufficient effective length so that the plunger thereof which has just formed a pocket in the film will remain in the formed pocket during the formation of the succeeding film pocket to prevent said first formed pocket from being deformed.

FILLING STATION

The conveyor **15** and film **17***a* with the pockets formed therein continue to travel upon leaving the pocket forming assembly **23** so as to carry the three rows of formed pockets beneath a filling station **42**. This station may comprise any apparatus or conveyor means specially adapted for the merchandise to be placed in the pockets or, in lieu thereof, the items may be placed in the pockets by hand. However, because of the speed of machine operation automatic delivery means is preferred. Since such filling means are generally known and form no part of the present invention it is not detailed.

OVERLAY FILM

Following filling of the pockets with the requisite item, the filling pockets continue to advance along the machine length and an overlay film **43** (FIG. 1) is placed over the filled pockets. This overlay film is carried in the form of a roll **44** supported on an auxiliary frame **40** (FIG. 6) mounted on the upper side of the main frame **11**. As shown in said figure, the roll **44** is carried on a mandrel **45** loosely supported in bearing blocks **46** (one shown). The web **43** leaving said roll is trained over an idler roller **47**, a dancer roller **48**, an idler roller **49** and thence downwardly between idler rollers **51**, **52**, the latter being located so that the web **43** leaving the same lies flat over the pocketed web **17***a* and advances therewith. This web may be slightly narrower than the bottom web **17***a* because no material is used to form pockets therein.

FILM FEED CONTROL

It not infrequently occurs that printed matter appears on the overlay film **43** that is intended to be visible on the formed package. It therefore is necessary to provide means to effect such register, as for example, by advancing the overlay film relative to the bottom film should it lag behind the bottom film. To this end a photo-cell **53** (FIG. 1) is arranged to scan the printed film after it leaves the roll and before it is laid on the conveyor system. Should the printed matter be out of register, as by dragging of the roll, novel registering means **54**, shown in FIGS. 1, 6, 7 and 8, is actuated to return the film to register.

The registering means **54** is driven by a chain **55** timed to the main conveyor. The chain **55** is trained over a sprocket **56** mounted firmly on a transverse shaft **57** journalled at its ends in bearing bracket **58**. This shaft carries a pair of spaced apart sprockets **59**. A companion parallel idler shaft **60** is also journalled in brackets **58** which also carries firmly sprockets **61** disposed in longitudinal alignment with sprockets **59**. Endless chains **62** are trained one over each pair of aligned sprockets **59**, **61**. These chains are bridged by a series of bars **63** secured firmly thereto. The bars **63** are not alike. As shown, select bars, identified as **63***a*, are arranged in the series of bars so that one of these bars will register with a transverse groove **15***b* in the surface of conveyor **15** as they are carried around the sprockets during machine operation.

In the present disclosure there are eight bars **63** arranged between each bar **63***a* so as to provide proper spacing and groove registration. The bars **63** carry on their outside face a layer **64** of rubber or other material that will have frictional engagement with the overlay film (FIG. 8) when carried into contact therewith. The other bars **63** each carry a spring loaded strip **65** nested therein which has at least two pins **66** projecting upwardly (inwardly of the chain contour). As the conveyor **15** with the films thereon advances beneath the registering means and when there is no misregister, the spring loaded strips **65** perform no function. However, means responsive to the photo-cell registering non-registration of the films, is brought into action to render strips **65** effective.

Now, when the photo-cell **53** impulse calls for additional overlay film to be fed to the machine, a solenoid **67** (FIG. 8) is energized to pull down a rock lever **68** fixed on a shaft **69**. This shaft carries a pair of cam shoes **70** which normally are in an elevated or ineffective position. However, rotation of shaft **69**, counterclockwise, rocks the cam shoes **70** in a downward direction thus locating them in the path of the pins **66** on the spring pressed strips **65**. As the bar carrying the spring pressed strip **65** advances beneath the cam shoes **70**, said shoes engage with and depress the pins **66** thus projecting the strips **65** below the bottom surface of the bar **63***a* mounting the same. When so projected, the strip **65** will bear down upon the overlay film and press it into the underlying registering groove **15***b* in the conveyor **13**. The additional film required to accommodate the depressed strip and enter said groove will be obtained from the supply roll inasmuch as the rubber coated bars **63** on the assembly will frictionally hold the film in the area that has already passed beneath the strip **65**.

Should the film feed to the machine be too rapid, the solenoid **67**, being deenergized, allows the lever **68** to move upwardly, releasing the strip as aforesaid, and at the same time applies brake means to the film feed. Referring to FIGS. 6 and 8, the brake means comprises a strap **71** wrapped around one end of the idler roller **51** and connected to lever **68** and which tightens about roller **51** when the lever **68** is in elevated position, thus offering resistance to its free rolling and slowing down the rate of film feed.

LONGITUDINAL HEATER

The advancing films now pass beneath a longitudinal heater station **72***a* which functions to heat seal the two films longitudinally between and on each outside edge of the packages formed in the film. The heater means is best shown in FIGS. 9 through 13. In the FIG. 9 disclosure there is shown but two of the sealers whereas it is to be understood that in the machine shown there will be four spaced apart transversely of the conveyor. These heat sealers are each complete in themselves, consequently only one will be described in detail and like numerals will identify corresponding parts of each.

Referring now to the elevational view of the heat sealing means, as shown in FIG. 10, the heat sealers each include a set of three endless steel belts or bands **72**, **73**, **74** which are trained over large rollers **75**, **76**, each channeled on its periphery to receive the three bands side by side. These rollers are carried on shafts **77**, **78** respectively, that are journalled in bearing structures **79** supported firmly on the top of frame **11**. The lower reaches of these bands travel over the top surface of the overlay film, lying in substantial contact with the sealing areas between adjacent packages and along the outside edges of the transversely outermost packages. The intermediate band **73** constitutes the heating band, whereas the related outside bands **72**, **74** constitute cooling bands that function to prevent melting or fusing of the film areas immediately adjacent to band **73**.

Suitable tension rolls **80**, **81** are associate with the upper reaches of said bands. As shown, the roll **80** bears downwardly on the two outer bands **72**, **74**, whereas the roll **81** bears down on the center band **73**.

Arranged above the films, between rollers **75**, **76**, is a heater element assembly generally indicated at **82**. This assembly is supported by upstanding bearing brackets **83** (FIGS. 9, 10) in which are journalled a pair of parallel rods **84**, **85**, that bridge the apparatus. The rod **85** provides pivotal mounting for a plurality of elongated bars **86** from each of which is suspended a heater shoe **87** having considerable length and each of which, when in use, lies against the top surface of a related center band **73**. Springs **88**, arranged on suspension studs **89** normally urge the heater shoes **87** into such contact. The rod **84**, which extends through and is secured firmly to the bars **86**, extends through a vertically elongated hole **91** in bearing bracket **83**. A compression spring **92** normally urges the bars **86**, the rod **84** and the shoes mounted thereon, downwardly at all times. When it is desired to raise the shoes off the bands, as when the apparatus is idle, a lever **93** carrying a cam **94** is rocketed to the left, as shown, to carry the cam beneath rod **84** to elevate same. The bars **86** each carry a series of spring pressed rollers **95** that bear at all times on the outside bands **72**, **74**, to hold them in engagement with the underlying film.

It should be evident that during machine operation, the bands **72**, **73** and **74** travel in the same direction and at the same speed as the films and that longitudinal heat sealing is accomplished as the film passes beneath

the shoes **87**. The specific drive for the bands will be described later herein.

TRANSVERSE HEATERS

The transverse heat sealing means **96** is best shown in FIGS. 14–17. As shown, this assembly is likewise supported above the conveyor and the films thereon as by means of upstanding rectangular plates **97** arranged one on each side of frame **11** and journalling a series of four shafts **98** that extend transversely over the conveyor between said plates. The shafts are arranged in pairs, one at each end of the plates and the shafts of each pair are disposed one above the other. These shafts mount sprockets **99**, one adjacent each end just inwardly of plates **97**, which carry endless chains **101** having thin spaced strips **102** of stainless steel or the like that are advanced at the same rate of speed as the rate of advance of the conveyor and film. Thus one strip will lie over the transverse sealed area of the film during its advance. The drive means for these chains, as well as the drive for the heater assembly will be described hereinafter.

The heater assembly likewise is driven at a speed corresponding to the rate of conveyor travel. This assembly includes a series of stud shafts journalled in each plate **97**. Referring specifically to FIG. 14, the stud shafts shown are duplicated on each side of the machine. As illustrated, there are two stud shafts **103, 104** journalled in each plate **97** and which extend transversely outwardly through auxiliary bearings **105** and each carrying on its end a sprocket **106**. These sprockets each have trained over them a chain **107** (FIG. 3) that leads to a power source for rotating said shafts in unison. Associated with each shaft **103, 104**, and located in advance (toward the feed end of the machine) of each shaft but in horizontal alignment, are two sprocket shafts **108, 109** respectively, mounting sprockets **110, 111** respectively. The shafts **103, 104** carry similar sprockets **112, 113** respectively, and an endless chain **114** is trained over sprockets **110–112** whereas an endless chain **115** is trained over the sprockets **111–113**. These chains **114** and **115** are rotated in unison when the driven shafts **103** and **104** are rotated in unison and their rate of travel is coincident with the rate of travel of chains **101**.

The two sets of chains **114** and **115** jointly constitute a mounting for a carrier for transverse heater elements. As best shown in FIG. 17, there are two carriers **116** which are supported on a pair of laterally extending rods **117** secured at their ends one to each set of chains **114** and **115**. These rods each mount a pair of rollers **118** (FIG. 16) spaced apart longitudinally on said rods. The carriers **116**, which are alike, each comprise a horizontal rail having upstanding portions having holes therein to receive the rollers **118** carried by the respective chains. As the chains **114** and **115** advance around their sprockets, the carriers **116** move in unison through an oval pattern in a vertical plane. More particularly, as viewed in FIG. 15, the members **116** are shown in elevated position on the upper run of the chains **114, 115**. As said runs advance in the direction of the feed end of the machine (to the left) the carriers **116** are carried downwardly in unison around the related sprockets **110, 111** and then move in the opposite direction (direction of conveyor travel) and at the same rate of speed as said conveyor.

These two carriers **116** are interconnected at their lower ends rigidly by transverse bars **119** (three used). Each of these bars **119** has vertical holes therein each to receive therethrough a stud **120** mounted firmly on and extending upwardly from a heated shoe **121**. There are therefore three heater shoes **121** and each is normally urged downwardly by springs **122** (FIG. 17) surrounding said studs **120**. The cross bars **119** and shoes **121** are spaced apart in a longitudinal direction of the machine distances equal to the spacing between packages formed in the film. When carried downwardly, during rotation of chains **114, 115**, the shoes are carried into pressure contact with the strips **102**, which underlie them, and the shoes and strips travel in unison with the film on the conveyor so as to heat seal the transverse areas of the film lying therebeneath. When the shoes are lifted off of the strips **102** said strips will remain in contact with the sealed areas for a considerable distance of the advance of the film to afford cooling of the transverse seams without rupture.

LONGITUDINAL CUTTERS

The packages are now sealed on all four sides and these sealed packages, still integral with the film, are then advanced beneath longitudinal cutters that sever the film between the longitudinal rows of packages and trim the side edges of the film therefrom. The longitudinal cutter **123** is best illustrated in FIGS. 18 and 19. In FIG. 18 there is shown but one longitudinal half of the conveyor and film disclosing two slitters, it being understood that this structure is repeated for the other half of the conveyor. As shown, a shaft **124** bridges the conveyor transversely and is journalled at its ends in rigid bearings **125**. The shaft extends beyond the bearing illustrated and carries a sprocket **126** over which is trained a chain **127** leading to a power source to be described hereinafter. The shaft mounts a series of cutter discs **128**, one in vertical register with the longitudinal center of each longitudinal seam in the package film. As the film advances beneath the rotating discs **128** it is slit longitudinally medially of the sealed area. In order to insure that the film is held firmly during the slitting, a pair of pressure-spreader rolls **129** are arranged to bear against the film just ahead of its engagement by the cutter discs. These rolls are each carried on an arm **131** freely journalled on a transverse shaft **132**. Springs **133** normally urge the arms **131** downwardly to maintain surface contact between the rolls and the film.

In order to dispose of the narrow strip **134** of film severed from the side edges of the film, a rewind wheel **135** is mounted above the slitter discs and one at each side of the conveyor, on a shaft **136**. As best shown in FIG. 19, the shaft has at one end a pulley groove **137**. A pulley **138**, but of a larger diameter, is mounted on the cutter drive shaft **124** and a belt **139** is trained in said grooves and pulley. As a consequence, the rewind wheel **135** is rotated during rotation of the cutter discs but at greater speed so as to rewind the edge strip **134**. Preferably, a tension or guide bar **141** is arranged just above the conveyor and in advance of the rewind wheel to guide and tension the film strip while it is being rewound.

TRANSVERSE SLITTER

The now separate longitudinal strips of packages advance from the longitudinal slitters to means for severing the packages from the strips. Because this cutting operation occurs during high speed travel of the conveyor and package film strips, it is necessary to use cutter mechanism that is disposed at an angle to the longitudinal axis of the conveyor. As best shown in FIG. 23, the cutter operates along a line **142** arranged at a 30° angle to the desired cutting line which is normal to the longitudinal axis of the conveyor. As described in detail hereinafter, the cutting elements are carried by endless chain means so as to advance across the width of the conveyor angularly in the direction of conveyor travel at a speed twice that of the rate of conveyor travel. Otherwise stated, since the sine of 30° is .5, the cut performed in the film or strips of packages is normal to the longitudinal axis of the conveyor, specifically along the lines indicated by the presence of transverse grooves **15*b*** in the conveyor surface between adjacent packages and which groove is always disposed beneath the cutting elements of the cutter means.

Referring now to the details of the transverse cutting

device shown in FIGS. 20–23, the cutter includes an endless chain **143**, in this instance comprised of ninety links. The chain is trained over sprockets **144**, **145** mounted firmly on shafts **146**, **147** respectively, journalled in bearing brackets **148**, **149** respectively, secured to the top of the respective side rails of the frame **11**. The shaft **147** extends beyond its bearing and mounts firmly a bevel gear **151**, meshed at all times with a bevel gear **152** carried firmly on a shaft **153** driven at a constant speed through chain **154**. The lower reach of the cutter chain **143** is disposed a short distance above the conveyor **15** and film thereon and it is rotated in a direction to carry its lower run across the conveyor and film in a direction substantially transverse to the conveyor but at an angle to the direction of travel of said conveyor as shown in FIG. 23.

The endless chain **143** carries a series of spaced apart cutter knives **155** each of which is mounted so as to be pivotally urged outwardly. As shown in FIGS. 21 and 22 each cutter **155** is carried in a bracket **156** that is hingedly connected, as at **157**, to the chain. Springs **158** normally urge the brackets **156** in an outward direction. This assures that the cutters will at all effective times contact and sever the underlying film as the cutters are carried thereacross. In the present disclosure there is one cutter knife attached to every ninth link in chain **143** so as to space them apart distances which, when the machine is operating, will coordinate the knives with the advance of the transverse groove **15***b* in the conveyor **15**. Specifically, the chain **143** is driven in a direction to carry its lower run angularly across the film at an angle of about 60° to the direction of travel of the conveyor and film.

Thus with the conveyor and film advancing beneath the cutters at a high rate of speed and the cutter mechanism operating at a greater rate of speed, a cutter knife will enter the film in the area of a transverse conveyor groove **15***b* and it will travel along said groove the entire width of the conveyor. More particularly, upon reference to FIG. 23, a knife will enter the groove **15***b*, as at X, and will travel transversely along said groove as the groove advances longitudinally a distance responding to that indicated at *y* in said figure. During this travel it will sever the packages along their seal separation areas that are aligned with the grooves.

Following the transverse severing of the film of packages, the packages **159** (FIG. 24) will drop through the conveyor onto a belt **160** (FIG. 1) or other means provided to carry them away from the machine.

DRIVE ASSEMBLY

The total drive mechanism may vary but as shown in FIG. 3, the motor **11***a* is the sole source of power. A belt or chain **161** connects the motor with one conveyor shaft **12***a*. This shaft carries a sprocket **162** over which chain **154** is trained. This chain **154** operates to drive the cutter **142**, and the alignment mechanism **54**. It is trained also over a sprocket **163** mounted on a shaft that also carries another sprocket over which the chain drive **107** for the heat sealer chains **114**, **115**. A smaller sprocket **164** on said shaft entrains a chain **165** that drives the heat sealer chain **101**. The conveyor mounting shaft **12** carries a sprocket **166** over which is trained an endless chain **167** which is connected to a drive sprocket **168** on the longitudinal heat sealer assembly **72***a*. The shaft **12** also carries a sprocket **169** training chain **28** that affords a drive connection with the pocket forming mechanism **23**.

ALTERNATE SEALING STRUCTURE

The longitudinal and transverse sealing means hereinabove described may be combined into a single unit structure all as illustrated in FIGS. 25–27.

As there shown, a plurality of sets of sprockets **170**, **171** (four per set) are provided on the machine above the frame **11** and conveyor **15**. The sprockets **170** are positioned rearwardly (longitudinally) of the sprockets **171** and they have an endless chain **172** trained thereabout. An endless chain **170***a* is trained around the sprockets **171**. As shown in FIG. 25, the chain **172** is on the back side of the machine whereas the chain **171***a* is on the front side. These chains constitute means for carrying a series of pressure plates **173** which are adapted to be carried successively downwardly into contact with the top surface of the films **17***a* and **43**, one in registering alignment with each transverse row of packages formed therein. Each has a circular opening **174** that register one with each package.

The plates **173** carry longitudinally offset bearing pintles **175**, the pintles on one end being connected to chain **171** and the pintles on the other end with chain **172**. This manner of mounting and the offsetting of the chains **171–172** insures that the plates remain horizontal while travelling downwardly or upwardly around the respective sprockets, as best shown in FIG. 26. When a pressure or heat transfer ring **173***a* on the under side of the plates is in pressure contact with the films the plates advance longitudinally of the machine at the same rate of speed as the conveyor and films advance.

This pressure plate-chain assembly has contained within its outline a heat sealer assembly generally indicated at **176**. This is somewhat like the assembly illustrated in FIG. 15, and it includes two sets of endless chains **177** each trained over a set of sprockets **178** disposed above the lower reach of chains **171***a* and **172**. The chains **177** mount, as at **179**, the upstanding portions **181** of a horizontal bar **182**, that mounts on its under side a plurality (four) of heater plates **183**. These heater plates are connected to the bar **182** by studs **184** and have expansion springs **185** thereon so as to urge the plates downwardly at all times. A series (three) of heater rings **186**, each mounting a Calrod **186***a*, is mounted beneath each plate **183**. Also disposed beneath each heater ring is a spring mounted pressure disc **187** of a size to fit freely into a related opening **174** in the underlying pressure plate **173**. It should be evident that as the chains **177** advance around their sprockets **178** the heating ring assembly is carried downwardly into engagement with the underlying pressure plate all as best shown in FIG. 27. When so positioned, the pressure disc **187** contacts the film and the heater ring **186** contacts the top surface of the pressure plate thus transmitting its heat through said plate and the heat transfer ring **173***a* to the film to heat seal same. After sealing, the heat sealers are raised from the film and the pressure plates remain in contact with the film for a predetermined period of time to prevent seal separation. After the sealing operation, the film is advanced as before to the cutter mechanism which severs the packages from the film.

Although I have described preferred embodiments of the invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details of the structure disclosed may be modified or changed without departing from the spirit or scope of the invention. Accordingly, it is not desired to be restricted to the exact construction described.

I claim:

1. In a packaging machine, a conveyor having mutually spaced apart longitudinal rows of openings therein and means to deliver a wide soft film of packaging material into overlying position on said conveyor, wherein the improvement comprises a first series of plungers engageable with the film over a longitudinal row of openings for pushing the film into said openings to form pockets and a second series of plungers engageable with the film over another of said rows of openings to push the film into said other row of openings to form pockets, said first pocket forming plungers remaining in engagement in the pockets formed thereby during formation of the later mentioned pockets.

2. A packaging machine comprising a conveyor having mutually spaced transverse and longitudinally aligned openings therein, means to deliver a film of packaging material onto said conveyor, and means operable to form pockets in said material, said means comprising an endless series of plungers engageable with the film over a medial longitudinal row of openings for pushing the film into said openings and like means comprising an endless series of plungers engageable with the film over laterally spaced areas to push the film into the openings in the longitudinal rows of openings on each side of the medial row of openings, said first pocket forming means remaining in engagement in the formed pockets during formation of the later mentioned pockets.

3. In a packaging machine, a horizontal conveyor having three mutually spaced apart longitudinal rows of openings therein, means to deliver a wide soft film of packaging material into overlying position on said conveyor, and means operable to form pockets in said material, said means comprising a plurality of endless series of plungers successively engageable with the material for pushing the material into the openings to form pockets, said series of plungers being arranged to initially engage and form pockets in the center one of said longitudinal rows of openings and subsequently, while the aforesaid plungers are still retained in the pockets formed thereby, to form the outside longitudinal rows of pockets.

4. Means for forming spaced rows of pockets in a soft film arranged over an endless conveyor having openings therein comprising, drive means for said conveyor, a plurality of endless chains arranged partially coextensive with the rows of pockets to be formed, plungers on said chains to successively engage the film and push it into the openings as the film and conveyor pass beneath them, at least one of said chains being longer than the remaining chains so as to cause its plungers to engage the film in advance of engagement of the plungers on the other chains, and common means for driving said chains in unison and at the same rate of speed as the conveyor.

5. The means recited in claim 4, in which the plungers on the longer chain remain in the formed pockets during formation of the pockets by the plungers on the other chains.

6. The method of forming a plurality of longitudinal rows of pockets in a film of packaging material which comprises laying the film over a conveyor having spaced longitudinal rows of openings therein, engaging the film in its medial area and pushing it into a central row of openings, and subsequently engaging side areas of said film and pushing them into the openings on either side of the central row of openings.

7. The method of forming three rows of pockets in a soft film of packaging material which comprises laying said film over an endless conveyor having three longitudinal rows of longitudinally spaced openings therein, engaging the film in its medial area and pushing it into the central row of openings to form pockets, and subsequently engaging the film in the areas of the two side rows of openings and pushing said film into said openings to form pockets.

8. In a packaging machine of the character having a driven conveyor formed with longitudinal rows of transversely aligned openings and transverse grooves in the upper surface thereof between adjacent openings, means to deliver a pair of films in overlying relation onto said conveyor for movement therewith, pockets formed in the lower film one in each conveyor opening, printed material on the upper film adapted to register with the pockets, and means to advance the rate of feed of the upper film to effect such registration, said means including transverse bars movable downwardly into underlying grooves in the conveyor for depressing the film thereinto, and gripper means to prevent retardation of said film during such deformation.

9. In a packaging machine of the character having a driven conveyor, transverse grooves in said conveyor, means feeding a film superposed on said conveyor, means forming merchandise pockets in said film, means feeding a printed overlay film superposed on said pocketed film, and means to insure register of the print on the overlay film with each pocket, said last named means comprising mechanism including a driven endless chain arranged above said overlay film, a plurality of transverse bars carried by said chain, at least some of said bars having a deforming strip thereon disposed to register with a groove in the conveyor, means on the other bars to frictionally engage with the overlay film to hold it in place, and means operable to urge a strip downwardly to push the overlay film into an underlying groove for advancing said film to insure print register with the pockets.

10. In a packaging machine of the character having a driven conveyor, longitudinally spaced transverse grooves in said conveyor, means feeding a film into superposed position on said conveyor, means forming merchandise pockets in said film one between each groove, means feeding a printed overlay film into superposed position on said pocketed film, and means to insure register of the print on the overlay film with each pocket, said last named means comprising mechanism including a driven endless chain operating on a horizontal axis and arranged above said overlay film, a plurality of transverse bars carried by said chain, at least some of said bars having a deforming strip thereon disposed to register with and be spaced normally above a groove in the conveyor, means on the other bars to frictionally engage with the overlay film in advance of the deforming strip to hold the film in place, and cam means operable to urge the strip downwardly to push the overlay film into the underlying groove for increasing the rate of feed of said film to insure print register with the pockets.

11. In a packaging machine including a conveyor having transverse grooves therein and adapted to have two superposed films arranged over said conveyor to move therewith at a given rate of speed normally, means to incrementally advance one of said films relative to the other, said means comprising a plurality of spring loaded strips advanced sequentially over the films and in register with an underlying conveyor groove, said strips being normally out of contact with the films, photo-electric means, and means responsive to actuation of said photo-electric means operable when the upper film lags to depress said strip for urging the film into the groove lying therebeneath.

12. In a packaging machine including a conveyor having transverse grooves therein and adapted to have two superposed films arranged over said conveyor to move therewith at a given rate of speed normally, means to incrementally advance one of said films relative to the other, said means comprising a plurality of bars each carrying a spring loaded strip advanced sequentially over the films and in register with the conveyor grooves, said strips being normally out of contact with the films, and means operable when the upper film lags to depress said strips for urging the film into the groove lying therebeneath.

13. In a packaging machine of the character including a driven conveyor having spaced longitudinal rows of openings therein, means feeding a film over said conveyor, means to press the film into the openings to form pockets, means to deliver merchandise to said pockets, means to feed an overlay film over said pockets, and a plurality of means to heat seal the two films one to the other in the areas between the longitudinal rows of pockets, said last named means each comprising three endless steel bands disposed above and in contact with a film area, means to drive said bands in a direction to advance their lower run over and at the same rate of speed as the films, a heater shoe disposed above and in contact with the lower run of the medial band adapted to transmit heat through the band and into the films for sealing one to the other, said heater shoes being located

adjacent to the area of initial contact of the band with the film.

14. In the packaging machine recited in claim 13, in which means is provided to elevate the heater shoes.

15. The packaging machine recited in claim 13, in which each heater shoe is carried in a frame, and pressure rollers are mounted on said frame to engage with and hold the two outside bands in firm engagement with the underlying film.

16. In a packaging machine of the character including a driven conveyor having a plurality of transverse rows of openings therein, means to feed a film over said conveyor for movement therewith, means to form pockets in said film one in each opening, means to fill said pockets, means to feed an overlay film over said pocketed film, and means to heat seal the films one to the other in transverse areas between the rows of pockets during conveyor operation, said means comprising an endless series of metal strips arranged above and in substantial contact with select transverse areas of the films, means to advance said strips with said areas, a plurality of heater shoes arranged normally above said films, means operable in unison with the film and strip advance to carry the shoes downwardly into engagement with the strips and advance them in unison therewith for a predetermined distance.

17. The packaging machine recited in claim 15, in which the heater shoes are carried on a frame mounted for movement in a vertical plane in an oval pattern.

18. The packaging machine recited in claim 16, in which the heater shoes are spring mounted on said frame.

19. A heat sealing mechanism for performing transverse seals in two webs of film advancing at a predetermined speed therebeneath, said mechanism comprising a series of strips arranged transversely of said film and mounted on endless carriers to have contact with and for movement at the same rate of speed as the film, a series of heater shoes mounted to have intermittent engagement with the strips while said strips are in contact with the film, said heater shoes travelling in the same direction and at the same speed as said strips and film, and means to drive said carriers at the same rate of speed as the film.

20. A heat sealing mechanism for performing transverse seals in two webs of film advancing at a predetermined speed therebeneath, said mechanism comprising a series of strips arranged transversely of said film and mounted to have contact with and for movement with the film, a series of heater shoes mounted to have intermittent engagement with the strips while the strips are in contact with the film, said heater shoes travelling in the same direction and at the same speed as said strips and film, the strips remaining in contact with the films for a predetermined period of time after the heater shoes have been moved out of engagement with the strips.

21. In a packaging machine of a character adapted to form longitudinal and transversely spaced rows of packages from superposed layers of film, means to sever the longitudinal rows of packages one from the other and to trim the side margins of the film therefrom, said means comprising a series of transversely spaced slitters arranged to engage the film between the longitudinal rows of packages and along the side margins thereof, free wheeling rollers disposed to engage the film on each side of each slitter to hold the film firmly, and a driven rewind roller to collect the severed side margins of the film.

22. A packaging machine comprising a horizontal conveyor, laterally and longitudinally spaced openings in said conveyor, means to feed a first film of packaging material to said conveyor in overlying relation, means cooperating with the conveyor to form a pocket in said film, filling means for said pocket, means to deliver an overlay film over said pocket to form with the pocket a closed package, an apertured pressure plate overlying the film and surrounding the package, a heater shoe arranged above the package to bear against the pressure plate to transmit heat therethrough for sealing the films in the area surrounding the package, and a pressure element in said heater shoe for bearing against the package through the aperture in the pressure plate.

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