



(51) International Patent Classification:  
**B65B 69/00** (2006.01)

(21) International Application Number:  
PCT/GB2009/001575

(22) International Filing Date:  
24 June 2009 (24.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0812144.4 3 July 2008 (03.07.2008) GB

(71) Applicant (for all designated States except US):  
**KNIGHT WARNER (CONTROL SYSTEMS) LIMITED** [GB/GB]; Automation House, Adelphi Way, Ireland Industrial Estate, Staveley, Chesterfield, Derbyshire S43 3LS (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KNIGHT, David** [GB/GB]; Knight Warner (Control Systems) Limited, Automation House, Adelphi Way, Ireland Industrial Estate, Staveley, Chesterfield Derbyshire S43 3LS (GB). **POWELL, Colin** [GB/GB]; Knight Warner (Control Systems) Limited, Automation House, Adelphi Way, Ireland Industrial Estate, Staveley, Chesterfield Derbyshire S43 3LS (GB).

(74) Agent: **BAILEY WALSH & CO LLP**; 5 York Place, Leeds LS1 2SD (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: CUTTING AND MOVING APPARATUS

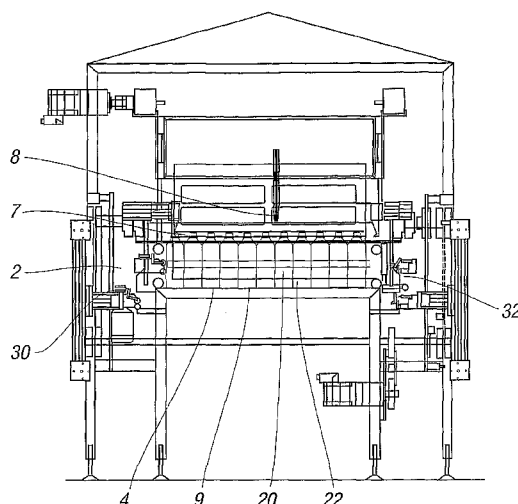


FIG. 1a

(57) Abstract: The invention relates to apparatus and a method for use in the removal of items from a package so as to allow the items, which in one embodiment are empty containers, to be moved onwardly to a location at which the containers are filled. The items are provided as a group enclosed within sheet material to form a package. The apparatus includes a blade provided with a series of teeth formed therein and the blade is moved onto the sheet material at one side of the package such that the teeth of the blade puncture the same and then as the blade is moved further the cut line is formed. The blade can be moved through the package to perform the cutting action on the opposing wall of the package. Sheet material removal means and movement means for moving the freed items onwardly are also provided, with the movement means allowing the leading row of the group of containers to be separated and moved from the remainder of the group of containers in a particularly efficient manner. The invention provides an automated or semi-automated apparatus to be provided.



## Cutting and Moving Apparatus

The invention to which this application relates is to apparatus which allows an improved handling of articles such as containers and particularly, but not necessarily exclusively, to apparatus which can be used to “ debug” a number of articles from a containment package in which the same are supplied to a location for use. The invention also relates to apparatus to be used to move the said articles once released from the said package.

In processing industries, such as food and/or drinks processing, there is a need for the liquid or foodstuff to be dispensed from a holding location, such as a vat, into a range of containers such as bottles or jars, to form a retail item which can then be placed into the retail environment for purchase. The containers can be formed on site and supplied at the location for filling or the containers are formed off site. In either case there is often a need for the containers to be gathered or bagged into a quantity and supplied to the filling location in the packaged condition. The containers are typically retained in this condition by a plastic sheet material surrounding the same and which is provided to enclose the same relatively tightly so as to retain the containers in the required configuration in the package. The sheet material is also provided to allow the containers to be stored hygienically until required to be filled with the storage often being required as a result of the filling of the containers having a quicker throughput than that at which the containers can be manufactured.

At the filling location, the containers are required to be debugged or removed from the sheet material package so that the same can be supplied as individual units and moved towards the filling point. Conventionally, the debugging has been carried

out by a human operator with a sharp instrument which is used to cut through the sheet material to then allow the operator to remove the sheet material and present the containers into the apparatus for filling. This procedure has several problems. One problem is that an operator is required to be employed to perform this task and this represents a cost to the employer. It can also mean that the containers may not always be provided in the correct orientation to the filling apparatus if, for example, the containers spill out of a partially opened package. A further problem is that the procedure may not be performed in a similar manner each time and there is a risk that the procedure may take too long to perform and thus represent a bottleneck in the filling procedure. A yet further problem is the safety risk which is inherent in the operator having to use a sharp instrument in a time pressure situation. A further problem is that with the human operator performing the cutting action there is a significant risk of contamination of the containers occurring from the operator, the tools used by the operator and, or the cut sheet material which, in due course, can cause contamination problems with the containers and the product with which they are subsequently filled.

It is known that attempts have been made previously to automate this process. One known method has been to utilise a hot wire which is passed through the sheet material to melt the same and hence open the package and allow the containers to be debagged. However in practice it is found that the molten sheet material quickly clogs and sticks to the wire. Unpleasant and/or dangerous fumes may be also be created by the melting process which, in extreme circumstances, may represent a risk of contamination of the material with which the containers are to be filled.

It is also known that even when the containers have been removed from the packages, problems are experienced in being able to efficiently and speedily move the containers to the filling location.

The aim of the present invention is therefore to provide apparatus which allows the debugging of bagged items such as containers, in a manner which allows the process to be performed reliably, safely and repeatedly. Furthermore the aim is to provide the apparatus in a manner which allows the debugging to be achieved by the apparatus without an operator's direct involvement being required. A further aim is to allow the containers to be efficiently moved once separated from the packages.

In a first aspect of the invention there is provided apparatus for use with a package comprising sheet material substantially surrounding a plurality of items which are retained by the sheet material in the package, said apparatus including a surface on which the items are placed and an elongate blade which can be moved towards the package wherein said blade is provided with a plurality of tooth formations along at least part of the length thereof such that the package is initially punctured at a plurality of spaced locations by the tooth formations as the blade makes contact with the sheet material of the package and subsequent movement of the blade causes the same to cut through the sheet material.

In one embodiment the continued movement of the blade causes the portions of the sheet material between the punctures to be cut to hence form the line of cut along the sheet material of a wall of the package.

In one embodiment the blade continues to be moved through the package to puncture and cut through the sheet material of the opposing wall of the package so as to form the package into two parts.

Typically the orientation of the package, the items in the package, the longitudinal axis of the blade and the direction of movement of the blade are selected such that the blade passes between adjacent rows of items in the package without damaging the same. Typically the orientation of the package and items is also selected such that when freed from the package the items are standing on their respective bottom faces on the surface of the apparatus.

In one embodiment the blade is provided to be used in conjunction with a tensioning means which causes the sheet material of the package, at least adjacent the location of the first line of cut, to be tensioned or taut prior to the puncture by the blade. In one embodiment the tensioning means includes a nib portion which runs along the length of the blade, at least to one side thereof. Typically the front end of the nib precedes the blade teeth in the direction of the travel of the blade such that the nib contacts the sheet material to tighten the same prior to contact by the blade. Typically the blade and nib are independently movable.

In one embodiment a nib is provided to each side of the blade. In one embodiment the tensioning means is biased to the advanced position of the blade teeth so as to ensure that the sheet material is brought to a predetermined tension level before the blade contacts and punctures the sheet material, thus ensuring that an effective and efficient cut of the sheet material is achieved.

In one embodiment the action of the tensioning means on the sheet material also acts to move apart the items on adjacent rows and between which rows the blade is to move.

Typically the surface of the apparatus on which the package is located is provided with a slot or recess which is shaped and located so as to accommodate the tensioning means and/or blade, thus allowing the tensioning means to move the sheet material of the second face to be cut into the slot to tension the same and for the blade to be moved through the sheet material fully, in order to cut the same.

Typically the position of the blade can be altered to suit the particular configuration of the package which is to be cut at that time.

In one embodiment the apparatus includes sheet material removal means which act on the sheet material once the cuts have been performed on the same. The removal means in one embodiment are provided in the form of at least a first means which acts to draw a first part of the sheet material, typically that which is parallel with the direction of movement of the blade, when cut, in a direction away from the blade, and second means which then act to grip said first part of the sheet material and move the same in a direction away from the base of the apparatus to fully remove the said part of sheet material out of contact with the items.

Typically, another set of sheet material removal means are provided to act on the second part of the sheet material on the other side of the cut line. Preferably said first and second removal means act simultaneously once the first and second cut parts have been formed by the cutting action of the blade to

move the respective sheet material parts out and upwardly from the items.

Typically the freed items from the package are then provided to be moved towards further apparatus, which, in one embodiment, may be filling apparatus. In one embodiment the items are containers such as bottles which are to be filled with liquid and the items are moved in rows towards a filling point.

In one embodiment the movement means used for moving the rows of items are belts thereby avoiding the possibility of oil or debris contamination occurring. Typically the movement of the items is achieved via servo driven motors and typically the belts are located to the side of the items rather than over the items.

In one embodiment the items are moved together as a group in a first direction towards movement means, said movement means provided to move a leading row of items in a new direction. In one embodiment the said new direction of movement is perpendicular to the said first direction.

In one embodiment the movement in the second direction is achieved by the use of paddles, with, in one embodiment, at least a first paddle at the head of the leading row and at least a second paddle at the rear of the leading row. In one embodiment the first and second paddles are independently driven with the respective drive means synchronised. Typically a series of the first paddles are located at spaced intervals on drive chains driven by first drive means, and a series of the second paddles are located at spaced intervals on a second set of drive chains driven by second drive means.

Typically the spacing between the paddles is dependent upon the number and size of items in the leading row.

Typically the above apparatus can be used without the need for direct operator intervention and can therefore be performed automatically.

In a further aspect of the invention there is provided apparatus for use in the removal of a sheet material surrounding items which are retained by the same, said apparatus including means to allow the sheet material to be separated into two parts wherein said apparatus includes at least one sheet material removal means, said removal means including first means to move a first part of the sheet material in a first direction away from the items and second means to move the said part in a second direction away from the items.

In one embodiment the first means includes one or more suction cups to attract the package part thereto and hence move the package part to the side of the said items. The second means typically includes gripping means which grip the said part and move the surface upwardly away from the base on which the items are mounted.

Typically the above apparatus can be used without the need for direct operator intervention and can therefore be performed automatically.

In a yet further aspect of the invention there is provided a method of removing a plurality of items from a package enclosure, said method comprising the steps of placing the package on a surface, moving a tensioning means onto a first wall of the package to tension the area of sheet material of the package adjacent the tensioning means and advancing a cutting blade to first puncture and then cut through the sheet material at said tensioned area of the sheet material.

Typically the tensioning means and blade are further advanced and the method repeated on the opposing wall of the package so as to separate the package sheet material into two cut parts.

Typically the method further involves the steps of applying a suction force onto opposing uncut side of the package to move the respective first and second cut parts in opposite directions away from the items and subsequently applying a gripping force on the first and second cut parts to move the same away from the items in a second direction.

In one embodiment the first movement is a sideways movement and the second movement is an upwards movement.

In a yet further aspect of the invention there is provided apparatus for selectively moving a plurality of items, said apparatus including first movement means to move said articles in a first direction so as to present a leading row of said articles at the front thereof, and second movement means to move the said articles in the leading row in a second direction and wherein said second movement means includes at least one paddle positioned at the front of said row and a second paddle positioned at the rear of the said row with respect to the second direction of movement, and said first and second paddles are moved under the influence of separate drive means.

In one embodiment the said first and second drive means each comprise at least one motor provided to drive at least one drive chain on which the paddle is located.

In one embodiment a series of first paddles are provided at spaced locations and a series of second paddles are provided at spaced locations along their respective drive chains. Typically

the position of said paddles is adjustable to suit the length of the row which is to be moved.

Typically the first paddle acts to support the position of the first item in the leading row as it moves and the second paddle acts at the rear of the leading row and acts to “strip” the items of the leading row from the remaining items.

In one embodiment the items are containers which are moved by the apparatus towards a location for the same to be filled and which therefore requires that the items are moved in a controlled and accurate manner to the filling location.

In one embodiment the first movement means includes a movable portion which is moved to the rear of the items to move the same in the first direction such that successive leading rows of items are presented to be moved by the second movement means.

Typically the first and second drive means are synchronised so as to ensure that the first and second paddles are provided at the required locations and moved at the required speeds. In one embodiment the motors used in the drive means are servo motors.

Specific embodiments of the invention will now be described with reference to the accompanying drawings; wherein

Figures 1a-d illustrate apparatus utilising the invention as herein described in one embodiment;

Figure 2a-c illustrate the blade of the invention in one embodiment;

Figure 3 illustrates a package of items of a type which can be separated using the apparatus and method of the invention;

Figure 4 illustrates movement apparatus in accordance with one embodiment of the invention; and

Figure 5 illustrates the movement of the containers using the apparatus in one embodiment of the invention.

Referring firstly to Figure 3 there is shown a package of a type for which the current invention can be used to advantage. The package 1 includes enclosing walls 3 formed by sheet material, such as plastics sheet material. The sheet material encloses therein a plurality of items which in this case are a plurality of empty plastics containers 6. The containers are held in rows 19 within the package by the sheet material. In order to be able to fill the containers it is necessary to remove the same from the sheet material while at the same time, ideally ensuring that the containers are retained together as a group, thereby improving the speed and efficiency of the ongoing handling of the same once freed from the package.

Figure 5 illustrates the required movement of the containers which can be achieved using apparatus in accordance with the invention. The packages 1 are introduced as indicated by arrow 70 to the base or surface 4 at which a cutting operation is performed by the apparatus as will be described. This opens the package and frees the containers which are then moved as indicated by arrow 42 to a point 72 at which the leading row of the containers are moved as indicated by arrow 44 for subsequent filling.

Referring now to Figure 1a-d there is shown apparatus 2 in accordance with one embodiment of the invention. The

apparatus includes a surface base 4 on which a plurality of items 6, in this case in the form of plastic bottles, are located in a selected configuration. The configuration is maintained by the sheet material surrounding the same and in which the same are delivered to the apparatus. In order to be able to fill and move the bottles individually the sheet material needs to be removed and this is achieved automatically by the apparatus as now described.

With the bagged containers in position on the base surface 4, a blade and tensioning means 8 are advanced downwardly from the position shown in Figures 1a-c down onto the top side wall 7 of the package which lies substantially in parallel with the tops of the containers 6.

The blade and tensioning means 8 is shown in more detail in Figure 1c and includes tensioning nibs 10 in advance of a blade 12. This means that the nibs 10 contact the sheet material 3 of the top 7 first and renders the same taut prior to contact by the blade. Typically the tensioning nib and blade are independently movable.

A preferred embodiment of the blade is shown in Figures 2a-c. The blade is elongate and linear and bevelled at one side of the cutting edge 14. Along the cutting edge 14 are provided a series of teeth formations 16 each having a puncture point 18. As the blade is brought into contact with the package sheet material so the puncture points form a series of spaced punctures in the sheet material side wall 7 along the length of the blade. The provision of the tensioning nib and the teeth formation in conjunction is found to improve the ability to cut through the sheet material significantly. The subsequent further advancement of the blade allows the whole cut to be performed through the sheet material of the side wall 7.

The blade and tensioning means movement is continued in a straight downward path and the package is arranged with respect to the blade such that the blade and tensioning means will pass down and between adjacent rows 20,22 of bottles without damaging the same. The blade and tensioning means eventually reach the opposing side wall 9 of the package and the same cutting process is repeated so as to cut through the side wall 9 with the blade passing into a slot in the base surface 4 so as to ensure that the blade passes through the sheet material to cut the side wall 9. This splits the package into first and second parts 26, 28.

With the package separated there is then a need to automatically remove the first and second parts of the sheet material from the bottles whilst allowing the bottles to remain upstanding and in the required configuration. In accordance with the invention this is achieved by two sets of removal means 30, 32.

Each of the sets 30, 32 comprise first means which include suction cups provided to entrain the sheet material of the respective side wall 36 , 38 of the parts 26, 28 sideways in respective directions perpendicular to the direction of movement of the blade. Second means are provided in each set which include grippers 34 which grip the sheet material and move the part upwardly and away from the base 4. The bottom radius of the external bottles in the group of bottles of the package assist in the sliding movement of the sheet material parts of the package away from the bottles and hence the bottles are then freed from the package and can be moved and filled as required.

In one embodiment the movement of the freed containers is achieved, by movement means (not shown) in the form of a

plate or portion which contacts a number of the containers from the first opened package towards a further handling point. When the containers of the first opened package are detected as having reached a certain location, then the containers from the second opened package can be moved forward and so on so as to ensure that the containers are being supplied as required. The containers are moved forwards in a first direction such that there is a provided a leading row of a required number of the containers. The leading row of the containers is then moved in a second direction 42, typically transverse or perpendicular to the first direction 42. This movement is achieved by using a paddle arrangement as shown in Figure 4. This apparatus includes a first drive means assembly 40 and a second drive means assembly 46.

The first drive means assembly includes a plurality of first paddles 48 provided on one or more drive chains 50 at spaced intervals therealong. The first paddles are designed to provide support for the container at the front of the leading row as it is moved in direction 44. The paddles are also provided in the retracted position shown until it is detected that one of the paddles is in the correct position for the first container of the leading row, at which point the paddle is moved outwardly.

The second drive means assembly includes a plurality of paddles 50 on one or more drive chains 52 at spaced intervals therealong. These paddles are designed to provide a moving force on the rear container in the leading row so as to move the containers in that row in direction 44.

The respective drive chains for the respective paddles are driven by independent motors to pass round the rotational axes 56, 58 with the motors being synchronised to ensure that the respective paddles are in the correct position to efficiently and accurately

the leading row of containers. Furthermore the movement of the paddles to the correct position for each leading row can be accelerated so as to increase the speed of operation of the apparatus. It should also be appreciated that the apparatus can be designed to be handed in a particular direction to suit operating requirements.

The apparatus as herein described therefore provides a means whereby the items can be freed from the enclosing package automatically and without human intervention being required. The specific arrangements of the invention allow the process to be repeatedly done with a high level of confidence.

## Claims

1. Apparatus for use with a package comprising sheet material substantially surrounding a plurality of items which are retained by the sheet material in the package, said apparatus including a surface on which the items are placed and an elongate blade which can be moved towards the package wherein said blade is provided with a plurality of tooth formations along at least part of the length thereof such that the package is initially punctured at a plurality of spaced locations by the tooth formations as the blade makes contact with the sheet material of the package and subsequent movement of the blade causes the same to cut through the sheet material.

2. Apparatus according to claim 1 wherein the continued movement of the blade causes the portions of the sheet material between the punctures to be cut to hence form the line of cut along the sheet material of a wall of the package.

3. Apparatus according to claim 1 wherein the blade continues to be moved through the package to puncture and cut through the sheet material of the opposing wall of the package so as to form the package into two parts.

4 Apparatus according to claim 3 wherein the blade passes between adjacent rows of items in the package.

5 Apparatus according to claim 1 wherein the orientation of the package and items is selected such that when freed from the package the items are standing on their respective bottom faces on the surface of the apparatus.

6 Apparatus according to claim 1 wherein the blade is used in conjunction with a tensioning means which causes the sheet

material of the package, at least adjacent the location at which the line of cut is to be formed, to be tensioned or taut prior to the puncture by the blade.

7 Apparatus according to claim 6 wherein the tensioning means includes a nib portion which runs along the length of the blade, at least to one side thereof.

8 Apparatus according to claim 7 wherein a nib is provided to each side of the blade.

9 Apparatus according to claim 7 or 8 wherein the front end of the nib precedes the blade teeth in the direction of the travel of the blade such that the nib contacts the sheet material prior to contact by the blade.

10 Apparatus according to any of claims 6-9 wherein the blade and tensioning means are independently movable.

11 Apparatus according to any of claims 6-10 wherein the tensioning means is biased to the advanced position of the blade teeth so as to ensure that the sheet material is brought to a predetermined tension level before the blade contacts and punctures the sheet material.

12 Apparatus according to any of claims 6-11 wherein the action of the tensioning means on the sheet material also acts to move apart the items on adjacent rows and between which rows the blade is to move.

13 Apparatus according to any of the preceding claims wherein tensioning means move with the blade to move the sheet material of an opposing wall of the package into tension prior to the blade moving through the same to cut the same.

14 Apparatus according to claim 13 wherein the surface of the apparatus on which the package is located is provided with a slot or recess which is shaped and located so as to accommodate the tensioning means and/or blade as they contact the opposing wall of the package.

15 Apparatus according to claim 1 wherein the position of the blade can be altered to suit the particular configuration of the package which is to be cut at that time.

16 Apparatus according to any of the preceding claims wherein the apparatus includes sheet material removal means which act on the sheet material once the cuts have been performed on the same.

17 Apparatus according to claim 16 wherein the removal means include a first means which acts to draw a first part of the sheet material in a direction away from the blade, and second means which grip said first part of the sheet material and move the same in a direction away from the surface of the apparatus to fully remove the said part of sheet material out of contact with the items.

18 Apparatus according to claim 17 wherein another set of sheet material removal means are provided to act on the second part of the sheet material on the other side of the cut line.

19 Apparatus according to any of the preceding claims wherein the apparatus is provided as part of a supply apparatus for providing the items to a filling location.

20. Apparatus according to claim 19 wherein the items freed from the package are then moved towards filling apparatus.

21 Apparatus according to claim 20 wherein first movement means are provided to move the items together as a group in a first direction towards second movement means provided to move a leading row of the items in a second direction.

22. Apparatus according to claim 21 wherein the said second direction of movement is perpendicular to the said first direction.

23 Apparatus according to claim 22 wherein the movement in the second direction is achieved by the use of paddles, with a first paddle at the head of the leading row and at least a second paddle at the rear of the leading row.

24 Apparatus according to claim 23 wherein the first and second paddles are independently driven with the respective drive means synchronised.

25 Apparatus according to claim 23 wherein a series of the first paddles are located at spaced intervals on drive chains driven by first drive means, and a series of the second paddles are located at spaced intervals on a second set of drive chains driven by second drive means.

26 Apparatus for use in the removal of a sheet material surrounding items which are retained by the same, said apparatus including means to allow the sheet material to be separated into two parts wherein said apparatus includes at least one sheet material removal means, said removal means including first means to move a first part of the sheet material in a first direction away from the items and second means to move the said part in a second direction away from the items.

27 Apparatus according to claim 26 wherein the first means includes one or more suction cups to attract the part thereto and hence move the part to the side of the said items and the second means includes gripping means which grip the said part and move the same upwardly away from the surface on which the items are mounted.

28. A method of removing a plurality of items from a package enclosure, said method comprising the steps of placing the package on a surface, moving a tensioning means onto a first wall of the package to tension the area of sheet material of the package adjacent the tensioning means and advancing a cutting blade to first puncture and then cut through the sheet material at said tensioned area of the sheet material.

29 A method according to claim 28 wherein the tensioning means and blade are further advanced and the method repeated on the opposing wall of the package so as to separate the package sheet material into two cut parts.

30 A method according to claim 29 wherein the method further involves the steps of applying a suction force onto opposing sides of the package to move the respective first and second cut parts in opposite directions away from the items and subsequently applying a gripping force on the first and second cut parts to move the same away from the items in a second direction.

31 A method according to claim 30 wherein the first movement is a sideways movement and the second movement is an upwards movement.

32 Apparatus for selectively moving a plurality of items, said apparatus including first movement means to move said articles

in a first direction so as to present a leading row of said articles at the front thereof, and second movement means to move the said articles in the leading row in a second direction and wherein said second movement means includes at least one paddle positioned at the front of said row and a second paddle positioned at the rear of the said row with respect to the second direction of movement, and said first and second paddles are moved under the influence of separate drive means.

33. Apparatus according to claim 32 wherein the said first and second drive means each comprise at least one motor provided to drive at least one drive chain on which at least one paddle is located.

34 Apparatus according to claim 32 wherein a series of first paddles are provided at spaced locations and a series of second paddles are provided at spaced locations along their respective drive chains.

35 Apparatus according to claim 32 wherein the first paddle acts to support the position of the first item in the leading row as it moves and the second paddle acts at the rear of the leading row to strip the items of the leading row from the remaining items.

36 Apparatus according to claim 32 wherein the apparatus includes a movable portion which is moved to the rear of the items to move the same in the first direction such that successive leading rows of items are presented to be moved by the second movement means.

1/4

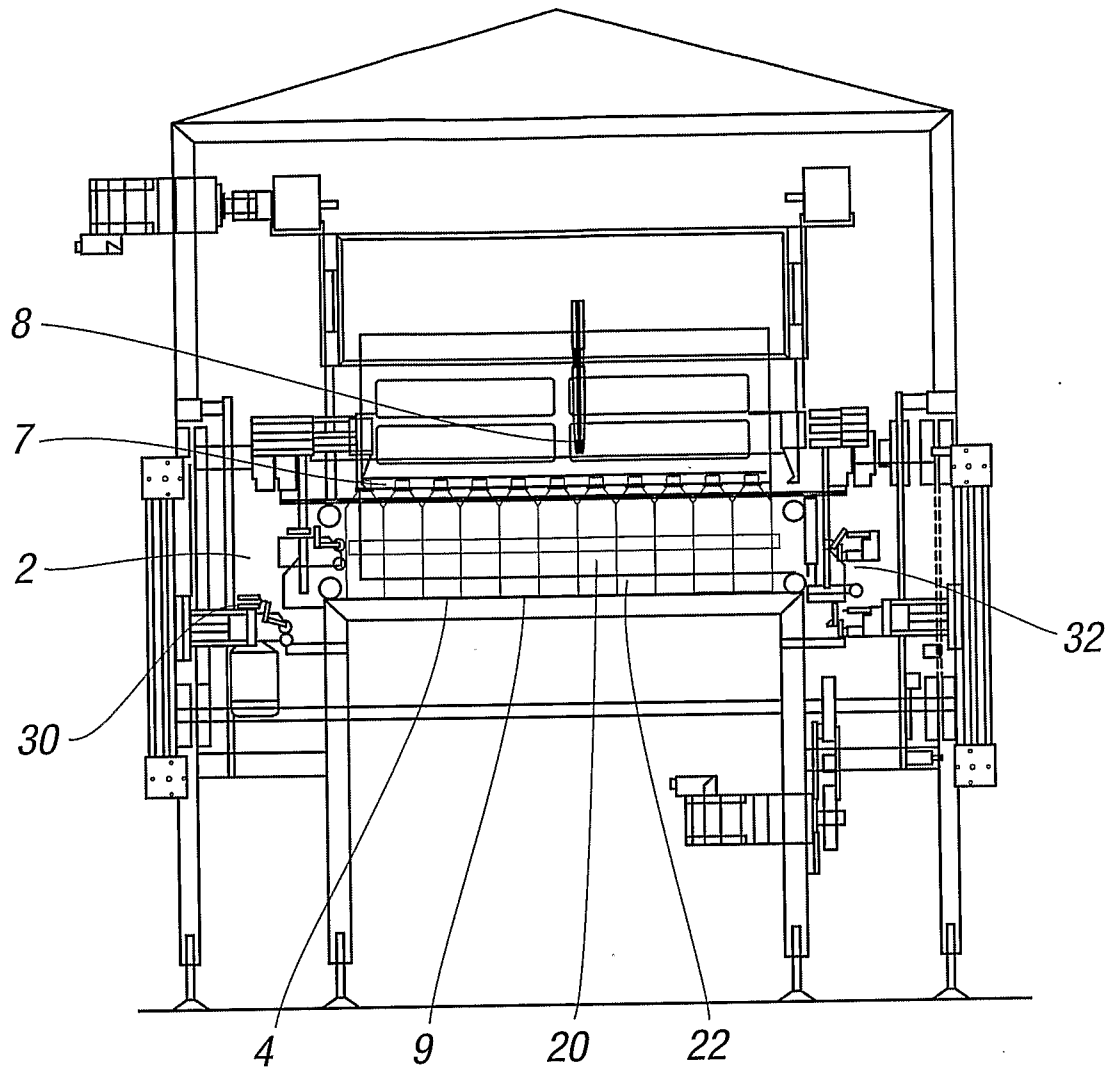


FIG. 1a

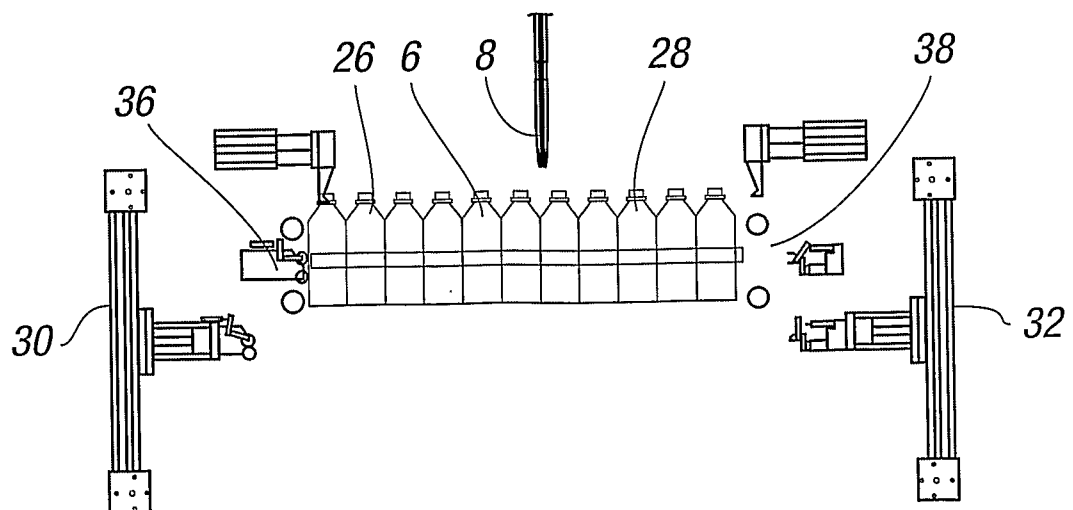


FIG. 1b

2/4

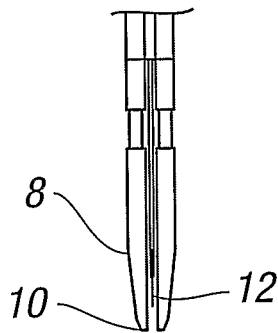


FIG. 1c

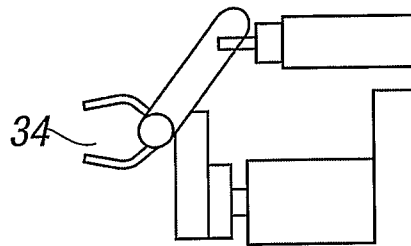


FIG. 1d

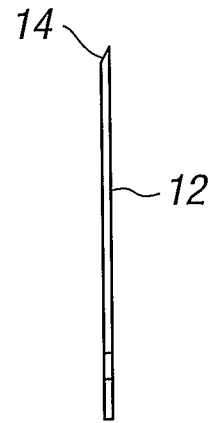


FIG. 2c

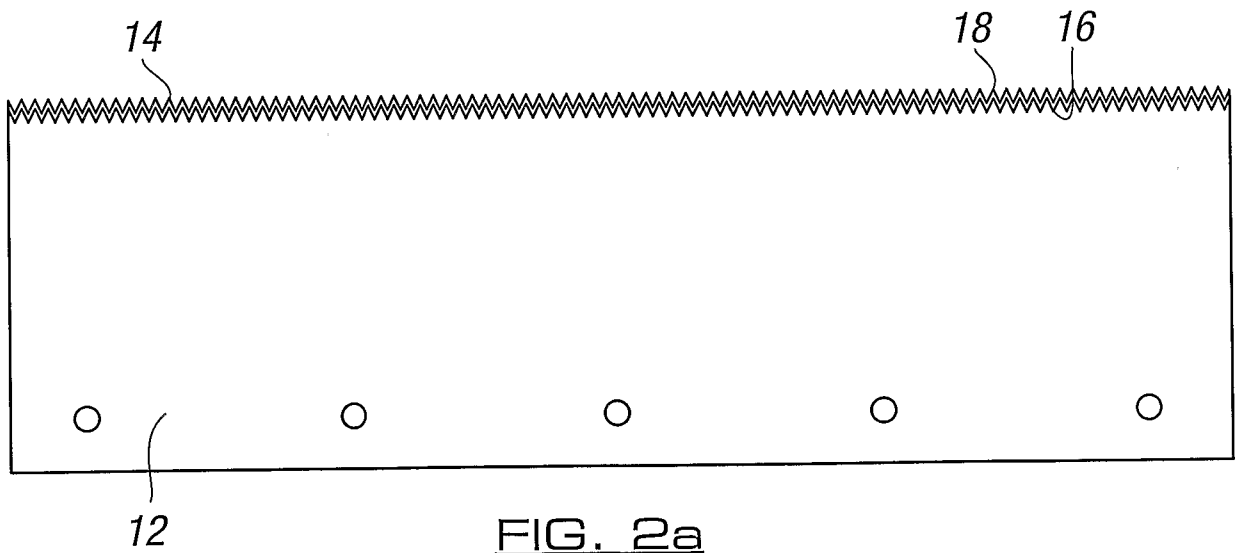
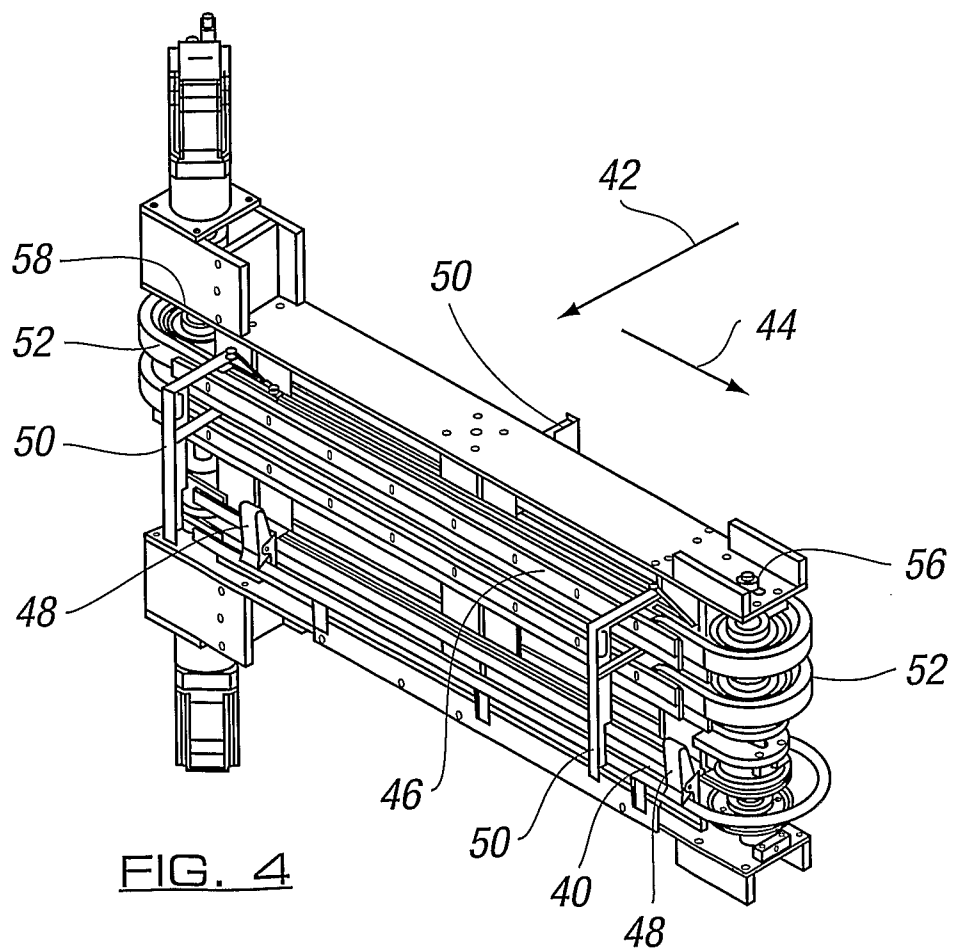
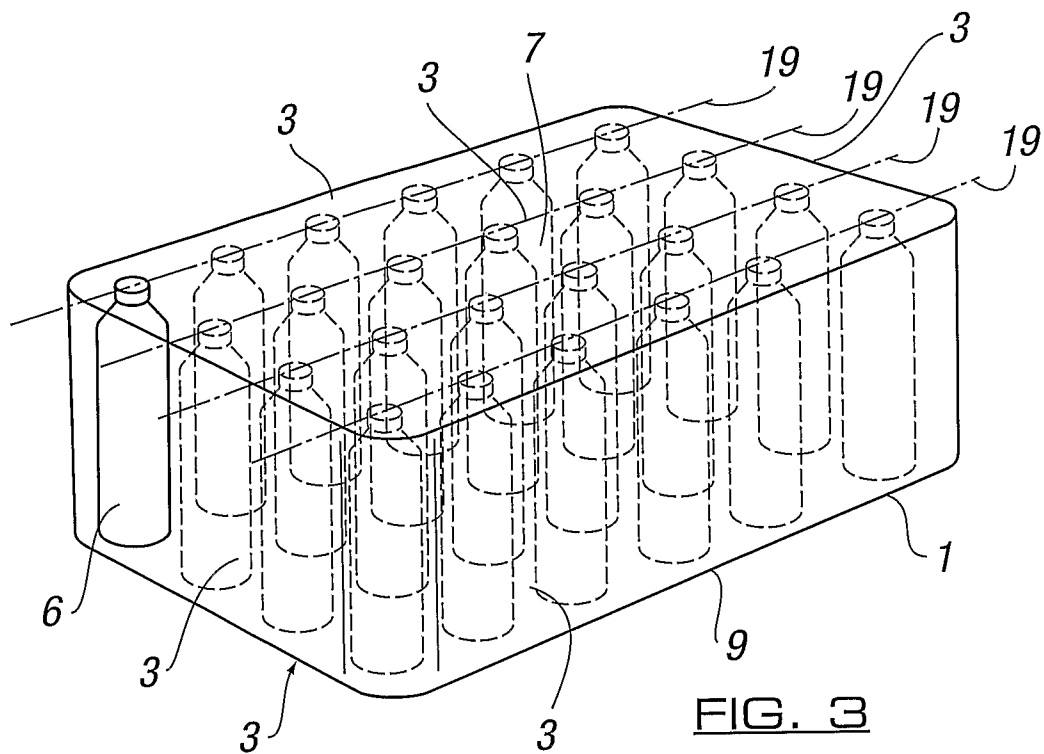


FIG. 2a



FIG. 2b

3/4



4/4

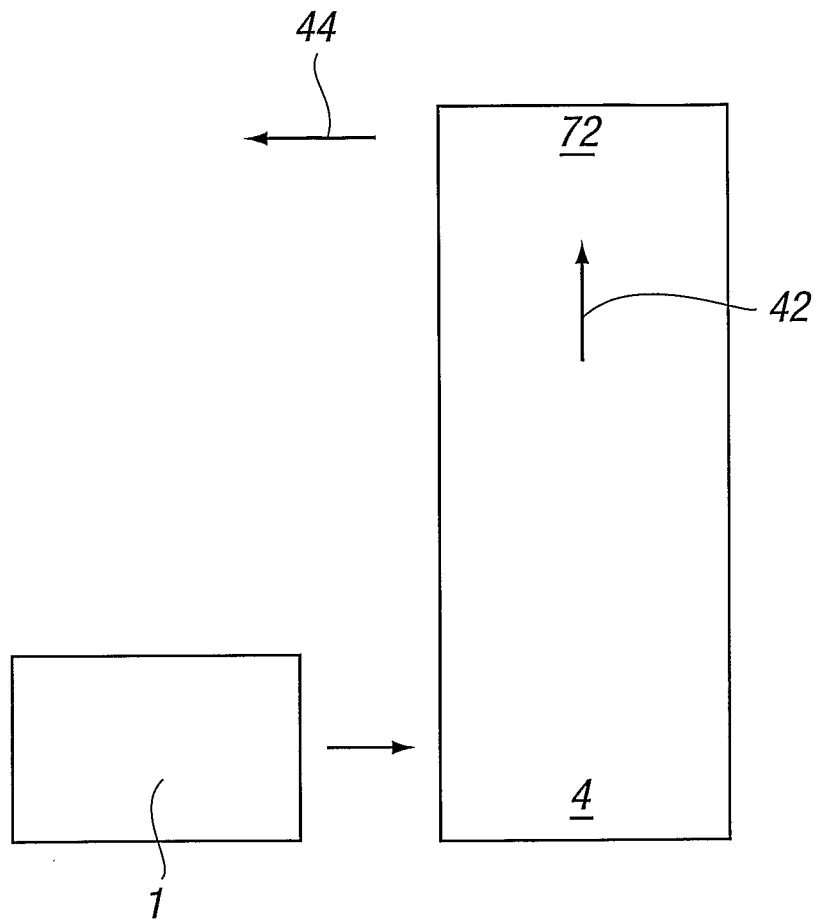


FIG. 5