

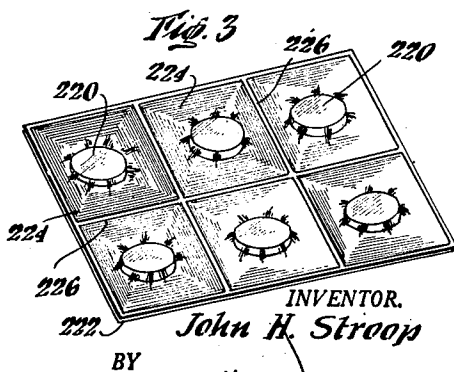
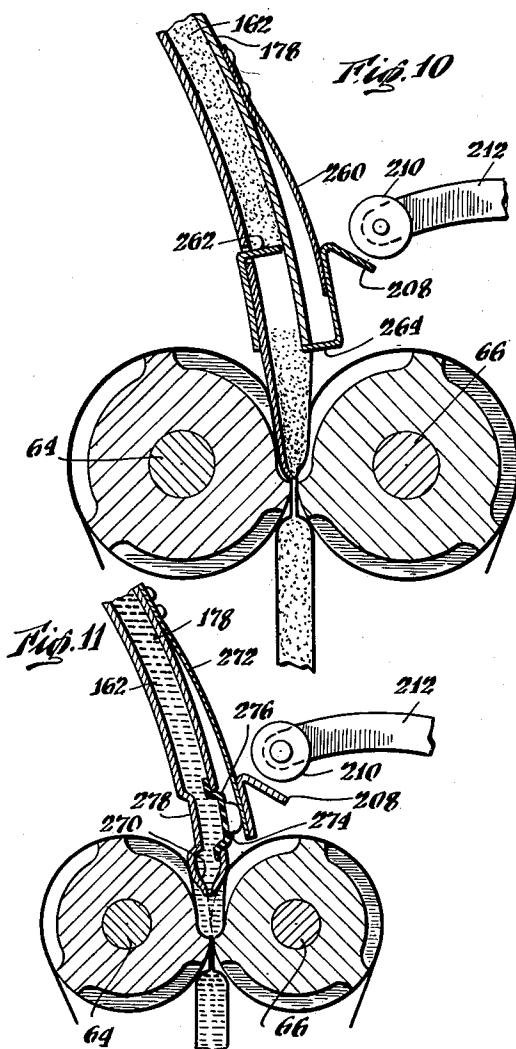
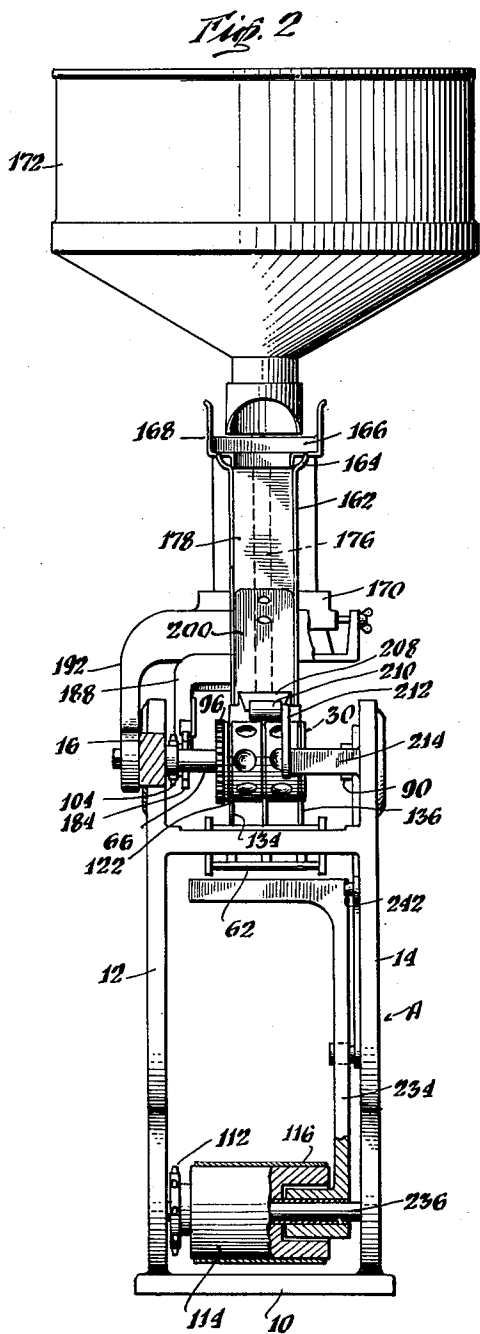
Sept. 2, 1952

J. H. STROOP
PACKAGING MACHINE

2,608,809

Filed Feb. 10, 1950

4 Sheets-Sheet 2



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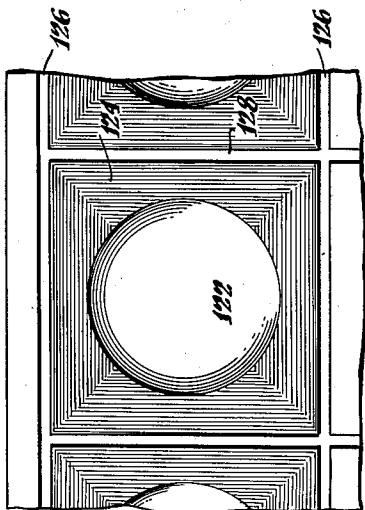
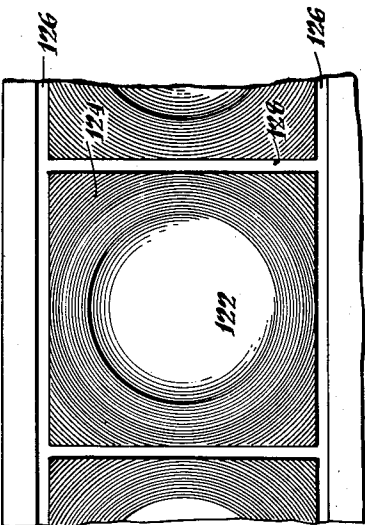
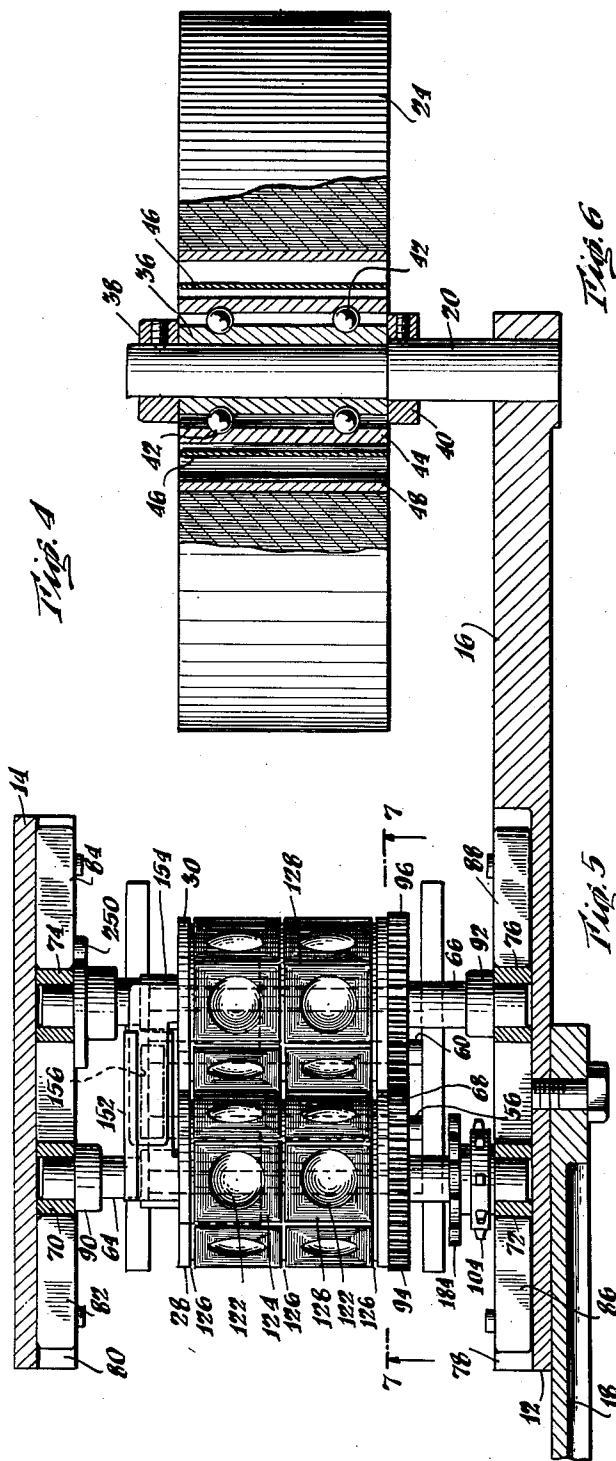
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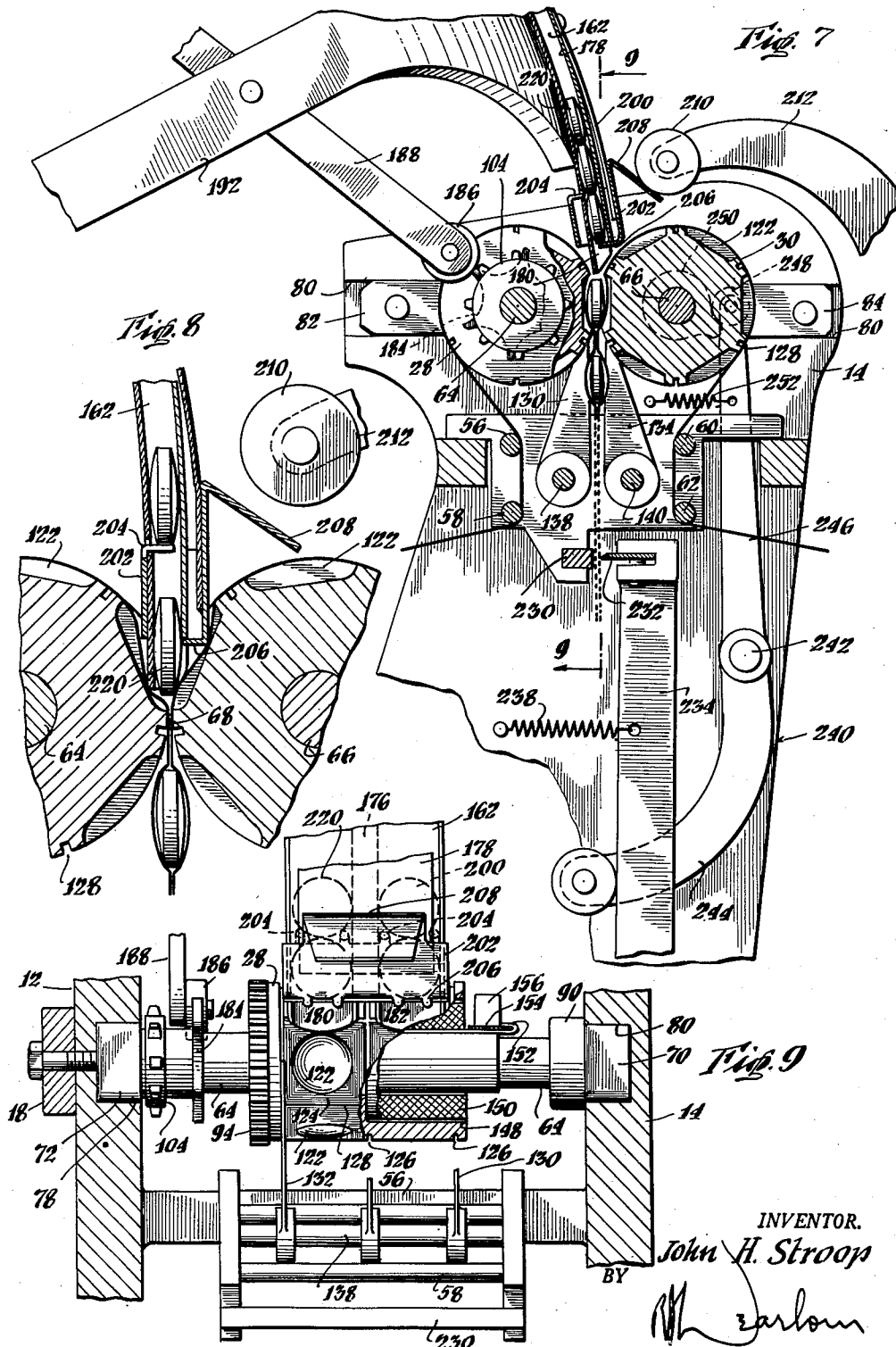
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4 Sheets-Sheet 4



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2,608,809

PACKAGING MACHINE

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29 Claims. (Cl. 53—86)

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This invention relates to machines for packaging articles by enveloping them in flexible materials, and is particularly concerned with apparatus for automatically forming the packaging material into article-receiving pockets independently of the articles themselves, feeding the articles into said pockets and sealing the material around the articles to produce hermetically sealed packages.

While the mechanism of the invention is capable of packaging commodities of various sizes and characteristics in any of the numerous kinds of pressure or heat sealable materials which are or may be available, it is well adapted for packaging pills and other pharmaceutical products between opposed layers of metal foil or heat sealable plastic material, such as cellophane or materials having a thermoplastic coating. Articles of this character normally require unusually careful handling during packaging in order to avoid damage and consequent impairment of their medicinal value, but can be safely, rapidly and economically handled by the apparatus of the present invention.

There are various machines already known which are adaptable to the same general purpose as that of the invention, such as the apparatus disclosed in my earlier United States Patent #2,248,471, but a primary object of this invention is to improve on the construction and method of operation of these prior devices so as to provide a simpler, more efficient, and less expensive mechanism for high-speed, automatic production of hermetically sealed commodity packages, particularly those containing articles which are relatively susceptible to injury by mechanical handling.

The invention may be briefly described as a packaging machine of the character indicated, including a pair of rotatable elements around which pass webs or films of flexible heat or pressure sealable strip material and which cooperate with a forming, feeding and filling device which is automatically actuated in timed relation to the rotation of said elements to preform the material to produce article-receiving envelopes or containers and to deliver articles into said envelopes without subjecting the articles to undue pressure or forced positioning between the opposed layers of packaging material, the rotors being so constructed as to hermetically seal the material about the article substantially simultaneously with the article feeding operation.

The rotatable elements are preferably heated and are provided with cooperating sealing sur-

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faces which produce a plurality of continuous independent barrier seals around each article-containing space or pocket, and the two webs of packaging material are so passed about the rotors that each web is in contact with one of the rotors or a substantial portion of the rotor circumference before it reaches the tangential sealing areas, whereby the material is preheated or plasticized in accordance with the requirements of the particular packaging material being utilized so as to facilitate formation of the article-receiving pockets and ultimate sealing of the material about the articles deposited therein.

The means for directing the packaging material into contact with the rotors are easily changed in position so as to provide a relatively easy adjustment and control of the period of contact of said material with said rotors in accordance with the heat sealing characteristics of the particular packaging material being utilized. The machine also includes a cutting mechanism for partially or completely separating the formed commodity-containing packages into finished units containing one or more articles or in any other desired manner. Also included in the mechanism are means whereby the formed packages may be quickly and readily removed from the machine by a conveyor belt or other suitable means if desired.

Although the particular embodiment of the machine described in this specification is intended for the packaging of commodities of predetermined size and characteristics, i. e., pills or other pharmaceutical products of a like nature, the machine may also be used for packaging fluids or free flowing solids, particularly loose pourables such as powders or granular material. When the machine is to be used for packaging fluids or free flowing solids, the feeding and filling device is provided with a delivery spout or orifice of flexible walled construction which is opened or closed by cam action in timed relation to the movement of the rotatable elements to measure the successive charges of material, and with which is associated one or more movable web-engaging members adapted to preform the commodity-receiving spaces.

An object of this invention is a provision of an improved machine for forming commodity-containing packages of strips or webs of flexible packaging material.

Another object of this invention is to provide an improved packaging machine for forming hermetically sealed commodity-containing packages from strips or webs of flexible packaging material

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that is simple and inexpensive in construction and is capable of operation at higher speeds than are possible with similar devices now available in the art.

Another object of this invention is to provide an improved machine for forming hermetically sealed commodity-containing packages of strips or webs of flexible packaging material capable of utilizing varied packaging materials.

Another object of this invention is to provide a machine for forming commodity-containing packages of strips or webs of flexible packaging material wherein the commodity is hermetically sealed by a plurality of continuous independent barrier seals.

Another object of this invention is to provide a machine for forming commodity-containing packages of strips or webs of flexible material having a pair of matched rotatable elements for the formation of a multiple barrier hermetic seal about the packaged commodity.

Another object of this invention is to provide an improved machine for forming commodity-containing packages of strips or webs of flexible material which may be utilized to package solids, loose pourables or liquids.

Another object of this invention is to provide an improved machine that is easily adapted to packaging different sized commodities in varying types of packaging material.

Another object of this invention is to provide an improved packaging machine of the type described including an improved package-forming and article-depositing element.

Another object is to provide an improved packaging machine which may be readily adapted to the thermoplastic characteristics of varying packaging materials.

Another object of this invention is to provide a method of constructing sealing elements for forming multiple continuous barrier seals in the fabricated packages.

Another object of this invention is the provision of an improved hermetically sealed commodity-containing package.

Another and further object of this invention is the provision of a novel construction of a sealing element for use in packaging machines of this general character.

These and other objects will appear more fully upon a consideration of the detailed description of the embodiments of the invention which follow.

For a better understanding of the nature of the invention, a practical form thereof will now be described in detail. In the illustrative example chosen, it will be assumed that the machine is to produce a continuous strip of individually packaged pharmaceutical tablets of friable character, the packaging material being a transparent, thermoplastic film, such as cellophane, and each tablet being surrounded by a plurality of continuous barrier seals which form a hermetic enclosure therefor.

Referring to the drawings:

Fig. 1 is a side elevation of a presently preferred embodiment of the invention;

Fig. 2 is a front elevation generally on the line 2—2 of Fig. 1;

Fig. 3 is an oblique view of the commodity-containing packages formed by the invention;

Fig. 4 is a sectional view on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged plan view of a portion of one of the rotatable elements illustrating a com-

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modity-defining pocket and the plurality of rectangular barrier seal forming serrations;

Fig. 6 is an enlarged plan view of a portion of one of the rotatable elements illustrating a commodity-defining pocket and the plurality of circular barrier seal forming serrations;

Fig. 7 is a sectional view on the line 7—7 of Fig. 4;

Fig. 8 is an enlarged side sectional view of a portion of the forming and feeding mechanism;

Fig. 9 is a section on the line 9—9 of Fig. 7;

Fig. 10 is an enlarged schematic view partially in section showing the construction of the feeding mechanism adapted for loose pourables; and

Fig. 11 is an enlarged schematic representation of an embodiment of the feeding mechanism adapted for liquids.

The principal elements of the presently preferred embodiment of the invention, as illustrated in the drawings, include a frame generally designated as "A" on Fig. 1, including means for supporting the rolled webs of packaging material in strip form, a rotor assembly for forming and sealing the packages generally designated as "B" on Fig. 1, a forming, feeding and filling mechanism, generally designated as "C" on Fig. 1, which cooperates with the rotors to form the packages and delivers the commodities, i. e., tablets, to the formed packages in timed relation to the operation of the rotors, and a cutter mechanism, generally designated as "D" on Fig. 1 for either partially or completely severing either individual packages or groups of packages from the strip at the delivery end of the machine.

Referring to Figs. 1, 2, 4, 7 and 9, there is provided a frame A comprising a U-type casting having a horizontally disposed base 10 and a pair of vertical spaced side plates 12 and 14 which are suitably machined to support the various shafts and other elements of the operating mechanism. One of the side plates 12 is provided with horizontally disposed extended support arms 16 and 18 for the packaging material. The support arms 16 and 18 are either cast integrally with the frame A or are detachably connected thereto. In the ends of the support arms 16 and 18 are journaled horizontally disposed shafts 20 and 22 for rotatably supporting rolls of strip or web packaging film 24 and 26 which are either homogeneously thermoplastic or are coated with thermoplastic sealing materials. The support arms 16 and 18 extend outwardly from the frame in opposite directions and support the rolls of packaging material 24 and 26 with their axes substantially parallel to those of sealing rotors 28 and 30.

To secure easy and constant alignment of the rolls of packaging material an improved mount therefor is provided. Referring to Figs. 1 and 4, the shaft 20 has a hub 36 fixedly positioned thereon by the collars 38 and 40. Mounted on the hub 36 and spaced therefrom by ball bearings 42 is a freely rotatable hub 44. Mounted on the hub 44 and spaced substantially 120° apart are three spring tension clips 46. Conventional rolls of packaging material, and particularly cellophane, are supplied wound on a cylindrical cardboard spool 48. The cardboard spool 48 is manually forced over the spring tension clips 46 in such a manner as to deflect said clips a slight amount. The spring-like characteristics of said clips 46 maintain the supply material in alignment and fixed in position for feeding the packaging material onto the sealing rotors 28 and 30.

The films of packaging material in strip form are drawn from the under portions of the supply

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rolls 24 and 26 mounted on the supporting arms 16 and 18 and are directed around suitable idler guide rollers 56 through 62 in such a manner that they first come into contact with the rotors 28 and 30 at points on the periphery thereof which are spaced away from the tangential sealing line intermediate said rotors. The idler rollers are positioned and supported by the vertical side plates 12 and 14. If desired, the idler rollers 56 through 62 may be shifted in location to bring the webs of packaging into contact with the rotors 28 and 30, at any predetermined location so as to obtain a dwell of the strips on said rotors in accordance with the heat sealing characteristics and thermoplastic requirements of the particular package material being utilized. The provision for obtaining any desired amount of dwell of the packaging material upon the rotors 28 and 30 either alone or together with an accurate control of the temperature of said sealing rotors 28 and 30 permits the utilization of varying packaging materials and affords an accurate control of the sealing efficiency of the machine by conditioning the packaging material in accordance with its thermoplastic characteristics so as to obtain a seal under the optimum sealing conditions for the particular packaging material utilized.

The rotor assembly comprises a pair of rotors 28 and 30 mounted on horizontal shafts 64 and 66 and extending between the side plates 12 and 14 of the frame, having their peripheries substantially in contact with each other at the tangential sealing location 68. The shafts 64 and 66 are rotatably supported at each end by small bearing blocks 70, 72, 74, 76 positioned in horizontally disposed machined channels 78 and 80 in the vertical side plates 12 and 14, respectively, which closely limit movement of the rotors 28 and 30 in the vertical plane but permit easy horizontal positioning of said rotors. Suitable spacing blocks 82, 84, 86 and 88 sized to ride in said channels 78 and 80 and adapted to be securely fixed in position are provided to position the bearing blocks 70, 72, 74 and 76 and thus position the rotors 28 and 30. To position the shafts 64 and 66 transversely of said side plates 12 and 14 positioning collars 90 and 92 are provided.

The sealing rotors 28 and 30 are geared together by the gears 94 and 96 (see Fig. 4) and are adapted to counter-rotate equivalently. The drive for continuous rotation of the sealing rotors 28 and 30 originates at an electric motor 98 (see Fig. 1) mounted on the horizontal base plate 10 of the frame. The motor 98 rotates a driving sprocket 100 which is connected by a suitable drive chain 102 to a drive sprocket 104 mounted on the shaft 64 adjacent the sealing rotor 28. A suitable tensioning idler roller 106 mounted on arm 108 pivotally mounted on the frame and biased by a spring 110 controls the tension in the drive chain 102. In the embodiment of the invention as illustrated in Fig. 1, the drive chain 102 also engages a sprocket 112 mounted on a belt pulley 114 for driving a conveyor belt 116. The conveyor belt 116 may be used, if desired, to transmit the finished commodity-containing packages from the machine to an inspection station or to another operating unit.

Each of the rotors 28 and 30 is provided with one or more series of peripherally spaced commodity-defining recesses or pockets 122 of a size slightly larger than that of the tablets to be packaged and the gearing of the two rotors together by the gears 94 and 96 must be such as to

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assure the proper continual exact registry of the recesses or pockets 122 on each of said rotors, as the rotors 28 and 30 rotate in response to the rotation of the motor 98 through the above described drive linkage. In some cases it may be advantageous to provide pockets only in one of the rotors instead of in both.

In the embodiment of the invention illustrated in the drawings, each rotor is provided with two adjacent banks of commodity-defining recesses or pockets 122 positioned in spaced array on its periphery. However, if desired, rotors having a single series of recesses or rotors having three, four or more series of recesses may be utilized in accordance with the production requirements of the commodity to be packaged.

The construction of the machine of the type disclosed in this application is particularly advantageous in that rotors having a number of series of recesses positioned axially thereon may be utilized in accordance with production requirements of the commodity to be packaged due to the fact that webs of material are maintained in contact with the surfaces of the rotors as the material is advanced to the sealing location. The web can be made as wide as necessary and the space above the rollers between the webs is unobstructed so that gang feed members or any appropriate number of individual feeding members, each of with its hollow mandrel, may be utilized to cooperate with the corresponding number of series of recesses on the rotors.

Referring to Figs. 5 and 6, each of the commodity-defining recesses or pockets 122 spaced on the periphery of the rotors 28 and 30 is surrounded by a plurality of closely spaced continuous independent concentric serrations 124. The serrations 124 which surround each of the pockets 122 on the sealing rotor 28 have cooperating matching counterparts on the sealing rotor 30. Fig. 5 illustrates one embodiment wherein the plurality of continuous independent serrations are rectangularly disposed around the commodity defining pocket 122, while Fig. 6 illustrates an embodiment wherein the plurality of continuous independent concentric serrations 124 are circularly disposed around the commodity-defining pocket 122.

The serrations 124 on the sealing rotors 28 and 30 coact to form a multiple barrier seal in the packaging material around the commodity positioned in the center thereof as the strips or webs of packaging material pass through the tangential sealing location 68 (see Figs. 4 and 7) between the sealing rotors 28 and 30. Each of the commodity-defining pockets 122 and its associated plurality of continuous independent serrations is bounded by relatively deep longitudinal grooves 126 and transverse grooves 128. The grooves 126 and 128 embedded in the surface of the rotors 28 and 30 serve to define the bounds of the package to be formed.

In addition, the longitudinal grooves 126 provide a track in which the points of the disengaging blade members 130, 132, 134 and 136 ride (see Figs. 1, 2 and 7). The blade members 130 and 132 are mounted on a horizontally disposed shaft 138 supported by the side plates 12 and 14 of the frame. In a similar manner the blade members 134 and 136 are mounted on a horizontally disposed shaft 140. The tips of the blade members 130 through 136 being thus disposed beneath the sealing surfaces of the sealing rotors 28 and 30 serve to disengage the formed packages from the surfaces of said rotors 28 and 30 and to direct

said formed packages in their downward movement between said blade members. The blade members should be slidably mounted on their respective supporting shafts so as to be shiftable in location in accordance with the spacing of the defining grooves on sealing rotors of varying dimensions.

If it is desired to form a single line of packages on the illustrated dual machine, the disengaging blade members may be positioned in engagement with the longitudinal groove intermediate the dual series of commodity-defining pockets illustrated in the drawings whenever it is desired to form a single array of packages through only utilizing half the available sealing surfaces of the rotors 28 and 30.

As the sealing rotors 28 and 30 are intended to provide a hermetically sealed commodity-containing package having a multiple barrier seal disposed around the packaged article, it is essential to have the serrations 124 on one of said rotors to be sealing counterparts of the serrations 124 on the other of said rotors. Therefore, as a part of this invention, there is included a simple and inexpensive method of sealing rotor formation.

This presently preferred method of forming matched sealing rotors is to have one master rotor formed of hard material, such as 24 ST hard aluminum, and engraved with a plurality of grooved, continuous, rectangular sealing lines or serrations 124 surrounding each of the commodity-defining recesses or pockets 122 embedded on the surface thereof. The master rotor is then placed in the above described frame and maintained in compressive engagement with the surface of a dead soft mating rotor formed of a soft material, such as 61 ST aluminum or like material. Positive rotation of the rotors through the above described drive mechanism, results in a reproduction of the engraved pattern of the master rotor on the second or soft rotor.

The above provides a simple and economical method of producing perfectly matched sealing surfaces by driving said rotors with their surfaces in tight compressive contact with each other resulting in an embossing of the pattern of the master rotor on the soft surface of the second rotor. After the sealing pattern has been applied to the soft rotor, it is, or the surface thereof is, then hardened by conventional known methods and is ready for use, together with the master rotor, in the packaging machine.

After the sealing pattern has been transferred from the master rotor to the soft rotor and said soft rotor has been treated to provide a hardened surface thereon, they are re-assembled in the machine in the manner illustrated in Fig. 4 with sufficient clearance at the tangential sealing location 68 to receive the opposed films of sealing material therebetween and to press the latter into sealing condition forming a plurality of continuous independent barrier seals disposed about the commodity-containing area.

To obtain a desired degree of plasticity in the packaging material in the vicinity of the tangential sealing location 68, heating elements are included in each of the sealing rotors 28 and 30. Referring now particularly to Fig. 9 which illustrates the sealing rotor 28, and with the understanding that the sealing rotor 30 is similarly constructed, there is provided an annular recess 148 in the body of the rotor 28. Rotatably mounted on the portion of the shaft 64 contained within the recess 148 is an annular heating element 150. The heating element 150 comprises a heli-

cally wound resistance element mounted on soapstone or other heat resistant insulating material and so positioned within the recess 148 in the rotor that the resistance element lies immediately below the sealing surface thereof. The heating element 150 has a flat horizontally disposed plate 152 mounted thereon. This plate is adapted to be secured to a similar plate 154 (see Fig. 4) mounted on the heating element associated with the sealing rotor 30. The securing of these plates 152 and 154 positions the heating elements and prevents their rotating in conjunction with their respective sealing rotors.

The heating circuit is composed of a low energy circuit, such as a six volt circuit, actuating a thermostatic switch 156 mounted on the plate 152 and directly associated with the resistance elements of the heater elements, and a suitable power relay activated by the low energy circuit carrying the full voltage required for the resistance heating elements. The use of a thermostatic switch constantly adjusted in accordance with the temperature variations of the heating elements provides an accurate low cost temperature control. The low energy circuit for the thermostatic switch minimizes the arcing across contacts in order to insure maximum life for the switch.

Positioned above the sealing rotors 28 and 30 is an arcuate quadrant shaped filler duct 162 pivotally mounted on the shaft 22 on the support arm 18. The upper end of the arcuate duct 162 is substantially horizontal and supports a trough 164 positioned beneath the lip 166 of a vibrating feed table 168 mounted on a supporting platform 170 formed by an extended portion of the support arm 18. The trough 164 extends backwardly beyond the lip 166 so as to continually remain in receiving position during its reciprocating action. The tablets to be packaged are fed onto the table 168 from a supply hopper 172 supported by an adjustable post 174. The tablets to be packaged are directed into the duct 162 by the vibrating feed table 168. When in the duct 162 the tablets are formed into two columns by the action of a centrally disposed abutment 176 and are maintained therein and limited to a depth of a single tablet by an arcuate cover member 178.

The lower end of the arcuate duct 162 lies in a substantially vertical plane closely adjacent the tangential sealing location 68 intermediate the sealing rotors 28 and 30. Mounted on the lower end of the arcuate quadrant-shaped filler duct 162 and positioned at the ends of the tablet columns contained therein are a pair of extended trough-shaped mandrels 180 and 182 which cooperate with the commodity-defining pockets 122 to form a tablet-receiving pocket in the packaging material and permit the tablets to pass therethrough. The duct 162 is reciprocable in the plane of its arc in timed relation with the rotation of the rotors 28 and 30 through the action of the actuating cam 184 mounted on the shaft 64 and the rotatable cam follower 186 on the cam follower supporting arm 188 mounted on the supporting arms 190, 192 of the duct 162. The amplitude of reciprocation of the duct 162 may be varied by varying the positioning of the follower arm 188 on the supporting arm 190.

The lower end of the filler duct 162 is also provided with a cam actuated release mechanism in the nature of a two-stage counting device which is adapted to release or drop the lowermost tablet in each of the columns in the duct while stopping or holding the next successive tablet in

line in each of said columns. Specifically (see Fig. 7) there is provided a spring member 200 secured at one end to the upper surface of the arcuate duct 162. The member 200 is normally biased away from the surface of the duct 162. Mounted on the free end of the spring member 200 is a rectangularly shaped cap 202 of a depth at least twice that of the depth of the duct 162 at that location. Mounted on the end of the cap 202, and spaced approximately a tablet's distance apart are oppositely extending pairs of tines 204, 206. When the cap 202 is in its normally biased position, i. e., away from the surface of the duct 162, the tines 204 by extending through suitable apertures in the lower surface of the duct 162 are positioned blocking each of the tablet columns and halt the motion of the column of tablets. At the same time as the tines 204 are disposed across the tablet column, the tines 206 are removed from blocking engagement in the mouth of the tablet columns in the duct 162 permitting any tablet positioned between said pair of tines to fall out of the duct. Conversely when the tines 206 are positioned across the mouth of the tablet columns, the tines 204 are removed from blocking engagement therewith and permit the tablets in the column to advance to the mouth of the column where they are halted by the tines 206. As the spring member returns to its normally biased position, the tines 204 intercept the tablet column and the concurrent removal of the tines 206 from the mouth of the duct permit the tablet disposed between the tines 204, 206 to fall, under the influence of gravity, out of the filling duct 162.

It should be clearly understood that two pairs of tines as above described are provided for each of the tablet columns in the duct 162. The utilization of tines as an arresting mechanism is preferred due to the conventional circular shape of pharmaceutical pills, however other arresting means, such as a solid bar or plate could also be utilized within the scope of the invention.

The cap 202 having the tines 204, 206 mounted thereon is horizontally reciprocated by the engagement of the actuating arm 208 with the cam roller 210 in the reciprocable movement of the duct 162 as described above. The cam roller 210 is positioned by the arm 212, mounted on and spaced from the vertical side plate 14 by the positioning members 214 (see Fig. 2).

Through the above described structures, the duct 162 is reciprocable in the plane of its arc in timed relation with the rotation of the sealing rotors 28 and 30 so as to move the package-forming mandrels 180 and 182 on the lower end thereof downwardly between the opposed webs of packaging material on the surfaces of the sealing rotors 28 and 30 to form a pocket, in cooperation with the commodity-defining pockets 122, of predetermined volumetric characteristics therebetween, to receive a tablet which is simultaneously dropped from the duct 162 when the actuating arm 208 moves downwardly out of engagement with the cam roller 210. The upward portion of the reciprocating movement of the duct 162 removes the mandrel-like members 180 and 182 from the package-forming location and clears the sealing areas for the continued rotation of the rotors 28 and 30. In addition, the upward movement of the duct 162 brings the actuating arm 208 into engagement with the cam roller 210, moving the tines 206 across the mouth of the tablet column simultaneously with the removal of the tines 204 from the blocking position therein and

permitting a new tablet to be moved into the portion of the duct disposed between the tines 204 and 206.

The reciprocating movement of the filler duct 162 also produces at its upper substantially horizontally disposed end, a vibrational or shaking action which augments the feed of tablets in the trough 164 and the directing of the same into the tablet columns within the duct 162.

The actuating cam 184 which controls the reciprocating action of the duct 162 is mounted on the shaft 64 which provides an accurate timing of the movement of the duct 162 in response to rotation of the sealing rotor 28.

As explained above, the two strips of packaging material are drawn from the underside of the supply rolls and passed over the idler rolls 56, 58, 60 and 62 in such a fashion that they first come in contact with the sealing rotors 28 and 30 in a substantial angular distance away from the tangential sealing location 68. As the packaging material flows over the surface of the sealing rotors 28 and 30 through this predetermined arc, there is ample time for heat transfer and a resultant plasticizing of the whole web or a thermoplastic coating on the web. This feature eliminates the machine speed time element which is normally a general factor to be considered in most sealing operations and there is no physical limitation placed on the speed of operation imposed by the filling or other operations incidental to the actual packaging of the commodities.

As the preplasticized or heated strips of packaging material approach the tangential sealing location 68 intermediate the sealing rotors 28 and 30, the arcuate filling duct 162 is brought down through the action of the cam 184 so that the mandrel-like members 180 and 182 positioned on the end thereof enter between the approaching webs and in cooperation with the commodity-defining pockets 122 on the surface of the sealing rotors 28 and 30 form a pocket of definite volumetric character to receive the tablets which are simultaneously released by the above described feeding mechanism. This is all continuously done in motion, and the webs having had their pockets formed through the above described cooperating action of the mandrels 180 and 182 and the commodity-defining pockets 122, the tablet placed and a complete multiple barrier seal effected as each package passes through the sealing zone.

A portion of the strip of formed packages is illustrated in Fig. 3. The tablets 220 are positioned between the packaging material 222. Each of the tablets is surrounded by a plurality of continuous independent seals 224 which form a multiple barrier seal. The longitudinal grooves 128 and transverse grooves 126 embedded on the surface of the sealing rotors 28 and 30 as described above, result in a plurality of spaced lines 226 defining the commodity-containing package.

After the packages have been formed and sealed in the manner described above, the strip of sealed packages is advanced past an anvil 230 positioned beneath the tangential sealing location 68. Cooperating with the anvil 230 is a cutting blade 232 mounted in an arm 234. The arm 234 is pivotally mounted on a shaft 236 (see Fig. 2) positioned between the vertical side plates 12 and 14 adjacent the horizontal base 10. The cutting arm 234 is adapted to be moved into cutting relationship with the anvil 230 by a powerful spring 238. The cutting arm 234 is maintained in a retracted or non-cutting position by the

action of a crank 240, pivotally mounted on the vertical side plate 14 at 242. One arm 244 of the crank 240 engages the arm 234 and the other arm 246 terminates in a cam follower 248 maintained in engagement with a cam 250 mounted on the shaft 66 by a biasing spring 252. The cam 250 is shaped so as to provide a sharp release of the cutting arm 234, which is then moved into cutting relationship with the anvil 230 under the influence of the powerful tension spring 238. The cam 250 is also provided with an adjacent sharp rise to quickly remove the cutting arm 234 from cutting relationship with the anvil 230 immediately after contact therewith. The cam 250 may, of course, be designed to sever any desired number of packages in accordance with a customer's desires. The cutting blade 232 may be shaped so as to either sever the packages completely from each other or to provide a serrated groove intermediate the packages.

It will be understood that the arcuate filling duct 162 described above is adapted to handle tablets or other solid objects whose deposition may be controlled by a counting or depositing mechanism of the type described above. However, the duct 162 may be modified to convey loose, free flowing pourables by the inclusion of a depositing mechanism adapted to release volumetric quantities of the material being handled. To these ends a modification such as that disclosed in Fig. 10 may be utilized. In this embodiment a spring member 260 is provided with oppositely disposed solid blocking members 262, 264 instead of the times described above in connection with tablet handling. The actuating mechanism for controlling the positioning of the blocking members 262 and 264 is similar in construction to and functions in a similar manner as that described above for tablet handling.

It will be further appreciated that the arcuate filling duct 162 could be readily adapted to convey fluids to the volumetrically preformed packages. To these ends, a modification such as that illustrated in Fig. 11 may be utilized. A nozzle 270 having a known orifice may act as a forming mandrel in addition to regulating the quantity of fluid released. In this modification the spring member 272 serves as a mount for a clamping arm 274 adapted to compress a flexible diaphragm 276 against an abutment 278 in the duct. The actuating mechanism for controlling the positioning of the clamping arm 274 is similar in construction and function to that described above for tablet handling. In the embodiment described above, there would be a regulation of the head pressure in the duct for controlling the quantity of fluid which would pass through the known orifice in the nozzle 270 during the time it was introduced into the package.

Having thus described my invention, I claim:

1. In a machine for forming commodity-containing packages of strips of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of continuous matched independent sealing serrations disposed around matched commodity-defining pockets thereon, a reciprocable mandrel operative in timed relationship with said rotatable elements and cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said package formed by said mandrel and said commodity-defining pocket.

2. The combination as set forth in claim 1 wherein said mandrel is so formed as to permit the commodity to pass the mandrel and enter the package.

3. In a machine for forming hermetically sealed commodity-containing packages of strips of flexible packaging material, in combination, a pair of matched counter-rotating sealing elements having a plurality of continuous matched independent sealing serrations disposed around matched commodity-defining pockets thereon, a reciprocable mandrel operative in timed relationship with said counter-rotating sealing elements and cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said package formed by said mandrel and said commodity-defining pocket.

4. The combination as set forth in claim 3 wherein said plurality of continuous independent sealing serrations are rectangularly and concentrically disposed around the commodity-defining pockets.

5. The combination as set forth in claim 3 wherein said plurality of continuous independent sealing serrations are circularly and concentrically disposed around the commodity-defining pockets.

6. A machine for forming commodity-containing packages from two independent strips of flexible packaging material, comprising, means for supporting independent rolled webs of the packaging material, a pair of matched rotatable elements between which the strips of packaging material are passed, a plurality of matched commodity-defining pockets spaced in a predetermined array on the peripheries of said rotatable elements, a plurality of continuous independent matched sealing serrations disposed around each of said commodity-defining pockets for effecting a plurality of continuous barrier seals on said packaging material as it passes between said rotatable elements, a reciprocable mandrel operative in timed relationship with said rotatable elements and cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said package formed by said mandrel and said commodity-defining pocket.

7. In a machine for forming commodity-containing packages of two independent webs of packaging material, in combination, a pair of matched sealing rotors whose surfaces abut each other at a sealing location, means for supporting independent webs of packaging material, guiding members for introducing said webs of packaging material in contact with the surfaces of said sealing rotors at a location spaced from said sealing location, a plurality of matched commodity-defining pockets spaced in a predetermined array on the surfaces of said rotors, a plurality of continuous independent sealing serrations disposed around each of said commodity-defining pockets for effecting a multiple barrier seal in the packaging material as said material is advanced through the sealing location, a reciprocable mandrel operative in timed relationship with said sealing rotors and cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said package

formed by said mandrel and said commodity-defining pocket.

8. In a machine for forming commodity-containing packages of two webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements abutting each other at a tangential sealing location and having a plurality of continuous, matched, independent sealing serrations disposed around each of a plurality of commodity-defining pockets spaced in a predetermined array thereon, said serrations being to effect a multiple barrier hermetic seal in the packaging material as said material is advanced through the sealing location, means for delivering said strips of packaging material to said tangential sealing location in continuous contact with the surfaces of said rotatable elements, means for softening said webs by heat as they contact said rotatable elements, a mandrel operative in timed relationship with said rotatable elements and cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said package formed by said mandrel and said commodity-defining pocket.

9. In a machine for forming a commodity-containing package of two webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of continuous matched independent sealing serrations disposed around each of a plurality of commodity-defining pockets spaced in a predetermined array thereon, said pair of rotatable elements abutting each other at a tangential sealing location, guiding rolls for placing said webs of packaging material in contact with the surfaces of said rotatable elements at a predetermined angular distance apart from said tangential sealing location, a reciprocable filling duct operative in timed relation with said sealing elements to advance a column of commodities toward said sealing location, a mandrel mounted at one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing commodities in said packages formed by said mandrel and said commodity-defining pockets.

10. In a machine for forming commodity-containing packages of webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of continuous matched independent sealing serrations disposed around matched commodity-defining pockets thereon, heating elements contained within said rotatable elements for raising the surface temperatures thereof, said pair of rotatable elements abutting each other at a tangential sealing location, means for placing said webs of flexible packaging material in contact with the surfaces of said rotatable elements at a predetermined angular distance from said tangential sealing location, a reciprocable mandrel operative in timed relationship with said rotatable elements and cooperatively associated with commodity-defining pockets for forming packages of predetermined volumetric characteristics, and commodity-feeding members for depositing commodities in said packages formed by said mandrels and said commodity-defining pockets.

11. In a machine for forming a commodity-containing package of webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of

continuous matched independent sealing serrations disposed around matched commodity-defining pockets thereon, a reciprocable arcuate filling duct operative in timed relationship with said rotatable elements, mandrels mounted at one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member responsive to the position of said mandrels for depositing commodities in said packages formed by said mandrels and said commodity-defining pockets.

12. A packaging machine comprising a pair of cooperating rollers having commodity-defining pockets thereon, means for feeding two webs of packaging fabric between the cooperating rollers, a hollow reciprocating mandrel to spread the webs into the pockets and form a series of envelopes therein and means for feeding the articles to be packaged through the hollow mandrel into the web envelopes.

13. A packaging machine comprising a pair of cooperating rollers having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs between the cooperating rollers, means for supplying a stream of articles between the webs whereby the rollers press the webs together around the individual articles, said supplying means including a reciprocable duct, and a web-spreading mandrel at one end of and reciprocable with said duct, the articles passing from the duct via the mandrel to enter the pockets.

14. A packaging machine comprising a pair of cooperating rollers mounted with their axes horizontal and having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs downwardly between the cooperating rollers, means for supplying a stream of articles between the webs, a reciprocally operating mandrel adapted simultaneously to enter successive pockets in succession and spread the webs to form envelopes for the articles without interfering with the flow of the articles into the pockets, and said rollers having continuous matched sealing serrations disposed around said commodity-defining pockets, to effect a multiple barrier hermetic seal around each envelope.

15. A pair of cooperating rollers having circumferentially spaced commodity-defining pockets, a pair of spaced webs, means for bringing the webs together where the rollers are in cooperation and feeding them between the rollers, a hollow mandrel reciprocated to expand the webs into the pockets of the rollers to form open envelopes to receive a series of commodities to be packaged.

16. A pair of cooperating rollers having circumferentially spaced commodity-defining pockets, a pair of spaced webs, means for bringing the webs together where the rollers are in cooperation and feeding them between the rollers, a hollow mandrel reciprocated to expand the webs into the pockets of the rollers to form open envelopes, and a feed duct for delivering a series of commodity increments between the webs and into the pockets through the hollow mandrel.

17. A pair of cooperating rollers having circumferentially spaced commodity-defining pockets, a pair of spaced webs, means for bringing the webs together where the rollers are in cooperation and feeding them between the rollers, a hollow mandrel reciprocated to expand the webs into the pockets of the rollers to form open envelopes, a

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feed duct for delivering a series of commodity increments between the webs and into the pockets through the hollow mandrel, and means for insuring that a measured quantity of the commodity enters into each pocket.

18. In a machine for forming hermetically sealed commodity-containing packages of strips of flexible packaging material, in combination, a pair of matched counter-rotating sealing elements abutting each other at a tangential sealing location and having a plurality of continuous matched independent sealing serrations disposed around each of a plurality of commodity-defining pockets thereon, a reciprocable filling duct operative in timed relation with said sealing elements to advance a column of commodities toward said sealing location, a mandrel mounted at one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member for depositing a commodity in said packages formed by said mandrel and said pockets.

19. In a machine for forming hermetically sealed commodity-containing packages of strips of flexible packaging material, in combination, a pair of matched counter-rotating sealing elements abutting each other at a tangential sealing location and having a plurality of continuous matched independent sealing serrations disposed around each of a plurality of commodity-defining pockets thereon, a reciprocable filling duct operative in timed relation with said sealing elements to advance a column of commodities toward said sealing location, a mandrel mounted at one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a timed release mechanism mounted on and in said duct for permitting a predetermined amount of commodity to pass from said duct and be deposited through said mandrel in said pockets between said strips.

20. In a machine for forming a commodity-containing package of two webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of continuous matched independent sealing serrations disposed around each of a plurality of commodity defining pockets spaced in a predetermined array thereon, said pair of rotatable elements abutting each other at a tangential sealing location, guiding rolls for placing said webs of packaging material in contact with the surfaces of said rotatable elements at a predetermined angular distance apart from said tangential sealing location, a reciprocable filling duct operative in timed relation with said rotatable sealing elements to advance a column of commodities by gravity toward said sealing location, a mandrel mounted at one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a timed release mechanism mounted on and in said duct for permitting one commodity at a time to pass from said duct and be deposited through said mandrel in said pockets between said webs.

21. In a machine for forming commodity-containing packages of webs of flexible packaging material, in combination, a pair of similarly sized rotatable elements having a plurality of matched commodity-defining pockets thereon, a reciprocable filling duct operative in timed relation with said rotatable elements, a mandrel mounted at

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one end of said duct cooperatively associated with said commodity-defining pockets for forming packages of predetermined volumetric characteristics, and a commodity-feeding member responsive to the position of said mandrel for depositing commodities in said packages formed by said mandrel and said commodity-defining pockets.

22. A packaging machine comprising a pair of cooperating rollers having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs between said rollers, and means for supplying a stream of articles between the webs whereby the rollers press the webs together around the individual articles, said supplying means including a reciprocating duct, a mandrel mounted at one end of said duct and reciprocable therewith to spread the webs into the pockets, and a timed article release mechanism mounted on and in said duct for regulating the release of articles from said duct.

23. A packaging machine comprising a pair of cooperating rollers with their axes horizontal and at least one of said rollers having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs of packaging material downwardly between said rollers, a filling duct reciprocable in timed relation with said rollers to advance a stream of articles toward said pockets by gravity, and a mandrel mounted at one end of said duct cooperatively associated with said pockets to spread said webs into said pockets.

24. A packaging machine comprising a pair of cooperating rollers with their axes horizontal and having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs of packaging material downwardly between said rollers, a reciprocable filling duct to advance a stream of articles toward said pockets by gravity, means mounted at the lower end of said duct for spreading said webs into said pockets, and a timed release mechanism carried by said duct for permitting a predetermined commodity increment to fall from said duct into each package.

25. The invention set forth in claim 24 in which said timed release mechanism includes a spring secured at one end to said duct and biased away therefrom, a cap mounted on the free end of said spring and having oppositely extending tines projecting through apertures in said duct, and means for horizontally reciprocating said cap so that first one and then another of said tines intercepts said stream of articles.

26. A packaging machine comprising a pair of cooperating sealing rollers with horizontal axes and having a series of peripherally-spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs of packaging material downwardly between said rollers, an arcuate filling duct having a horizontal end and a vertical end to advance a stream of articles toward its vertical end by gravity, means for reciprocating said duct in timed relation with said rollers, means for supplying articles to the horizontal end of said duct, a hollow mandrel mounted at the vertical end of said duct for spreading said webs to conform to said pockets and adapted so that articles can pass there-through from said duct to enter the pockets between the webs, and a timed release mechanism carried at the vertical end of said duct for assuring that one article enters each package, said

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mechanism including a spring secured at one end to said duct and biased away therefrom, a cap mounted on the free end of said spring and having oppositely extending spaced tines projecting through apertures in said duct, and means for horizontally reciprocating said cap so that first one and then another of said tines intercepts said stream of articles.

27. In a machine for continuously forming article-containing packages of two webs of flexible packaging material, a pair of cooperating sealing rollers having a series of peripherally spaced article-defining pockets to receive the articles to be packaged, means for feeding said webs between said rollers, a reciprocable mandrel operable in timed relation with said rollers and cooperatively associated with said pockets to spread the webs to conform thereto, and means for conducting articles to said pockets between said webs.

28. A packaging machine comprising a pair of cooperating rollers mounted with their axes horizontal and having a series of peripherally spaced commodity-defining pockets to receive the articles to be packaged, means for feeding two independent webs downwardly between the cooperating rollers, means for supplying a stream of articles between the webs, and a reciprocally operating mandrel adapted simultaneously to enter successive pockets in succession and spread the webs to form envelopes for the articles without interfering with the flow of the articles into the pockets.

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29. In a machine for continuously forming article-containing packages of two webs of flexible packaging material, a pair of cooperating sealing rollers having a series of peripherally spaced article-defining pockets to receive the articles to be packaged, means for feeding said webs between said rollers, a movable mandrel operable in timed relation with said rollers and cooperatively associated with said pockets to spread the webs to conform thereto, and means for conducting articles to said pockets between said webs.

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