July 26, 1938. G. RUEGENBERG 2,124,931

METHOD AND APPARATUS FOR PRODUCING PACKING DEVICES

Filed March 17, 1937 4 Sheets-Sheet 1

Fig. 1

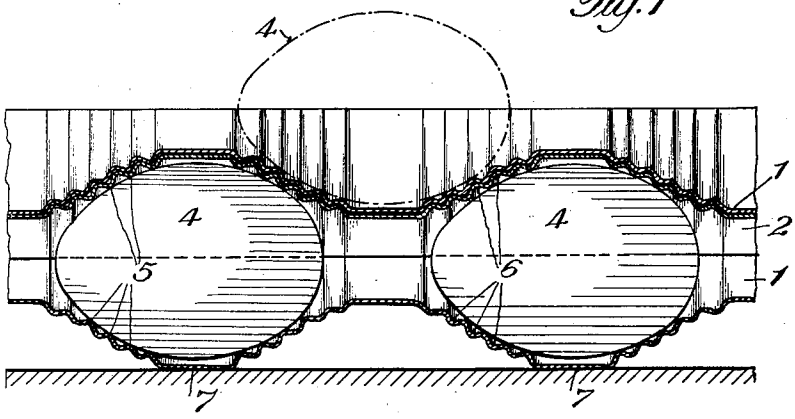
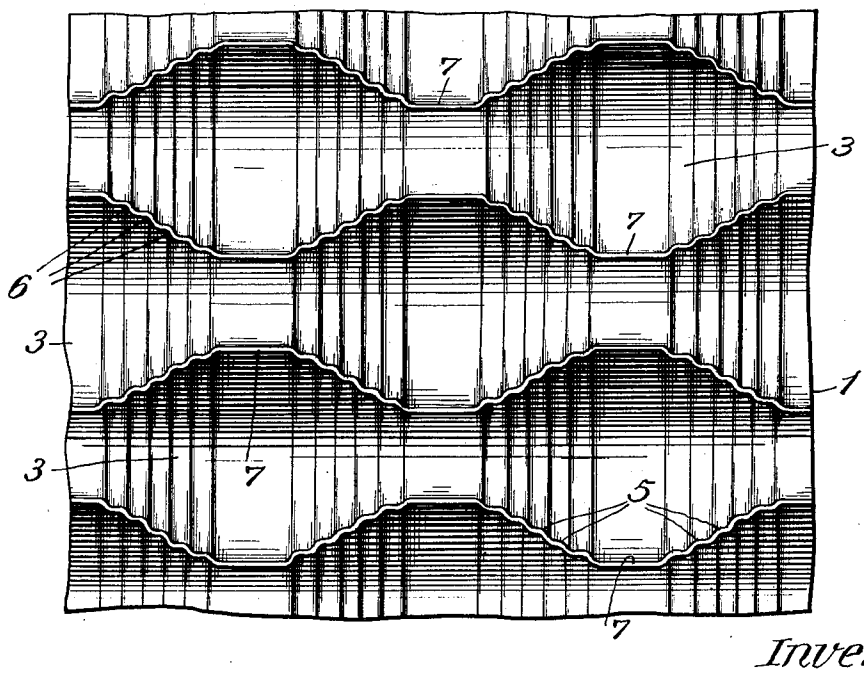


Fig. 2



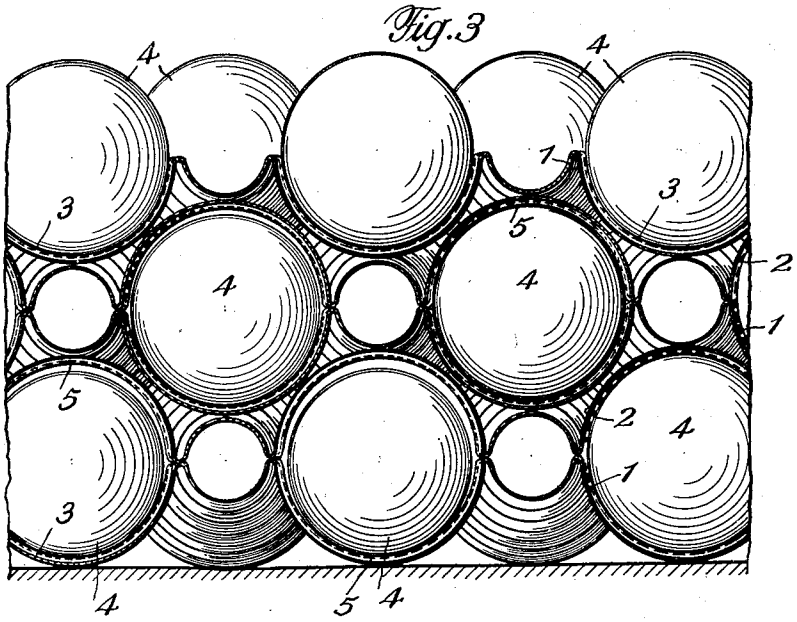
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METHOD AND APPARATUS FOR PRODUCING PACKING DEVICES

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Fig. 3



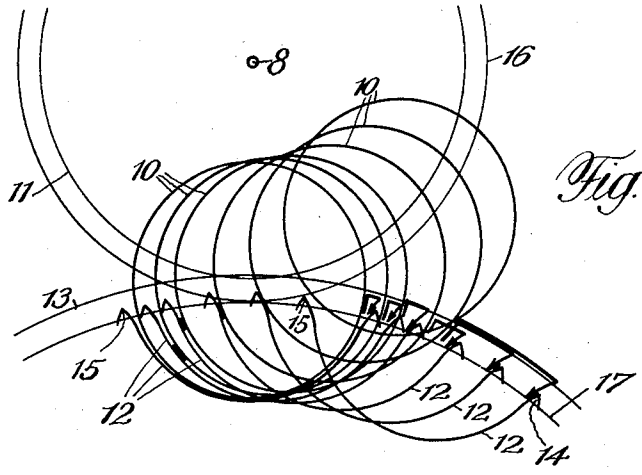


Fig. 4.

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METHOD AND APPARATUS FOR PRODUCING PACKING DEVICES

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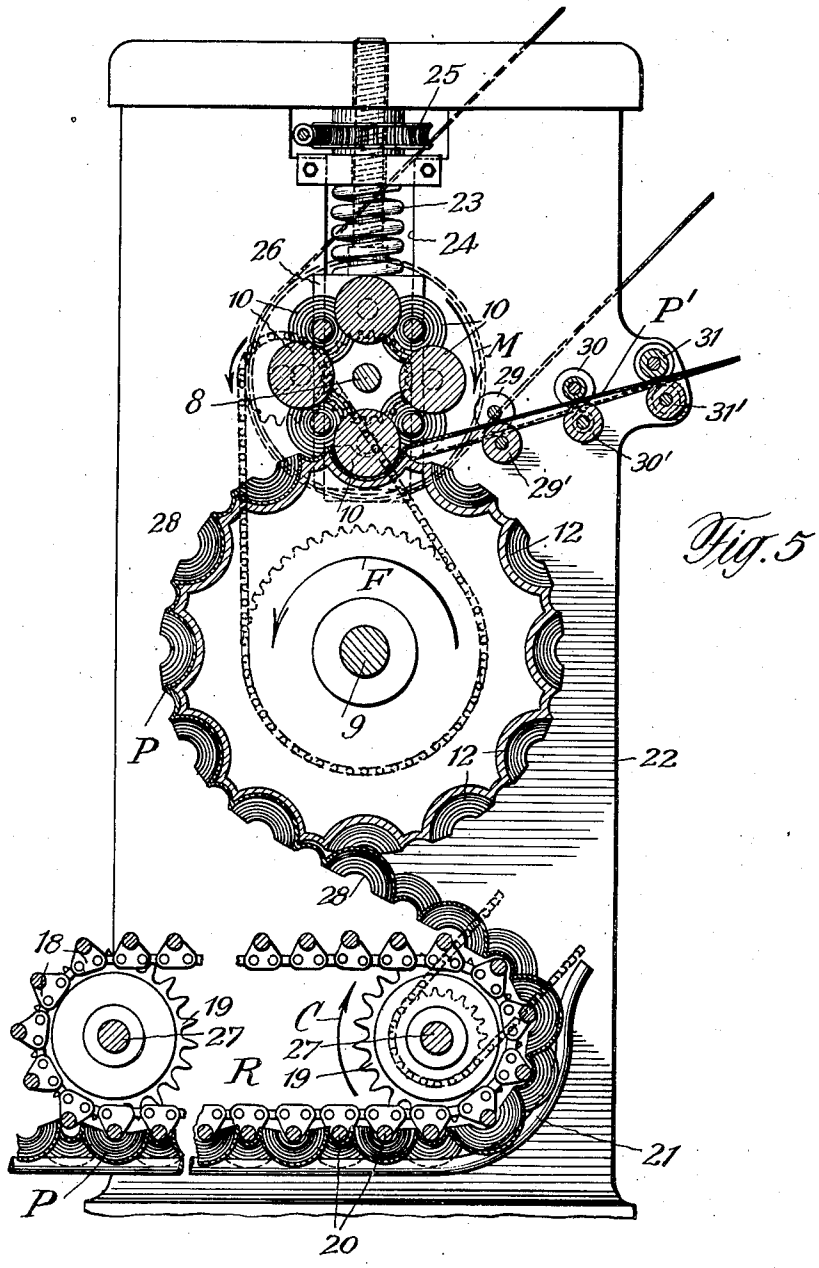


Fig. 5

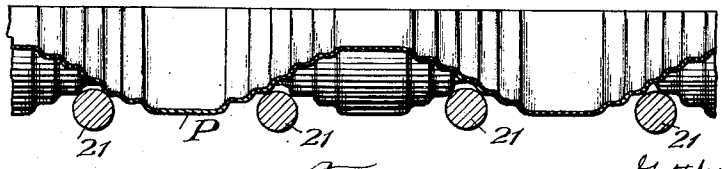


Fig. 6

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METHOD AND APPARATUS FOR PRODUCING PACKING DEVICES

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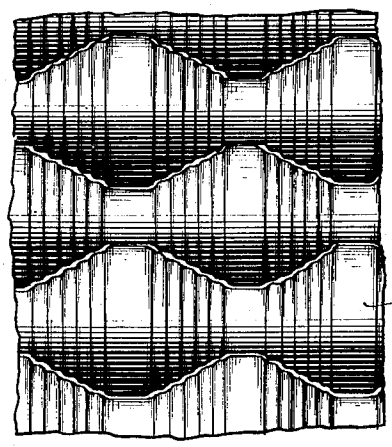


Fig. 7

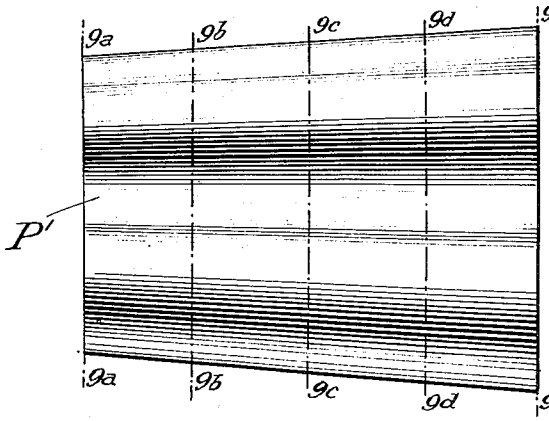


Fig. 8

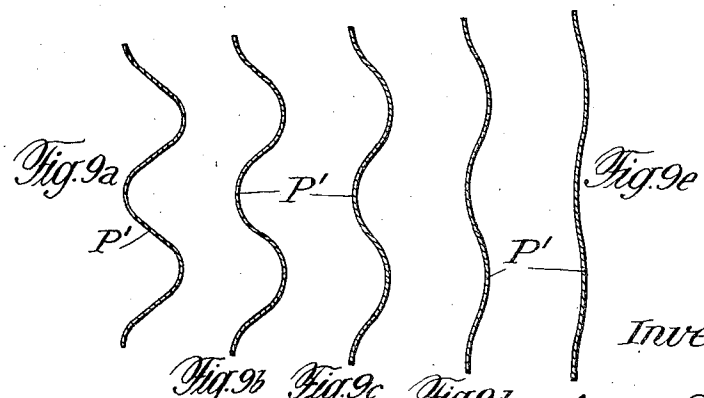


Fig. 9a Fig. 9b Fig. 9c Fig. 9d Fig. 9e

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UNITED STATES PATENT OFFICE

2,124,931

METHOD AND APPARATUS FOR PRODUCING PACKING DEVICES

Gottfried Ruegenberg, Dusseldorf, Germany

Application March 17, 1937, Serial No. 131,499
In Germany March 20, 1936

8 Claims. (Cl. 93—37)

The principal object of the invention is to provide for the manufacture of packing devices for food products such as eggs, fruits and the like which are cheaper, and occupy less space than the hitherto known packing devices, yet are strong and give a good cushioning effect to protect the products and moreover provide an effective aeration of the inclosed products.

A further object of the invention is a method for producing packing devices of a cheap material, for instance of paper of an inferior quality having only a low inherent strength against tearing, that paper being treated by pressing in such a manner that the desired configuration for forming depressions acting as receptacles for the products is obtained without undue stretching or tearing of the paper.

Another object of the invention is to provide an installation for carrying into effect the said method of producing the packing device in the shape of packing strips of a continuous length which may be cut according to requirements.

Compared with known methods, the method according to this invention presents the main advantage that the packing means can be made in rational manner of marketable paper, thus from a web of paper of any quality, even of inferior quality.

The packing means, produced according to the invention, each constituent layer of which is composed of two mating packing sheets, is distinguished by cell-halves for receiving the articles which are provided by widenings of depressions which alternately widen and constrict in continuous manner so as to extend as individual units across the full width of the packing sheet and form ventilating ducts that are open at both ends.

Apart from the presently best known and most frequently used cardboard packing means as is sometimes termed "insertion case packing means", in which eggs are arranged inside of rectangular cases side by side and above each other in upstanding position or diagonal relation to the case, there exist many different kinds of egg packing means with embossed packing sheets having cavities of greatly varying configurations for the reception of the eggs. The manufacture of the known kinds of such high relief packing sheets can, however, be effected in rational manner only from paper pulp by means of expensive mechanical equipments.

In distinction therefrom, the method according to the present invention has the advantage that between the continuously rotating elements of a relative simple machine a packing strip with ovoidal cell-halves is stamped from a paper web, which may consist of a single layer or several interconnected layers.

There are different known methods by means of which a packing strip or the like is stamped from a running paper web between rotating molding rollers. If the molding elements on the circumference of these rollers are provided by surfaces produced in revolution, a normal disposition with rotational movements of equal angular speeds of the convex and concave portions of the molding elements may be adopted. With this disposition simple profiles, for example for the accommodation of bottles with a gently curved intermediate portion between the body and the neck portions, can be imprinted in the paper web.

The packing means for eggs and similar articles, according to the present invention, however, having a highly embossed surface and consecutive abrupt widenings and constrictions of profile cannot be carried out by means of the known methods since, due to the fact that the imprinting operation is effected too abruptly incidental to the male and female mold portions fully interengaging, the paper web is not given sufficient time and clearance to divide over all the points of the mold in the requisite manner and to adapt itself to the latter without risk of tearing.

The method according to the present invention distinguishes from the known methods substantially by the provision of special relative kinematic conditions between the cooperating mold elements.

According to this method, the paper web is continually drawn or rolled into the female mold portion of one of the molding rollers, point for point or strip for strip, in distinction from the normal disposition in which the pitch circles of both molding rollers coincide with the corresponding rolling circles of equal circumferential speed, by reducing the diameter of the pitch circle of the male molding roller and increasing that of the female molding roller, thereby accelerating the rotational speed of the concave mold elements relative to that of the convex mold elements.

Contrary to the properties of the packing sheets of paper pulp, by the peculiar nature of this method and by the shape of the packing means provided for by this method, a great rigidity of the packing sheets even with the minimum possible thickness of material is obtained and

at the same time the possibility is offered of accommodating eggs to be packed within a minimum of space but with maximum protection against pressure and bumping. A further advantage of the packing means produced by means of the method according to the present invention resides in the ideal manner in which it can be ventilated, compared with known packing means, none of which offers a similar advantage by far.

A still further advantage of the method according to the invention consists in that the material is rolled into the mold entirely from edge to edge at a uniform pressure independently of the thickness of the paper web, whereas with the known methods the impressing operation, as such, takes effect only at the moment of full inter-engagement between the mating mold elements so that the normal pressure is exerted by the rollers only at the lowermost point of the mold.

The device for carrying out the method according to the invention is provided with a disposition of the molding roller system as described below:

The mold elements are applied to the circumferences of two roller bodies, which roll on one another with an elastic pressure, in the shape of convex and concave surfaces of revolution, each of which extends as an individual unit of variable cross section over the width of the rollers. The axes of these surfaces of revolution are so displaced relative to the geometrical axes of the rolling cylinders that the axes of the concave surfaces of revolution are imparted a certain acceleration of rotational movement relative to that of the convex surfaces of revolution. In this way, under the assumption that the dimensions of mating molding elements are accordingly chosen, the result is obtained that each time a male mold portion on the circumference of one of the roller bodies rolls across the mating female mold portion from edge to edge, provided that the intermediate ridge between two adjoining female portions is of a shape facilitating the developing operation.

During the developing operation there is sufficient clearance left at the place where the paper web enters between the male and female mold portions up to the completion of the stamping out of each row of cell-halves to permit the material necessary for the stamping operation to pass through the clearance space without risk of being rubbed or torn. The mold elements are staggered so that the widening of each surface of revolution enters smoothly into the constriction of the adjacent surface of revolution, the meridional curve of the concave surfaces of revolution being advantageously so shaped that the widened and inverted constricted portions thereof are similar. In order to divide the paper over the width of the web, thus transversely to the direction of movement, in such a way, that at each point a sufficient amount of material for properly carrying out the stamping operation is available, the paper web is upset in wave- or crepe-like fashion transversely of the longitudinal direction prior to its introduction between the molding rollers by means of an appropriate appurtenance.

Each row of cell-halves of the packing strip impressed in such manner has the form of a thin-walled body of revolution the variable cross sectional contours of which are arcuate curves subtending an angle at the center of less than 180°, due to the position of the concave mold elements on the circumference of one of the rollers as provided for by the geometrical and kinematic measures explained above. In other words, the cell-halves in the packing strip are either too wide and flattened or not sufficiently deep for surrounding the egg to be packed up as snugly as possible upwardly beyond its middle plane. For this reason the shape of the impressed depression must be so redressed that the depth of the cell-halves is increased while the width thereof is decreased and that their cross sectional contours approach the semi-circular shape of the required diameter as closely as possible. This redressing operation is advantageously continuously effected by slightly closing the individual depressions a certain amount.

In the accompanying drawings, the packing device, mechanical means for producing the same and schematic illustrative matter for explaining the method in accordance with which the mechanical means operate are shown, by way of example only.

Fig. 1 shows a longitudinal section of a constituent layer of the packing device;

Fig. 2 shows a cross section of several superposed constituent layers;

Fig. 3 is a cross section of Fig. 1;

Fig. 4 is a schematic illustration of the effect of male and female mold elements;

Fig. 5 is a sectional side elevation of a machine for stamping and redressing the cell-halves;

Fig. 6 is a schematic cross-sectional view of a grill-shaped support with a packing sheet carried thereby;

Fig. 7 is a top plan view of Fig. 1;

Fig. 8 is a top plan view of the paper web portion in advance of the entrance to the molding rollers, and

Figs. 9*a*—9*e* represent different cross sections of this paper web portion.

The packing is composed of a plurality of constituent layers. Each of these constituent layers of the packing consists of two complementary packing sheets, a lower packing sheet 1 and an upper packing sheet 2. The interfitting staggered rows of cell-halves 3 of each packing sheet form together an ovoidal cell for accommodating an egg 4. The walls of these cells are provided with transverse ribs and grooves 5 and 6 respectively for resiliently holding the egg. These ribs and grooves are staggered relative to the fluted portions of the adjoining cell-halves so that at all places projecting ribs and depressed grooves are opposed to each other. At the region of maximum diameter of the cell-half the fluted portions are interrupted, at 7, so that at this region the part of the egg most susceptible against pressure and bumping does not contact with the packing means.

In the superposed positions of these layers, of which Fig. 7 represents a top plan view, the embossed portions on the outer surface of each sheet interfit with the rear recesses of the adjoining sheets more or less snugly (Fig. 1) in dependence on the imposed load, thereby strengthening each other. This peculiar mode of superposition of the layers renders the closed "interior packing means" highly elastic which permits jamming by the "exterior packing means", for example, a wooden crate, without danger of breakage of the eggs. The total pressure of the imposed load is taken up and supported by the rigid vault-like construction of the packing sheets, so that

each egg accommodated in a cell is safeguarded against exterior pressure and bumping.

The method according to the invention for stamping the packing sheets is schematically exemplified in Fig. 4.

Fig. 4 shows schematically the cross sectional contours of a mating pair of molding elements, as applied to the circumferences of two roller bodies having rotation axes 8 and 9 and rolling on each other under elastic pressure in six different relative positions of the rollers. The convex mold portions 10 (male portions) of circular cross section are arranged on the circumference of the roller 8 so as to be rotatable about their axes which move along the pitch circle 11. The mating concave surfaces of revolution 12 (female portions) which move along a pitch circle 13 on the circumference of the roller 9 have, due to their geometrical disposition an arcuate cross sectional contour subtending an angle at the center of less than 180°. By 14 the ridge between each pair of adjacent female mold portions is designated which is situated at the entrance side for the paper web, whereas 15 denotes the corresponding ridge at the exit side. The portions of the space between the male and female mold portions that are filled in on the drawings indicate approximately the lengths of pressure exertion in the respective relative positions of the mold portions. The arrows shown are intended to indicate the widths of entrance gap leaving the necessary clearance for the paper web to be moved on during the molding operation.

The mold elements move in accordance with their relative dimensions and disposition of their axes in offset relation to the corresponding rolling cylinders 16, 17 of the roller bodies rotating about the fulcrums 8 and 9 respectively relatively to one another, in such manner, that the point or line of contact between their surfaces shift continually from one edge of the female mold portion to the other. The friction that would be apt to arise in consequence of the difference in speed between the two surfaces is prevented by the male mold portions being rotatably mounted. The molding of the material is thus effected after the paper web has been drawn into position unimpeded, by rolling the latter into the female mold portion in a continuous manner free of friction and crushing.

The machine shown in Fig. 5 is constructed for carrying the aforesaid requirements into effect.

The cooperating roller bodies carrying the male and female mold portions 10 and 12 respectively are mounted by means of their axles 8 and 9 respectively in the side shields 22 of the machine. These roller bodies roll on each other by means of the respective mold portions, in the directions indicated by the arrows M and F respectively, and are resiliently pressed one against the other by elastic compression coil springs 23 acting on the axle 8 of the upper roller body which is arranged to slide in vertical guide slots 24. The pressure between the upper slidable roller body and the lower stationary roller body can be adjusted with the aid of worm drives 25 acting on slide blocks 26 in which the axle 8 takes its bearings.

The paper web prior to entering between the cooperating molding rollers is pretreated so as to be given a wave- or crepe-like cross section of increasing amplitude as the web approaches the gap between the molding rollers. This is effected with the aid of a number of consecutive pairs of coordinated pressure rolls 29, 29'; 30, 30' and 31, 31' which are positioned in advance of the entrance to the gap. The individual pairs of pressure rolls each consist of two series of upper and lower pressure rolls that are alternately offset relative to the vertical for each roll to press out a groove in the paper web, the offset between the pairs of rolls increasing from the pair 31, 31' towards the pair 29, 29'. In this way the paper web portion P' (Figs. 5 and 8) is given a cross sectional shape as indicated in Fig. 9 by a series of consecutive cross sections IXa–IXe.

The molded paper web P leaves the gap between the cooperating molding rollers to the left in Fig. 5 in link chain fashion and is then passed about the adjacent portion of the circumference of the stationary lower roller over to a redressing device R for the individual cell-halves.

The redressing device is constructed as follows:

Between two endless link chains 18, which are each slung about two chain wheels 19, above each second chain link a cylindrical bar 20 is rigidly arranged in such manner that the axes of these bars move at a certain distance from each other exteriorly beyond the pitch circles of the chain wheels. The wheels 19 are mounted with their axles 27 in the side shields 22 below the stationary roller body. The distance between the bars 20, which in the taut condition of the chains between the two pairs of chain wheels 19 is equal to twice the pitch length of the chains 18 and equal to half the distance between the successive packing pockets of the molded paper web P, increases, when the chains deflect about the wheels, in the relation of the radius of the arcuate path of the bar axes to the radius of the pitch circle of the wheels. When the chain wheel 19 to the right in Fig. 5 is driven in the direction of arrow C in this figure in timed relation with the roller bodies, by means not shown, the packing sheets of the molded paper web P engage with the bars 20 with the aid of the hollow cores 28 formed by the depressions in the packing sheets. Within the range at which the distance between adjacent bars is increased, due to the chains deflecting, the rows of cell-halves on the oncoming packing strip are grasped at their portions of maximum restriction of cross section between a bar 20 and a juxtaposed grill-shaped support 21 and are closed a certain extent while passing from the range where the chains deflect to that where the latter are taut.

I claim:

1. A method of producing a packing device, which comprises providing a web of paper and the like with depressions for the reception of the products to be packed by causing the roller elements of a male roller to press the web into the matrices of a female roller, and effecting an acceleration of the rotational movement of the male roller elements over that of the female roller matrices by arranging the centres of the former inside and the centres of the latter outside of the contacting circles of the rollers causing thereby the web to be drawn and rolled at points and lines into said matrices and preventing thus undue strain on the web.

2. A method of producing a packing device, which comprises providing a web of paper or the like with continuously, alternately narrowing and widening depressions for the reception of the products to be packed by causing the roller elements of a male roller to press the web into the matrices of a female roller, and increasing

the depth of the depressions and decreasing their width in a second step by compressing the paper strip by moving the various portions thereof together.

3. In a mechanism for producing packing devices for eggs, fruits and similar articles from a paper web, a pair of cooperating molding rollers, male and female mold portions carried by said molding rollers respectively, individual male and female mold elements on said mold portions in the form of surfaces of revolution combined into individual units for extending over the full width of the paper web to be molded, alternate widenings and restrictions forming a meridional profile of said units provided with consecutive ovoidal cell-halves, and means for rolling said male and female mold portions on one another.

4. In a mechanism for producing packing devices for eggs, fruits and similar articles from a paper web, a pair of cooperating molding rollers, male and female mold portions carried by said molding rollers respectively, individual male and female mold elements on said mold portions in the form of surfaces of revolution combined into individual units extending over the full width of the paper web to be molded, alternate widenings and restrictions forming a meridional profile of said units provided with consecutive ovoidal cell-halves, the course of said meridional profile at said widenings being similar to the inverted course of said profile at said restricted portions, and means for rolling said male and female mold portions on one another.

5. In a mechanism for producing packing devices for eggs, fruits and similar articles from a paper web, a pair of cooperating molding rollers, male and female mold portions carried by said molding rollers respectively, individual male and female mold elements on said mold portions in the form of surfaces of revolution combined into individual units for extending over the full width of the paper web to be molded, alternate widenings and restrictions forming a meridional profile of said units provided with consecutive ovoidal cell-halves, said mold elements of adjacent units being so staggered relative to one another that the outwardly convexed widenings of each mold element are oppositely disposed to the inwardly concaved constrictions of the adjacent mold elements, and means for rolling said male and female mold portions on one another.

6. In a redressing mechanism for running molded webs comprising individual packing cells, perambulating parallel horizontal redressing bars of a spacing equal to that of consecutive packing cells of the running web for engagement with hollows of said cells, means for driving said bars in timed relation to said running web, and means for temporarily reducing said spacing of said bars for closing said cells an amount corresponding to the reduction in spacing of said bars.

7. Apparatus for forming packing plates from sheet material comprising, means for moving the material longitudinally, means for rolling the material into corrugated waves extending in the direction of movement, means comprising interengaging rollers having respectively depressions and mating projections, the projections being of slightly smaller dimensions than the depressions and being mounted slightly movably to roll the sheet material into the depressions with a line contact, and means for pressing portions of the sheet together to increase the depth and decrease the width of the cells formed therein by the rollers.

8. Apparatus for forming packing plates from sheet material comprising, means for moving the material longitudinally, means for rolling the material into corrugated waves extending in the direction of movement, means comprising interengaging rollers having respectively depressions and mating projections, the projections being of slightly smaller dimensions than the depressions and being mounted slightly movably to roll the sheet material into the depressions with a line contact, said projections and depressions having local undulations in their inclined molding surfaces extending generally peripherally of the rollers forming corresponding resilient portions in the packing plates.

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