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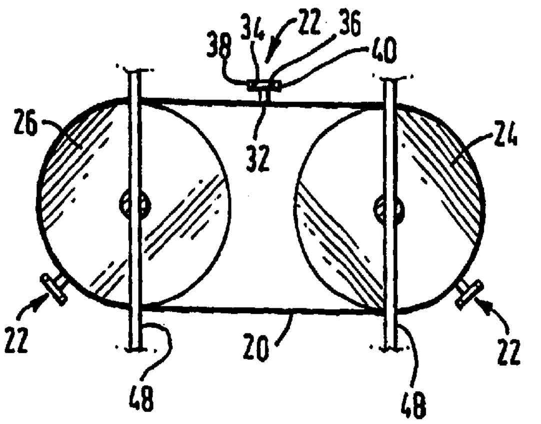


(57) Abstract

An apparatus (10) is arranged to reposition substantially front and rear facing flaps (12 and 14) on a carton (16) which is transported along a feed path (18). The apparatus comprises one or more lugs (22) arranged to move around a predetermined locus and is operable such that the or a lug is periodically positioned in the feed path (18) in front of a carton (16) causing the carton (16) to contact the lug (22) and reposition the front flap (12) on the carton (16). The apparatus (10) is further operable periodically to increase the velocity of the lug or lugs (22) so as to bring the or a lug into contact with the rear of the carton (16) thus repositioning the rear flap (14) thereon.

APPARATUS FOR REPOSITIONING CARTON FLAPS

Technical Field of the Invention

This invention relates to a repositioning apparatus and in particular to an apparatus arranged to reposition substantially forward and rear facing flaps on a carton automatically.

Background of the Invention

It has become common practice in the retail trade when selling multiples of individual products, such as beverage cans and bottles, to produce multi-packs containing several individual units. With cans and bottles of beverages in particular it is common to produce cartons containing six, eight, twelve or even twenty-four individual bottles or cans. The size of the multi-pack and form of carton or carrier used to contain the individual units depends on the product being sold and to a degree on national preferences for different carton styles.

One requirement of all of these types of cartons is to ensure that the bottles or cans therein are retained securely and are prevented from moving significantly with respect to each other, as this could cause damage to the individual units. Further, the bottles or cans must be securely retained to ensure that they are not easily removed or do not fall from the carton.

To address this requirement, various carton designs have been developed. For example, with open-ended cartons of the wraparound type, corner gussets may be provided extending between the carton side walls and the bottom and/or top carton walls, as can be seen in EP-A-0 459 658. Alternatively, retention panels may be provided to extend across the upper end and/or lower end of the carton, as can be seen in EP-A-0 560 658. Still further, wraparound cartons may be provided with end doors which are folded to a closed position. As can be seen in EP-A-0 499 426, when such cartons are for use with bottles having tapered necks, the doors may be provided with upper portions that are angled against the necks of the outermost bottles.

In all of these examples, the wraparound cartons are typically applied to the container group by automated packaging machinery, in which the container group moves along a conveyor. The carton blanks is applied to the top or bottom of the group, with the side walls extending transversely of the conveyor direction. The carton is then wrapped around the group. The retention structure is typically folded into position either during or subsequent to the wrapping operation.

With fully-enclosed, sleeve-type cartons for bottles, upper portions of the end walls may also be angled against the necks of the outermost bottles. Such cartons are also loaded on automated packaging machinery, in which the container group moves along one or more conveyors. If the sleeve is applied vertically to the group, such as by lowering from above, the angled upper portions may be folded into position after the carton has been applied to the group.

In all of the above examples, the positioning of the flaps comprising the retention structure is made difficult because the flaps are located at both the forward and tailing ends of the carton as it is moved along the conveyor. Thus, both forward and rearward folding of the flaps are required.. As packaging machines operate at extremely high speeds, with container packaging machines commonly packaging 250 containers per minute, there is a requirement for a means of positioning these flaps which can be automated without either damaging the containers or cartons, or slowing down the packing machine.

Object of the Invention

It is an object of the present invention to overcome or ameliorate some of the disadvantages of the prior art or at least to provide a useful alternative.

Summary of the Invention

There is firstly disclosed herein an apparatus arranged to reposition substantially front and rear facing flaps on cartons being transported along a feed path, the apparatus comprising one or more lugs arranged to move around a predetermined locus, the apparatus being operable such that a lug is periodically positioned in the feed path in front of a carton causing the carton to contact the lug and reposition the front flap on said carton, the apparatus being further operable periodically to increase the velocity of the or a lug so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

There is further disclosed herein a method of repositioning substantially forward and rear facing flaps on cartons being transported along a feed path utilising an apparatus having one or more movable lugs arranged to move around a predetermined locus the method comprising periodically positioning the or a lug in the path of a carton such that the carton contacts the lug and repositions the front flap on said carton, the velocity of said lug or lugs being increased so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

There is further disclosed herein an apparatus for loading bottles having an angled neck into cartons, the apparatus including means for repositioning flaps on said cartons adjacent the necks of said bottles, said repositioning apparatus being arranged to reposition substantially front and rear facing flaps on such cartons being transported along a feed path, the repositioning apparatus comprising one or more lugs arranged to move around a predetermined locus, the apparatus being operable such that a lug is periodically positioned in the feed path in front of a carton causing the carton to contact the lug and reposition the front flap on said carton, the apparatus being further operable periodically to increase the velocity of the or a lug so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

The present invention, at least in a preferred embodiment provides a method of and apparatus for automatically repositioning flaps on a carton at processing speeds comparable with that of container loading machines.

The present invention further preferably provides an apparatus for loading containers into cartons, which includes an apparatus for repositioning flaps on the cartons in order to secure the containers in place in the carton.

Preferably, the locus is defined by a single variable speed continuous belt to which the lug or lugs are attached.

Preferably, the apparatus comprises a control means arranged to control the speed of said lug or lugs.

More preferably, the control means comprises means for receiving information regarding the speed of cartons in the feed path. Preferably, said control means comprises a manual input means. Alternatively, said control means comprises a sensor arranged to measure the speed of cartons in the feed path.

Preferably, the apparatus has a sensor arranged to measure the speed of the lug or lugs.

Preferably, said control means varies the speed of the lug or lugs to lie within the range plus or minus 1-30% of the speed of said cartons traversing said feed path.

Most preferably, the control means causes the lug or lugs to move at a speed 20% less than the speed of the cartons on said feed path when the apparatus is arranged to close a front flap on said carton and at a speed 20% greater than the speed of said cartons when the apparatus is arranged to close the rear flap on a carton.

Preferably, the apparatus comprises three equally spaced lugs arranged on said continuous belt.

Preferably, the or each lug is substantially T-shaped, the base of the T being attached to the continuous belt and the substantially front and rear facing edges of the T having resilient, preferably rubber, portions formed thereon.

Preferably, the continuous belt is a friction belt, which is moved due to friction between the belt and a feed roller. Alternatively, the continuous belt contains recesses which engage correspondingly shaped protrusions on a feed roller, during use.

Preferably, the method includes the speed of the cartons in said feed path being received by a control means which controls the repositioning apparatus.

Preferably, the speed of said cartons is entered manually. Alternatively, the speed of said cartons is sensed automatically.

Preferably, the speed of the or each lug is varied by said control means to lie within the range plus or minus 1-30% of the speed of the cartons traversing said feed path.

More preferably, the or each lug is moved at a speed 20% less than the speed of the cartons in said feed path when a front flap is being repositioned and at a speed 20% greater than the speed of the cartons in the feed path when a rear flap is being repositioned.

Brief Description of the Drawings

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of an apparatus in accordance with an embodiment of the present invention adjacent a feed path of an apparatus for loading containers into cartons;

FIGURE 2 is a plan view of the apparatus of Figure 1;

FIGURE 3 is an perspective view of an alternative roller and continuous belt which may be utilised in the apparatus of Figure 1;

FIGURE 4 is an illustration of a carton with which the present invention may be utilised;

FIGURE 5 is a plan view of the operation of a dual apparatus at specific intervals throughout the repositioning process;

FIGURE 6 is an electrical block diagram of the apparatus of Figure 1; and

FIGURE 7 is a schematic block diagram of a container loading apparatus incorporating the apparatus of Figure 1.

Detailed Description of a Preferred Embodiment

Figures 1 and 2 illustrate an apparatus 10 arranged to reposition substantially front and rear facing flaps 12 and 14 on a carrier 16 being transported along a feed path 18 of a standard apparatus for loading bottles into a carton. The apparatus 10 comprises a continuous belt 20 having, in this embodiment, three lugs 22 attached thereto. The belt is placed around a drive roller 24 and a follower roller 26. Controlled movement of the drive roller 24 powered by a drive motor 28 (Figure 6) under the control of a control means 30 (Figure 6) causes the drive roller 24 to rotate causing the continuous belt 20 to move which in turn causes the follower roller 26 to rotate. Preferably, the drive motor 28, is a servo motor. The continuous belt 20 may be manufactured from a frictional material such as rubber and may be caused to move due to friction between the roller 24 and the continuous belt 20. Alternatively, the drive motor may have a toothed section as illustrated in Figure 3 each of the teeth being received in co-operating recesses 27 in the continuous belt 20, during use, in order to move the belt 20.

The rollers 24 and 26 are positioned adjacent a feed path 18 in a bottle loading apparatus such that movement of the belt 20 will periodically bring lugs 22 into the feed path 18.

The apparatus 10 is operable such that the individual lugs 22 are periodically positioned in the feed path 18 in front of cartons 16 causing each carton 16 to contact the lug 22 and in so doing to reposition the front facing flap 12 on the carton 16.

The continuous belt 20 is positioned at a height such that the lugs 22, when in use, will contact the front and rear flaps 12 and 14 of the cartons 16 so as to move the flaps. This is explained further with reference to Figures 4 and 5.

The apparatus 10 is further operable to increase the velocity of the lugs periodically so as to bring the individual lugs 22 into contact with the rear facing flaps 14 of the cartons 16, thus repositioning the rear facing flap 14. In the present embodiment, a single variable speed continuous belt 20 is utilised. However, a plurality of belts may be utilised. In addition, a single roller with one or more lugs 22 attached thereto may be utilised without the use of a continuous belt.

As illustrated in Figures 1 and 2 the lugs are preferably in the form of a T-shaped member, positioned at equal intervals around the continuous belt 20. The base 32 of each lug 22 is connected to the continuous belt 20 such that the first arm 34 of the T will project forward of the base 32 and the second arm 36 of the T will project rear of the base 32 with respect to the feed path 18, when in use. The end portion of the front and rear facing arms of the T are provided with resilient portions 38 and 40, formed for example from rubber, so as to minimise the likelihood of damage to the bottles within the cartons 16 during use.

The apparatus 10, as illustrated in Figure 6 includes a control means 30 arranged to control the speed of the continuous belt 20 during use. This control means may be a dedicated processor or may be a control means for a packaging machine with which the apparatus 10 is used, which is adapted to control the apparatus 10. Alternatively, the control means may preferably be a known, programmable servo control system.

The control means 30 receives information from a sensor 42 arranged to detect the speed of the continuous belt 20; which may detect the speed of the belt directly or may detect the speed of the drive roller 24. In addition the apparatus 10 includes means in the form of a sensor 44 for receiving information regarding the speed of the cartons on the feed path 18 which is transmitted to the control means 38. Alternatively, there may be manual input means 46 through which the speed of the cartons 16 on the feed path may be input into the control means 30.

As is illustrated in Figure 2, the apparatus 10 is mounted on a pair of rails 48 which run perpendicular to the feed path 18 thus enabling the apparatus 10 to be rolled into an operating position wherein the or a lug 22 projects into the feed path 18, when in use, and rolled out of this position to a rest position in which the or a lug 22 does not extend into the feed path 18. Thus, the apparatus 10 can be withdrawn when the packaging machine with which it is used is loading cartons which do not require the repositioning of flaps.

Before discussing the method of operation of the apparatus 10, it may be useful to detail, by way of example, a carton 16 with which the apparatus 10 may be used.

Figure 4 illustrates such a carton 16 having a front wall 50 and a rear wall 52 each of which are divided into a lower portion 54 and an upper flap 12 and 14. The flaps 12 and 14 and the lower portions 54 of the front and rear walls 50 and 52 are each separated by a crease (or fold) 56 which allows the flaps to pivot with respect to the lower portion 54 of each wall. A second crease (or fold) 58 is located on each of the side faces 60 of the carton between the point where the crease 56 joins the side wall of the carton and the top surface 62 of the carton. This crease is provided so that the side wall can bow out slightly allowing the flaps 12 and 14 to reposition against the neck 62 of the bottle 64 within the carton 16, as illustrated by the dashed lines 63 and 65. With such a carton 16 it would be appropriate for the or a lug 22 to strike the flaps generally centrally. However, if the flaps are not completely forward and rear facing and are angled in some way then it may be appropriate for the or a lug 22 to contact some other portion of the flaps. Also, two apparatuses may be used, as illustrated in Figure 5, in which case each of the lugs 22 will be arranged not to contact the flap centrally, but instead to contact the flaps at a predetermined position closer to the sides 60 of the cartons 16.

When in use, the apparatus 10 is rolled into a position wherein the lugs 22 will project into the feed path 18 as illustrated in Figure 1. When starting up the apparatus the continuous state speed of the conveyor means which transports the cartons 16 is input into the control means 30 using the manual input means 46 (Figure 6). Thus when the apparatus 10 is input into the in use position a lug 22 will be arranged to contact the appropriate flap 12 or 14 of the carton 16 at a specific percentage above or below the speed of the feed path, as will be discussed in detail below.

During the initial start up process both the conveyor means used to propel the cartons 16 along the feed path 18 and the continuous belt 20 will increase gradually in speed to a standard running speed. Both of these apparatuses will be controlled such that this process will be gradual and no damage will occur to the cartons 16 or their contents.

If we first discuss an embodiment of the invention in which two apparatuses 10 are used and consider the action of a single lug 22 there are two ways of considering the repositioning process depending upon whether or not you consider the lug to strike the front or rear facing flaps first. For example, if the lug 22 is positioned in the feed path in front of a carton 16 at a speed less than that of the cartons 16 on the feed path then a carton 16 will contact the lugs 22 and the front flap 12 will be repositioned. Thereafter, the control means 30 will increase the speed of the motor 28 which will cause the lug 22 to increase in speed and to make a revolution around the locus of the continuous belt 20 causing the lug 22 to contact the rear flap 14 of the same carton.

However, if you consider that the lug 22 strikes the rear flap of a first carton initially and the speed of the lug 22 is then reduced to less than that of the speed of the cartons in the feed path 18 then the lug 22 will then contact the front flap 12 of the subsequent carton to be propelled along the feed path 18. These two processes are essentially the same the difference depending on the point in the cycle at which the analysis is begun. If you then consider an embodiment having a plurality of lugs after a first lug 22 is slowed to cause the repositioning of the front flap 12 of a carton 16, the increase in speed of the lugs 22 causes the first lug to be moved out of the cartons way and causes a second lug 22 to be brought into contact with the rear facing flap of the carton as illustrated sequentially in Figure 5.

Figure 5 illustrates one embodiment of the apparatus and five steps of repositioning the front and rear facing flaps on cartons being transported on a feed path. In step 1, the lugs move into the feed path. Then, the lugs are accelerated relative to the feed path velocity to be brought into contact with and to reposition the rear facing flaps, shown as step 2. Thereafter, as the carton leaves the apparatus, the lugs are decelerated relative to the feed path velocity, so that the lugs are brought into contact with the front facing flaps of the next succeeding carton and the flaps are repositioned, shown in step 3. In steps 4 and 5 the lugs are accelerated to be moved out of the feed path. Rear lugs are then moved into the feed path behind the carton and the above procedure is repeated.

It is most efficient to have three lugs 22 on a continuous belt 20 as a carton 16 can be located between two lugs 22; one at the front and one at the rear of the carton, without causing interference with the remaining cartons 16 in the feed path 18, the third lug 22 being at a point on the continuous belt 20 remote from the feed path 18 at that time. As the forward most of these lugs 22 is accelerated the carton 16 in front thereof is moved along the feed path 18 out of the path of the lug 22. No more than two lugs can be used in the feed path 18 in any one time as a third lug 22 would require a carton 16 to be maintained in front of the middle lug 22 while the rear most lug 22 is accelerated to contact the rear flap 14 of the rear most carton 16. However, this would mean the repeated contact of the second lug 22 with the second carton 16 which may cause damage.

When the foremost lug 22 is slowed to cause a carton 16 to contact the lug 22 the speed of the continuous belt 20 is within 1 to 30% less than that of the cartons 16 progressing along the feed path 18. Likewise, when the lug 22 is accelerated to cause contact with the rear most flap 14, the speed of the continuous belt 20 is between 1 and 30% greater than that of the cartons 16 in the feed path 18. Preferably, the continuous belt is moved at a speed 20% less than the speed of the cartons 16 in the first instance and at a speed 20% greater than the speed of the cartons 16 in the feed path in the second instance, as this provides a sufficient force to reposition each of the flaps without damaging the carton 16.

As the speed of the cartons in the feed path is varied to accommodate the speed of bottling of other parts of a bottling process the speed of the continuous belt 20 is also varied so that the speed of the continuous belt 20 is maintained within these percentage variations. However, there may be some situations in which a faster or slower speed is required, for instance if a particularly thick caliper of board is used to produce the carton then a greater variation may be required to cause sufficient force to reposition the flaps thereon. Also, the speed may be varied if one or two apparatuses are used.

Figure 7 is a schematic representation of an apparatus 70 for loading bottles into cartons 16, which illustrates the position in the apparatus 70 of the apparatus 10 for repositioning flaps, in accordance with the present invention. The apparatus 70 includes a carton hopper and feeder mechanism (block 72) from where cartons 16 are taken and fed to a mechanism (block 74) which combines bottles and cartons either by wrapping cartons around the bottles or placing bottles in the cartons depending on the type of carton used. Bottles are fed into this mechanism at a predetermined rate and in a predetermined arrangement, from a storage area (block 76). Once the cartons and bottles are united the carton is locked in place by suitable locking means, usually in the base of the carton, (block 78) in a known manner. Thereafter, the flaps 12 and 14 in the carton are repositioned in accordance with the present invention (block 80), and the cartons are fed to a storage area (block 82) from where they can be crated for shipping. The order of the processes detailed in blocks 78 and 80 can be reversed in some apparatuses in accordance with the present invention.

While the preferred embodiment described herein is for loading bottles into cartons, it will be recognised that the invention is not limited to cartons for bottles. The invention may be used with machines for packaging cans, paperboard "bricks" and other bottles into cartons.

Moreover, while the preferred embodiment described herein is shown as part of a machine for loading bottles into a vertically loaded sleeve type carton, the invention is not limited to cartons of this type. As will be recognised by those skilled in the art, the invention, may be used with wraparound or end loaded cartons, and may be used to reposition various carton flaps used for retention and other purposes.

Modifications may be incorporated without departing from the scope of the present invention as defined in the accompanying claims.

What we claim

1. An apparatus arranged to reposition substantially front and rear facing flaps on cartons being transported along a feed path, the apparatus comprising one or more lugs arranged to move around a predetermined locus, the apparatus being operable such that a lug is periodically positioned in the feed path in front of a carton causing the carton to contact the lug and reposition the front flap on said carton, the apparatus being further operable periodically to increase the velocity of the or a lug so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

2. The apparatus of Claim 1, wherein there is a single variable speed continuous belt to which the lug or lugs are attached.

3. The apparatus of Claim 2, wherein control means are arranged to control the speed of said lug or lugs.

4. The apparatus of Claim 3, wherein the control means comprises means for receiving information regarding the speed of cartons in the feed path.

5. The apparatus of Claim 4, wherein said control means comprises a manual input means.

6. An apparatus as claimed in Claim 4, wherein said control means comprises a sensor arranged to measure the speed of cartons in the feed path.

7. An apparatus as claimed in Claim 3, having a sensor arranged to measure the speed of said lug or lugs.

8. An apparatus as claimed in Claim 3, wherein said control means varies the speed of the lug or lugs to lie within the range plus or minus 1-30% of the speed of said cartons traversing said feed path.

9. An apparatus as claimed in Claim 8, wherein the control means causes the lug or lugs to move at a speed 20% less than the speed of the cartons on said feed path when the apparatus is arranged to reposition a front flap and at a speed 20% greater than the speed of said cartons when the apparatus is arranged to reposition a rear flap on a carton.

10. An apparatus as claimed in Claim 1, wherein there are three equally spaced lugs arranged on said continuous belt.

11. The apparatus of Claim 1, wherein the or each lug is substantially T-shaped, the base of the T being attached to the continuous belt and the substantially front and rear facing edges of the T having resilient, preferably rubber, portions formed thereon.

12. An apparatus as claimed in Claim 1, wherein the continuous belt is a friction belt, which is moved due to friction between the belt and a feed roller.

13. An apparatus as claimed in Claim 1, wherein the continuous belt contains recesses which engage correspondingly shaped protrusions on a feed roller during use.

14. A method of repositioning substantially forward and rear facing flaps on cartons being transported along a feed path utilising an apparatus having one or more movable lugs arranged to move around a predetermined locus the method comprising periodically positioning the or a lug in the path of a carton such that the carton contacts the lug and repositions the front flap on said carton, the velocity of said lug or lugs being increased so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

15. The method of Claim 14, wherein the speed of a carton in said feed path is received by a control means which controls the repositioning apparatus.

16. A method as claimed in Claim 15, wherein the speed of said cartons is entered manually.

17. The method of Claim 15 wherein, the speed of said cartons is sensed automatically.

18. The method of Claim 15, wherein the speed of the or each lug is varied by said control means to lie within the range plus or minus 1-30% of the speed of the cartons traversing said feed path.

19. The method of Claim 15, wherein the or each lug is moved at a speed 20% less than the speed of the cartons in said feed path when a front flap is being repositioned and at a speed 20% greater than the speed of the cartons in the feed path when a rear flap is being repositioned.

20. An apparatus for loading bottles having an angled neck into cartons, the apparatus including means for repositioning flaps on said cartons adjacent the necks of said bottles, said repositioning apparatus being arranged to reposition substantially front and rear facing flaps on such cartons being transported along a feed path, the repositioning apparatus comprising one or more lugs arranged to move around a predetermined locus, the apparatus being operable such that a lug is periodically positioned in the feed path in front of a carton causing the carton to contact the lug and reposition the front flap on said carton, the apparatus being further operable periodically to increase the velocity of the or a lug so as to bring the or a lug into contact with the rear of the carton, thus repositioning the rear flap thereon.

21. The apparatus of Claim 20, wherein there is a single variable speed continuous belt to which the lug or lugs are attached.

22. The apparatus of Claim 21, wherein control means are arranged to control the speed of said lug or lugs.

23. The apparatus of Claim 22, wherein the control means comprises means for receiving information regarding the speed of cartons in the feed path.

24. The apparatus of Claim 23, wherein said control means comprises a manual input means.

25. An apparatus as claimed in Claim 23, wherein said control means comprises a sensor arranged to measure the speed of cartons in the feed path.

26. An apparatus as claimed in Claim 22, having a sensor arranged to measure the speed of said lug or lugs.

27. An apparatus as claimed in Claim 22, wherein said control means varies the speed of the lug or lugs to lie within the range plus or minus 1-30% of the speed of said cartons traversing said feed path.

28. An apparatus as claimed in Claim 22, wherein the control means causes the lug or lugs to move at a speed 20% less than the speed of the cartons on said feed path when the apparatus is arranged to reposition a front flap and at a speed 20% greater than the speed of said cartons when the apparatus is arranged to reposition a rear flap on a carton.

29. An apparatus as claimed in Claim 20, wherein there are three equally spaced lugs arranged on said continuous belt.

30. The apparatus of Claim 20, wherein the or each lug is substantially T-shaped, the base of the T being attached to the continuous belt and the substantially front and rear facing edges of the T having resilient, preferably rubber, portions formed thereon.

31. An apparatus as claimed in Claim 20, wherein the continuous belt is a friction belt, which is moved due to friction between the belt and a feed roller.

32. An apparatus as claimed in Claim 20, wherein the continuous belt contains recesses which engage correspondingly shaped protrusions on a feed roller during use.

33. An apparatus arranged to reposition substantially front and rear facing flaps on cartons being transported along a feed path, substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

34. A method of repositioning substantially forward and rear facing flaps on cartons being transported along a feed path, said method substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

35. An apparatus for loading bottles having an angled neck into cartons, said apparatus substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

Dated 30 April, 2001
The Mead Corporation
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON

FIG. 1

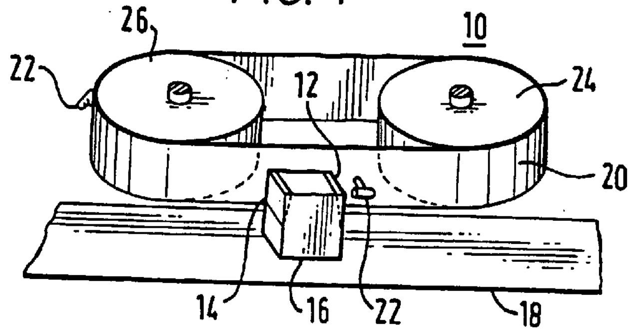


FIG. 2

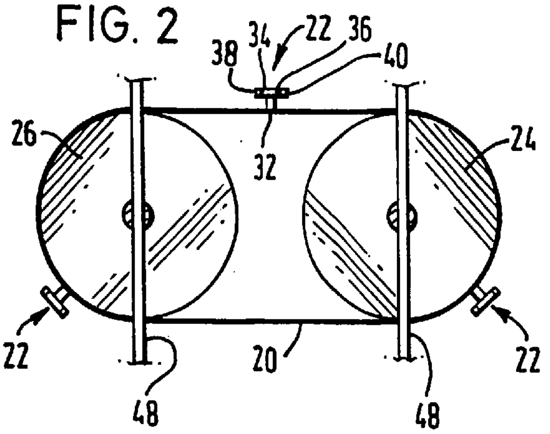
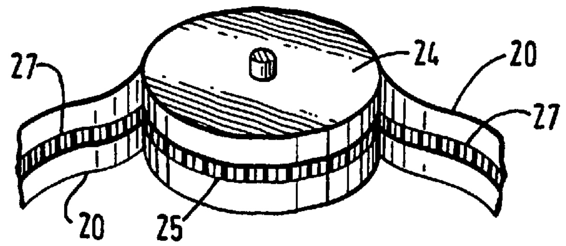


FIG.3



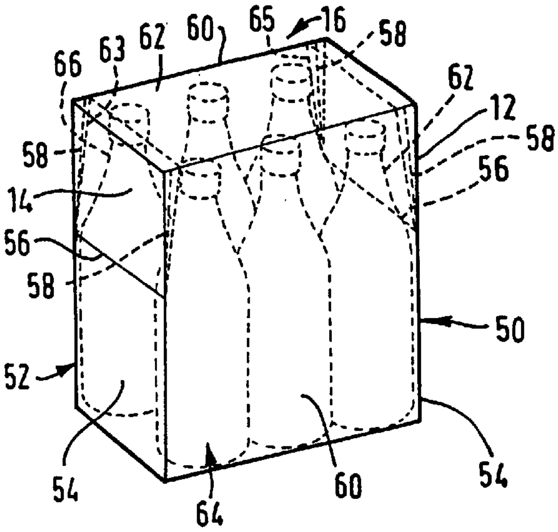


FIG. 4

FIG. 6

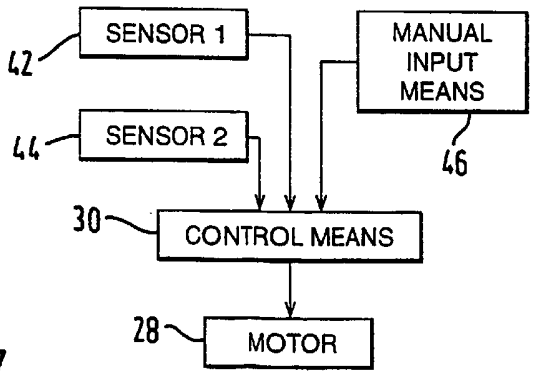
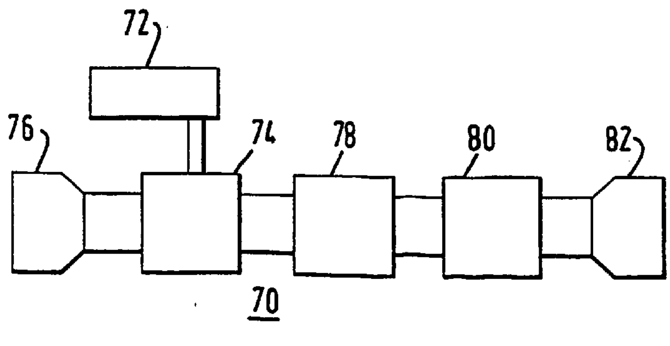


FIG. 7



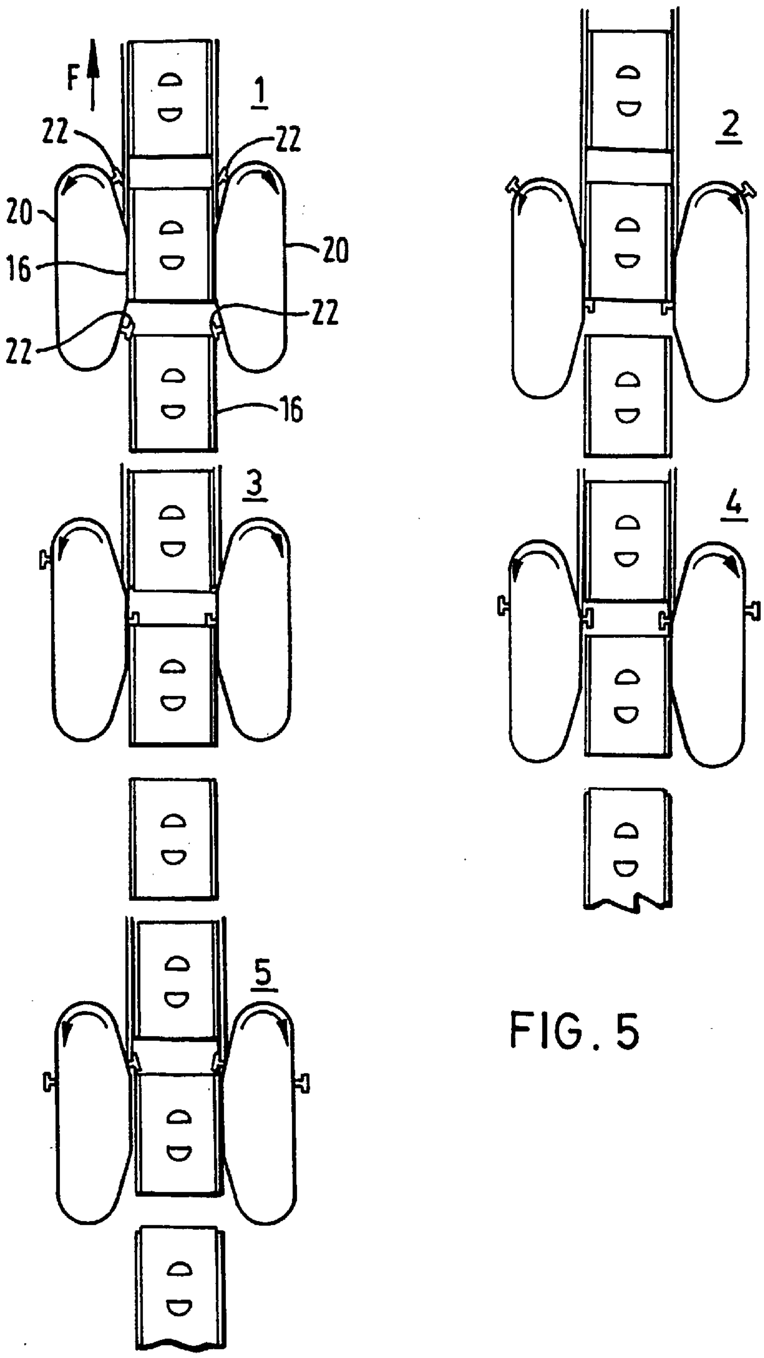


FIG. 5