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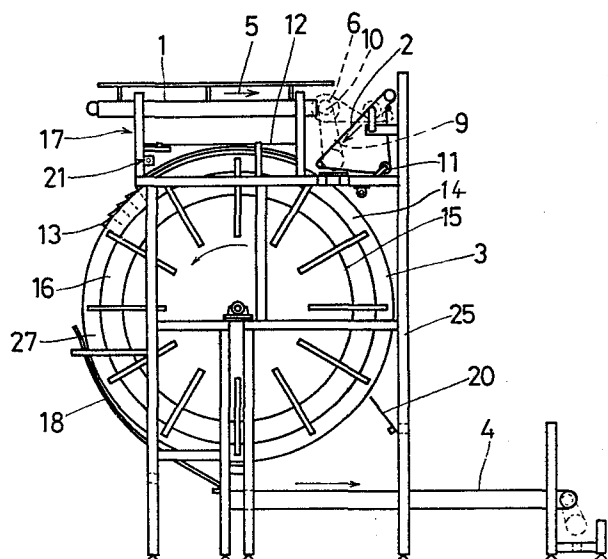
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A method of, and means for unpacking bottles from crates.

Apparatus for and a method of removing bottles from crates is described. The apparatus comprises conveying means (1) which automatically conveys crates towards crate inverting means which in turn is adapted to invert the crates. Thereafter in use, the bottles fall from the inverted crates into partitions formed in the periphery of a rotatable wheel (3). The bottles fall out of the partitions after the wheel has rotated through approximately 180°. Thereafter a final conveyor (4) is adapted to remove the now upright bottles from below the wheel.



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A METHOD OF, AND AN APPARATUS FOR
UNPACKING BOTTLES

THIS INVENTION relates to a method and apparatus for unpacking bottles from crates thereof preparatory to further processing the bottles such as, for example by washing etc. Such bottles are usually return bottles.

In conventional unpacking machines, air operated grippers are employed to lift, individually, the bottles out of containers such as crates or cases in order that they may be further processed and the case optionally washed. The same criteria apply irrespective of whether the crate is a recycleable plastic crate or a cardboard box which may or may not be reused. In any event more sophisticated machines comprise a large number of grippers in assemblies thereof and each assembly is adapted to remove all the bottles from one whole crate at one time.

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These unpacking machines have a number of disadvantages, not least of which is their tremendously high capital cost. Also, once the bottles have been removed from the crate or box, the latter, if it is to be reused, must be turned upside down, in any event, in order to allow debris to fall therefrom. In many cases broken bottles can also cause a problem with known unpacking machines as the broken bottle often will not have a neck which can be contacted by the appropriate gripper.

It is the object of this invention to provide a simple, relatively inexpensive, and yet effective method and means for unpacking crates or boxes of bottles which obviate the necessity for employing a large number of individual grippers.

In accordance with one aspect of this invention there is provided a method of unpacking bottles from crates or boxes or the like comprising inverting the crate or box with the bottles therein so that the latter tend to fall out but to land on a suitable damage resisting surface, and thereafter allowing the individual bottles to fall into receptacles therefor on conveying means to separate the bottles from the now upside down crates or boxes; and subsequently inverting the bottles to their normal upright condition.

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Further features of the method of this invention provide for the crate to be transported on conveyors at the end of the first of which inversion of the crate takes place with the aid of a crate
5 inverting means; for the said conveying means to be a circular wheel arrangement having receptacles into which individual bottles may descend from the top; and for the bottles to be removed from said
10 receptacles at approximately 180° angular spacing from their point of entry at which stage the bottles have been inverted to their normal orientation.

The invention also provides apparatus for carrying out the abovedefined method, said apparatus comprising a first conveyor for conveying crates or
15 boxes of bottles in the normal orientation, crate inverting means adapted to invert a crate; means for separating crates from inverted bottles, and means for returning the bottles to their normal upright position.

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Further features of the invention provide for the means for returning bottles to their normal upright position to be a wheel arrangement adapted to receive, in partitions formed in the peripheral region thereof, transverse rows of bottles; and for the said means to have a resilient stop surface adapted to be engaged by the tops of inverted bottles.

The crate inverting means may comprise an endless conveyor belt mounted at an incline to and at least partially below the discharge end of the first conveyor, the said endless conveyor belt adapted to engage a crate which moves off the discharge end of the first conveyor and rotate the crate about an axis of rotation which is substantially coincident with the axis of rotation of an end roller of the discharge end of the first conveyor, the crate being held against the first conveyor by the endless belt during rotation. The endless belt will preferably include an unsupported region which engages the upper surface of the crates during rotation. Preferably the endless belt travels around at least one spring loaded roller

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such that the space between the discharge end of the first conveyor and the endless belt may vary in accordance with the thickness of the crate being inverted.

5 In a preferred form of the invention a final conveyor is provided for moving the bottles away from the wheel to a washing station or the like. The latter type of conveyor may be what is termed a flat chain conveyor. The bottles may be positioned on the final
10 conveyor on removal from the receptacles.

 The peripheral region of the wheel may be releasably secured to the remainder of the wheel and may be replaceable with a peripheral region having different
15 sized partitions. The peripheral region may be formed from a plurality of sections. The periphery of the wheel may have teeth extending radially outwardly therefrom, said teeth adapted to engage a crate near the top of the wheel and pull the crate into position to
20 allow inverted bottles to fall from the crate into partitions in the wheel. The wheel may be formed having a variable width in order that a variable number of bottles may be fed into a corresponding number of transverse rows of partitions around the
25 periphery of the wheel. The wheel may be a compo-

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site wheel comprising a plurality of wheels mounted on the same axis of rotation, separate wheels adapted to be rotated at different speeds.

5 These and further features of the invention will be made more apparent from the description of a preferred embodiment thereof given below by way of example. In the description reference is made to the accompanying drawings in which:

10 Figure 1 shows an side elevation of apparatus for unpacking bottles from crates,

 Figure 2 shows an end elevation of the apparatus of

15 Figure 1, Figure 3 shows an plan view of the apparatus and

 Figure 4 shows in diagramatic form part of the apparatus for use in inverting crates.

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Referring to the drawings, apparatus for unpacking crates comprises a first conveyor 1, a second conveyor 2, a wheel 3 and a third or final conveyor 4. The first conveyor is located substantially above the wheel 3 and is adapted to move crates or boxes filled with empty bottles towards the wheel 3. The crates or boxes may be fed continuously onto the first conveyor by means of a feed conveyor (not shown) or the like. It is envisaged that the device as shown may be used to unpack approximately 2500 crates per hour although with adjustments and speed variation the number of crates which may be unpacked could be varied.

Crates on the first conveyor 1 move in the direction as shown by arrow 5 towards the second conveyor 2. When reaching the discharge end 6 of the first conveyor, the crates tend to tilt off the end of the first conveyor and land on the second conveyor 2. This initial falling of the crate onto the second conveyor is shown at numeral 8 in Figure 4. The second conveyor 2 moves in an anti-clockwise direction as shown in Figure 1. The crates fall onto an inclined surface 9 on the second conveyor

and are thus urged downwardly by the second conveyor as well as by the belt at the discharged end 6 of the first conveyor. As the crate moves downwardly it will rotate about the axis of rotation 10

5 of the roller at the discharge end of the first conveyor. In so doing it will force the second conveyor belt inwardly to form sufficiently wide the gap to move down between the two conveyors. The second conveyor has a roller 11 which is spring
10 loaded and which when the belt is urged inwardly by the crate as the crate moves down inclined surface, the spring loaded roller 11 will also move inwardly thereby allowing the crate to move around the discharge end of the first conveyor. As the crate
15 reaches the end of the second conveyor 2, the crate will be in a substantially inverted condition and the bottles in the crate will be lying on a slotted resting plate 12 located above the wheel 3.

The wheel 3 is mounted on a substantially norizontal
20 axis and comprises a series of partitions 14 at the periphery thereof adapted to receive bottles in an inwardly extending configuration. Radially projecting teeth 13 formed on the periphery of the

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wheel engage the crates while they are resting on the slotted resting plate 12 and move the crates forward off the plate. In so doing, the bottles located in the crate fall out of the crate and into the partitions 14. The wheel 3 has an inner buffer wall 15 against which individual bottles can impinge without being damaged. This surface is, consequently, of an elastomeric nature. The speed of the conveyors and wheels will of course be selected such that as the teeth 13 pull the crate forward, the bottles fall into the partition 14 without damage. The partition will be spaced at substantially the same spacing as the spacing of the partitions within the crate wherein the boxes are held. The partitions will preferably be formed of or covered with a suitable elastomeric material in order that as the bottles move into the partition they are not damaged in any way. Preferably the partitions 14 define only a short portion of the height of a bottle so that a large space 16 remains on the sides of the wheel between the inner wall 15 and the partitions 14. This space is such that broken bottles or debris may fall out of the wheel as the wheel rotates and accordingly

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will not present a problem to subsequent operations in the plant wherein the apparatus is used.

5 The crates which move from the resting plate 12 will be moved further by subsequent plates being pushed along by the teeth 13 on the periphery of the wheel and a shute arrangement or like conveying means will be located at the discharge end 17 of the resting plate 12 in order to move the crates. The crates, it will be appreciated, will be
10 at this stage in an inverted condition, which is a condition normally required for washing operations.

 As it will be clear from above, the bottles are adapted to fall, in their upside down orientation into the partitions 14. The wheel is
15 adapted to rotate and a guide plate or guide arrangement 18 is provided in the lower region to prevent the bottles from falling out of the recepticals once they pass the horizontal orientation. This guide plate 18 terminates on the
20 upper surface of a third conveyor 4 which can conveniently be a slat chain conveyor. The slat chain conveyor could be driven through a variable

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speed motor in order to ensure that the bottles can be accepted at the same rate as the machine delivers them.

5 Similarly, whenever required in the apparatus, variable speed drive arrangements can be employed.

At convenient points in the apparatus trip devices will be positioned which will interrupt the operation of the apparatus when any particular stage in the process is not properly completed. Thus for example a first trip switch 20 is located just adjacent the point where bottles leave the wheel 3. Should any bottle fail to fall out of its partition for some reason, the trip switch will strike the bottle and will bring the apparatus to a stop. This is important as were the bottle to remain in its partition it would interfere with the operation of the apparatus when that particular portion of the wheel reached the top of the rotational circuit. A second trip switch which may conveniently comprise a reflected light may be located near the top of the wheel as shown at numeral 21. This trip switch

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will interrupt the operation should a bottle not fall properly into its partition and thus stick up out of alignment. The third conveyor 4 may also have a suitable trip switch associated therewith such that if bottles which have been unpacked from crates back-up to any large extent on the conveyor, they will not be allowed to back-up so far as to start interfering with the rotation with the wheel.

The apparatus is mounted in a suitable metal tubular frame 25. Preferably the elements of the frame will be bolted together such that the apparatus may be assembled in position with relative ease. A platform 26 is provided on which an operator may stand in order to facilitate the correct operation of the apparatus.

The peripheral portion 27 of the wheel is preferably formed from a plurality of individual sections, each of which make up a section of the arc of the periphery of the wheel. It is envisaged that these portions will releasably mounted to the remainder of the wheel, in order that if necessary

the whole peripheral portion 27 may be replaced with
a different peripheral portion. Thus, if it may
become necessary to vary the size of the bottle with
which the apparatus is to be used, the peripheral
5 portion will be substituted by a peripheral portion
having a corresponding size of partitions therein.
This will also be applicable if the shape or size of
the crate were to be changed. The peripheral
portion will preferably be bolted to the remainder
10 of the wheel and it is envisaged that a changeover
of the entire peripheral portion would take about
twenty minutes. This could, if necessary, be done
once or twice a day if one apparatus was needed to
service a number of different sizes of bottles or
15 crates. It is envisaged that the second conveyor 2
will have sufficient flexibility in order to
accommodate crates of different sizes.

In the embodiment shown the wheel is shown
having three rows of partitions. Many crates are
20 designed being three partitions wide and four
partitions long. These crates will then be fed in
lengthways such that the three partitions of the

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crate will correspond with the three rows of
partitions in the wheel. The three rows of
partitions are best shown in Figure 2 at numeral
28. It will be apparent that in order to increase
5 the rate which crates may be fed through the
apparatus it will be possible to manufacture a wheel
having rows of four partitions which will then be
able to handle the crates in their sideways
orientation. Similarly, it will be possible for
10 there to be two independant wheels which run
alongside each other and which will be able to
handle independantly bottles of differing sizes.
The same basic principle of operation will apply and
it is envisaged that with only marginally greater
15 capital cost outlay, a rate of processing bottles
which is twice that of the wheel herein described
could be achieved.

There may be many variations to be above
described embodiment without departing from the
20 scope of invention. Although it is believed that the
method of inverting crates as herein before
described is most satisfactory, it will also be

possible to use another arrangement to effect the inversion. In particular it is envisaged that a swing-arm arrangement or like device could be used which may prove more satisfactory in some applications. In this embodiment the device is shown having three separate drive motors 29. It may be advantageous for the entire device to be run off a single drive motor and all the different conveying means linked by means of suitable timing claims to the single drive motor to ensure that everything runs at the correct speed. The advantage of having separate drive motors is that the speed of each element may be varied as required and for this reason it is also envisaged that infinitely variable drive speed motors will be used.

It will be understood that there is no necessity, generally speaking, for any operator to be present and the operating costs can thus be a fraction of that of more complex machines. Also, it is envisaged that there will be no damage or stoppage as a result of broken bottles being present in a crate or box. It is envisaged that inverting

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the crate and bottles in the manner as herein described will serve as an initial cleaning step which should prove advantageous in many applications.

5 The invention therefore provides a simple yet highly effective method and means for unpacking bottles from crates or boxes.

CLAIMS

1. A method of unpacking bottles from crates or boxes or the like comprising inverting the crate or box with the bottles therein so that the latter tend to fall out but to land on a suitable damage resisting surface,
5 and thereafter allowing the individual bottles to fall into receptacles therefor on conveying means to separate the bottles from the now upside down crates or boxes; and subsequently inverting the bottles to their normal upright condition.
- 10 2. A method as claimed in Claim 1 wherein the crates are transported on a conveyor (1) at the end of which inversion of the crate takes place with the aid of crate inverting means.
- 15 3. A method as claimed in either preceding claim wherein the conveying means comprises a circular wheel arrangement (3) having receptacles into which individual bottles may descend from the top.
- 20 4. A method as claimed in Claim 3 wherein the bottles are removed from the receptacles at approximately 180° angular spacing from their point of entry at which stage the bottles have been inverted to their normal
25 orientation.

5. Apparatus for unpacking bottles from crates comprising a first conveyor (1) for conveying crates or boxes of bottles in the normal orientation, crate inverting means adapted to invert crates, means for
5 separating crates from bottles, and means for returning the bottles to their normal upright position.

6. Apparatus as claimed in Claim 5 wherein the means for returning the bottles to their normal upright position
10 is a wheel arrangement (3) adapted to receive, in partitions formed in the peripheral region thereof, transverse rows of bottles; and for the said means to have a resilient stop surface (15) adapted to be engaged by the
tops of inverted bottles.

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7. Apparatus as claimed in either Claim 5 or 6 wherein the crate inverting means comprises an endless conveyor belt (2) mounted at an incline to and at least partially below the discharge end (6) of the first
20 conveyor (1), the said endless conveyor being adapted to engage a crate which moves off the discharge end of the first conveyor and rotate the crate about an axis of rotation which is substantially coincident with the axis
25 of rotation of an end roller of the discharge end of the first conveyor, the crate being held against the first conveyor by the endless belt during rotation.

8. Apparatus as claimed in Claim 7 wherein the endless belt includes an unsupported region which engages the upper surface of crates during rotation of the crates.

5 9. Apparatus as claimed in either Claim 7 or 8 wherein the endless belt travels around at least one biased roller which is movable in order to vary the space between the discharge end of the first conveyor
10 and the endless belt in use in accordance with the thickness of crate being inverted.

10. Apparatus as claimed in any one of claims 6 to 9 wherein the means for separating the bottles from the
15 crates comprises a peripheral region of the wheel which is divided into partitions into which bottles are adapted to fall, and means for supporting empty inverted crates above the wheel.

20 11. Apparatus as claimed in Claim 10 wherein the periphery of the wheel has teeth extending radially outwardly therefrom, the teeth being adapted to engage an inverted crate and pull the crate into position to
25 allow inverted bottles to fall from the crate into partitions in the peripheral region of the wheel.

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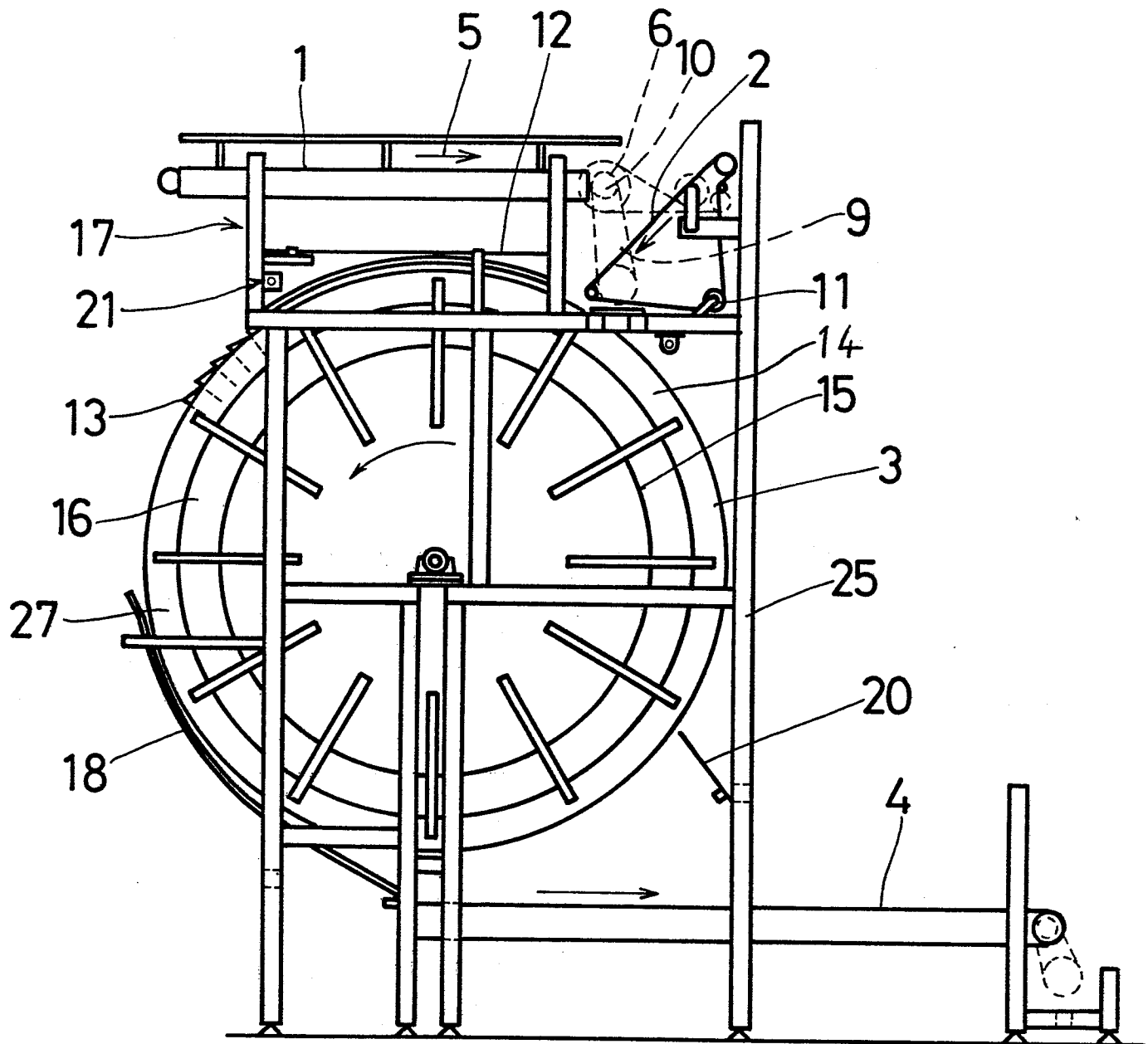


FIG. 1

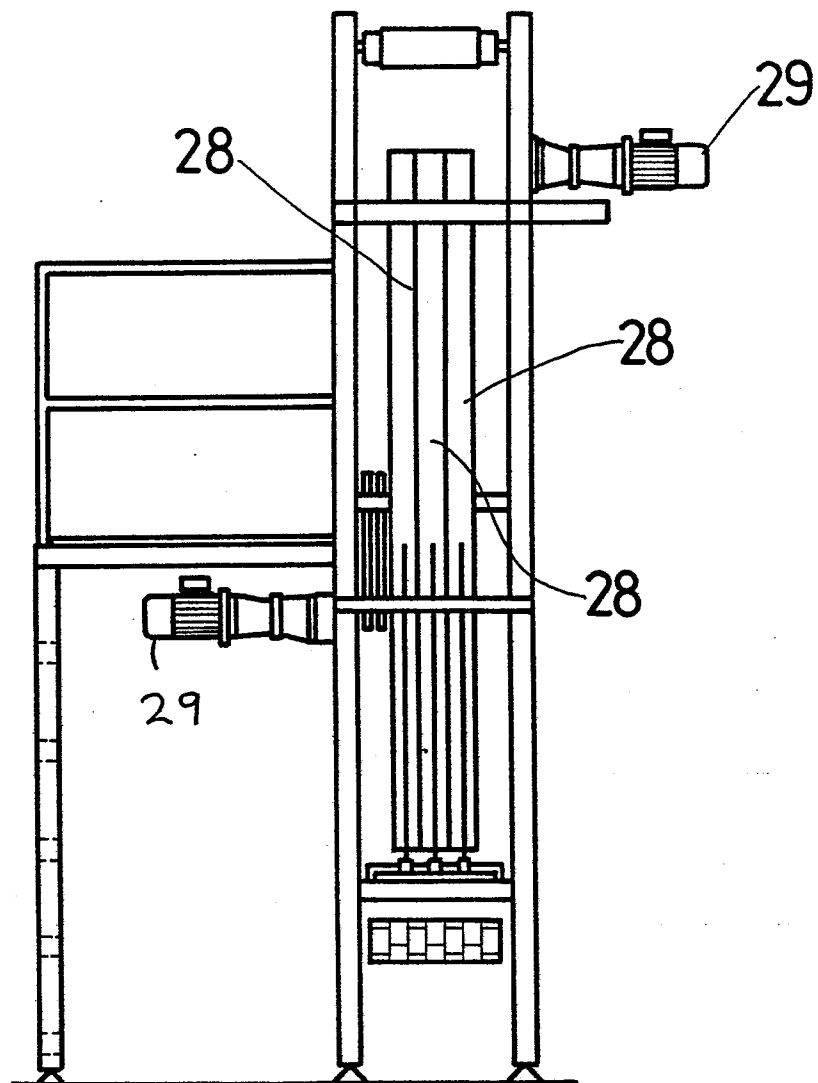


FIG. 2

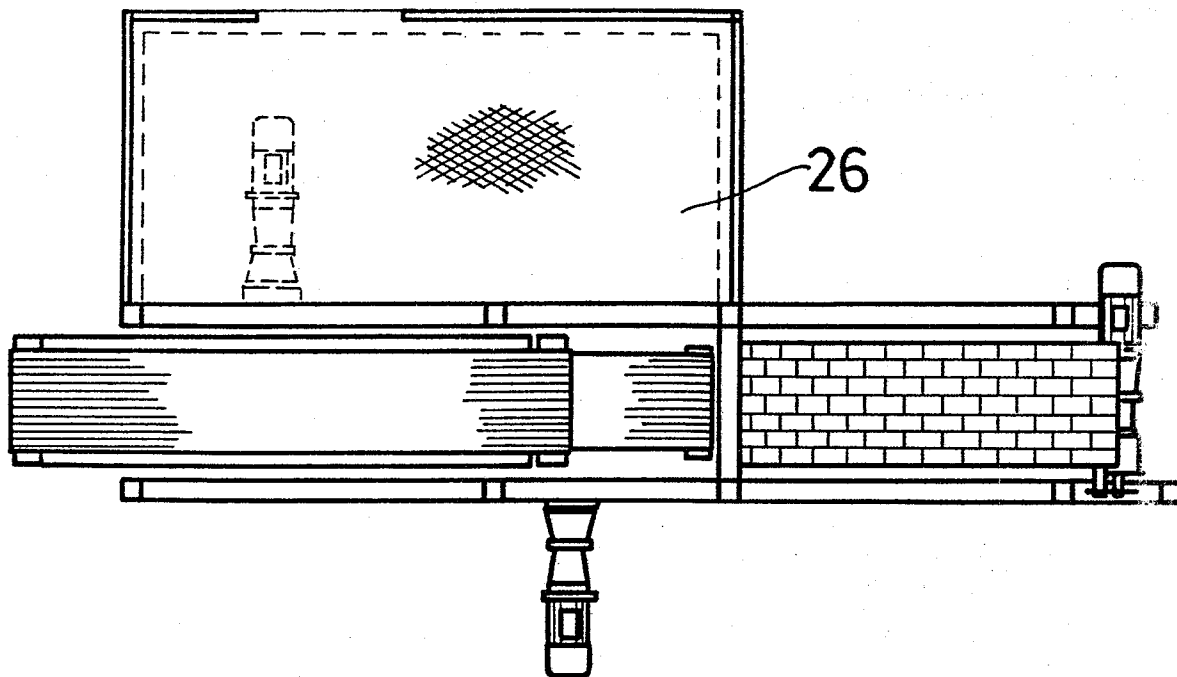


FIG. 3

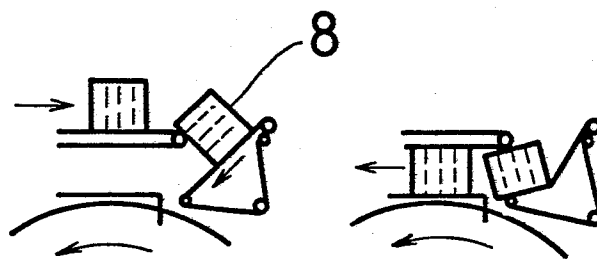


FIG. 4



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EUROPEAN SEARCH REPORT

Application number

0126636

EP 84303384.6

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. 7)
X	<u>US - A - 2 812 085</u> (COPPING) * Fig. 2 * --	1-10	B 65 B 21/10
Y	<u>DD - A - 146 926</u> (PAPE) * Totality * --	1-10	
Y	<u>GB - A - 709 238</u> (AUTO-DAIRY ENGINEERS LTD.) * Totality * --	1,5	
A	<u>US - A - 2 605 883</u> (THAMES) * Fig. 1 * ----	7-9	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			B 65 B 21/00 B 65 B 25/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 27-08-1984	Examiner MELZER
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			