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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

Filed Nov. 2, 1966 15 Sheets-Sheet 1

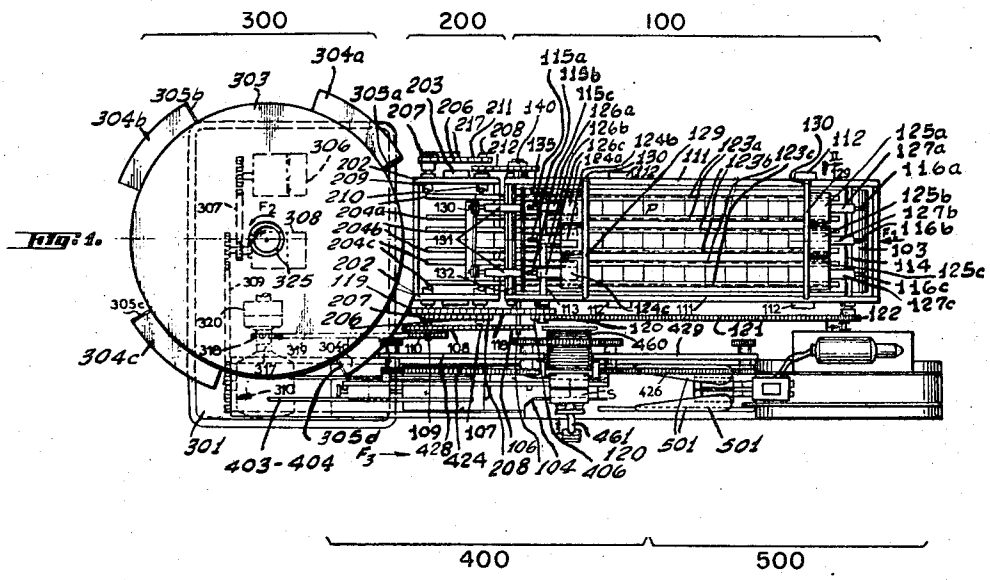

Fig. 1.

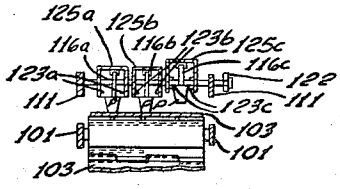

Fig. 2.

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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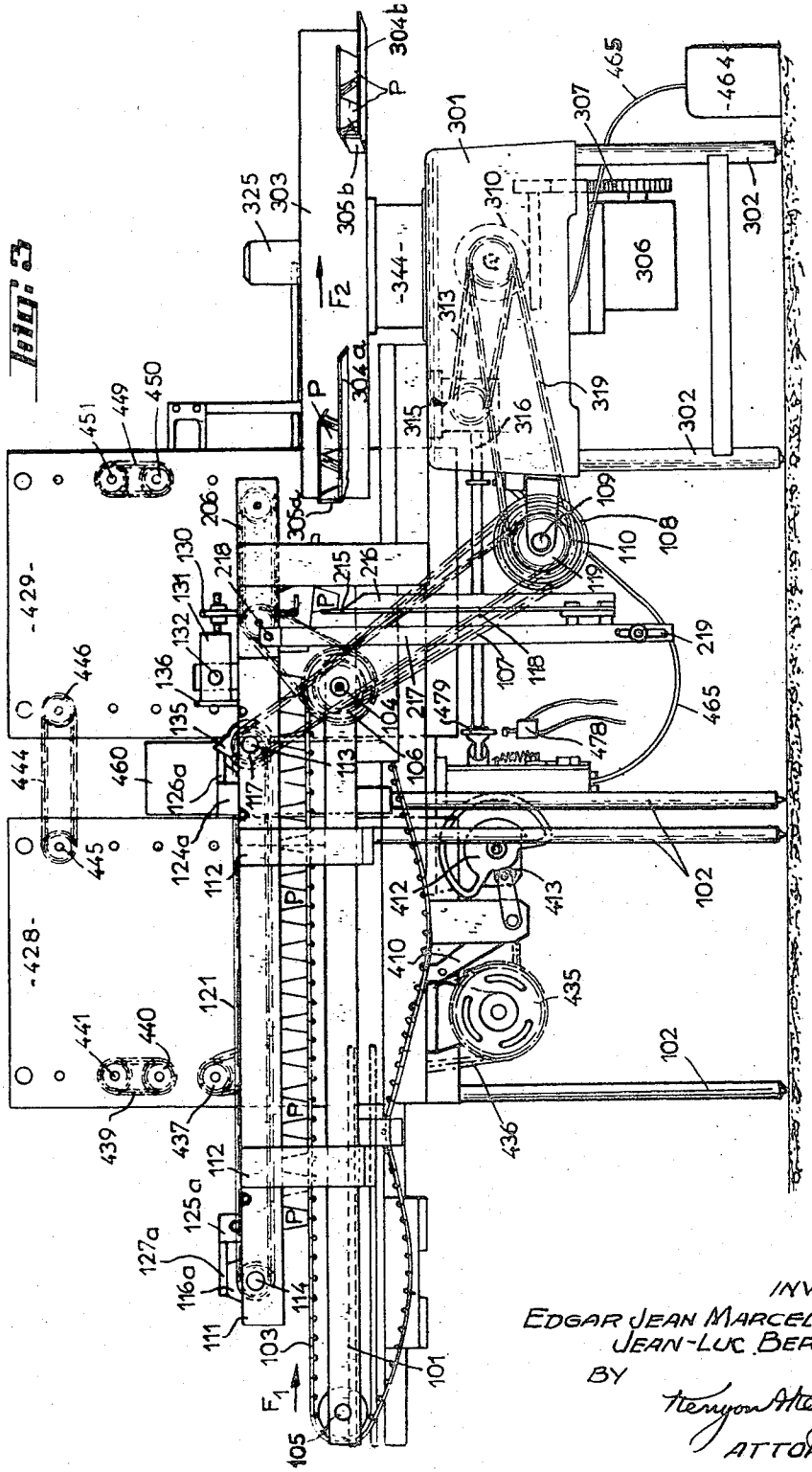

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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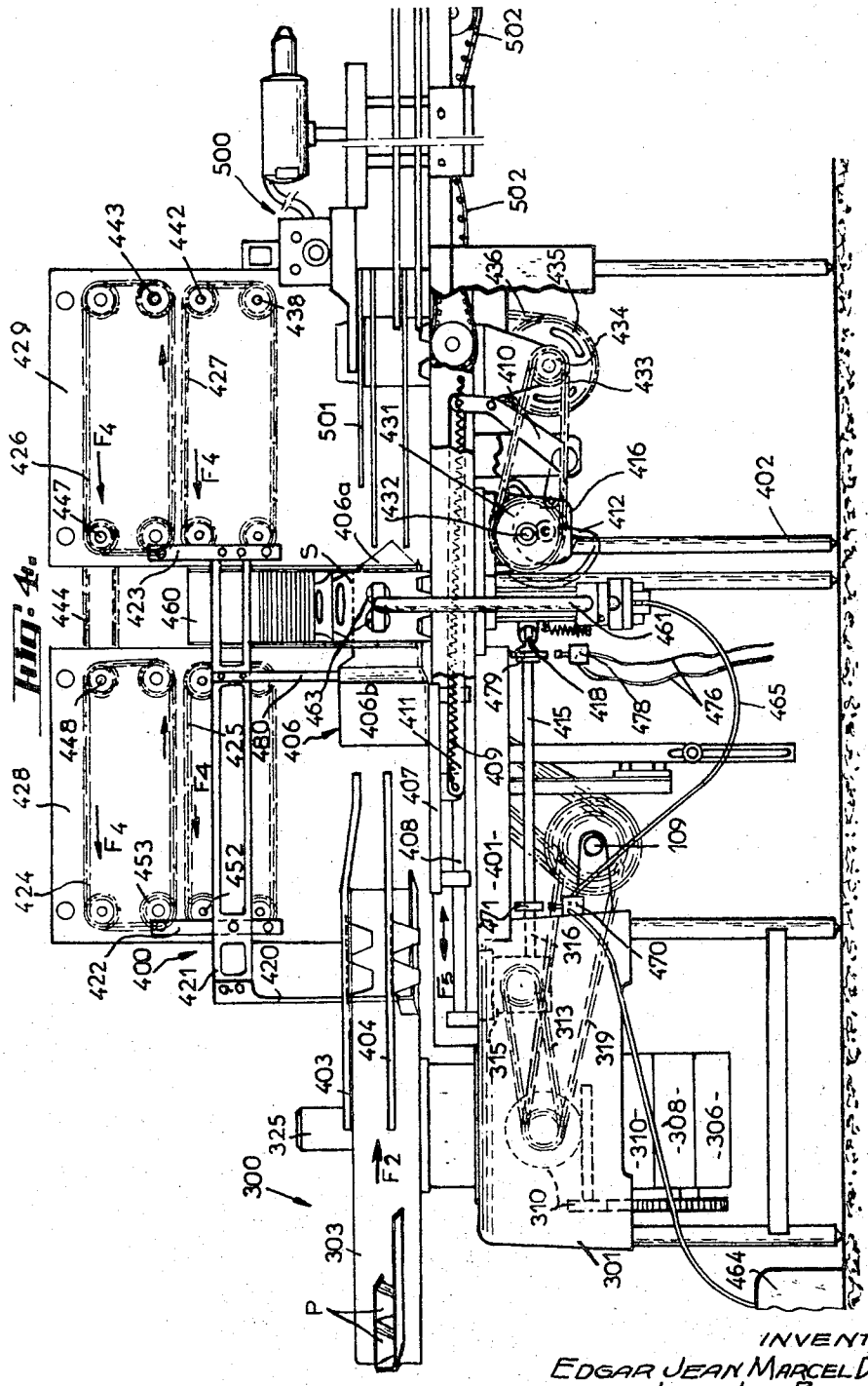

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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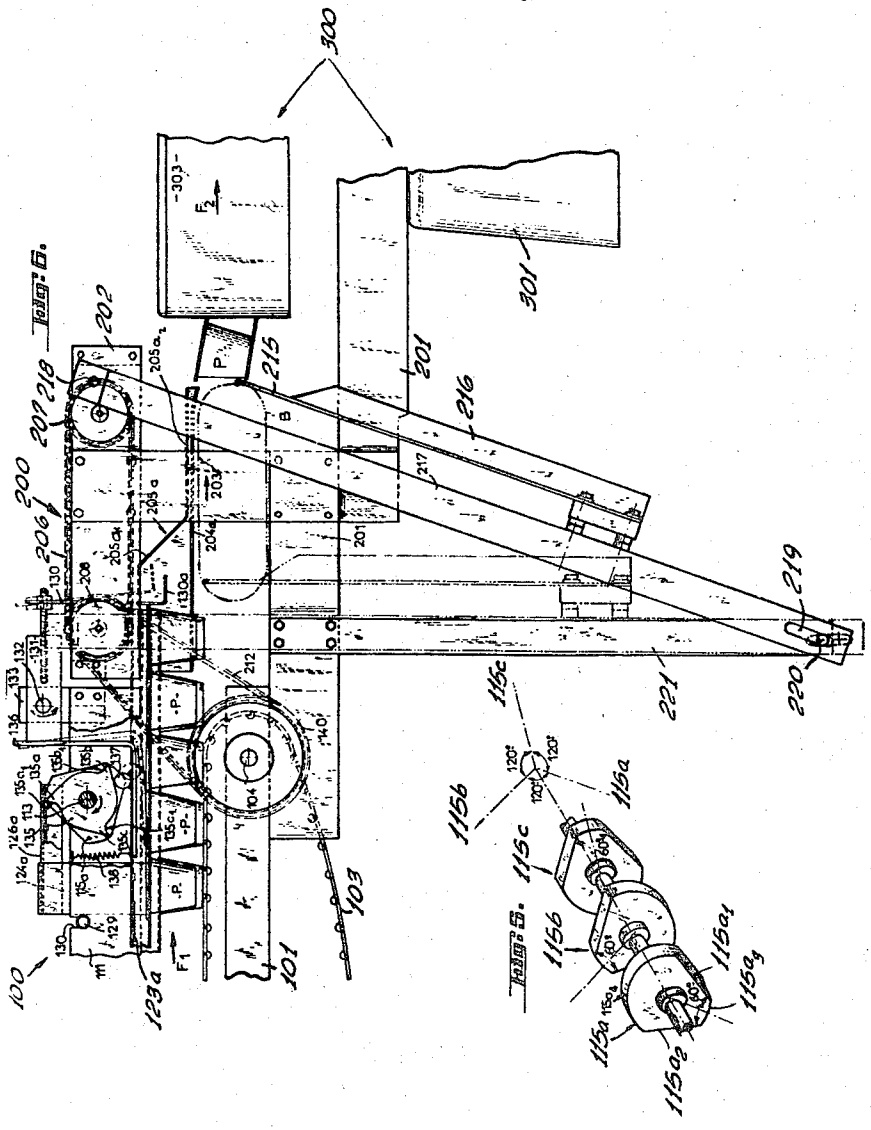

FIG. 6.

FIG. 5.

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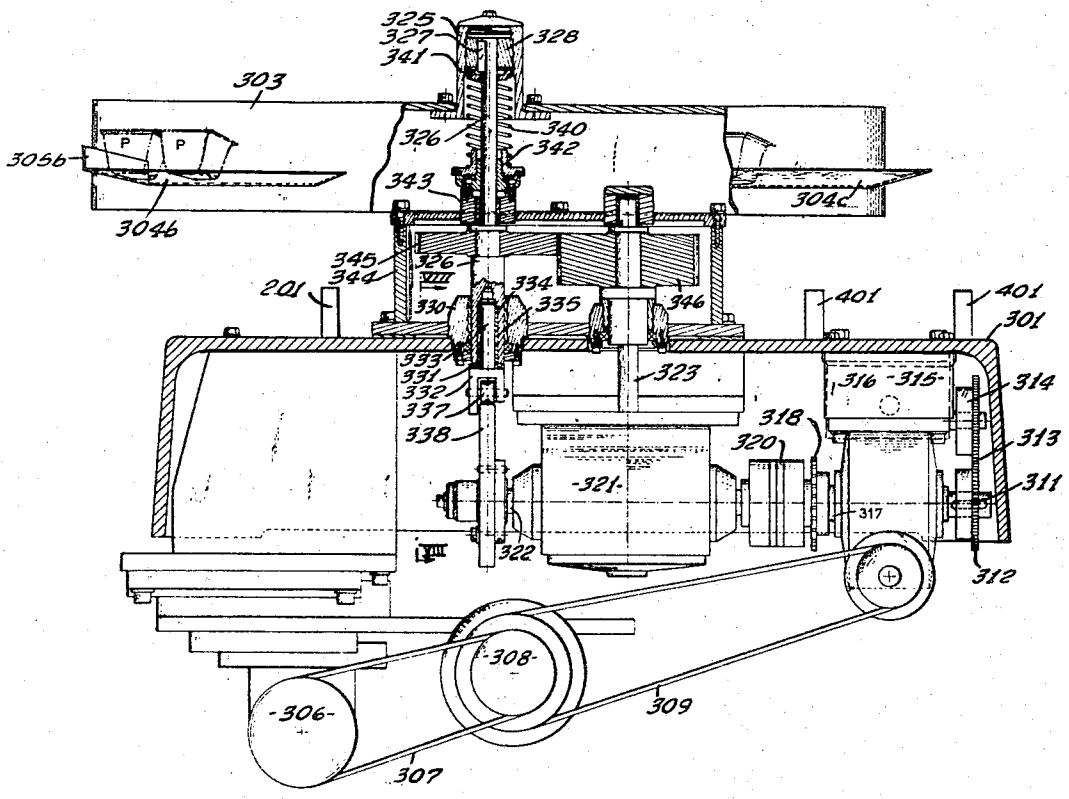
Fig. 7.



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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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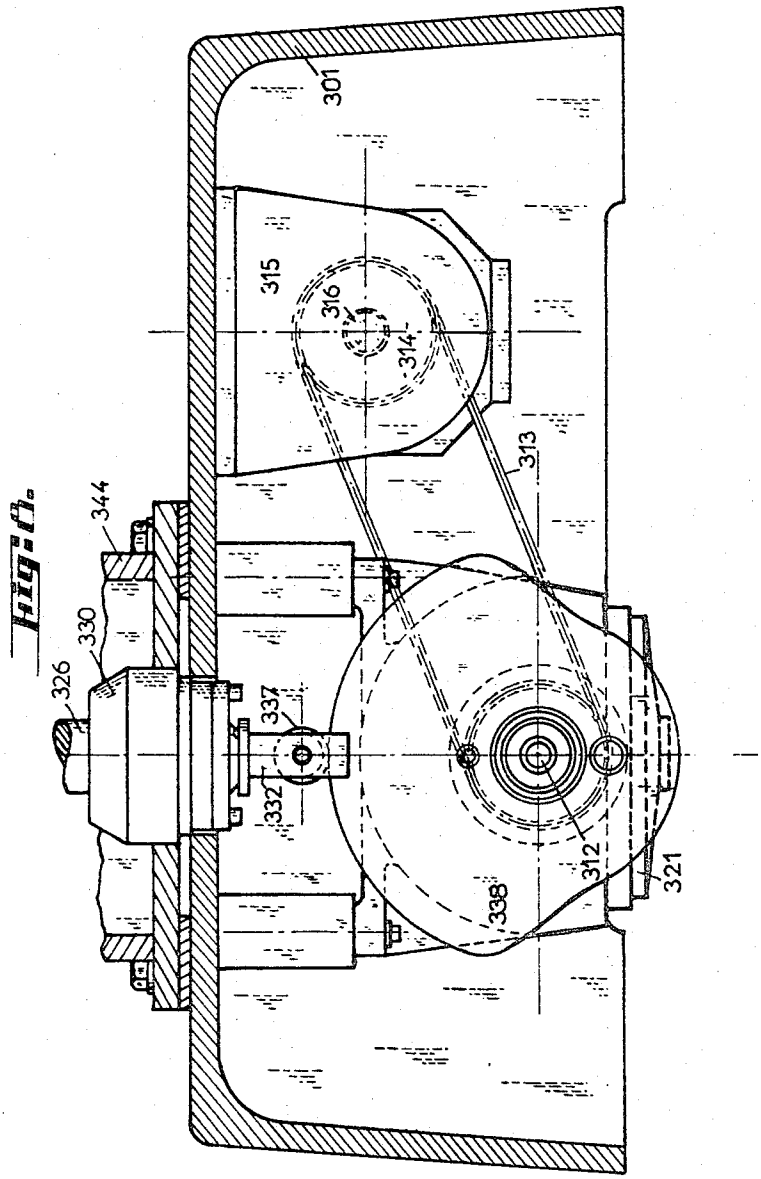
fig. 6.



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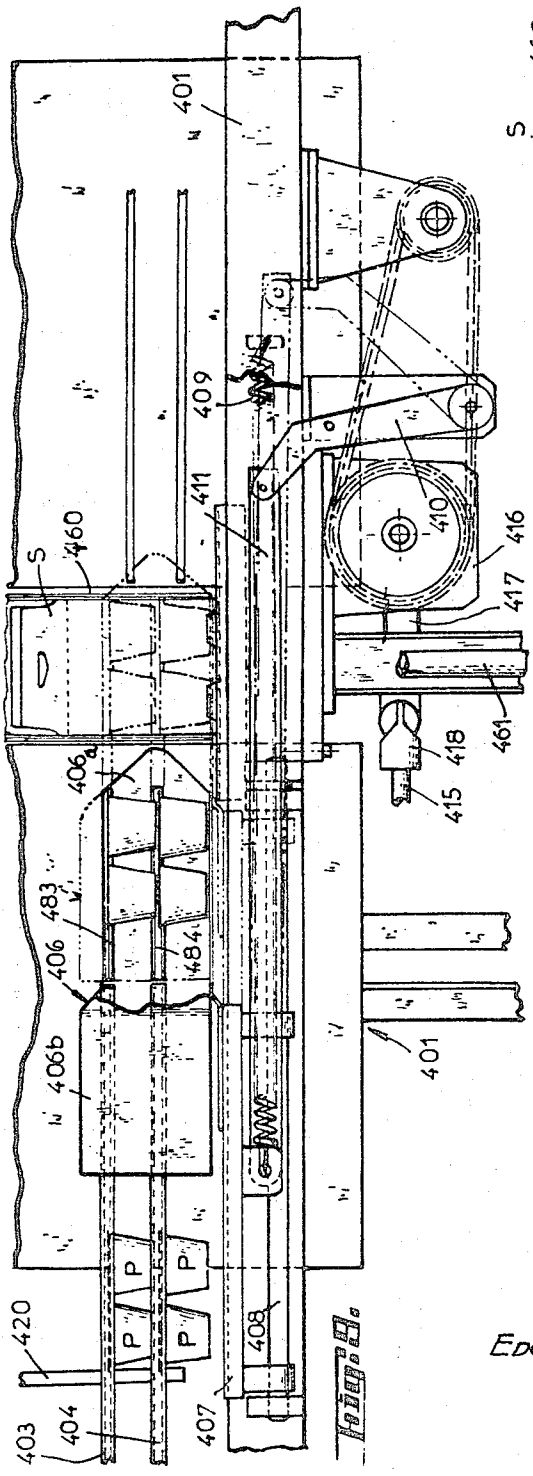

Fig. 11a.

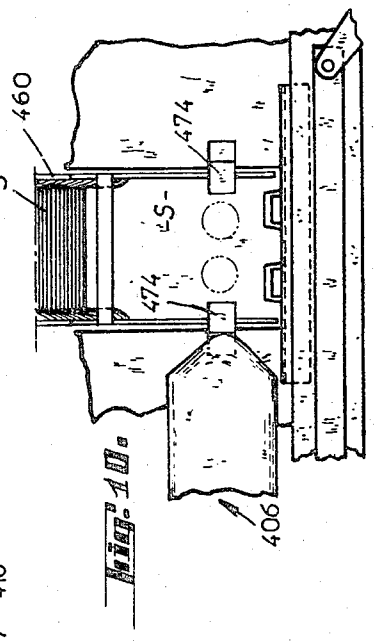

Fig. 10.

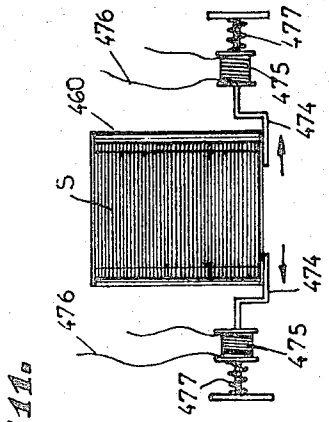

Fig. 11.

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Fig: 12.

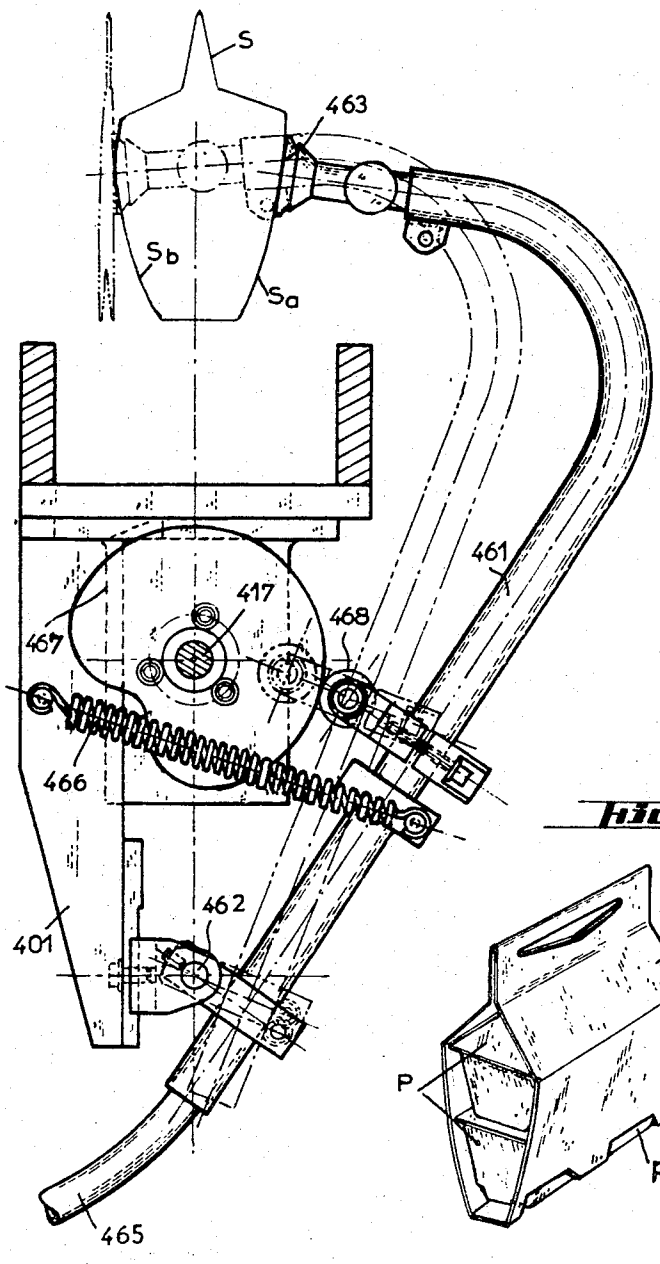

Fig: 13.

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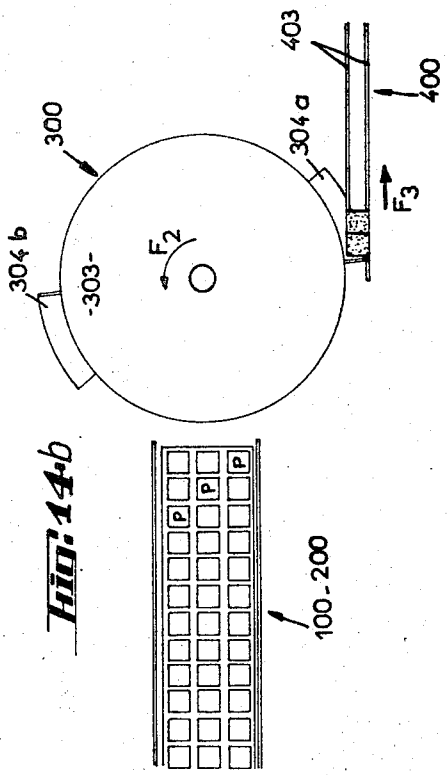

Fig: 14b

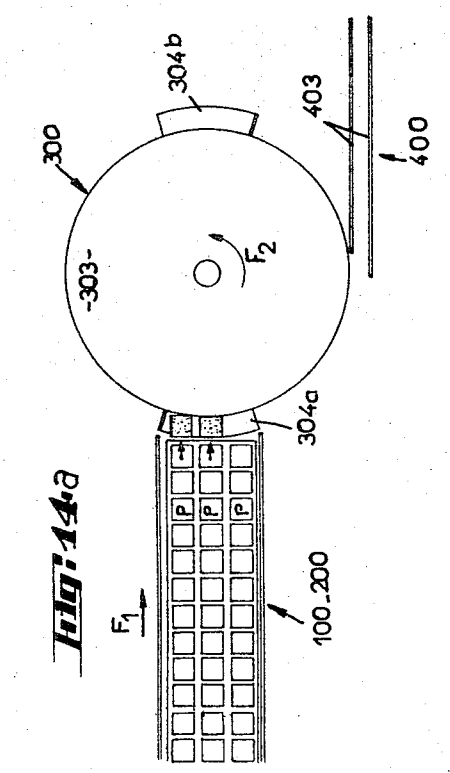

Fig: 14a

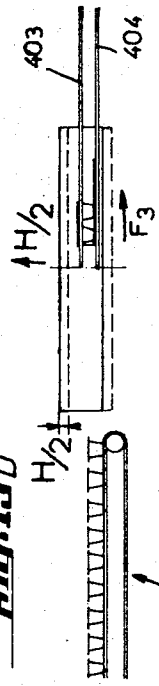

Fig: 15b

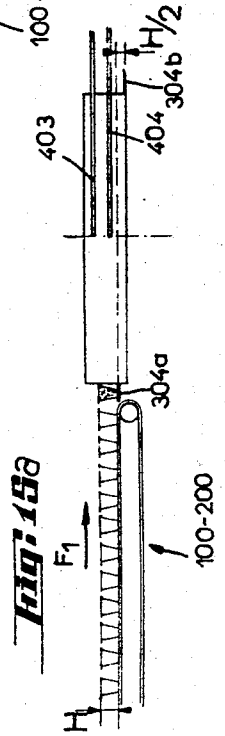

Fig: 15a

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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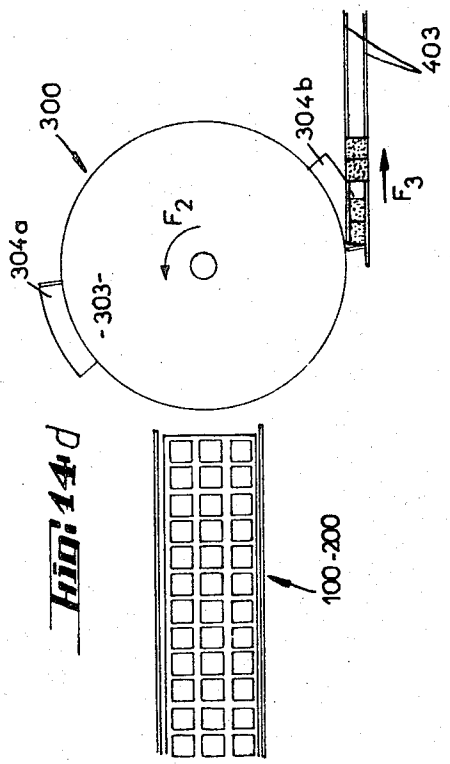

Fig: 14d

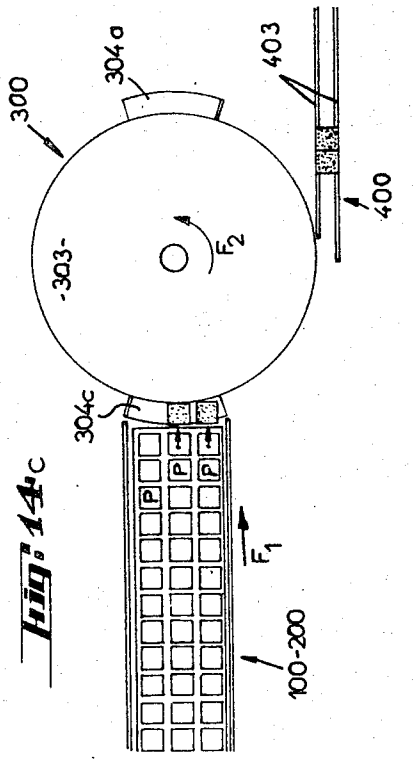

Fig: 14c

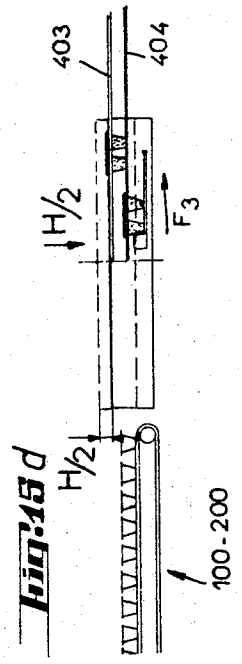

Fig: 15d

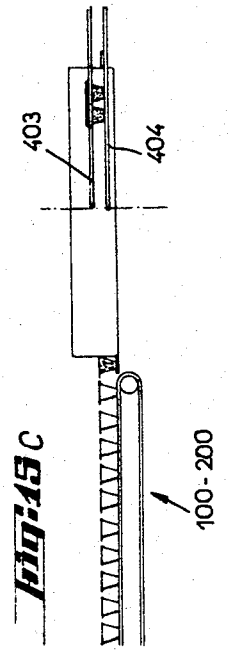

Fig: 15c

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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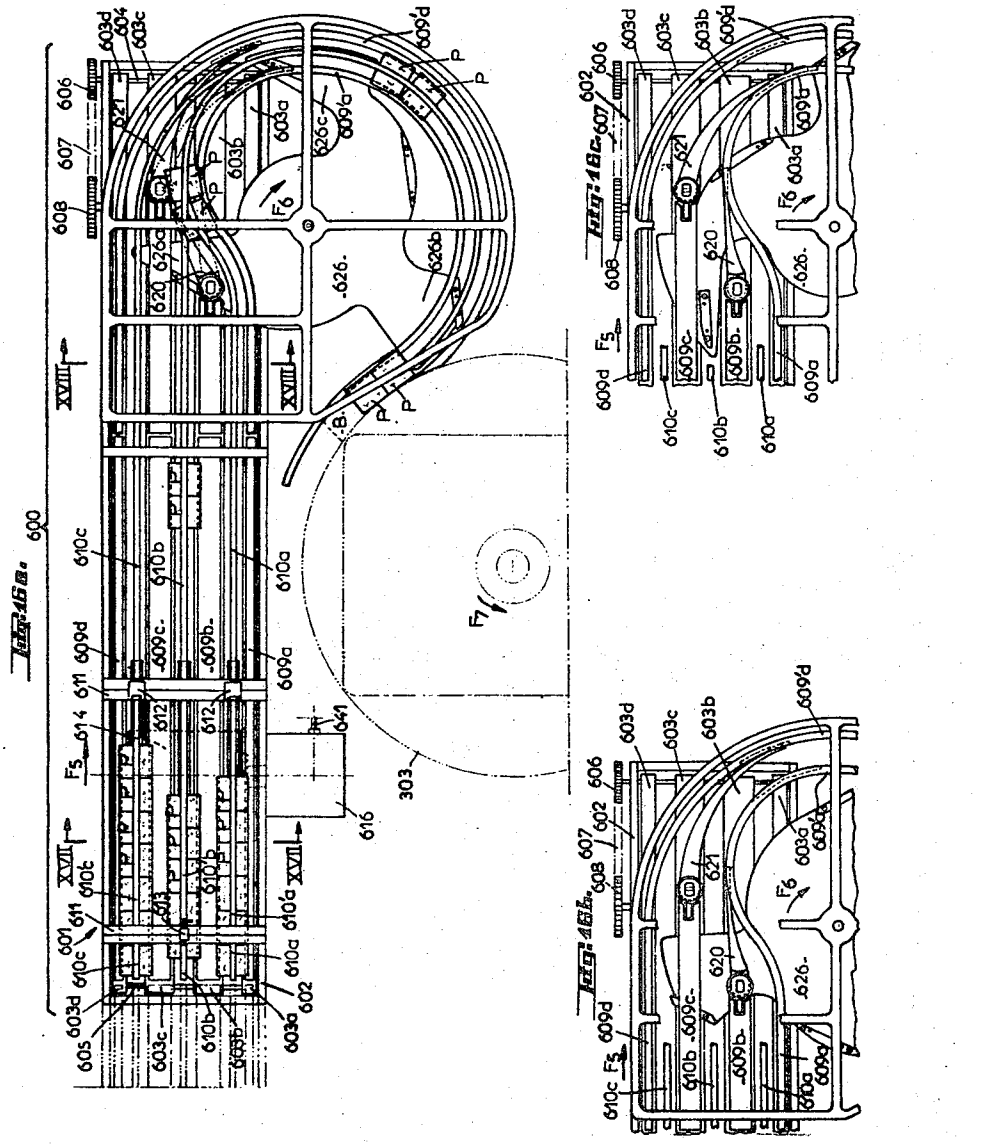

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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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Fig: 1a.

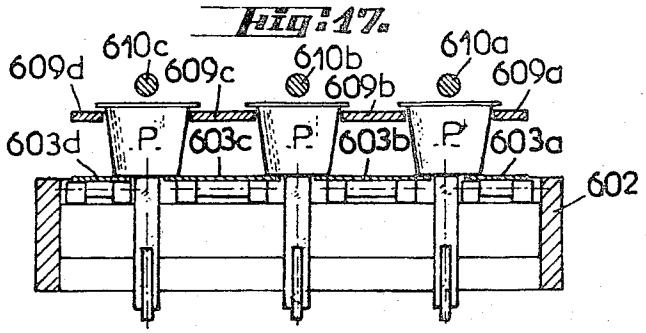

Fig: 1b.

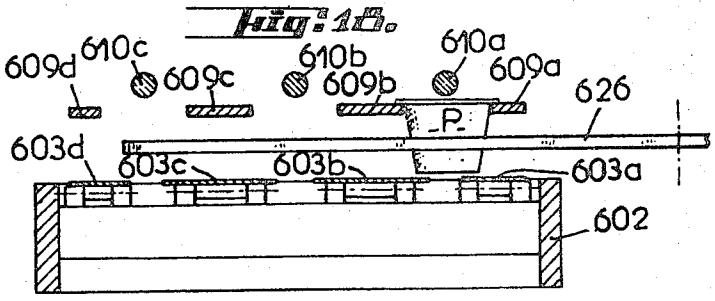

Fig: 2a.

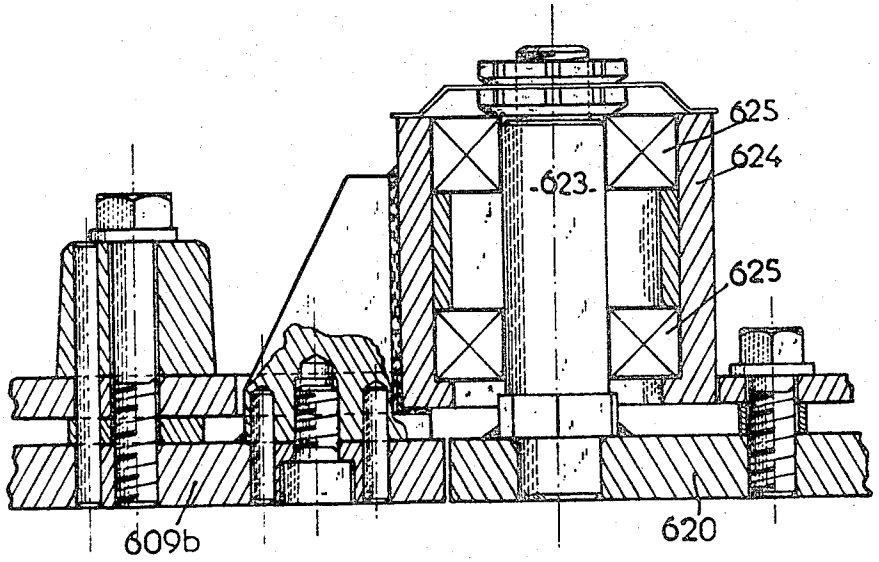

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Fig. 2B.

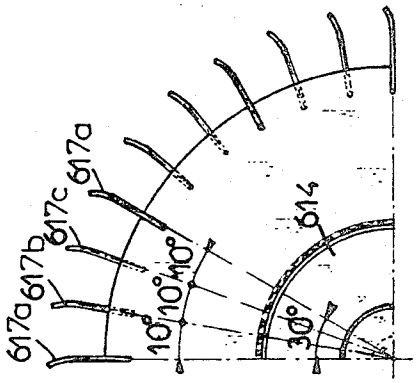


Fig. 2A.

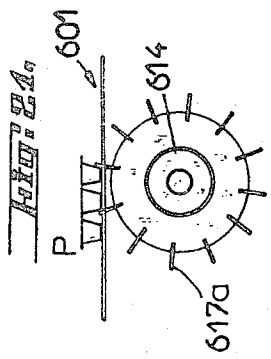
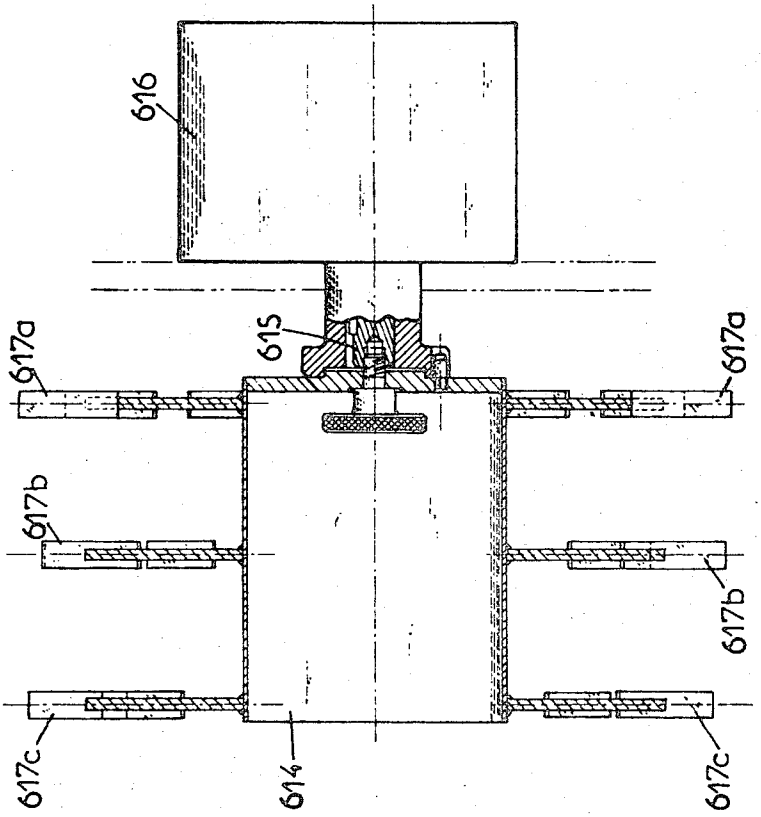


Fig. 1A.



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MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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Fig. 23.

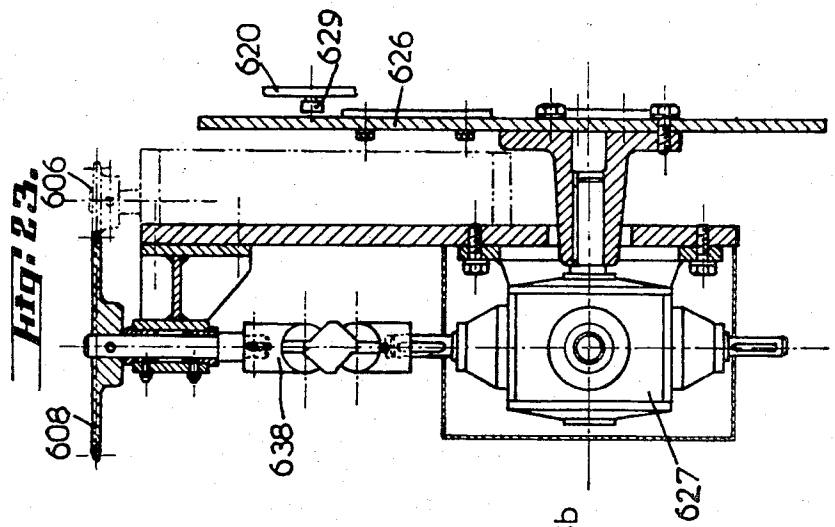

Fig. 22.

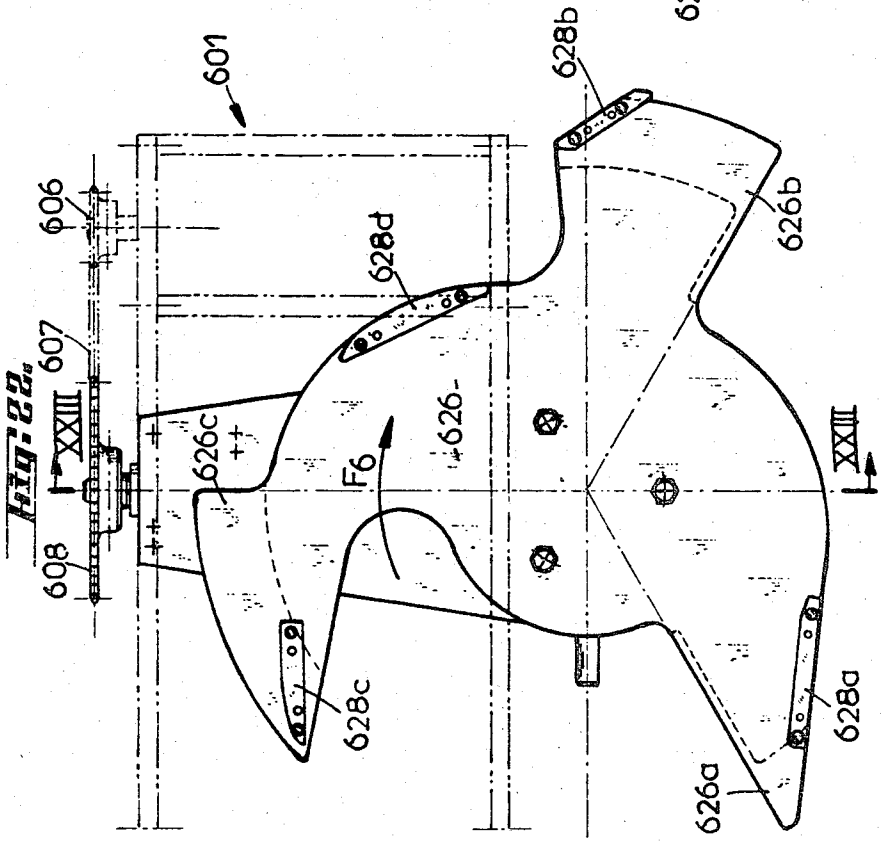

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Fig: 25.

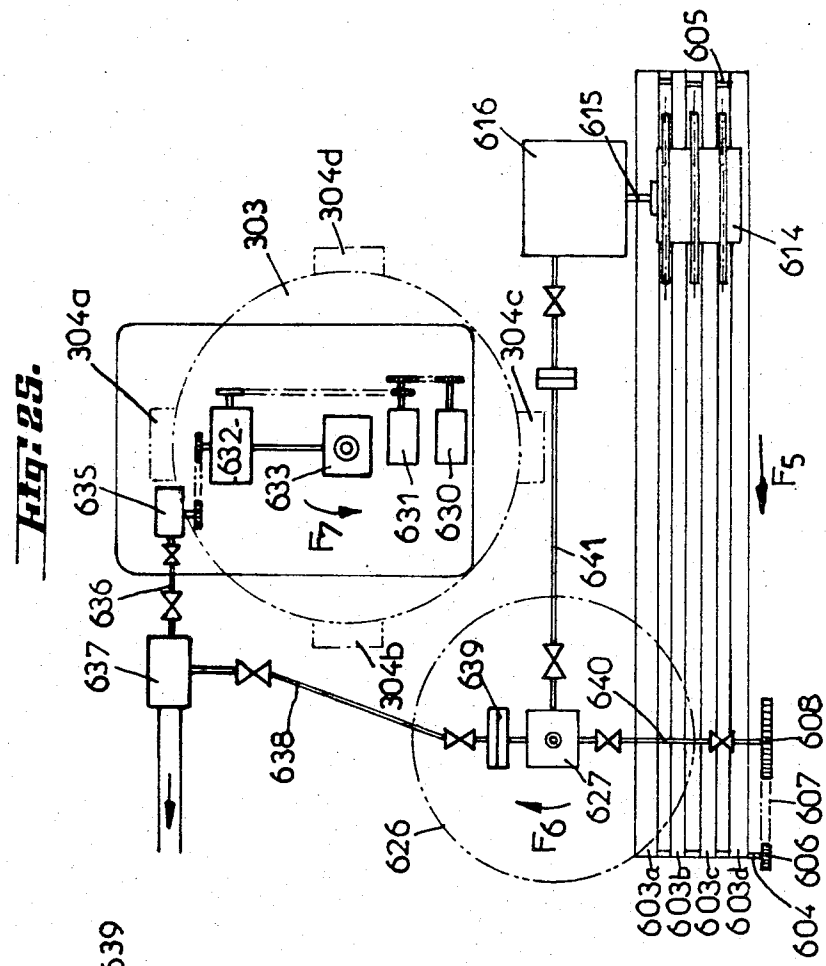
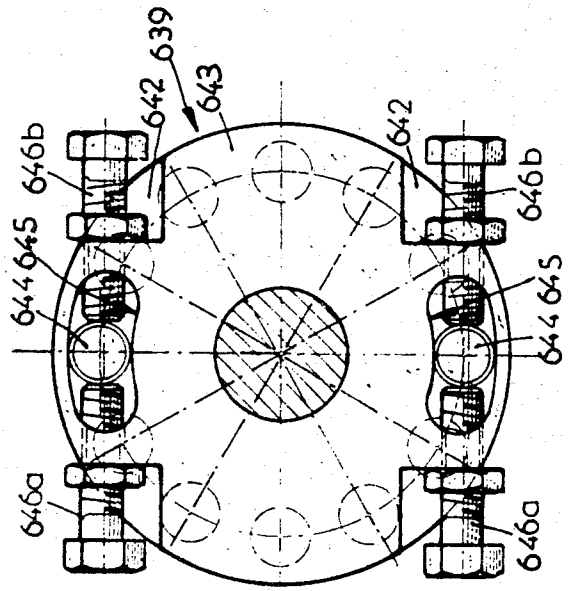


Fig: 26.



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United States Patent Office 3,416,675
Patented Dec. 17, 1968

3,416,675

MACHINE FOR AUTOMATICALLY PACKING THINGS IN OVERLYING TIERS

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Filed Nov. 2, 1966, Ser. No. 591,461
Claims priority, application France, Jan. 4, 1966, 44,816
39 Claims. (Cl. 214—16.4)

ABSTRACT OF THE DISCLOSURE

A machine for automatically selecting, stacking in overlying relationship and then packing articles such as pots of yogurt and the like, comprising in combination an arranging device receiving the pots and like articles all lying on a same level and aligned in a number of parallel rows, said arranging device comprising means for driving said rows of pots in translation and selecting among these rows a constant number of pots so as to deliver them in groups containing a same number of pots; a rotary distributor receiving the groups of pots delivered by the arranging device and comprising means for collecting these groups of pots on a constant level and carrying them to different levels, and a device receiving the groups of pots delivered by the rotary device and comprising means for superposing said groups of pots so as to form a set of pots comprising a plurality of overlying rows of pots, said arranging device and rotary distributor being driven in synchronism by a common driving mechanism in order to continuously perform the successive automatic driving steps of the pots.

The present invention essentially relates to a machine for automatically selecting, stacking and then packing things such as pots of yogurt, jars of jam, parcels of biscuits, etc.

Some products, in particular the pots of yogurt, are often presented or displayed to the customers, mainly in the so-called "self-service" shops or stores, not separately, but by groups or sets of four to six pots and even more. These pots are packed in a small bag or box made from cardboard or plastic material, forming a kind of tunnel open at both of its side ends and provided, at its upper portion, with a handle enabling to take easily hold thereof. The pots are arranged in these small bags or boxes into overlying rows or tiers, for example in two rows of two pots or two rows of three pots, in order to give the packing a shape or formation as compact as possible.

The manufacturers who supply these shops or stores are therefore compelled to deliver their pots of yogurt ready for sale, that is placed in the small bags in question as mentioned hereinabove.

Now, the pots of yogurt are coming out from the filling machines on belt conveyors on which they are arranged in any number of rows, all of the pots being of course located at the same level.

When the pots concerned are made of plastic material, the filling machine receives the plastic material in the form of plane, generally square sheets or foils; these sheets pass prior to the filling operation into forming or shaping dies wherein they are deformed by suction so to present a number of hollows or recesses adapted to receive the yogurt or the like. After filling up of the hollows or recesses, the sheet is automatically cut along its parts which have not been deformed, so as to provide a

corresponding number of pots of yogurt, independent from each other. In general, the dies are adapted to form, in such a square sheet, nine hollows which of course yield nine pots arranged or distributed in three rows of three pots. The operation being performed continuously, the pots are coming out from the machine in three continuous rows.

The means presently used in the industry to place these pots, which therefore always present themselves at the same level and in any number of rows, but generally in three rows, into the small bags which will be put up for sale later on, merely consists in instructing employees to grasp by hand a number of pots, four pots for instance, for placing them into a small bag upon superposing them two by two for example, then to introduce the small bag, still by hand, into a closing machine which automatically seals both of its upper edges against each other. Such a manual operating step involves considerable costs and breaks off the automatic process of handling pots.

The object of the present invention is to dispense with these manual operations, and therefore, to provide a machine capable of effecting, in an entirely automatic manner, the positioning of the pots within the small bags. This machine should be adapted to the existing or available filling machines, that is it should be capable of receiving any number of rows of pots and of delivering small bags comprising any number of pots arranged in superposed rows. These machines should in particular be adapted to receive pots arranged into three rows such as they are delivered by a great number of existing filling machines and to deliver them in packed condition within small bags mostly containing four pots, superposed two by two, as required by the sale shops, or stores.

The machine according to the invention is characterized in that it comprises in combination: an arranging device receiving the pots or the like all located at the same level and aligned in a number of parallel rows, for example in three rows, this arranging device comprising means for carrying along or driving said rows of pots in translation and selecting, among these rows, a constant number of pots so as to deliver them in groups containing an equal number of pots, for example two pots; a rotary distributor receiving the groups of pots delivered by the arranging device and comprising means for collecting, packing or gathering up or recovering these groups of pots at a constant level and for bringing them to different levels, for example to two different levels; a conditioning device receiving the groups of pots delivered by the rotary distributor as well as packings adapted to contain them, these packings being in the form of pockets with two walls and being delivered in a flat position, said conditioning device comprising means for superposing said groups of pots so as to form a pot unit or assembly comprising a plurality of rows of superimposed pots, for example a set of four pots comprising two rows of two superposed pots, means for carrying along or driving these sets or assemblies of pots thus formed towards an inserting member adapted to introduce them into a packing, means to open each aforesaid packing each time a set of pots is brought forward thereto so as to enable the penetration of said inserting member and means for driving or carrying along each packing filled with pots towards a closing or sealing station; the arranging device, the rotary distributor and the conditioning device being driven in synchronism by a common driving mechanism with a view to continuously carry out the successive steps of automatically packing the pots.

It is readily appreciated that the machine may be supplied or fed by filling systems of conventional type, while delivering these pots under conditions required for offering them for sale, since the conveyor-selector is adapted to select, among the three rows of pots which are presented thereto, two pots only which it delivers at regular intervals to the rotary distributor and to the conditioning device that are provided for superposing and packing these groups of two pots.

According to a characteristic feature of the invention, the arranging device may comprise a conveyor-selector with which is associated a transfer member located at the delivery or outgoing end of said conveyor-selector for the pots or the like, said transfer member receiving each group of pots delivered by the conveyor-selector and comprising guiding means in extension of said conveyor-selector and means for driving or carrying along in translation said groups of pots along said guiding means.

According to an alternative embodiment of the invention, the aforesaid arranging device comprises in combination means for distributing the pots or the like in groups comprising a same number of pots disposed in the same manner, directional means for directing each group towards a guiding member and driving means for driving or carrying each group along said guiding member and for delivering it to the rotary distributor.

The arranging device according to this alternative embodiment is advantageous in that it positively guides the groups of pots up to the rotary device, thereby enabling to obtain a strictly continuous motion of these pots, hence a very big rate of flow.

Other features of the invention will become apparent as the following description proceeds.

In the accompanying drawings, given by way of example only:

FIGURE 1 is a plan view of the top of the machine according to the invention, this machine being provided with an arranging device according to a first form of embodiment comprising a conveyor-selector and a transfer member;

FIGURE 2 is a cross-section taken along the line II—II of FIGURE 1;

FIGURE 3 is an elevational view of the machine shown in FIGURE 1, seen from the side of the conveyor-selector of said arranging device;

FIGURE 4 is an elevation of the machine of FIGURE 1, as viewed from the side of the conditioning device;

FIGURE 5 is a partial view showing the cams controlling the advance of the rows of pots on the conveyor-selector;

FIGURE 6 is a partial elevational view of the machine of FIGURE 1, as viewed from the side of said conveyor-selector and more particularly showing the transfer member;

FIGURE 7 is a section through the rotary distributor, passing through the axis of the plate or drum;

FIGURE 8 is a partial section taken along the line VIII—VIII of FIGURE 7;

FIGURE 9 is a partial elevational view of the machine of FIGURE 1, as seen from the side of the conditioning device; this view more particularly showing the means for inserting the pots of yogurt into the packings;

FIGURE 10 is a partial elevational view corresponding to FIGURE 9 and showing the distributor for small packing bags;

FIGURE 11 is a partial view of the distributor of FIGURE 10 showing the retaining mechanism for the packings as seen from above;

FIGURE 12 shows the mechanism for opening the packings;

FIGURE 13 is a perspective view of a small bag as delivered by the machine, that is comprising four pots of yogurt disposed into two rows of two superposed pots;

FIGURES 14*a* to 14*d* diagrammatically show how the pots travel along the conveyor-selector, are driven or carried along by the rotary distributor and arrive, in overlying rows, at the conditioning device, the machine being assumed to be viewed from above;

FIGURES 15*a* to 15*d* also are diagrammatic showings corresponding to that of the preceding FIGURES 14*a* to 14*d*, the machine being assumed to be seen in elevation, in order to make apparent the vertical movement of the rotary distributor;

FIGURE 16*a* shows a bottom view of an arranging device according to an alternative form of embodiment the directional means of which are positioned to make one of its strainers, passageways of channels communicate with the guiding member, this arranging device being usable instead of the conveyor-selector and of the transfer member shown in FIGURES 1, 2, 3, 5 and 6;

FIGURE 16*b* is a partial view of the arranging device of FIGURE 16*a*, the directional means being positioned to make a second strainer, passageway or channel communicate with said guiding member;

FIGURE 16*c* is a partial view of the arranging device of FIGURE 16*a*, the directional means being positioned to make the third strainer, passageway or channel communicate with said guiding member;

FIGURE 17 is a section taken along the line XVII—XVII of FIGURE 16*a* showing the position of the pots with respect to the paddle or vane chains and to the guide ramps in the corresponding portion of the conveyors;

FIGURE 18 is a section taken along the line XVIII—XVIII of FIGURE 16*a*, showing the position of the pots with respect to the paddle or vane chains and to the guiding ramps of the corresponding portion of the conveyor;

FIGURE 19 is an elevational partially sectional view of the selector device consisting of rotary drum provided with radial fingers;

FIGURE 20 shows the drum of FIGURE 19 viewed from the left, only one quarter of this drum having been shown in order to simplify the drawing;

FIGURE 21 diagrammatically shows one of the sets of fingers of the drum in engagement with the pots;

FIGURE 22 is a plan view for driving or moving the pots along the guiding member;

FIGURE 23 is a section taken along the line XXIII—XXIII of FIGURE 22;

FIGURE 24 is a partial sectional view of said directional means;

FIGURE 25 diagrammatically shows the kinematic driving chain of the arranging device according to said alternative form of embodiment as well as further devices forming the packing machine according to the invention;

FIGURE 26 shows an adjustable coupling device enabling to effect a synchronous driving of the arranging device by the general drive motor.

According to the form of embodiment shown in FIGURES 1 to 15 of the drawings, the machine according to the invention, essentially comprises as is more particularly shown in FIGURE 1:

An arranging device itself consisting of a conveyor-selector **100** which receives pots of yogurt P or the like, arranged in three parallel rows and delivered in the direction F_1 by an automatic filling machine (not shown) and drives or moves them in the same direction according to an intermittent translative motion and of a transfer member **200** following this conveyor-selector and aligned with this latter, this transfer member receiving the pots delivered by the conveyor-selector and pushing them in translation in the same direction F_1;

A rotary distributor **300** following the transfer member and the axis of rotation of which is substantially lying in the medial plane of the conveyor-selector and of the transfer member, that is in the medial or central plane of the path of the pots, this distributor driving or carrying along according to a rotary movement in the direction F_2 the pots it receives from the conveyor-selector through

the medium of the transfer member and bringing them up to different levels;

A conditioning device **400** which follows the rotary distributor and is lying in parallel relation to the conveyor-selector and to the transfer device on the one hand and in tangential relation to the rotary distributor on the other hand, this conditioning device driving, carrying along or moving, in the direction F_3 opposite to F_1, the pots delivered by the rotary distributor in order to cause them to enter small bags and bringing the small bags filled with pots always in the direction F_3 to a machine **500**, known per se, which folds back one over the other and seals to each other the upper flanges or edges of said small bags.

(A) ARRANGING DEVICE (FIRST EMBODIMENT)

(a) Conveyor-selector

The conveyor-selector comprises a framework consisting of a frame of generally rectangular shape, **101**, supported on feet or stands **102** and on which is mounted a belt conveyor consisting here of a paddle chain **103** which runs over two supporting rolls one of which is mounted on a drive shaft **104** located at that end of the frame **101** which corresponds to the delivery or outlet of the conveyor-selector, whereas the other is mounted on a loose shaft **105**, lying at the other end of the frame **101**. The drive shaft **104** is uniformly rotated by means of a sprocket wheel **106**, mounted on one of its ends and operatively connected, through the medium of a sprocket chain **107**, to a sprocket wheel **108** keyed to an intermediate drive shaft **109** one sprocket wheel of which is operatively connected to the general drive motor of the installation as will be explained hereinafter.

The conveyor-selector is provided, at its upper part, with two beams or cross-members **111**, integral with standards, posts or uprights **112** secured to the frame **101**. Two parallel cam carrying shafts **113** and **114**, comprising each one a set of three cams **115***a*, **115***b*, **115***c* and **116***a*, **116***b*, **116***c*, respectively, are rotatably mounted at both ends of the beams **111**.

The shaft **113** is provided with a sprocket wheel **117** operatively connected through the medium of a sprocket chain **118** to a sprocket wheel **119** keyed to the intermediate drive shaft **109**. The shafts **113** and **114** are integral with each other in rotation owing to a transmission chain **121** which passes over their respective sprocket wheels **120** and **122**.

Above the paddle chain **103** is mounted a system for intermittently driving or carrying away the three rows of pots. This system consists of three pairs of slideways **123***a*, **123***b* and **123***c* formed each one by two structural channel sections the open faces or flanges of which are confronting each other and are separated by a spacing slightly greater than the width of the upper edge of the pots, so that when these latter are caused to move between said slideways, their upper edge moves between the flanges of the structural sections. Both structural sections of a same pair of slideways are secured at their both ends on clevis **124***a*, **124***b*, **124***c* and **125***a*, **125***b*, **125***c* having the shape of an inverted channel. Each clevis carries at its upper part a bracket or the like **126***a*, **126***b*, **126***c* and **127***a*, **127***b*, **127***c*, respectively, each bracket resting on one of the cams of the shaft **113** and of the shaft **114**. Each pair of slideways forms, together with both clevis which are associated therewith, a rigid assembly or unit which rests, through the medium of the aforesaid brackets, on one of the cams of each one of the sets of cams, and therefore, follows the vertical upward and downward displacements imparted thereto by these two cams during their rotation. Two locking bars **129** engaged in slots or notches **130** of the beams **111** prevent the pairs of slideways from being moved in longitudinal translation.

Each set of cams, provided at each one of the ends of the conveyor-selector, comprises, as may be seen on FIGURE 5, which shows the cams mounted on the shaft **113**, three identical cams, such as **115***a*, **115***b*, **115***c*, having each one two flat parts such as **115***a*–**1** and **115***a*–**2**, forming therebetween an angle of about 60° and connected to each other by two portions having a rounded profile, such as **115***a*–**3** and **115***a*–**4**. The three cams of a same set are staggered or set off with respect to each other by 120°, so that for a rotation of 360° of the cam-carrying shaft, there are three positions staggered or offset by 120° with respect to each other, for each one of which the flat parts of two cams lie in a same horizontal plane.

Both sets of cams carried by the shafts **113** and **114** are strictly identical as to their shape and to their respective orientations and both cams which support a same pair of slideways, such as the cams **115***a* and **116***a* for instance, are aligned. It results therefrom that when both sets of cams are rotating in synchronism, owing to their operative connection through the sprocket chain **121**, the pairs of slideways will alternately and regularly move, during a rotation of 360°, to a high position and to a low position, one pair of slideways being in a high position, while the two others are in a low position.

The size of the cams and/or the size of the clevis to which the slideways are secured are depending upon the height of the pots P and are such that when a slideway is in the low position, the pots rest on the paddle chain **103** and are therefore carried away in translation by the latter, the structural sections then assuming no function or at the most a guiding function, whereas in the high position on the contrary the pots are lifted above the paddle chain and rest through their upper edges or flanges onto both lower flanges of the slideways, so that in this case, the pots cannot be carried away by the paddle chain.

It is seen that owing to this device, the three rows of pots advance or move forward, not homogeneously but intermittently, two rows of pots simultaneously advancing whereas the third row remains stationary. Moreover, the travel and stop periods are the same for the three rows so that the conveyor-selector uniformly delivers two by two the pots it selects by turns among the three rows of pots.

The conveyor-selector further comprises means for periodically locking and releasing the pots, these means consisting of an L-shaped retractable stop **130** provided at its outgoing or delivery end and secured on two arms or the like **131** integral with a shaft **132** pivotally mounted on pillars or uprights **133**, integral with the beams **111**. The stop **130** may assume two positions: a low position (shown in solid lines on FIGURE 6), in which it engages the path of travel of the pots P and therefore stops or blocks the latter, and a lifted position (shown in dashed and dotted lines on FIGURE 6) in which it is disengaged from this path and therefore enables the pots to pass. The stop **130** is actuated for oscillation or swinging motion by a cam **135**, secured onto the cam-carrying shaft **113** and formed with three peaks or apexes **135***a*, **135***b*, **135***c*, uniformly distributed on its periphery. This cam **135** acts upon a cranked or bent lever or the like **136**, integral with the arms **131**, through the medium of a cam bowl, roller or follower or the like **137**, integral with said lever. A return or drawback spring **138**, secured on the one hand to the end of the lever **136** and on the other hand, to the frame of the conveyor-selector, returns said lever back to its high or upper position which corresponds to the low position of the stop **130**.

It may be seen that when the cam-carrying shaft **113** rotates about itself, the cam **135** causes the stop **130** to be retracted three times during a rotation of 360°, thus periodically releasing, disengaging or freeing the pots fed by the conveyor-selector. Owing to its angular or L-shape, the lower bend **130***a* of the stop **130**, while letting the pots pass, remains in engagement with the upper face of these latter and the stop immediately drops back again as soon as a transverse row of pots has left the slideways of the conveyor-selector in order to move into the trans-

fer device and thus stops the next transverse row of pots. It is for this purpose that the peaks or apexes **135***a*, **135***b* and **135***c* of the cam **135** were given a steep profile **135***a*–**1**, **135***b*–**1**, **135***c*–**1**, which enables the immediate falling back of the stop **130** as soon as the lower part of the latter is no longer in contact with the top or upper face of the pots.

(b) Transfer member

The transfer member comprises a framework essentially consisting of a rigid frame **201**, in extension of the frame **101** of the conveyor-selector, this frame carrying at its upper part two cross-members **202** supported by standards or uprights **203** integral with the frame **201**, these cross-members **202** being in extension of the beams **111** of the conveyor-selector.

The transfer member comprises means for guiding the pots which consist of three pairs of rails or the like, **204***a*, **204***b*, **204***c* (see FIGURE 1) which are in extension of the slideways **123***a*, **123***b*, **123***c* of the conveyor-selector but lying at a level substantially lower than these latter, so that the pots are passing from the slideways to the rails when the stop **130** retracts thereby falling down by an amount corresponding to this difference between levels. To assist the passage of the pots moved, driven or carried along by the paddle-chain as soon as the stop **130** retracts for enabling their forward movement, guiding ramps such as **205***a*, are provided which are formed with a portion such as **205***a*–**1** sloping with an angle of about 45° and with a horizontal portion such as **205***a*–**2** (FIGURE 6).

The transfer member also comprises means for moving or carrying the pots along the rails **204***a*, **204***b*, **204***c*. On each one of both of the cross-members **202** are mounted two identical sprocket chains **206**, each one of which meshes with two sprocket wheels **207** and **208**. Both sprocket wheels **207** are keyed to the same shaft **209**, whereas both sprocket wheels **208** are keyed to a same shaft **210**. The shaft **210** comprises in addition a sprocket pinion **211**, operatively connected through a sprocket chain **212** to a sprocket pinion **140** keyed to the shaft **104** which is driven by the drive motor of the installation as previously described.

The pots which arrived on the rails **204***a*, **204***b*, **204***c* are moved or carried in translation along these rails owing to a horizontal push-bar or the like **215** (see in particular FIGURE 6) extending substantially to the whole width of the transfer member and carried by two supports **216** secured to two arms **217**. The arms **217** are secured at their upper part at **218** to the sprocket chains **206** and comprise at their lower part elongated slots or holes **219** in which is engaged a guide rod or bar **220** secured to two vertical posts or struts **221** depending from the framework **201**.

It is seen that when the sprocket chains **206** are driven or moved by the general drive motor of the system, they carry with them the arms **217** guided at their lower part by the bar **219**, so that the push or thrust bar **215** performs a cyclic motion of translation as shown in dashes and dots at B on FIGURE 6 during which movement it moves or carries along the pots while describing the upper portion of its path of travel.

(B) ROTARY DISTRIBUTOR

The rotary distributor **300** essentially comprises a framework or base **301** supported on legs **302**, and upon which is mounted a rotary plate or drum **303** having the shape of a flattened circular cylinder carrying on its periphery four shelves or racks **304***a*, **304***b*, **304***c*, **304***d* adapted to receive the pots pushed by the bar **215** of the transfer device when they move past the rails **204***a*, **204***b*, **204***c* of said transfer device. These shelves or racks are provided at their upper part taken in the direction of rotation of the plate or drum, with raised edges or flanges **305***a*, **305***b*, **305***c*, **305***d*.

The four shelves or racks are uniformly distributed on the periphery of the cylindrical plate or drum **303**, that is they are angularly spaced from each other by 90°, but they are staggered or offset in height with respect to each other; two diametrically opposite shelves or racks such as **304***a* and **304***c*, forming a pair of shelves or racks, are both at the same level, and likewise the shelves or racks **304***b* and **304***d* which form a second pair of shelves or racks are both at the same level, but the pair of shelves **304***a*–**304***c* exhibits with respect to the pair of shelves **304***b*–**304***d* a difference of levels equal to the half height of a pot, that is a difference of level of $H/2$, if H denotes the height of the pots P. In the case shown, the pair of shelves **304***a*–**304***c* is at a higher level (by $H/2$) than the pair **304***b*–**304***d*.

The shelves are given a slightly sloping position towards the axis of the plate or drum so as to compensate for the effect of the centrifugal force upon the pots.

The framework **301**, as shown in particular on FIGURE 7, carries the general drive motor of the system **306** which drives, through the medium of a belt **307**, a motor-variator set **308**, which drives in turn, through the medium of a belt **309**, a first worm-gear reducer **310**. The speed-reduction gear **310** comprises a first output shaft **311** to which is keyed a sprocket pinion **312** which through the medium of a transmission sprocket chain **313**, drives the sprocket pinion **314** of a second reducing-gear **315** the output **316** of which is used to drive the conditioning device, as will be seen later on.

The reducing-gear **310** comprises a second output shaft **317** to which is keyed a sprocket pinion **318** which through the medium of the transmission sprocket chain **319** and of the sprocket wheel **110** rotates the intermediate transmission shaft **109**.

The shaft **317** also drives through the medium of a box-coupling **320**, a counter or bevel gear **321** comprising two output shafts **322** and **323** arranged at right angles to each other, the reduction ratio being such that the shaft **322** effects one rotation of 360° while the shaft **323** effects a rotation of 180° only.

The plate or drum **303** is secured to a sleeve, bushing or the like **325** carried itself by a rotary shaft **326**. The sleeve **325** is made integral in rotation with the shaft **326** through a key **327** driven on or fitted in both, the aforesaid shaft **326** and a ring-shaped part **328** integral with the sleeve **325**.

The shaft **326** is slidably mounted at its lower part, in a bearing, car or the like **330** and is supported, through the medium of a thrust block **331**, by a clevis **332** provided at its upper part or top with a rod, stem or shank **333**, engaged or fitted through the medium of the bushings **334**, into a bore or recess **335** of the shaft **326**. The clevis **332** carries a rotary cam follower, bowl or roller **337** which bears against a cam **338** keyed to the shaft **322** of the reducing gear **321**.

The profile of the cam **338** (see FIGURE 8) is designed to impart to the aforesaid shaft and therefore to the plate or drum **303** supported by this shaft, an alternative upward and downward motion. A spring **340**, arranged in coaxial relationship with the shaft and bearing by its upper or top end against a stop, collar or the like **341**, integral with the aforesaid annular member **328** and by its lower or bottom end against a stop means or the like **342**, rotatably mounted on a stationary bearing **343** integral with a stationary casing or housing **344** which is integral with the framework **301**.

The function of the spring **340** is to enable a vertical movement of translation of the plate or drum **303** with suitable resilient relationship, while avoiding any sudden motion of this plate or drum likely to throw the pots on the shelves out of balance. This spring is actually compressed during the downward motion of the plate or drum so that it slows down with downward motion and stores energy which it gives back during the upward motion.

The shaft **326** comprises for being driven in rotation a pinion **345** meshing with a pinion **346** keyed to the shaft **323**. Both pinions **345** and **346** are arranged within the

casing or oil-pan **344**. The pinion **346** has a height or thickness much greater than that of the pinion **345** so as to remain in meshing engagement therewith in spite of its vertical movement of translation.

The dimensions of the cam **338** are designed so that the displacement in the vertical direction of the plate or drum be equal to $H/2$, this displacement being carried out alternatively upwards and downwards, and each 360°-rotation of the cam **338** causing an upward motion of the plate or drum (and therefore of the shelves or racks) by a distance of $H/2$, then a downward motion of the plate or drum (hence of the shelves) by the amount $H/2$. Since on the other hand the shaft **322** rotates twice as fast as the shaft **323** or in other words the cam **338** effects a 720°-rotation when the plate or drum carries out a 360°-rotation, it results therefrom that the plate or drum carries out the following displacements in the vertical direction: a rise by $T/2$, *a* downward displacement by $H/2$, a rise by $H/2$, a downward displacement by $H/2$.

Since each shelf or rack is designed to receive two pots each time it moves past the rails of the transfer device, it is obvious that all the shelves or racks must be at the same level when they move past said transfer device. To this end, it would be sufficient to key or adjust the cam **338** on its shaft in such a manner that the plate or drum be in the low position when a "high" shelf (**304***a* or **304***c*) is in front of the transfer device and on the contrary, in the high position when a "low" shelf (**304***b* or **304***c*) lies in front of the transfer device, since the difference between the high position and the low position of the plate or drum corresponds to the difference between the levels of both pairs of shelves or racks.

(C) CONDITIONING DEVICE

The conditioning device **400** essentially comprises a framework **401** consisting of a frame having a generally ractangular shape, supported on the one hand by legs **402** and bearing on the other hand on the framework **301** of the rotary distributor. It is disposed substantially in tangential relation to the plate or drum **303** of the rotary distributor, so that the pots pass from the transfer device to the conditioning device after having effected a 270°-rotation. Since the plate or drum **303** carries the four shelves angularly spaced by 90° with respect to each other, it results therefrom that when a shelf of one pair of shelves moves past the transfer device to receive there two pots, a shelf of the other pair of shelves moves in front of the conditioning device to discharge or deliver there the pots it has previously received itself from the transfer device.

It is immediately apparent that when a "high" shelf such as **304***a*, arrives in front of the transfer device, a "low" shelf such as **304***d* arrives in front of the conditioning device and vice versa. On the other hand, it has been stated that the plate or drum **303** effects, at each complete rotation, two upward motions and two downward motions and the cycle of the rotary and translative displacements of the plate or drum is such that it is lowered by $H/2$ when a "high" shelf such as **304***a* has to move past the transfer device, and it is lifted by $H/2$ when a "low" shelf such as **304***d* has to move past this transfer device. It immediately results therefrom when referring to the transfer device that the plate or drum is lifted by $H/2$ just before a high shelf passes in front of the conditioning device and that it is lowered by $H/2$ just before a low shelf passes in front of the conditioning device, so that both groups of pots delivered by both successive shelves arrive at the conditioning device at two different levels spaced by a distance H which precisely corresponds to the height of a pot.

The conditioning device comprises means for superposing the pots thus delivered at two different levels by the rotary distributor, these means consisting of two pairs of identical overlying rails **403** and **404** vertically spaced from each other by a distance equal to or very slightly greater than the height H of a pot. These pairs of rails are disposed so as to enable the pots lying on the shelves to move therebetween in order to collect or pick them up when they pass. The rails **403** receive the pots brought by the high shelves whereas the lower rails **404** receive the pots brought by the low shelves. The pairs of rail **403** and **404** are arranged in such a manner that the high shelves pass above the pair of rails **404** and the low shelves pass below the pair of rails **404**. It results therefrom that the pots immediately engage from above by their upper edges both rails adapted to receive them and they are pushed over a certain length along these rails by the rear raised edges or flanges **305***a*, **305***b*, etc. of the shelves or racks, and this as long as these raised edges or flanges continue to engage the space comprised between both pairs of homologous rails.

The conditioning device further comprises an inserting member adapted to introduce all of the pots thus conveyed to the rails **403** and **404** into the packings. This inserting device consists of a container or the like **406** having a general parallelepipedic shape open at both of its ends as well as at its upper part or top. This container comprises a relatively narrow forward or front portion **406***a* the width of which is substantially greater than twice the width of a pot and a rear or back portion **406***b* substantially wider, this rear or back portion being designed to encompass the rails **403** and **404**.

The container **406** is mounted on a plate **407** itself slidably mounted on guiding bars **408** and extending in parallel relation to the rails **403** and **404**. This plate **407** is moved in translation on the one hand by a spring **409** which tends to move it from the left to the right (when referring to FIGURE 4) and on the other hand by a swinging arm **410** to which it is connected through the medium of a road or link **411**. The arm **410** is itself moved according to a swinging motion by a cam **412** against which it bears through the medium of a cam follower or roller **413** (see FIGURE 3). The cam **412** is rotated by the general drive motor **306** through the medium of the reducing-gear **315**, of its output shaft **316**, of a rotary transmission shaft **415**, of a counter or bevel gear **416** having two outputs in the input shaft **417** of which is connected to said rotary transmission shaft **415** through the medium of a Cardan joint **418**, the cam **412** being mounted on one of the output shafts of the counter or bevel gear. The cam **412** is keyed to the aforesaid output shaft in such a manner that the plate **407** and hence the container **406** effect a movement of translation from the right to the left, then a movement of translation from the left to the right each time the plate drum **303** effects a 180°-rotation. The container is adapted to assume two end positions, one at the left wherein its rear portion **406** encompasses the rails **403** and **404** and in which it receives the pots which are moved in translation by a bar **420** to be described hereinafter, this position being shown in solid lines on FIGURE 9 and an end position at the right wherein it is engaged into a small bag S, this position being shown in dashed and dotted lines on FIGURE 9.

The front or forward portion **406***a* of the container **406** is provided inside with two pairs of guides **483**, **484** lying on the same level as the rails **403** and **404** and coming in extension of these latter when the container assumes the position shown in solid lines on FIGURE 9. The conditioning device further comprises means for pushing the sets of pots present on the rails **403** and **404** in order to introduce them within the container **406** when this latter is in its end position at the left, that is in the position wherein its rear or back portion **406***b* embraces the right hand end of the rails **403** and **404**. These means consist of a vertical bar or the like **420** adapted to be inserted between the rails **403** and **404** behind the set of pots carried by these rails and to cause this set of pots to slide from the left to the right so that they may engage the guides **483**, **484** which are in extension of the rails **403**, **404** and provided in the forward or front portion

406*a* of the container **406**. The bar **420** is mounted on a horizontal cross-member **421** itself supported by two uprights or standards **422** and **423** which are pivoted to two pairs of endless sprocket chains **424**, **425** on the one hand and **426**, **427** on the other hand. Both of these pairs of sprocket chains **424–425** and **426–427** are carried by two vertical panels **428** and **429**, respectively, integral with the framework **401**. They are driven according to a uniform motion of translation by the general drive motor **306** of the system through the medium of the transmission gear comprising a sprocket wheel **431** keyed to the second output shaft **432** of the bevel gear **416**, the sprocket chain **433**, the spocket pinion **434**, the sprocket wheel **435** integral with the pinion **434**, the transmission sprocket chain **436**, the sprocket pinion **437** (see FIGURE 3) integral in rotation with the sprocket pinion **438**, the transmission sprocket chain **439** which operatively connects to each other the sprocket pinions **440** and **441** integral with the pinion **442** and **443**, respectively, the transmission sprocket chain **444**, which operatively connects to each other the sprocket pinions **445** and **446** integral with the pinions **447** and **448**, respectively, and finally the transmission sprocket chain **449** which interconnects the sprocket pinions **450** and **451** integral with pinions **452** and **454**, respectively.

It is seen that when both pairs of sprocket chains are driven in the direction indicated by the arrows F_4 on FIGURE 4, the transverse bar **421** and therefore the vertical bar **420** describe a rectangular motion of translation during which the bar **420** moves, when it is in the lower position, from the left to the right thereby carrying the pots along the rails **403** and **404** until they engage the guides **483** and **484** of the container. The backward motion from the right to the left is effected when the transverse bar **421** and the bar **420** are in the high position, this latter passing then above the rail **403**.

The conditioning device further comprises means to open each packing, these packings consisting of small bags made of cardboard or of plastic material comprising two side faces S*a* and S*b*, integral with each other and devoid of lateral walls so that when they are open, these small bags assume somewhat the shape of a tunnel open at both of its ends and in which the pots P may be introduced. These small bags S are stacked in a flat laid position within a magazine **460** of circular arcuate shape arranged between the panels **428** and **429**. These means for opening the small bags comprise a gripping member or "hand" consisting of a hollow arm **461** privotally connected to a shaft **462** integral with the framework **401** so as to be swingable in a plane at right angles to the path of travel of the pots and passing substantially through the medial plane of the magazine **460** in order to present itself in front of the small bags. This arm **461** bears at its upper end two suckers or suction devices **463** connected to a vacuum pump **464** through the medium of a duct **465**.

The arm **461** is actuated for oscillatory or swinging motion about its pivot axis **462** on the one hand by a spring **466** which tends to apply the suckers of suction devices **463** against the front or forward face S*a* of the first small bag which is arriving and on the other hand by a cam **467** keyed to the input shaft **417** of the bevel gear **416**.

The control of the circuit producing the vacuum in the suckers or the suction devices **463** is performed by a control valve **470** (see FIGURE 4) which establishes or cut off the communication between the suckers or the suction devices and the vacuum pump **464**, this valve being actuated by means of a cam **471** affixed onto a rotary transmission shaft **415**.

Two retractable stops **474**, provided at the forward or front portion of the magazine **460**, enable to retain the back or rear face S*b* of a small bag when the front or forward face S*a* of said small bag is carried away by the suckers **463**. Each stop **474** is integral with the core of an electromagnet **475** fed by a source of electric current (not shown) through the medium of leads or conductors **476**. When the electromagnets **475** are energized, they pull or attract their respective cores and retract both stops which let pass the second face of the small bag. Springs **477** return the stops to the blocking position when the electric current is cut off. The electric supply of the electromagents **475** is controlled by a micro-switch **478** actuated by a cam **479** integral with the rotary gear shaft **415**.

The cam **467** which controls the swinging or oscillatory motion of the arm **461**, hence the opening of the small bags, is keyed, with respect to the cam **412** which controls the position of the container **406**, in such a manner that the opening of the small bags is effected when said container is in its left-hand end position, that is at the time when it receives the pots coming from the rails **403** and **404**.

The material constituting the small bag is flexible or yieldable enough to enable the first face S*a* of the small bag to pass past the two stops **474** while being deformed without being necessary to retract these stops. The stops **474** retain on the contrary the second face S*b* of the small bag thus enabling the opening thereof and the stops retract after the insertion of the container into the small bag so as to release or free the latter.

The pots having been pushed by the bar **420** into the container **406**, within its forward or front portion **406***a* and the container having been inserted into the small bag previously opened by the "hand," the container should be allowed to come back without of course carrying the pots therewith and then the small bag filled with pots should be pushed or driven towards the closing device **500** the function of which is to seal together both upper edges of the small bag to confine or enclose the pots. This is achieved owing to a second bar **480** identical with the bar **420** and also secured to the cross-member **421**. The movement of translation of one small bag filled with pots towards the closing device and the translative motion of the next or following set of pots towards the container are therefore effected simultaneously.

The small bag filled with pots is pushed or driven by the bar **480** between the converging guides **501** of the closing device until they reach the belt conveyor **502** which continues to carry them along. This closing device being known, it is useless to describe it in more detail. In FIGURE 12 is shown a small bag such as it comes out from the closing machine **500**.

OPERATION OF THE MACHINE

The operation of the machine will be better understood when referring at first to FIGURES 14*a* to14*d* and 15*a* to 15*d*.

On these figures are diagrammatically shown the conveyor-selector and the transfer member **100–200** which move the pots in translation in the direction of the arrow F_1, these pots being arranged in three rows but moving ahead two by two as previously described, and the rotary distributor **300**, this distributor being assumed for reasons of simplification to only comprise two shelves or racks **304***a*, **340***b* diametrically opposed and vertically staggered or offset with respect to each other by the distance $H/2$, and finally the conditioning device reduced here to the rails **403** and **404** only. To simplify the elevational views, it has been assumed that the conditioning device while being parallel to the conveyor-selector and tangent to the plate **303**, is located on the other side of this conveyor-selector with respect to the axis of the plate or drum **303**. It is obvious that this changes absolutely nothing to the principle of operation of the machine and its only merit is to simplify the description.

The conveyor-selector moves two of the rows of pots forward so that the two first pots pass on the high shelf **304***a* (see FIGURES 14*a* and 15*a*). The rotary device rotates in the direction of the arrow F_2 and is lifted dur-

ing this rotation by an amount $H/2$, so that when the shelf **304***a* moves past the rails of the conditioning device, it is the upper rails **403** which receive the two pots (FIGURES 14*b* and 15*b*). The rotary device continues its movement of rotation in the direction of the arrow F_2 so that the low shelf **304***b* the level of which is lower by the amount $H/2$ than the shelf **304***a*, but which is lifted together with the plate or drum precisely by this amount $H/2$, moves past the conveyor-selector on the level of which the shelf **304***a* has previously passed, so that it is also ready to receive the two first pots of both rows of pots carried along by the conveyor-selector (see FIGURES 14*c* and 15*c*). The rotary distributor keeps rotating while however lowering by the amount $H/2$ so that the pots it carries engage when passing the lower rails **404** of the conditioning device (see FIGURES 14*d* and 15*d*). The pots being thus superposed, are ready to be carried away towards the container.

It should be noted that, in the case of FIGURES 14*a*–15*a*, it is the pots of the first and second rows which have moved forward whereas in the case of FIGURES 14*c*–15*c*, it is the pots of the second and third rows which have moved forward and in a further step (not shown), it is of course the pots of the first and third rows which will move forward so that the advance of the three rows of pots is effected in an alternative but regular manner.

Reference should be made now to the embodiment of the machine as shown in the drawings. It is seen that the conveyor-selector carries along two rows of pots and the two first pots of both of these rows pass from the rails **123** to the guides **204** as soon as the stop **130** has been retracted by the cam **135**. The bar **215** of the transfer device then drives these two pots upon travelling along the upper portion of the path B (see FIGURE 6) from the left to the right so as to push or to drive these pots onto the shelf of the plate or drum **303** which precisely at this time moves past the guides **204**. This shelf discharges or delivers these two pots for example on the upper rails **403** of the conditioning device. The two pots remain in position until the two following pots, carried by the next shelf, are brought onto the lower rails **404**. The bar **420** then moves in position behind the set of four pots and drives them from the left to the right towards the container which has come into position at the end of the rails **403** and **404**. The bar **420** then pushes the pots until they engage the guides **483** and **484** of the container. During this time, the "hand" opens a small bag, the front or forward wall S*a* of the small bag being held by the suckers **463**, momentarily against motion in the position shown in solid lines in FIGURE 12, whereas the rear or back wall S*b* of this small bag is retained by the stops **474**. The container **306** is then driven or carried along from the left to the right until it enters the small bag while the bar **420** effects its return or backward motion to go and fetch the set of next pots, and the bar **480**, which is integral with the bar **420**, also effects its return or backward motion and moves into position behind the pots still contained in the forward or front portion **406***a* of the container, which is located within the small bag. The container then recedes or moves back towards the rails **403** and **404** thus leaving the pots which are retained by the bar **480** and which are lying, as soon as the container has left the small bag, within the small bag proper. The bar **480** then drives the small bag filled with pots towards the closing device. During this time, the "hand" has been caused to open the next small bag which will receive the set of following pots.

Many modifications may of course be made to the embodiment described. Thus for example, instead of four shelves, it is possible to provide for instance eight shelves on the periphery of the plate or drum **303**, and this of course provided that the profile of the cam **338** should be altered accordingly so as to cause, instead of two upward movements and two downward movements during a 360°-rotation, four upward movements and four downward movements.

The conveyor-selector could also be designed to carry along any number of rows of pots, for example, four, five, six, etc. rows, the number of cams **115**, **116** being of course equal to that of the rows and their profiles having been modified to enable a forward motion of the pots either two by two or three by three or four by four, etc. according to the number of pots it is desired to put into each small bag.

(D) ARRANGING DEVICE (ALTERNATIVE EMBODIMENT)

The arranging device **600** described and shown in FIGURES 16 to 26 is adapted, as the arranging device previously described and consisting of the combination of the conveyor-selector **100** and of the transfer member **200**, to select among the rows of pots of yogurt P (three rows in the case shown), groups of pots comprising each one a determined number of pots (two in the case shown) and to distribute them to the rotary plate or drum **303** of the rotary distributor **300**, this rotary plate or drum bringing said groups of pots to the conditioning device **400** (not shown) as previously explained. These pots of yogurt have the general shape of an inverted frustum of a pyramid and are provided at their upper part with a flange as seen on FIGURES 17 and 18 for example.

According to the embodiment shown, the pot driving device of the arranging device **600** consists of a conveyor **601** comprising a framework formed by a frame of generally rectangular shape **602** on which are mounted four separated flap-carrying chains **603***a*, **603***b*, **603***c*, **603***d* simultaneously driven in continuous translation in the direction of the arrow F_5. These flap-carrying chains pass over two supporting rollers one of which is mounted on a drive shaft **604** located at that end of the frame **602** which corresponds to the outlet or egress of the conveyor whereas the other is mounted on a loose shaft **605** located at the other end of the frame **602** which corresponds to the inlet of the conveyor. The drive shaft **604** is driven for uniform rotation through a sprocket wheel **606** mounted at one of its ends and connected through the medium of a sprocket chain **607** to a sprocket pinion **608** driven by the general drive motor as will be explained hereinafter.

Straight and parallel ramps **609***a*, **609***b*, **609***c*, **609***d*, integral with the frame **602** are disposed above the flap-carrying chains **603***a*, **603***b*, **603***c*, **603***d* and form therebetween guiding shoots or channels for the pots P carried along by these flap-carrying chains, these shoots or channels being disposed above the spacings or gaps between two adjacent flap-carrying chains. These straight ramps **609***a*, **609***b*, **609***c*, **609***d* are lying in the initial portion of the path of travel of the pots, that is extending from the inlet of the conveyor **601** to the operating area of the cam **626** which will be described hereinafter, at a distance from the flap-carrying chains substantially smaller than the height of the pots, so that these latter rest simultaneously upon both flap-carrying chains which therefore carry them along in translation (see FIGURE 17). The ramps **609***a*, **609***b*, **609***c*, **609***d* then exhibit in the vicinity of the cam **626**, an upward slope, so that the edges provided at the upper portion of the pots then engage said ramps and the pots are thereby lifted until they are disengaged from the flap-carrying chains and stop temporarily, their further motion being produced by the cam **26** as will be described hereinafter (see FIGURE 18).

Above the channels or shoots defined by the ramps **609***a*, **609***b*, **609***c*, **609***d* and extending along the center line of each one of these shoots or channels comprised between these ramps are provided guide bars **610***a*, **610***b*, **610***c* which are adapted to prevent the tilting of the pots during their motion produced by the flap-carrying chains.

To promote access to the pots, in case a manual interference or operation would be required during the working of the machine, these guide bars are partially removable. To this end, an element **610'***a*, **610'***b*, **610'***c* of each one of

said bars is mounted on a frame **611** adapted to rock or to tilt about hinges **612** and provided at its other end with a rocking member **613**.

The selecting device for the pots consists of a drum **614** (see FIGURES 19 to 21) disposed below the flap-carrying chains and secured to the output shaft **615** of a counter or bevel gear **616** operatively connected to the general drive motor as will be described hereinafter. The drum **614** is provided on its periphery with three sets of fingers **617***a*, **617***b*, **617***c* arranged in three circular rows spaced by intervals corresponding to the gaps between the flap-carrying chains. These fingers are disposed radially on the drum and are also distributed about its periphery. The three sets of fingers **617***a*, **617***b*, **617***c* are angularly staggered or offset with respect to each other by an angle corresponding to one third of the angle defined between two successive fingers of a same set. Thus for example in the case shown, the drum **614** comprises three sets having each one twelve fingers, the fingers of a same set being angularly staggered with respect to each other by 30°, the set of fingers **617***b* being staggered by 10° with respect to the set of fingers **617***a* and the set of fingers **617***c* being staggered by 10° relative to the set of fingers **617***b*.

The drum **614** is disposed beneath the flap-carrying chains so that during their rotation, the fingers, passing between the gaps between two neighbouring chains, slightly project beyond or from the plane of these chains so as to be insertable between two successive pots and therefore to retain all the pots located upstream. For this purpose, the flap-carrying chains are moved with a speed of translation much greater than the horizontal component of the linear velocity of the finger tips.

The guide ramps **609***a* and **609***d* extend up to the vicinity of the outgoing or delivery end of the conveyor **100** by portions of concentric circles **609'***a*, **609'***d* thereby defining a circular shoot or channel of the same width than the straight shoots or channels. To enable passing from any one of these three straight shoots or channels to this single circular channel or shoot, the intermediate ramps **609***b* and **609***c* are provided at their ends adjacent to the outlet of the conveyor, with swinging arms in the form of circular arcs **620** and **621**, respectively, which, depending upon their position, enable the connection or communication between one of the three intermediate shoots or channels between the ramps **609***a*, **609***b*, **609***c*, and **609***d*, and the shoot or channel lying between the ramp portions **609'***a* and **609'***d*. To this end, each one of both arms **620** and **621** may assume two positions wherein it establishes one or the other of the aforesaid communications. On FIGURE 16*a*, it is apparent that it is the straight shoot or channel lying between the ramps **609***a* and **609***b* which communicates with the circular shoot or channel; in the position shown on FIGURE 16*b*, it is the intermediate straight channel or shoot that is the one lying between the ramps **609***b* and **609***c* which communicates with the circular channel or shoot and in FIGURE 16*c*, it is the straight channel or shoot lying between the ramps **609***c* and **609***d* which communicates with the circular channel or shoot. In order that the swinging motion of the arms **620** and **621** about their pivot point may be effected even under the influence of an extremely weak force, these latter are provided at their pivoting end with a shaft such as **623** carried by a stationary sleeve such as **624** through the medium of ball bearings **625** (see FIGURE 24).

In concentric relation to the circular elements **609'***a*, **609'***d*, of the guide ramps is rotatably mounted a cam **626** (see FIGURES 22 and 23) having three arms **626***a*, **626***b* and **626***c* and which passes between the flap-carrying chains and the guide ramps. The cam **626** is continuously rotated in the direction of the arrow F_6 by means of a bevel gear **627**, itself operatively connected to the general drive motor of the system as will be explained hereinafter. The cam **626** further comprises dogs, catches or the like **628***a* **628***b*, **628***c*, **628***d*, co-operating with rollers or followers such as **629** integral with the swinging arms **620** and **621**, so as to enable to rotate the latter and to move them from one position to another.

On FIGURE 25 has been diagrammatically shown the kinematic drive chain of the machine in the direction in which the latter forms a part of a packing plant of the aforementioned type. This chain comprises a general drive motor **630** for the system which drives a motor variator set **631** which drives a first form-gear reducer **632**. The reducing gear **632** drives in turn on the one hand a counter or bevel gear **633** for rotating the rotary distributor plate or tray A and on the other hand a second reducing gear **635** which, through the medium of a homokinetic joint **636**, drives a bevel gear **637**. The bevel gear **627** comprises three outputs, namely; a vertical shaft on which is mounted the cam **626**, a second output which drives through the medium of a homokinetic joint **640**, the flap-carrying chains and a third output which also drives through the medium of a kinetic joint **641**, the counter gear **616** of the drum **614**.

On FIGURE 26 is shown the coupling device **639** enabling an accurate angular adjustment of the homokinetic joints. This member comprises two circular coaxial discs **642**, **643** one of which **642** is provided with spigots, studs or the like **644** whereas the other **643** is formed with two elongated apertures **645** which are engaged by the spigots or studs **644**. On the element **643** are mounted opposite screws **646***a*, **646***b* bearing upon the spigots or studs **644**. It is immediately apparent that it is possible to accurately adjust through the medium of these screws the angular position of both elements **642** and **643** with respect to each other.

The machine operates as follows. The pots P arriving in three parallel rows move into the shoots or channels lying between the ramps **609***a*, **609***b*, **609***b*, **609***c*, **609***c*, **609***d*. The pots which rest by their bottom upon two neighbouring flap-carrying chains, are moved at the speed of these flap-carrying chains. When they arrive at the level of the selecting drum **614**, the first pot of a row meets with one of the fingers of the sets of fingers **617***a*, **617***b*, or **617***c*, depending upon the row to which it belongs. The drum having a relatively low velocity of rotation, the pot is slowed down and retains therebehind all the following pots. It may be assumed that it is one pot of the row lying between the ramps **609***a* and **609***b* which is the first to meet a finger **617***a* of the set of fingers corresponding to this row of pots. This pot is then slowed down as has been previously explained and constrained to move at a linear speed much smaller than that of the flap-carrying chains. When the drum has effected an additional 10° rotation, it is a finger of the set of fingers **617***b* which comes in front of one of the pots of the row lying between the ramps **609***b* and **609***c* which slows down this pot as well as all the following pots. After a further 10° rotation, it is a finger of the set of fingers **617***b* which in turn slows down one pot of the row lying between the ramps **609***c* and **609***d*. After a new 10° rotation, it is again one finger of a set of fingers **617***a*, which inserts itself between two pots of the first row, thereby stopping the pot which lies upstream as well as all the pots which follow it, while at the same time the preceding finger of the same set retracts and releases or frees the two pots which are driven or moved at the speed of the flap-carrying chains.

When the pots arrive in the vicinity of the outlet of the conveyor, that is in the operating area of the cam **626**, they engage the upward portion of the ramps so that they are carried upon these ramps by their upper flange and are no longer in contact with the flap-carrying chains. During its movement of rotation, the cam **626** drives, by one of its arms (**626***a* in the case shown), the two pots towards the arcuated ramps **609'***a*, **609'***d*. Since the arm **620** is in the position shown on FIGURE 16*a*, the pots

keep moving along these circular ramps until they arrive to a receiving station that is to the rotary plate or tray A driven in the direction of the arrow F_7.

When passing under the arm **620**, the dog or catch **628***a*, provided on the rear or back edge of the arm **626***a*, drives this arm **620** through the medium of its roller or follower **629** to bring it into the position shown on FIGURE 16*b*. After a new 10° rotation, it is a second finger of the set of fingers **617***b* which inserts itself between two pots of the second row, whereas the first finger of the same set releases or frees the two pots it had retained heretofore.

The pots of the second row engage in turn the upward portions of the ramps **609***b* and **609***c* and then are moved onto the arm **626***b* of the cam **626** along the circular portion of the guide ramps. When passing, the dog or catch **628***b* of the arm **626***b* pushes back the needle or tongue **621** into the position shown on FIGURE 16*c*.

After a further 10° rotation, it is a further finger of the set of fingers **617***c* which inserts itself between two pots of the third row while the first finger of this set of fingers releases or frees in turn the two pots of the third row.

It is thus apparent that the pots are successively released or freed in groups of two at regular intervals.

It is then the turn of the two pots of the third row to be driven or carried along by the arm **626***c* of the cam **626** and to engage the circular portions of the guide ramps. The dog or catch **628***c* of the arm **626***c* returns the needle or tongue **621** into the position shown on FIGURE 16, that is it prepares again the path for the pots of the first row.

It should be noted that the circular ramp portions **609'***a*–**60'9***d* are preferably given a sloping with respect to the horizontal direction corresponding to that of the shelves or racks **304***a*, **304***b*, **304***c*, **304***d* of the plate, drum or tray **303**.

It is understood that the invention should not be construed to be limited to the forms of embodiments described hereinabove and shown with reference to the accompanying drawings which have only been given by way of examples and that many modifications and changes may be made thereto within the scope of the appended claims.

What we claim is:

1. A machine for automatically selecting, stacking in overlying relationship and then packing articles such as pots of yogurt and the like, comprising in combination an arranging device receiving the pots and like articles all lying on a same level and aligned in a number of parallel rows, said arranging device comprising means for driving said rows of pots in translation and selecting among these rows a constant number of pots so as to deliver them in groups containing a same number of pots; a rotary distributor receiving the groups of pots delivered by the arranging device and comprising means for collecting these groups of pots on a constant level and carrying them to different levels, and a device receiving the groups of pots delivered by the rotary device and comprising means for superposing said groups of pots so as to form a set of pots comprising a plurality of overlying rows of pots, said arranging device and rotary distributor being driven in synchronism by a common driving mechanism in order to continuously perform the successive automatic driving steps of the pots.

2. A machine according to claim **1** wherein said arranging device comprises a conveyor-selector with which is associated a transfer member located at the outgoing end for the pots of said conveyor-selector, said transfer member receiving each group of pots delivered by the conveyor-selector and comprising guiding means in extension of said conveyor-selector and means for carrying said groups of pots in translation along said guiding means.

3. A machine according to claim **2** wherein said conveyor-selector and said transfer member are aligned so that the pots follow therein a substantially straight path of travel, whereas said rotary distributor is located after the transfer member and its axis of rotation lying substantially at the medial plane of the straight path of travel of the pots, a conditioning device being disposed substantially in parallel relation to said conveyor-selector and to said transfer member so that the pots also follow therein a straight path of travel, that end of said conditioning device which receives the pots being disposed in substantially tangenial relation to said path of travel of the pots carried along by the rotary distributor.

4. A machine according to claim **3** wherein said conveyor-selector and transfer member are adapted to enable the straight displacement of the pots to be effected therein in one direction, and the conditioning device is adapted to enable the displacement of the sets of pots to be effected therein in the opposite direction whereas a rotary selector is provided to cause the pots to pass from a first straight path of travel to a second one by a 270° rotation.

5. A machine according to claim **4** wherein said conveyor-selector comprises means for driving the pots in intermittent translation, which means consist of a belt conveyor moving with a constant translative speed and above which are disposed parallel slideways each one of which is engaged by a row of pots and along which said row of pots is displaceable, said slideways being adapted to assume an upper position wherein the pots are out of engagement with said belt and therefore remain stationery in the slideway, and a lower position wherein the pots are in engagement with the belt and are driven in translation by the latter with respect to the slideway.

6. A machine according to claim **5** wherein each slideway of said conveyor-selector consists of two structural bars upon which the pots rest by their upper flange, said structural sections being provided at each one of their ends with bracket means carried by cams rotated in synchronism with said belt conveyor so that the distance between each slideway and the belt depends upon the angular position of said cams.

7. A machine according to claim **6** provided at both ends of said conveyor-selector with two identical sets of cams, the cams of a same set being mounted on a same shaft and having the same profile, said cams being angularly staggered with respect to each other so that some of them keep the slideways which are associated therewith in the upper position, the corresponding row of pots remaining stationary, whereas the other keep the slideways which are associated therewith in the lower position, the corresponding row of pots being carried along in translation by said belt.

8. A machine according to claim **7** wherein the pots are arranged in three parallel rows and there are provided three cams having two flattened portions defining an angle of 60° therebetween and connected by two circularly arcuated portions, these cams being staggered with respect to each other by 120° so that at a given time, two rows of pots are carried along while one row remains stationary, said pots being delivered by groups of two pots.

9. A machine according to claim **8** wherein said conveyor-selector further comprises means for periodically stopping and releasing said pots, said means consisting of a retractable stop disposed at the outgoing end of said belt conveyor and swingably mounted about a horizontal shaft, said stop engaging the path of travel of said pots in the lower position and leaving said path in the lifted position.

10. A machine according to claim **9** wherein said retractable stop is actuated for swinging motion on the one hand by a cam mounted on a shaft carrying one of the sets of aforesaid cams and moved in rotation by said shaft and on the other hand by a return support which keeps it in the lower position.

11. A machine according to claim **10** wherein the transfer member comprises guiding means consisting of rails

disposed in extension of said slideways and which are engaged by said pots as soon as they have left said slideways.

12. A machine according to claim 11 wherein said transfer member further comprises means for driving said groups of pots on said rails, said means consisting of a push-bar periodically moving back and forth so as to drive said pots towards said rotary distributor.

13. A machine according to claim 12 wherein said bar is mounted on an arm pivoted at its lower part onto a horizontal shaft and secured at its upper part to an endless chain which drives it according to a closed motion of translation.

14. A machine according to claim 1 wherein said rotary distributor comprises a plate having the shape of a circular cylinder provided on its periphery with shelves adapted to receive the groups of pots delivered by the distributing device, two successive shelves being staggered in height with respect to each other by an amount corresponding to the half height of a pot.

15. A machine according to claim 14 wherein each aforesaid shelf comprises a vertical flange at its rear portion with respect to the direction of rotation of said plate.

16. A machine according to claim 15 wherein said plate comprises two pairs of shelves, the two shelves of a same pair being diametrically opposed and located at the same height, both pairs of shelves being angularly spaced by 90° from each other and vertically staggered by an amount corresponding to the half height of a pot, the driving mechanism of said plate being so designed that the latter effects a downward translation by an amount equal to the half height of a pot during a 90° rotation and an upward translation by an amount equal to the half height of a pot during the following 90° rotation.

17. A machine according to claim 14 wherein said plate is mounted on a rod connected to a driving mechanism which imparts to it both, a motion of rotation and a motion of alternative vertical translation, the upward and downward displacement of said rod and therefore that of said plate corresponding to a half height of a pot.

18. A machine according to claim 17 wherein the driving mechanism of said rod comprises on the one hand a cam moved in rotation upon which said rod rests through the medium of a follower, the rotation of said cam causing a vertical upward and downward translation of said rod by an amount equal to the half height of a pot and on the other hand a driving pinion meshing with a driven pinion integral with said rod.

19. A machine according to claim 18 wherein said plate comprises four shelves and said driving pinion is adapted to effect a 180° rotation when said cam effects a 360° rotation.

20. A machine according to claim 19 wherein said cam and driving pinion are keyed to two output shafts of a same reducing gear.

21. A machine according to claim 20 wherein there is provided a spring coaxial with said rod and disposed between an element integral with said plate and an element integral with the frame of the machine, said spring being compressed during the downward motion of said plate and being extended during its upward motion so as to cause a movement in translation under determined conditions of resilience.

22. A machine according to claim 1 wherein said device receiving the pots comprises means for superposing the groups of pots, said means consisting of at least two pairs of overlying rails spaced from each other by an amount slightly greater than the height of a pot, said pairs of rails being disposed in substantially tangential relation to a cylindrical plate provided with shelves carrying the pots so that the pots positioned on said shelves when passing engage said rails that is alternatively the upper rails and the lower rails so as to superpose said groups of pots thus delivered by the rotary device.

23. A machine according to claim 1 wherein said arranging device comprises in combination means for distributing said pots and like articles in groups comprising the same number of pots disposed likewise, directional means for directing each group towards a guiding member and driving means for driving each group along said guiding member and to deliver it to said rotary distributor.

24. A machine according to claim 23 wherein said distributing means comprises a device for driving the rows of pots and a selecting device which alternatively separates in each row of pots, a fixed number of pots corresponding to the number forming each group and successively releases at regular intervals the pots thus separated.

25. A machine according to claim 24 wherein said driving device consists of a conveyor formed by parallel flap-carrying chains spaced fom each other by gaps and driven with a same constant speed, each pot of a row of pots being simultaneously driven by two adjacent flap-carrying chains.

26. A machine according to claim 25 wherein said conveyor comprises above said flap-carrying chains, stationary ramps which are parallel to each other and form channels between which move the rows of pots carried along by said flap-carrying chains.

27. A machine according to claim 26 wherein said conveyor also comprises guide bars disposed above said ramps in parallel relation thereto, each bar lying between two guide ramps so as to prevent tilting of the pots while being moved by said flap-carrying chains.

28. A machine according to claim 27 wherein said bars are mounted at least in part on a rocking frame so as to allow direct access to said pots.

29. A machine according to claim 24 including flap-carrying chains and wherein said selecting device consists of a drum rotatably mounted on a shaft extending at right angles to the direction of translative motion of said flap-carrying chains and comprises radially disposed fingers arranged in parallel rows equal in number to that of the rows of pots, each finger inserting itself during the rotation of the drum between two successive pots of a row of pots.

30. A machine according to claim 29 wherein said drum is disposed below said flap-carrying chains, said rows of fingers being inserted between the gaps and the fingers of a same row projecting during a part of the rotation of the drum above the plane of said flap-carrying chains.

31. A machine according to claim 30 wherein the successive fingers of a same row are angularly staggered by an amount which depends upon the number of pots to be selected for constituting a group.

32. A machine according to claim 31 wherein said rows of fingers are angularly staggered with respect to each other so as to successively release the groups of pots in each one of the rows of pots.

33. A machine according to claim 32 wherein said drum is driven in synchronism with said flap-carrying chains at such a speed of rotation that the linear velocity of said fingers is much smaller than the linear velocity of said flap-carrying chains.

34. A machine according to claim 23 wherein said directional means consist of swinging arms and are disposed at the ends of at least some of the ramps of said conveyor, said arms connecting, according to their angular position, one of the channels of said conveyor to said guide member.

35. A machine according to claim 23 wherein said guide member consists of at least two parallel ramps of circularly arcuate shape, in extension of the conveyor ramps and between which said groups of pots are coming to move.

36. A machine according to claim 23 wherein the means for driving said groups of pots consist of a rotary cam provided with radial arms, said cam being disposed in concentric relation to said circular ramps.

37. A machine according to claim 36 wherein said cam comprises a number of radial arms which is equal to the number of rows of pots carried along by said conveyor.

38. A machine according to claim 37 wherein each one of the arms of said cam is provided with dogs cooperating with followers integral with said arms so as to control the angular position of said arms.

39. A machine according to claim 38 wherein said cam is driven in synchronism together with said conveyor.

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