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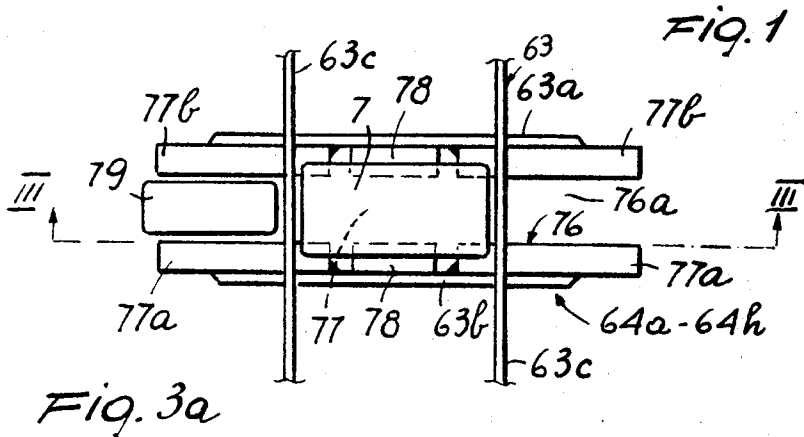
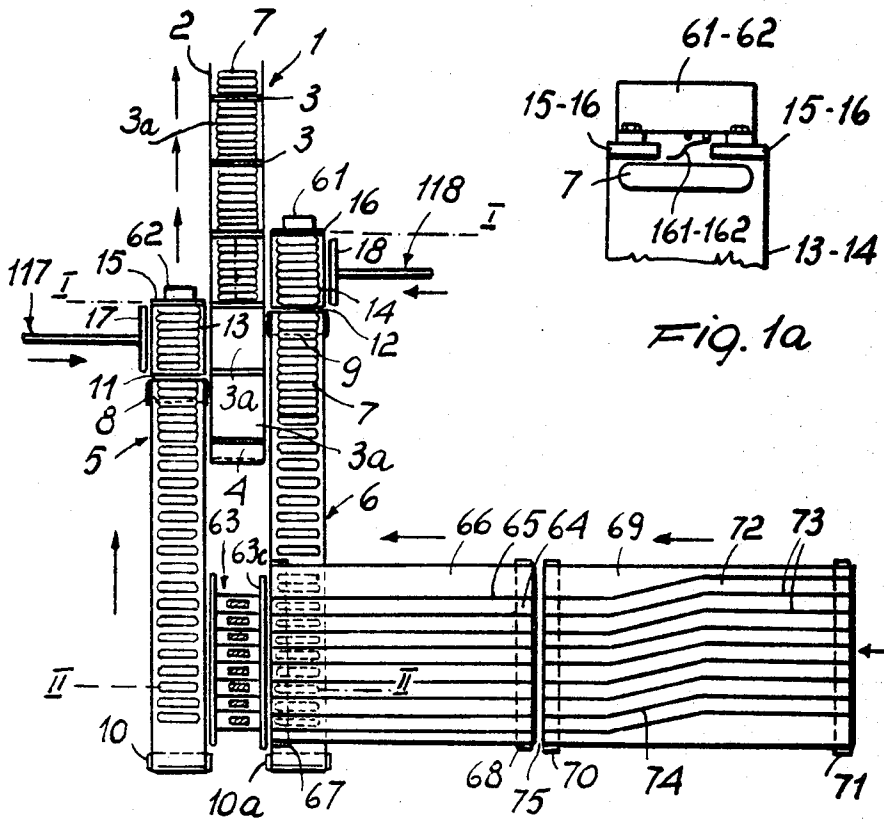
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3,412,843

FEEDING APPARATUS FOR A PACKAGING MACHINE

Filed Feb. 10, 1967

4 Sheets-Sheet 1



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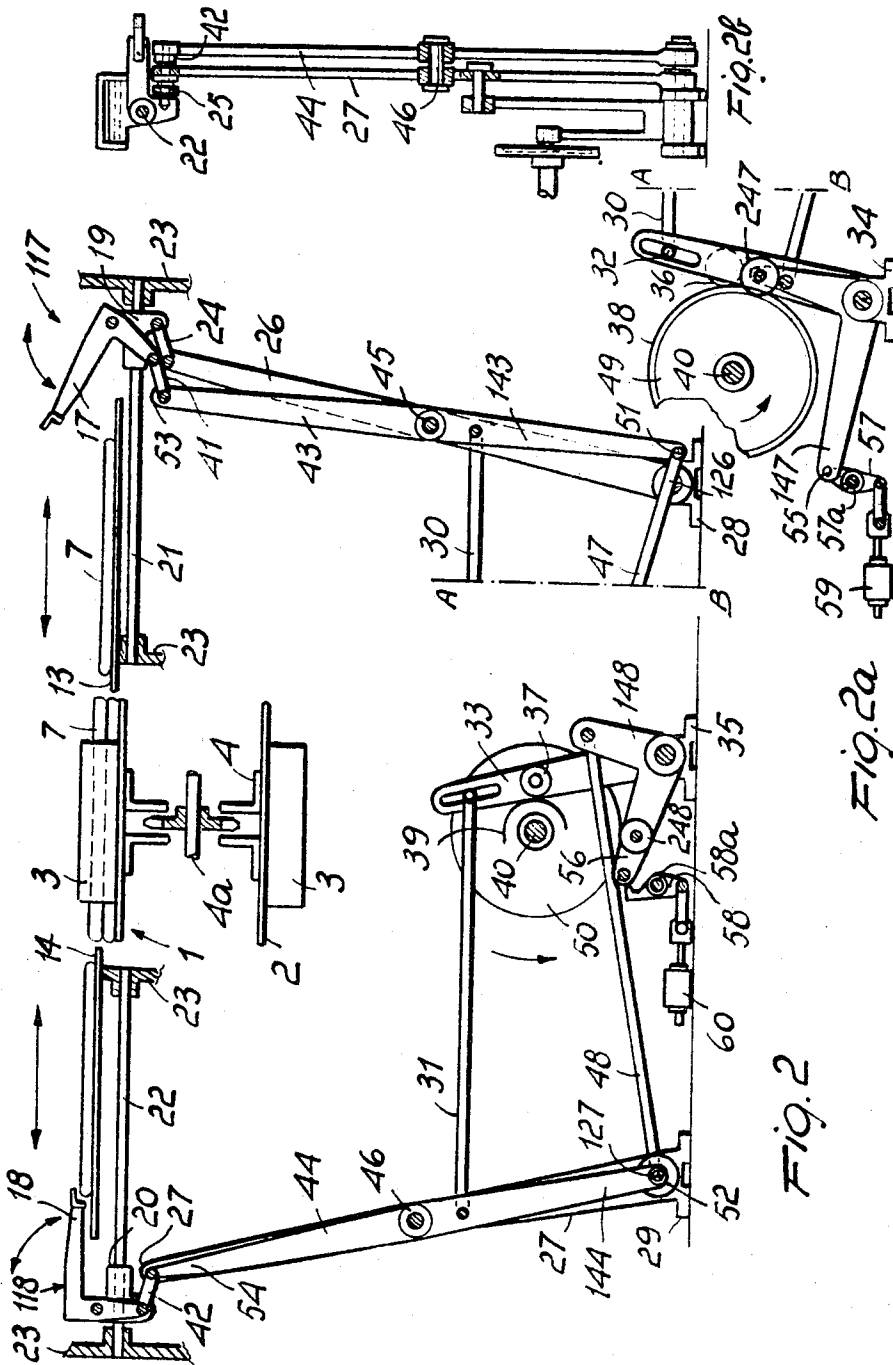
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4 Sheets-Sheet 3

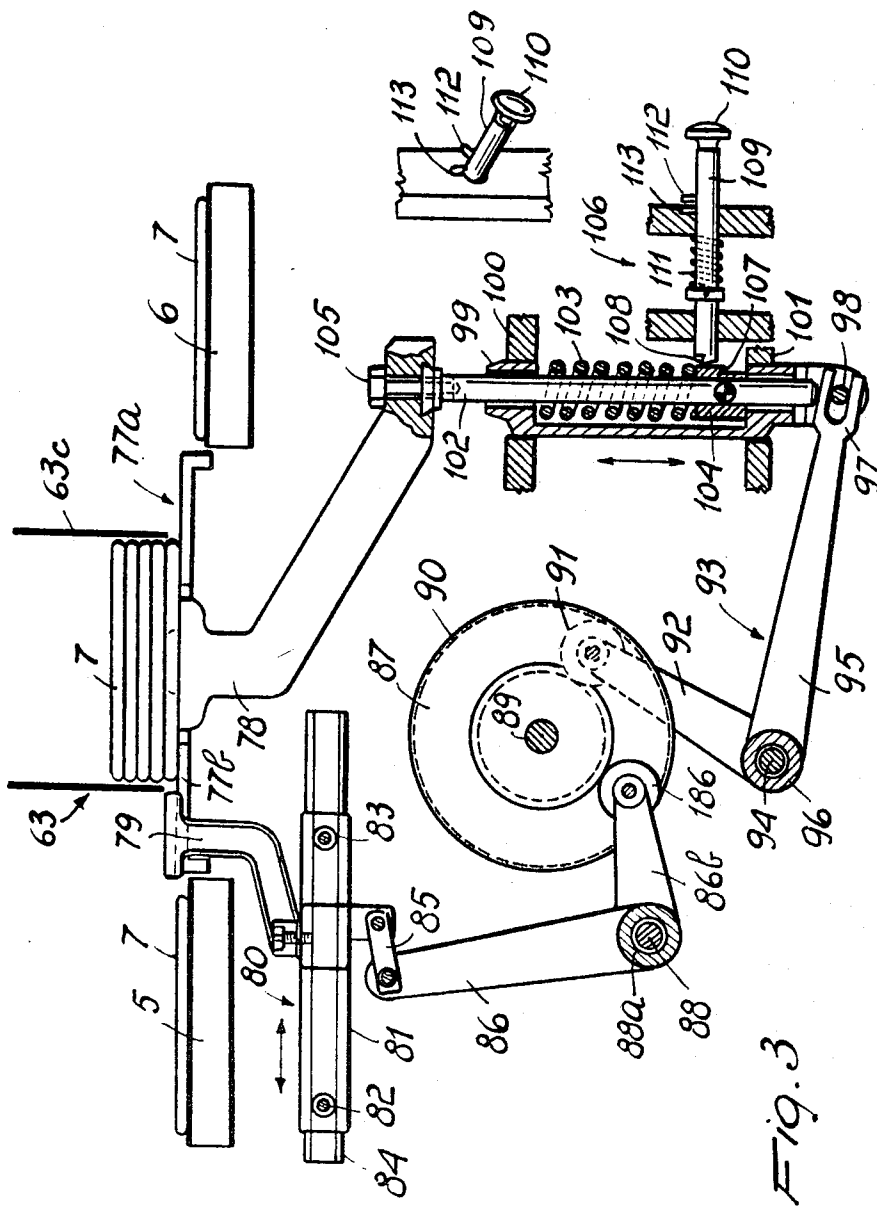


Fig. 3

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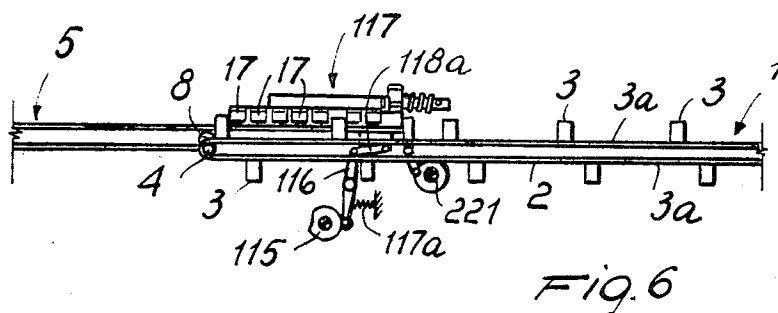
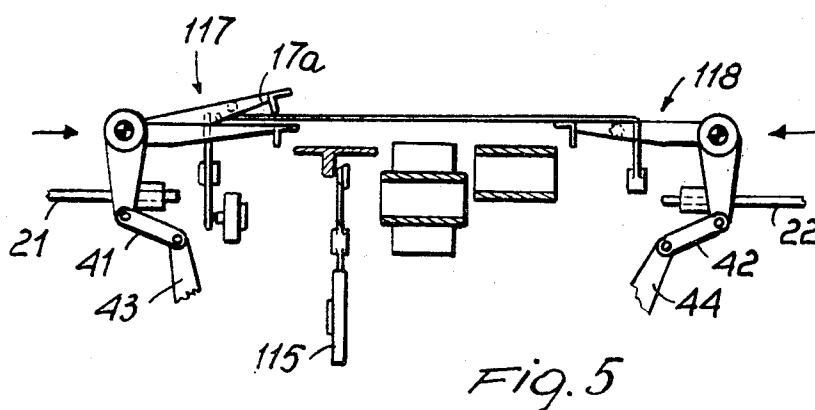
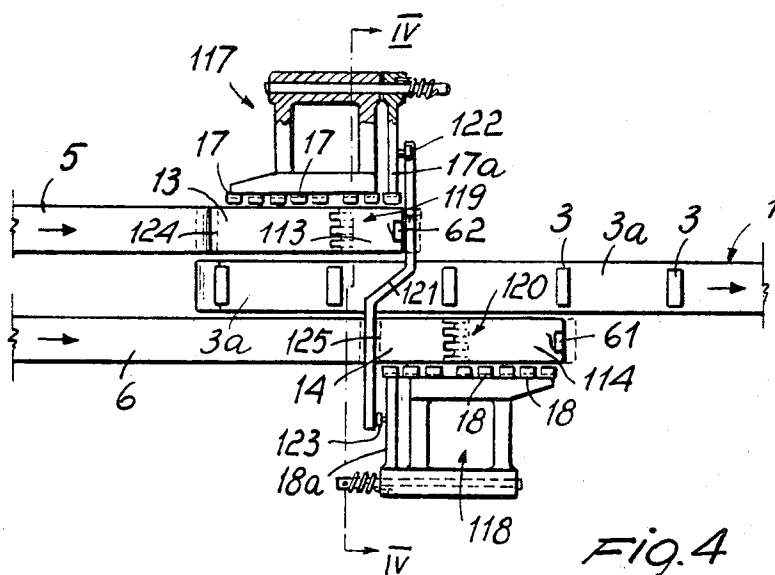
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4 Sheets-Sheet 4



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3,412,843 FEEDING APPARATUS FOR A PACKAGING MACHINE

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8 Claims. (Cl. 198—35)

ABSTRACT OF THE DISCLOSURE

This disclosure relates to apparatus for feeding groups of articles to a packaging machine. Each group of articles comprises a plurality of superimposed layers of articles. The apparatus essentially comprises a central conveyor means arranged to feed the packaging machine, and a plurality of side conveyor means arranged in side-by-side relationship with said central conveyor means and at different levels thereto. Pusher means are arranged to transfer articles from said side conveyor means into feed pockets carried by said central conveyor means.

The invention relates to an apparatus for feeding superimposed article groups to an input line of a packaging machine drawing from one or more side lines, comprising a plurality of substantially parallel conveyor means placed at different levels and a number of pusher means shifting groups of articles from one conveyor means to another.

The main object of the invention is to assemble a number of conveyor means for articles, such as those passing from a continuous oven to storage means, in such a manner that articles may be drawn from said conveyor means to form groups of articles which each contain a predetermined number of articles.

Another object is to provide, between the direct supplying line of the machine and the article supplying channels, transport means which ensure a constant provision of product at transferring members to the said main input line.

Another object is to provide a proper feeding system for superimposable article groups, adapted to ensure that each group to be transferred to the input line is completed before the transfer thereof is carried out.

These and still other important objects are attained by an article feeding apparatus for supplying article groups arranged in superimposed layers to a packaging machine; comprising a first and second substantially horizontal side conveyor means spaced apart from and located substantially parallel to one another at different levels; a central conveyor means parallel to and located between said side conveyor means at a lower level with respect to each of said first and second conveyor means, a first pusher means near said first conveyor means and extending transverse thereto for shifting a group of articles from said first conveyor means towards said central conveyor means, a second pusher means near said second conveyor means and extending transverse thereto for shifting another group of articles from said second conveyor means towards said central conveyor means, said first and said second pusher means being offset with respect to each other in the direction of said central conveyor means, and supplying means for feeding articles to said first and said second conveyor means.

Further characteristics and features of the invention will better appear from the description of a preferred, but not exclusive embodiment of a feeder according to the invention, illustrated by way of non-limiting example in the accompanying drawings, in which:

FIG. 1 is a diagrammatic plan view of the apparatus where details have been omitted to facilitate the understanding of the general operation,

FIG. 1a shows in a single drawing two details of FIG. 1, in an enlarged scale,

FIG. 2, shows a cross section of the device along the line I—I in FIG. 1, in considerably enlarged scale, with reference to the members for conveying articles in groups with the respective driving and control means,

FIGS. 2a, 2b, represent part of the mechanism not visible in FIG. 2, and a side view from the left to the right hand of FIG. 2, respectively.

FIG. 3, is a cross-section of the same apparatus taken along line II—II in FIG. 1, and better still along line III—III of FIG. 3a, which illustrates a hopper device directly receiving the articles from upper supply channels (not visible),

FIG. 3a is a plan view of a hopper loader,

FIG. 4 is a diagrammatic plan view of means conveying articles in three superimposed layer groups which comprise an odd number of articles, as will be explained hereinafter,

FIG. 5 is a diagrammatic cross-section of the mechanism of FIG. 4 taken along line IV—IV, and

FIG. 6 is a diagrammatic side view of the apparatus of FIG. 4.

With reference to the drawing, the above mentioned feeder comprises a main input line 1 which directly supplies the packaging machine (not shown), which includes a conveyor belt 2 arranged to travel with intermittent or step-wise motion dependently upon control means, which are known in the art for such feeding motion kind. Each step of the feeding motion corresponds to the distance between two consecutive partition members 3. The conveyor comprises an endless belt on which a plurality of said partition members 3 are provided equally spaced from one another so as to define a plurality of feed pockets 3a designed to receive groups of articles 7 to be packaged.

The conveyor belt is taut mounted on two rotating supports, namely—a rear roller 4 past with the shaft 4a and a front roller mounted in analogous and readily understandable manner at the front and it is not represented in the figure for the sake of clarity.

On either side of said input line 1 two endless belt conveyors 5 and 6 are located. Said conveyors 5 and 6 are arranged in two different mutually parallel offset planes, the difference in level between said conveyors being equal to the thickness of the article 7 (in this case biscuits).

The conveyors 5 and 6 are supported at the front part thereof on the end rollers 8, 9, and at the rear part thereof on the rollers 10, 10a. The motion reversal in the front part takes place at the points 11, 12, near which two planes 13, 14 are provided designed to support the article 7 supplied thereon by the two corresponding conveyor belts 5 and 6. Two stationary projections 15, 16 alternatively positioned with respect to the said planes 13, 14 form a stop for the article in arrival, so that the articles 7 in a preestablished number will be arranged in side-by-side relationship to form a group on each plane 13, 14 while the conveyor belts 5 and 6 will continue to slide under the remaining articles in arrival because the rows are stopped at the front. At the same level as the two article groups, two units 117, 118 of pushers 17, 18 diagrammatically shown in FIG. 1, or more clearly visible in FIG. 2, operate transversally. They have the function of transferring the article groups onto the stepping conveyor 1. More precisely the unit 117 will directly transfer the articles on the central conveyor 1, while the other unit 118 will transfer the same onto the layer

of articles previously arranged in a feed pocket 3a by the first unit 117. The pusher unit 118, is in fact offset down-stream of the unit 117 by a distance substantially corresponding to the central conveyor pitch.

The two pusher groups are arranged to operate simultaneously. The control mechanism may be easily understood from the view in FIG. 2. The pushers in group 117, 118 arranged in side-by-side relationship are swingably mounted on the slides 19, 20 carried by respective guides 21, 22 fast with the general structure 23 of the feeder. Furthermore the slides are connected through connecting rods 24, 25 to two levers 26, 27 swinging on supports 28, 29 and connected in turn through connecting rods 30, 31, to a pair of rocker arms 32, 33 pivoted on supports 34, 35 and engaged with the rollers 36, 37 on cams 38, 39 both fast with a common shaft 40.

Such a shaft is represented twice so as to slice for clarity sake the two left and right controls. In fact one of the controls is partially shown next to the main figure, but in practice it should be considered as superimposed to that symmetrical thereto and centrally positioned under the conveyor belt 2.

The said pushers 17, 18 are connected to connecting rods 41, 42 and to two rocker arms 43, 44 pivoted at 45, 46 on the said levers 26, 27 respectively. Furthermore bell cranks 147, 148 and relative rollers 247, 248 are connected by means of connecting rods 47, 48 at the lower portion thereof to two cams 49, 50 fast with the shaft 40. The length of the arms 143, 144 of the rocker arms 43, 44 is such that the lower end thereof describes a circle arc passing through the pivots 126, 127 respectively, of the said levers 26, 27.

The cams 49, 50 are shaped so as to cause the ends 51, 52 of the rocker arms 43, 44 to coincide with the said pivots provided underneath of the connecting rods 26, 27 while the pushers 17, 18 effect the feeding stroke. Since the other two ends 53, 54 of the rocker arms 43, 44 will also coincide in an analogous manner with the ends corresponding to the levers provided underneath, the two pusher groups will remain substantially horizontal during their feeding stroke. At the beginning of the return stroke of the two pusher groups, the two cams 49, 50 will come into operation causing the two rocker arms described with reference to the supporting levers provided underneath to effect two revolutions in an anti-clockwise and clockwise direction, respectively thus orientating upwardly both the pushers. In the meanwhile new articles will be fed on the planes or shelves 13, 14.

A number of the above described members then contribute to form a device adapted to convey the grouped articles from the side conveyors 5 and 6 to the central conveyor 1 provided that such groups of articles 7 are completely formed. In fact the rocker arms 147, 148 may be blocked at the ends 55, 56 by two levers 57, 58 supported at 57a and which are 58a and orientable and controlled by two electro-magnets 59, 60, respectively, controlled by two detecting contacts 61, 62 (FIGS. 1, 1a) provided on the said projections 15, 16 which stop the product and are situated at the front of the above described planes or shelves 13, 14. The two detecting contacts 61, 62 are mounted at the front of the said projections, the actuating levers 161, 162, however project from the latter so as to be actuated by the articles 7 in arrival, which as it is shown in the detail of FIG. 1a, pile upon another.

The electric circuit of such a device is of a known type easily understandable by a person skilled in the art. As a matter of fact the circuit is such as to maintain said electro-magnets 59 and 60 energized and, therefore, said rocker arms 147 and 148 locked until the two article groups, which are being formed on the planes 13, 14 are completed.

The locked condition of the said rocker arms prevents the following action of the respective control cams

whence the two pushers remain upwardly orientated. In other words the latter two pushers will be able to effect the transfer of the respective article groups only when the first article 7 at the head of the group, by pushing on the respective detecting contacts 61, 62 will open the electric circuit unblocking accordingly the said rocker arms 147, 148.

With reference to the FIGURES 1, 3, 3a, a hopper device 63 is now described having a mechanism adapted to transfer article groups alternatively on the said conveyors 5, 6. Preferably in the present case, the number of articles transferred from the hopper 63 to the conveyors 5 and 6 will be that necessary for the formation of a layer in the pocket 3a of the conveyor 1. The device 63 comprises a plurality of stationary or vertically adjustable loaders 64a, 64b, 64c, 64d, 64e, 64f, 64g, 64h, which are aligned and located between the said conveyors 5, 6 at a rear section thereof. In the said loaders 64a-64h a number of channels 64 open which are limited by stationary side walls 65 under which a conveyor belt 66 wound on supporting rollers 67, 68 is provided. The conveyor belt 66 is preceded by another conveyor belt 69 wound in an analogous manner on supporting rollers 70, 71 and forming a movable bed for respective channels 72 arranged in communication with the channels 64.

The article is channeled between guides or sidewalls 73 which limit these channels and is conveyed by the corresponding conveyor belt. The channels 72, along a length 74 thereof, have an oblique bottom designed to turn the articles (in this specific case biscuits with a convex face) upsidedown. The two subsequent conveyor belts 66 and 69 are adjustably spaced apart to form a gap 75 through which incomplete articles may fall.

The articles 7 upon coming out of the guides 64 suitably fall into the loaders 64a-64h, the speed of the tape 66 being adjustable, and pile up in a compact manner. The bottom of each loader (FIGS. 3 and 3a) has a shaped opening 76a and at the widest central zone 77 a raisable fork support 78 is adapted to raise periodically the article pile from the bottom acting near the sides of the first article. Such an article otherwise rests on two stationary edges 77a, 77b in alignment with the said fork supports and secured to the side walls 63a, 63b of each load 64a-64h. An ejector 79 is adapted to slide in the cavity 76 of the loader crossing said member 78. The stationary rest plane formed by the said edges 77a, 77b is arranged at a higher level than the plane of each side conveyor 5, 6. The side wall of the loader is sufficiently distant from the bottom 76 to allow an article to pass transversally. Therefore the ejector, which has a reciprocating motion will pick up an article from the loader bottom during the forward stroke and similarly during the return stroke. All the ejectors 79 are fast with one another and are carried by a frame 80 which is provided at its opposite ends with two slides 81 (only one being visible in FIG. 3). The group of articles picked up in a direction will pass onto one of the conveyors and another group will pass pushed in the other direction onto the other conveyor.

In the space of time between two pick-up operations in the same direction the conveyors 5, 6 respectively, which is supplied will travel a distance corresponding to the length of an article group. It is easy to space one article group from the preceding article group on the conveyor 1 by adjusting the speed of travel of the conveyor 1. By suitably lowering then the level of the loader bed, the side walls being stationary, it is also ideally possible to pick up or remove more article layers at a time. The mechanism actuating the said frame 80 with slides 81 slidably running with rollers 82, 83 on two stationary guides 84, comprises two connecting rods 85 connecting the frame to two rocker arms 86 and also comprises a channel cam 87 which acts on the rocker arms 86 through arm 86b and roller 186. The rocker arms are pivoted at 88

and are made fast with one another by means of a hub 89, while the cam is fast with the shaft 89. With the same shaft 89 is also rigid a channel cam 90 (shown in dotted lines because it is located behind the cam 87), which engages with a roller 91 provided at the end of a lever 92 belonging to a rocker arm 93 pivoted at 94 and consisting of two arms 95, only one of which being visible in FIG. 3, parallel to one another and made fast with the arms 92 by means of a common hub 96.

Said arms 95 are each provided at the end thereof with a fork 97 which slidably engages a pin 98 of a support 99, a slide sliding on guides 100, 101 on which a plurality of slidable stems 102 are axially and slidably mounted on the support 99 and urged downwardly by relative springs 103 acting on collars 104 rigid with said stems 102. The upper ends of said stems 102 are each secured by means of bolts 105 to one of the said fork supports at the bottom of the relative loaders 63. The contour of the cam 90 is such as to impart an upward movement to the said fork supports 78, as a result of which they reach the articles placed in the loaders when the ejectors 79 are substantially passing over the mean vertical axis of the loaders so that the fork 78 abutting with the bottom biscuits 7 and beginning then the return stroke will permit the latter to lean gently on said supports 77a, 77b, thus permitting a rational adjustment of the biscuit piles in the loaders 64a-64h. The springs 103 together with the stems 102 lock said fork 78 in a raised position releasing the return control of the cam on stop means generally indicated at 106, thus maintaining the article 7 in the loaders 64a-64h raised at a level higher than that at which the ejector 79 operates and preventing transfer of the product.

Another object is also that of maintaining in all the loaders 64a-64h the level of the product fed by the supply channels 64 substantially equal. In fact it could happen that the imperfect articles be previously eliminated at a channel of the above described gap 75 (FIG. 1). Accordingly when the article level in the corresponding loader is too low an incorrect fall of the articles contained therein could result.

More precisely the collar 104 has a notch 107 adapted to engage with a tooth 108 provided at the end of a rod 109 controlled by a handle 110 provided with a spring 111 and a side projection 112 adapted to be inserted in a recess 113 to effect the said stop of the relative stem. By actuating the handle and rotating the relative rod, the projection will be prevented from entering the recess thus avoiding the mutual engagement. Such handles are usually manually operated. It is possible however to provide a suitable mechanical control actuated by detecting means adapted to detect the article level in the loader.

The general operation of all the assembly at this stage should be easily understandable. It should be noted however that such assembly allows the introduction into the central step conveyor 1 of an even number of article layers (in the present case two layers), by simultaneously picking up each layer from one of the two side conveyors 5 and 6. In order to be able to transfer, for instance, three layers of groups each formed by an odd number of articles, the transfer device has to be modified as will now be described with reference to the FIGS. 4, 5, 6.

In this technical solution the central conveyor 1 is still controlled in the above mentioned way, the levels of the planes 13, 14 are shifted upwardly with respect to the plane of the stepping conveyor 1 respectively by a distance slightly greater than the thickness of an article or slightly greater than the thickness of two superimposed articles and in an analogous manner the levels of the side conveyors 5 and 6 and the pusher units 117 and 118 are adjusted. Furthermore the planes or shelves are elongated at least to a length corresponding to $n+1/2$

grouped biscuits, n being the odd number of articles per layer.

As far as the transfer units are concerned the one indicated at 118 in FIG. 4 is shifted forward substantially one step and a half with respect to the other unit 117. The total number of pushers of each transfer unit will be

$$n + \frac{n+1}{2}$$

n being equal to the (odd) number of articles in a group.

During the transfer a nominal group of articles will be completely transferred by a number n of pushers belonging to the unit 117 onto one of the empty pockets 3a of the stepping conveyor, while the second layer which is formed in the preceding pockets, is made up of the sum of all the auxiliary pushers less one. A number n of pushers 18 will form the third layer on the second from last pocket. The sum of the auxiliary pushers would give a complete group of articles plus one; furthermore two of the biscuits would hit each other during the transfer. This is avoided because the last pusher 17a of the unit 117 and the first pusher 18a of the unit 118 are alternately raisable from a stop element 121 controllable by a cam mechanism 221 which either causes it to engage with the roller 122, rigid with the pusher 17a releasing the pusher 18a or causes it to engage with the roller 23 carried by the latter, while it releases the other. The alternating operation is designed to transfer evenly articles from both the side conveyors 5 and 6. The intermediate group of articles is formed simultaneously by $n-1/2$ pushers of one of the transferring units and by $n+1/2$ pushers of the other.

In order to avoid that the intermediate partition elements 3, of the three consecutive pockets 3a concerned, impede the transfer of the product, the auxiliary pushers of the two units 117 and 118 are moved forward with respect to the respective units of n pushers by a distance equal to the thickness of a partition element. Furthermore, the two planes 13 and 14 have two moveable portions 113, 114, respectively, forwardly displaceable and a cam 115 (FIGS. 5, 6) by means of a rocker arm 116 arranged therebetween and provided with a spring 117a and connected through connecting rods such as 118a to the said moveable portions of the planes. These portions are suitably guided by a slide on the structure.

In order to avoid that in the shifting zone of the moveable portions of the planes from the respective relative stationary portions hollow spaces are formed through which the articles can fall, the corresponding ends are caused to cross each other by shaping the same comb-like 119, 120 (FIG. 4).

What has been said is valid when the article number of a single group is odd and for an odd number of layers (three). When the article number of a layer is even while the layer number is odd, the auxiliary pushers in each transfer unit will be equal to half the number of the articles.

Returning to the function of said detecting contacts 61, 62 (FIGS. 1, 1a), besides preventing the transfer of an incomplete group, they are adapted to stop the feeding movement of the step conveyor to guarantee that the pockets reaching the machine are completely filled with the articles.

In order to ensure an easier transfer of the article groups, the pressure exerted by the rows of articles coming from the side conveyors 5, 6 is eliminated by two pressing elements 124, 125 located at the beginning of the shelves or planes 13, 14 and adapted to stop on said planes the first of the biscuits behind the groups already formed.

Such pressing elements 124 and 125 are actuated by conventional cyclically operating control members of known type and thus not described.

Always for the above specified purpose a modification

is provided for the detecting means 161, 162 which control the article group transfer from the planes 13, 14 supporting the feed pocket conveyor 1.

According to this modification each projection 15, 16 which stops the article is swivelably mounted with a predetermined stroke on a support which may be orientated to disengage the projections or stops 15 and 16 before the pushers 17 and 18 are actuated. On such support is mounted a micro-switch arranged to be actuated by a lever secured to the stop.

What is claimed is:

1. An article feeding apparatus for supplying article groups arranged in superimposed layer to a packaging machine comprising a first and second substantially horizontal side conveyor means spaced apart from and located substantially parallel to one another at different levels; a central conveyor means parallel to and located between said side conveyor means at a lower level with respect to each of said first and second conveyor means, a first pusher means near said first conveyor means and extending transverse thereto for shifting a group of articles from said first conveyor means towards said central conveyor means, a second pusher means near said second conveyor means and extending transverse thereto for shifting another group of articles from said second conveyor means towards said central conveyor means, said first and said second pusher means being offset with respect to each other in the direction of said central conveyor means, and supplying means for feeding articles to said first and said second conveyor means.

2. A feeding apparatus according to claim 1, further comprising an article magazine device near said first and second conveyor means, transfer means at the said magazine device for transferring articles from the said device onto the said side conveyor means, article group collecting means near the said first and second pusher means, respectively, detecting contact means at the said first and second pusher means, for controlling the said pusher means.

3. A feeding apparatus according to claim 2, wherein the said magazine device includes a plurality of loaders each comprising a vertically movable fork-like bottom element, a reciprocable transfer member near the said bottom element end extending transverse thereto for transferring an article from the said bottom element to one of the said side conveyor means, and control and transmission means for the said fork-like element.

4. A feeding apparatus according to claim 1, wherein the said first and second pusher means each consists of at least a pushing element, a sliding member engageable with the said pushing element, and a control means for shifting the said pushing element.

5. A feeding apparatus according to claim 4, wherein the said pusher means comprise a number of pushing elements equal to the number of the group articles.

6. A feeding device according to claim 4, wherein the said first pusher means comprises a number of additional pushing elements equal to $n+1/2$ and the said second pusher means a number equal to $n-1/2$, n being the odd number of articles forming a group.

7. A feeding device according to claim 6 wherein an articulated mechanism is provided between the outer pushing elements of the said additional pushing elements for alternatively excluding one of the same.

8. A feeding apparatus according to claim 7, wherein the said collecting means consist of support plane element near the said sliding member of said pusher means, the said plane element being extendable.

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