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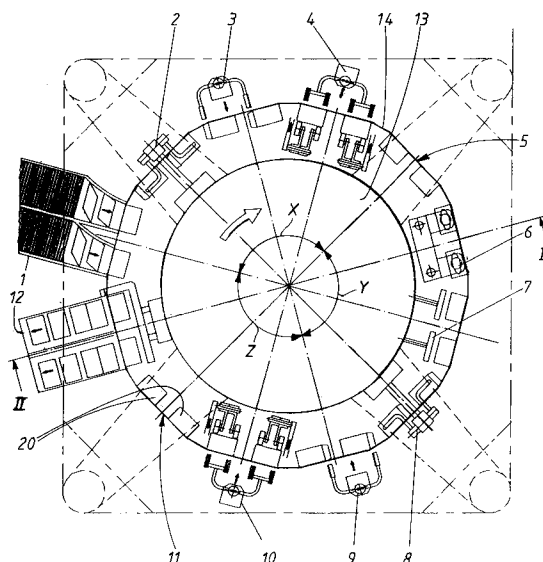
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S-401 22 Göteborg (SE)(54) **Method and apparatus for filling packaging containers.**

(57) The invention concerns the filling of packaging containers (20), of cardboard or the like, with a viscous substance (34) such as soft ice-cream. The invention provides a method and an apparatus for the preferably continuous supply of a viscous substance, whereby a device in the form of a hot wire (39) is present for cutting the stream of substance at an appropriate position so as to allow each packaging container to be filled entirely whilst at the same time providing a high rate of production in the machine. The invention also provides a turntable (13) which is constructed in segments (X, Y, Z) so as to allow easy interchangeability of turntable units foreseen for different package dimensions.

*FIG. 1***EP 0 640 525 A1**

Field of the invention

The invention relates to a method of filling packages with a viscous substance such as soft ice cream and also to a device for use in the method. The invention also relates to an apparatus for supplying empty packaging containers to a filling station in accordance with the preamble of claim 8.

Background to the invention

In the field of packaging of viscous products, such as the packaging of ice cream into cardboard containers, the ice cream is supplied in a relatively viscous state into the package. The consistency can be compared to something like soft-ice cream, thus somewhere between melted and frozen.

Due to this consistency, several problems arise when filling containers with the required contents. Firstly the ice cream should fill the package to as great an extent as possible, otherwise valuable packaging material is wasted in every pack. Secondly, the speed of filling must be high in order to be economical. A third problem is the starting and stopping of the flow of contents to the package whilst still having a device which is not too complicated.

Thus, when the viscous ice cream is filled slowly and carefully into the packages, the packages can be filled accurately to about 100% of their intended volume. However, this requires a great deal of time or complicated variable filling speed mechanisms, due to the way the ice cream settles in the packages as a type of dome. Additionally, stopping the flow of ice cream at precisely the right time means that the process becomes slower due to the restarting of the flow after subsequent indexing of the container. If a high filling speed is used, the cartons cannot be accurately filled to occupy the available volume. Since the device should be economical and simple, one solution currently adopted is to accept some waste of packaging to maintain a relatively high speed and to have a continuous contents supply.

Such a packaging device normally has the form of a rotating rose whereby packages will be fixed to a turntable and rotated through various filling and sealing stations, before being ejected. The various devices for opening, filling and sealing the packages are situated around the turntable at regular intervals, both above and below the turntable unit. A further problem arises in this regard concerning the manner in which the machine can be changed to cater for different sizes of packaging containers. The turntables are heavy and access is limited from above. Thus considerable down-time results whenever a machine run involving a new size of carton or package takes place. From an

economical point of view alone, this is of course undesirable and leads to companies requiring excess machinery which then often lies idle.

Summary of the invention

The features of the method according to the invention are as defined in claim 1 appended hereto. The invention further concerns apparatus for supplying containers to a filling station where the method of claim 1 is to be performed and also a device for performing the method of claim 1.

Preferred features of the invention are defined in the dependent claims.

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Brief description of the Figures

The invention will now be described in more detail with reference to the figures which depict certain features of preferred embodiments.

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Fig. 1 shows a plan view of a machine for supplying, opening, filling and sealing of folded packaging blanks,

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Fig. 2 shows a partially schematic side view of the machine in fig. 1, as seen along line II-II,

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Fig. 3 shows, in a series of cross-sectional views (a) to (e), the series of operations involved in the filling of one packaging container,

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Fig. 4 and Fig. 5 show perspective views of the front and rear sides of a packaging container after having been filled with viscous product and sealed, and

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Fig. 6 shows a flat blank for use in the method according to the invention

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Description of preferred embodiments

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Fig. 1 shows a view from above of a packaging machine having twelve operating stations 1-12, station 1 being an inlet station comprising a folded blank supply magazine and station 12 being a removal station for filled and sealed packaging containers which have been processed in the stations 1 to 11.

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The device has a turntable unit 14 (see also Fig. 2) which rotates intermittently by means of an indexing control system between each of the equally angularly spaced stations 1-12 which are themselves positioned on the turret 13 above or below the turntable 14, or level therewith. The station 6 at which the product is filled into the open package is shown on the turret 13 in fig. 2. Similarly, station 12 for removing filled packaging containers is depicted at the level of the turntable.

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In the example shown in fig. 1 the turntable supports a series of twenty-four packaging containers 20 arranged in pairs at equally spaced locations of the turntable. In accordance therewith the folded blank supply is effected by two parallel arranged storage and supply magazines 1.

It is however desirable from an economic point of view that the turntable should be able to cope with packages of a different size or type and there may thus only be sufficient space for one package at each location on the turntable, rather than in pairs. For this purpose, complicated refitting and adjusting of the various parts has been the solution adopted up until now. The turntable itself is very heavy and cannot be lifted without hoisting apparatus. However as can be seen in fig. 2 for example, access from above for fitting and manoeuvring of a crane for lifting the heavy turntable is severely restricted and very complicated to arrange. Thus this problem is solved in accordance with the invention in that the turntable is divided into a number of segments, preferably three segments X, Y and Z, each of which is attached to the adjacent section and also to the rotation means for the turntable. In this way, the machine can be adapted by fitting a new turntable, merely by disconnecting the segments from one another and from the rotation means, before lifting each relatively light segment off from the side.

Fitting a new turntable is a reversal of the process, the only adjustments required being the repositioning of the machine's automatic units present in stations 1 to 12, by setting them up for the new packages to be filled.

It is obviously a requirement that the packaging containers must not be damaged by their means of support and attachment on the turntable. Similarly the support means must be capable of releasing the containers and still providing resilient resistance when required. To this end, the packaging containers may be supported for example by spring-loaded fingers (not shown but known per se) located on the turntable 14. Opening of these fingers for release at station 12 combined with closing them after receiving the opened blank at station 1 is most readily accomplished by cam means comprising, for example, a cam mounted fixedly to a driven shaft of the machine (possibly the main drive shaft) and cooperating with cam follower means which cause actuation of each set of fingers.

Thus in the depicted embodiment, twelve sets of cam following means will be arranged for operating said fingers at twelve equally spaced locations. The term "cam following means" is however to be interpreted in its broad sense and is not restricted to purely mechanical means. For example the cam following means could be constituted by pneumati-

cally, hydraulically or electrically operated actuation means responsive to an input from a control system which would complement the cam means or even constitute the cam means.

Thus, the segmental splitting of the turntable into segments X, Y and Z for ease of handling and exchange for other turntables will mean that each of the turntable segments will have one or more sets of cam following means attached thereto.

The operations involved in processing of an opened blank will now be described briefly in order to aid further understanding of the invention.

Packaging blanks (see also Fig. 6) are stored in the magazines 1 as pre-formed flattened tubes which are open at either end. These are supplied to the turntable 14. Means (not shown) such as suction cups are provided for opening the blanks as they exit from the magazines 1. The boxes are then fed into open holding finger means on the turntable which are synchronised with the feeding of said packages. The opened blanks are indexed on the table to station 2, at which the internal lower end flaps 60, 61 of the blank are bent. Where heat-sealable plastic coatings such as polyethylene coatings are used on the blank, the following indexed station 3 will be a unit for heating and closing the lower internal end flaps 60, 61 by heat activation of the polyethylene and subsequent folding and joining of the flaps, whilst station 4 is used for closing the lower external end flaps 62, 63. The bottom is thus closed and sealed. As an alternative, hot melt adhesive instead of, or in addition to, polyethylene-type coatings may be used.

The packages are further indexed in the next cycle to a checking station 5 where the sealing of the end panels is checked automatically. Improperly sealed boxes are memorised by the control system and will be ejected at station 7 when they reach it.

Station 6 which will be described later in more detail is a filling station comprising a supply means for filling containers, preferably a continuous supply means, which thus operates continuously once the machine is started, without stopping the supply of substance to be filled between one packaging container and the next.

At station 7 the packages will again be inspected for correct filling and if incorrect may be rejected. At each of the indexed stations 8, 9 and 10 in turn the inner upper end flaps 64 and 65 and the outer upper end flaps 66 and 67 will be closed and sealed similar to the manner described above for the lower end flaps. The packages are then indexed further to station 11 for inspection and possible ink jet printing and then further to station 12 (see also fig.2) where the holding finger means are open such that the filled and sealed packages 20 as shown in Figs.4 and 5 can be removed

appropriately on to a conveyor system.

The filling operation performed at station 6 will now be described in more detail with reference to fig. 3.

During the working cycle at station 6, the container remains positioned on the turntable 14 beneath the supply means outlet. The supply means comprises an inner tubular part 30 and outer tubular part 31 having an outlet 32. The parts 30 and 31 are movable telescopically with respect to each other and inner tubular part 30 (together or separate from part 31 or otherwise) may also be moved vertically. With regard to the size of the various components, the size of the tube 31 should be such that it may enter the packaging container without interfering with the sidewalls thereof, thus suitably giving a clearance of some millimetres.

Fig. 3(a) represents an empty packaging container positioned in station 6 by indexing the turntable one step from station 5. In station 6 the container is open at its top end and placed beneath the supply means outlet 32 which has been moved downwardly already. The substance 34 to be filled into the container is preferably supplied continuously from a continuous freezer to a flexible tube connected at coupling point 35.

In the first stage in fig. 3(a), the outlet 32 of the outer part 31 is at the same level as the packaging container open top end and substance is being fed along the tubes 30 and 31 to this outlet. As shown in fig. 3(b), the two tubes 30 and 31 are then moved downwardly such that outer tube 31 extends into the package with its outlet 32 marginally above the base, thus leaving a small clearance 37 from the base thereof. At the stage shown in fig. 3(c), tube 30 is held still and tube 31 is then moved upwardly whilst product substance 34 fills the package from the base upwards. This process continues as shown in Fig. 3(c). At the next stage, Fig. 3(d) the package is almost full and both inner and outer tubes move upwardly at an accelerated rate such that the continuous stream of substance between the substance in the package and that in the combined tube 30, 31 narrows (as partially visible in fig. 3(e)). Thus the outlet 32 is moved upwardly clear of the packaging container.

The almost filled package 20 then has a product substance formation at its upper end which is truncated or "narrows" in an upward direction yet still connected to the supply substance. In order to dissect the stream of substance from that at the outlet 32, the stream is cut by mechanical means 38, 39, 40 above the level of the opening in the container at a location and time according to an empirical calculation based on viscosity, supply speed and amount of unfilled packaging container still remaining. Thus, for any one particular set of conditions, the ideal height and time of dissection

of the stream can be calculated so as to give substantially 100% full packaging containers. The supply may be slowed down after dissection has occurred, or in the less preferred embodiment even stopped, but no flap or other valve-controlled shutting means is required to cover the outlet 32 which has been a constant source of defects in prior art devices.

The cycle of filling events is then repeated for the following (pairs of) empty container. Meanwhile the packaging container that was just filled in station 6 is indexed to the next station (inspection). During the time between stream dissection and start of the operation at station 8, the substance in the packaging container has time to settle from a truncated shape at the upper end to one having a level surface, thus capable of totally filling the package 20. Due to the inspection means at station 7, this level surface of product should however already be present at station 7.

The means of dissection, particular when using ice-cream as the product substance, is formed by a heated wire element 39 which is mounted in a support element 39 for substantially horizontal displacement with respect to the turntable. If desired, vertical displacement of the wire element may also be provided, although the height will normally be set for each container. A further support element 40 may also be provided if required.

As an alternative to a horizontally displaceable wire element, the wire could be arranged stationary and the table itself moved, but in this way the indexing speed of the turntable has to be suitable to cut the product stream effectively, which may as a result interfere with the stability of the ice cream in the container.

The wire 39 itself may be heated by any suitable means, although an electrical heating of the wire has been found most suitable.

With reference to the blank and container in Figs. 4, 5 and 6, it is of little importance which type of blank and which type of container are used as long as they are suitable for the method of the invention. For example, the invention may also be performed with other types of containers such as plastics or laminated plastics pots or tubs if desired.

Furthermore, the embodiments of the invention described above are given purely as examples and it will be clear to those skilled in the art that the invention is not limited thereto but may be varied widely within the scope of the following claims.

Claims

1. Method of filling packaging containers with a relatively viscous substance (34), such as soft ice cream, said method comprising the steps

- of arranging an open packaging container (20) below an outlet (32) of a supply means (30, 31) for said substance such that an uninterrupted stream of said substance is present between the supply means outlet (32) and the packaging container opening, whereupon a mechanical separation means (39) is made to pass through and thus separate said stream at a height below said outlet (32).
2. Method according to claim 1, wherein said supply means (30, 31) supplies said substance (34) continuously such that the supply is not stopped between filling said packaging container and a subsequent filling of a following container.
 3. Method according to either of claims 1 or 2, wherein said supply means outlet (32) is moved during filling, from a position inside said packaging container to a position outside and above said packaging container.
 4. Method according to any one of the preceding claims, wherein said mechanical separation means (39) is movable relative to means for supporting said packaging containers, and comprises a heated element, preferably an electrically heated wire.
 5. Method according to any one of the preceding claims, wherein, when the packaging container is close to full, the supply means outlet (32) is moved upwardly at an accelerated rate in order to reduce the cross-sectional area of the stream of substance (34) being supplied to the container immediately prior to the mechanical means (38, 39) separating the stream.
 6. Method according to any one of the preceding claims, wherein the supply means comprises a movable inner tubular part (30) and a movable outer tubular part (31), said parts being telescopically movably arranged with respect to each other, and wherein the outer part (31) is arranged to have a small clearance with respect to the inner sides of the packaging container (20) for movement with respect thereto.
 7. Method according to claim 6, wherein said outer part (31) is moved downwardly into the container so that its outlet (32) is at a small distance (37) from the base of said container in a first filling stage and is then gradually moved up inside the container and finally outside thereof in further filling stages.
 8. Apparatus for supplying empty packaging containers to a filling station, said apparatus comprising an intermittently rotating turntable (13), **characterized in that** said turntable (13) is composed of two or more removable segments (X, Y, Z) which can be fitted together and attached to a substantially central rotating support.
 9. Apparatus according to claim 8, **characterized in that** each of said segments (X, Y, Z) contains one or more movable holding means, preferably sprung locating fingers, to releasably hold one or more packaging containers in position on said segment.
 10. Apparatus according to either of claims 8 or 9, **characterized in that** each of said movable holding means is provided with cam following means which are operated by a cam means in order to effect opening and closing of said holding means.
 11. Apparatus according to any one of claims 8 to 10, **characterized in that** the turntable (14) is configured so as to have a series of equally angularly spaced areas, each of said areas comprising said movable holding means capable of releasably holding two packaging containers.
 12. Apparatus according to claim 11, **characterized in that** the turntable (14) is positioned substantially centrally in a packaging machine, and in that said turntable is indexable between separate operating stations (1-12), each of which is spaced so as to align with each of said spaced segmental areas upon equal rotational indexing of said turntable.
 13. Device for separating or cutting through a continuous stream of viscous substance (34) in a packaging machine for carrying out the method of claim 1, **characterized in that** said device is a heated wire element (39) which is mounted (by means 38, 40) for substantially horizontal displacement with respect to a packaging container (20) to be filled.
 14. Device according to claim 13, **characterized in that** said heated wire element (39) is also mounted for vertical displacement.

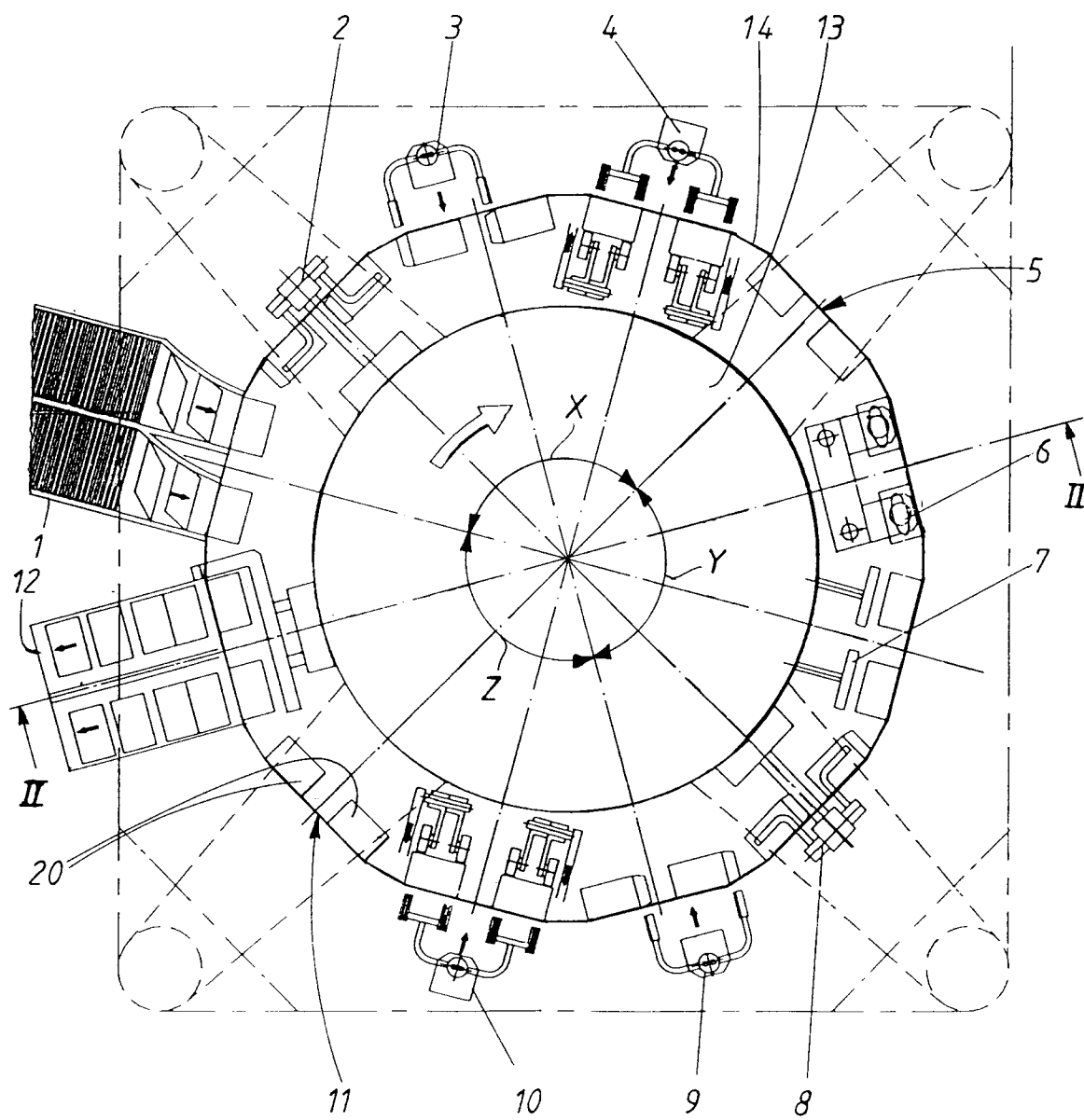


FIG. 1

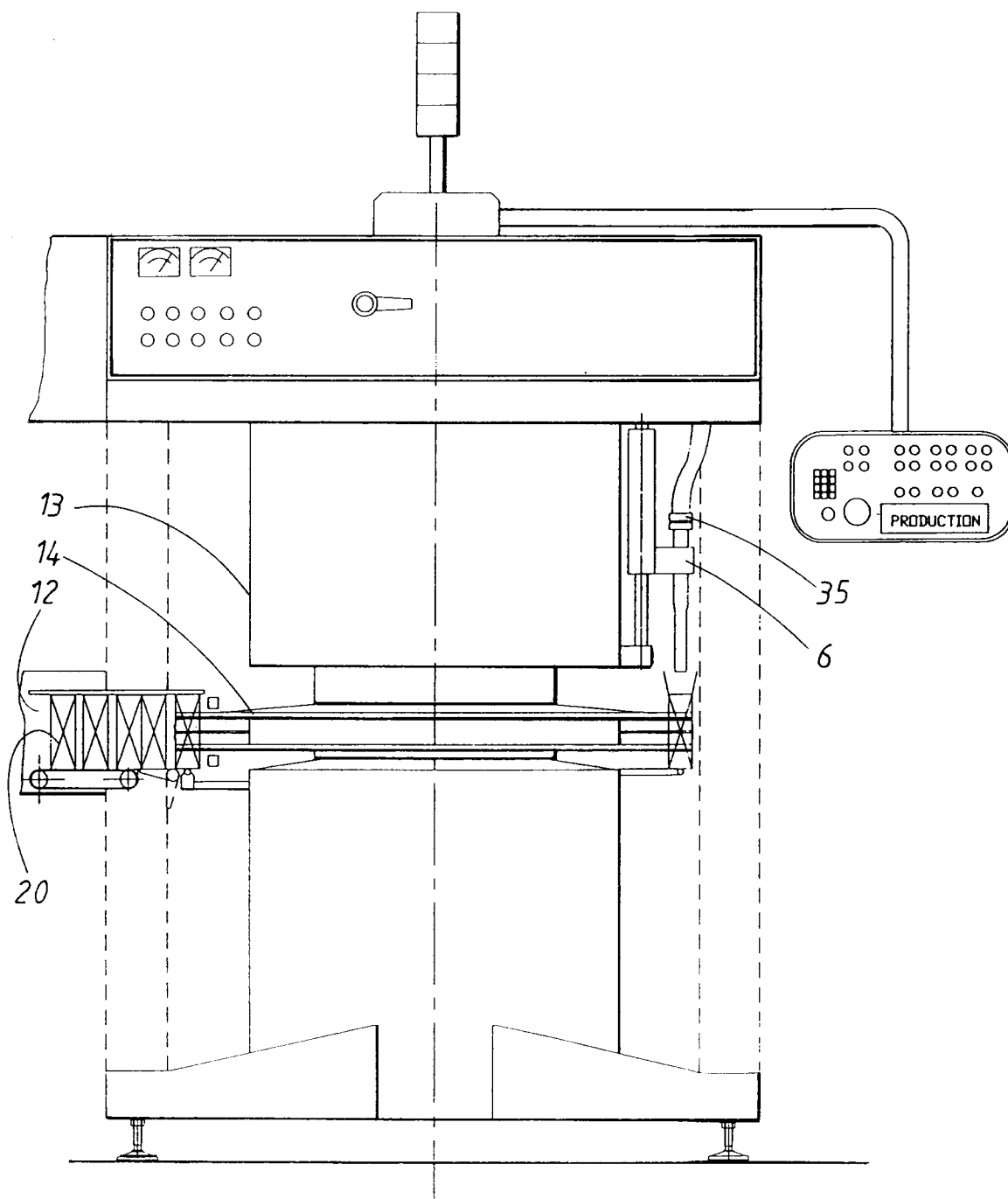


FIG. 2

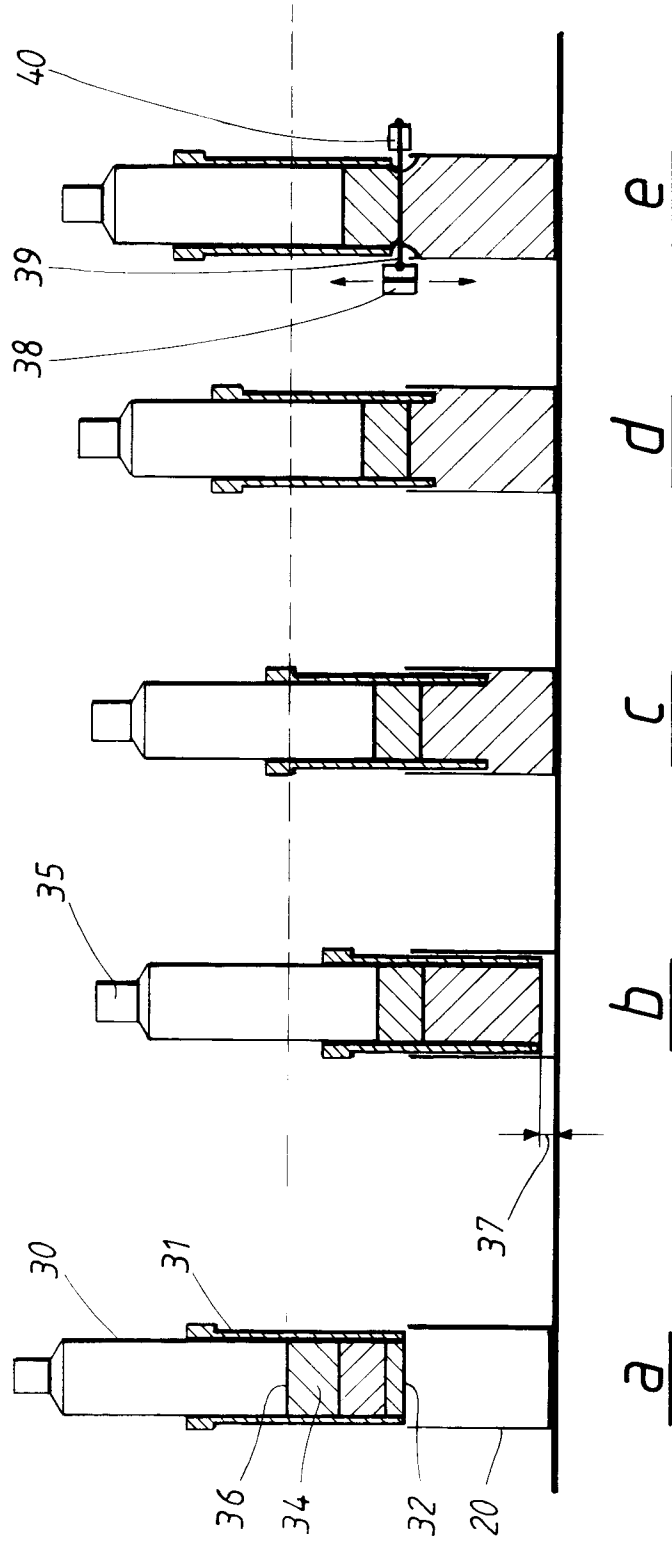


FIG. 3

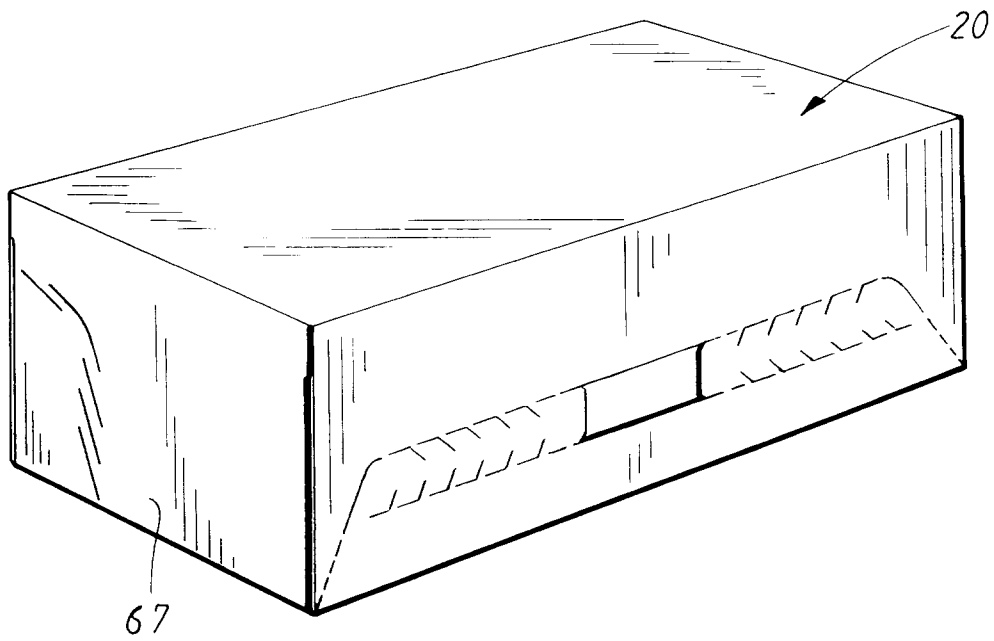


FIG. 4

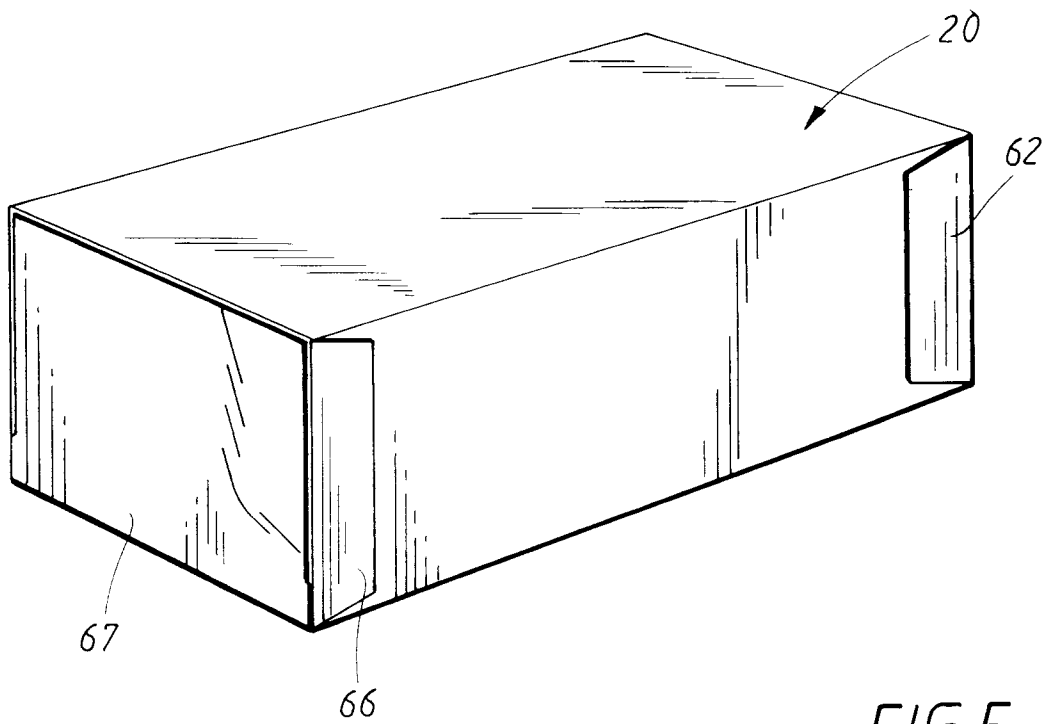


FIG. 5

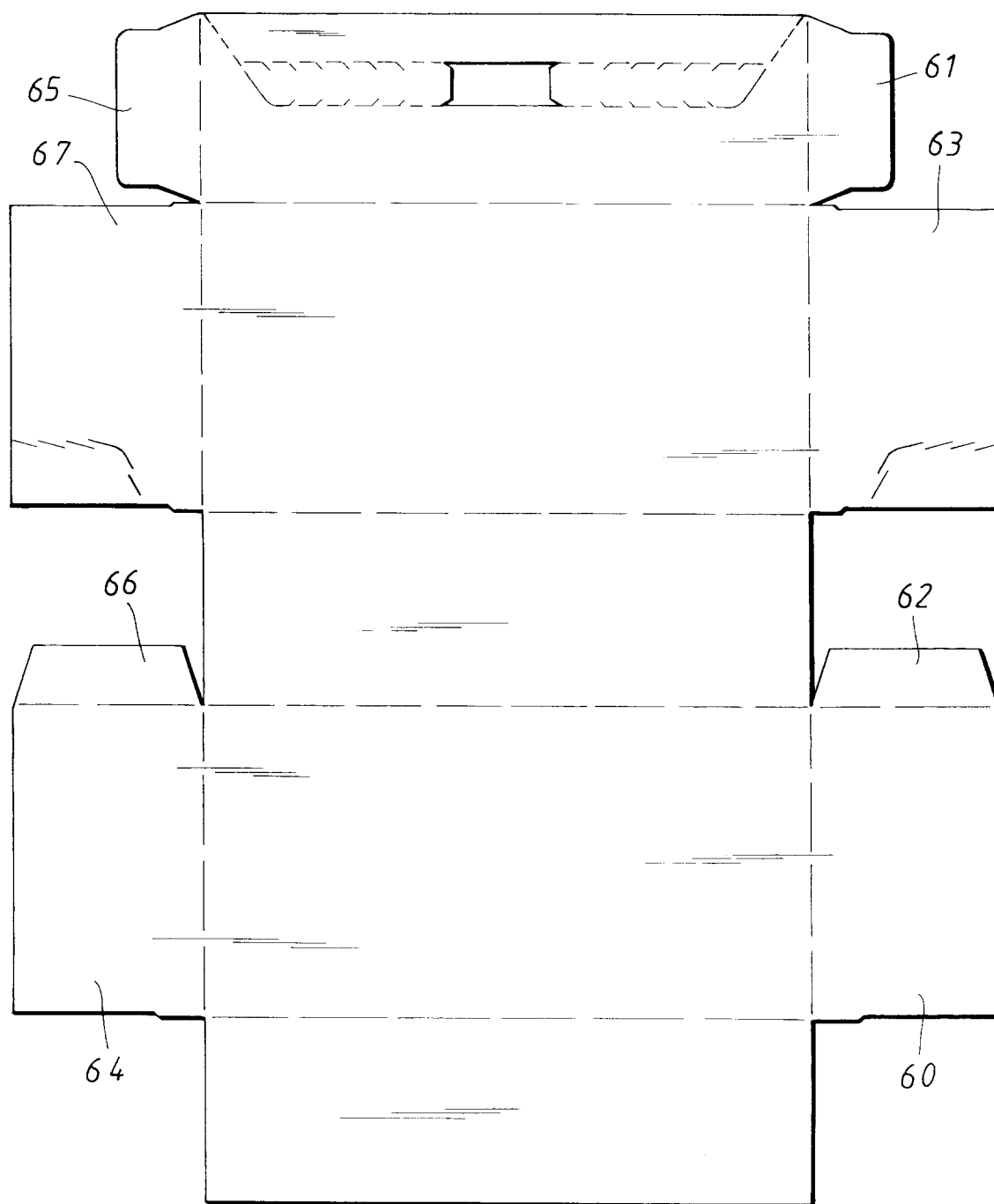


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 93 85 0164

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB-A-728 903 (ROSE BROTHERS) * page 2, line 25 - page 2, line 80; figures 1-3 *	1,2	B65B3/36 B65B59/04 B65B39/12
Y		3,4,13, 14	
X	FR-A-2 280 554 (KUSTNER) * page 2, line 25 - page 2, line 28; figures 1-4 *	1	
Y	GB-A-1 029 300 (AKERLUND & RAUSING) * page 2, line 103 - page 2, line 124; figures 1,2 *	3	
A		7	
Y	US-A-3 822 623 (WIGHT) * column 1; figures 1,2 *	4,13,14	
X	US-A-3 225 889 (WEST) * column 4, line 55 - column 4, line 72; figures 1,4 *	8	
Y		9-12	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Y	US-A-2 327 267 (HOWARD) * page 3, column 2; figure 1 *	9-12	B65B
A	DE-A-35 03 992 (ROBERT BOSCH) * page 5, line 10 - page 5, line 22; figure 1 *	11	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 March 1994	Examiner Grentzius, W
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,

namely:

see sheet -B-

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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EP 93 85 0164 -B-

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-7,13,14 : Method and device for filling containers with quantities of a viscous substance separated from a continuous stream.
2. Claims 8-12 : Apparatus for supplying packaging containers, using a modular turntable.