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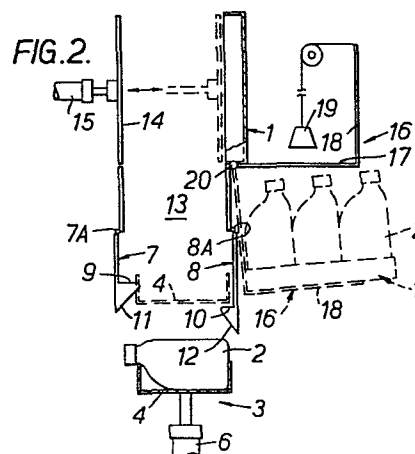
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54 Method and machine for packing elongate articles into boxes or trays.

57 Elongate articles such as plastics bottles (2) are packed into a box or tray (1) by arranging the articles (2) side by side in a stack of superimposed horizontal rows and then displacing horizontally from the stack, and in the direction of their horizontal parallel axes, an array of the superimposed articles into the box or tray arranged on its side, the box or tray being then tipped onto its base.



Method and machine for packing elongate articles
into boxes or trays

This invention relates to the packing of elongate articles such as plastic bottles into boxes or trays.

The invention concerns more particularly the loading of elongate articles end first into a tray or box as
5 a preliminary to a subsequent wrapping operation, or for the purpose of conveying the articles to a machine which utilizes the articles, such as a packaging or filling machine. Where the articles are in the form of bottles or plastic containers they may be loaded base first into a shallow
10 tray prior to the wrapping of the articles and the tray in plastics film to retain the articles in the tray. Alternatively, where the articles in question are plastic bottles which have subsequently to be filled, it is advantageous to load the bottles into a box or tray
15 head first, so that the open ends of the bottles face downwardly and contact the base of the box or tray, thereby minimising the risk of internal contamination of the bottles.

Existing machines for the collating and loading of
20 articles such as bottles into boxes or trays tend to be complicated and expensive, since the articles are generally conveyed upright along a horizontal conveyor to an empty tray which is disposed horizontally and either receives the collated articles, or has to be displaced
25 into registration with the articles.

The present invention seeks to provide a simplified and therefore potentially less expensive method and

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machine for the filling of boxes or trays with articles.

According to one aspect of the present invention there is provided a method of packing elongate articles such as plastic bottles into boxes or trays, in which
5 the articles are arranged side by side in superimposed rows with their axes horizontal and are then displaced horizontally in the direction of their parallel axes into a box or tray arranged on one side, and the loaded box or tray is then tipped onto its base. The tipping of
10 the loaded box or tray may be effected by the engagement of the horizontally displaced articles with the base of the box or tray upon displacement of the articles into the box or tray.

15 The invention also provides a machine in which a tray or box to be filled is placed on its side facing a stack of articles and the stack is pushed horizontally into the tray or box, displacing the tray with the stack into a delivery device which turns the tray or box into
20 a substantially horizontal position with the tray or box lowermost.

The machine according to the invention is particularly well suited to the packaging of elongate articles such as plastics or glass bottles, which can conveniently be
25 stacked on their sides horizontally and then displaced horizontally, with either their closed or open ends leading, into the tray or box, which is supported on

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one side. When the tray or box has been fully loaded it is tipped onto its base, into a substantially horizontal position.

A delivery device may conveniently be arranged to
5 turn the tray or box onto its base when the tray has been fully loaded with its complement of articles. In one embodiment of the invention the delivery device comprises a hod hinged about a horizontal axis and having a side wall adjoining the hinge axis and an end wall
10 remote from the hinge axis, the hod having a receiving position in which the side wall is substantially horizontal so that the tray or box and the stack of articles are displaced over the side wall until stopped by the end wall, and a delivery position in which the hod has
15 rotated so as to bring the end wall into an upwardly-facing position supporting the tray or box and the articles therein. The hod may be spring-loaded or counterweighted into its receiving position but may be displaceable into its delivery position by the weight
20 of the tray or box and its contents.

The invention finds particular application in the packing of articles such as plastic bottles which are relatively soft - for example following a printing or labelling operation, or a manufacturing process. Such
25 articles have to be handled carefully so that they do not make hard contact with each other or with the packing machine, to avoid damage to or distortion of the

articles. Thus where the articles are essentially cylindrical the method of the present invention provides for movement of the articles by rolling on their sides to a loading station where the articles are collated
5 into superimposed rows before loading into the box or tray. An array of superimposed rows of articles may be displaced horizontally into the box or tray by pushing the array over an underlying row of the articles, thereby guiding the horizontal movement of the array.

10 According to another aspect of the invention there is provided a machine for packing elongate articles such as plastic bottles into a tray or box, comprising a conveyor for conveying the articles with their longitudinal axes horizontal and transverse the direction of conveyor
15 advance to a loading station, collator means at the loading station for arranging the articles in a stack of superimposed rows of articles, means for displacing an array of articles from the stack of articles horizontally and parallel to their longitudinal axes into a tray or
20 box arranged on one side, and means for guiding or pushing the tray or box when loaded so that it tips onto its base.

The machine preferably includes means for feeding the tray or box, with its base vertical, to the loading station to receive an array of articles from the

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collator means, and a trip member for initiating automatically the operation of the means for displacing the array.

The means for pushing the loaded tray or box preferably comprise an ejector which is movable vertically to act upon the side wall of the box which is disposed lowermost at the loading station, causing the loaded box to tip about a horizontal guide surface contacting a lower part of the base of the box.

With a view to minimising damage to the articles, where the latter are essentially cylindrical, the conveyor for conveying the articles to the loading station preferably comprises a pair of parallel rails on which opposite ends of the tubular articles can roll, and continuously moving flights between the rails which engage successive articles and cause them to roll on the rails. In a preferred embodiment there is a stop at the loading station for arresting the articles arriving from the article conveyor to form a row of articles, and means for displacing the stop horizontally in the direction of conveyor movement between two positions in alternation for successive rows of articles formed, so that the articles in the rows interlock when the successive rows are superimposed.

The machine preferably includes a horizontal receiving platform at the loading station for receiving



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a row of articles from the conveyor, and means for elevating the platform to lift each row of articles successively until the array is formed.

The collator means at the loading station for arranging
5 the articles into a stack preferably include ratchet support devices for supporting the articles forming each successive row at opposite ends at the bottom of the stack; the said devices permit the ascent of the row of articles on the receiving platform but prevent their subsequent descent
10 with the platform when the latter returns to its receiving position.

The ratchet support devices may comprise displaceable support members carrying at their lower ends article support ledges with downwardly facing inclined faces which
15 are engaged by the row of articles as the latter is elevated on the platform to cause the support members to move apart, the said members returning, under a spring return force or under gravity, to rest positions in which the ledges support the articles in the row after the platform has
20 returned to its receiving position.

In a preferred embodiment of the invention the means for feeding the tray or box to the loading station comprises a conveyor extending generally parallel to the conveyor for the articles, the loading station being
25 interposed between the two conveyors.

The invention will be further described, by way of example, with reference to the accompanying purely diagrammatic drawings, in which:

Figure 1 is a perspective view of a packaging tray

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partially filled with articles, in this case plastic containers, illustrating one example of packaging tray used in a machine of the present invention;

Figure 2 is a side elevation of a machine according to one embodiment of the invention for filling trays such as that illustrated in Figure 1;

Figure 3 is a partial frontal elevation of the machine illustrated in Figure 2;

Figure 4 is a schematic frontal elevation of part of a machine according to another embodiment of the invention, for packing cylindrical plastic bottles;

Figure 5 is a perspective view of another part of the packing machine illustrated in Figure 4, and

Figure 6 is a side elevational view of the part shown in Figure 5.

The machine according to the invention as illustrated in Figures 1-3 is designed for filling flat horizontal trays, usually of cardboard, with semi-rigid articles such as plastic containers. Figure 1 illustrates a typical tray 1 partially loaded with plastic containers 2 which, in this example, are of rectangular cross-section so as to form a compact stack fitting snugly into the tray 1. Once filled the tray 1, together with its contents, is normally covered with transparent plastics film which is tightly stretched over the stack of containers 2 and sealed beneath the base of the tray 1.

Figures 2 and 3 illustrate a machine according to the



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invention for filling successive trays 1 with containers 2. The machine has a vertically movable pneumatically operated elevator 3 with a horizontal platform 4 capable of receiving a row of containers 2 disposed horizontally. Vertical movement of the platform 4 is guided by fixed guide rods 5, shown in Figure 3, and is effected by a vertically arranged pneumatic ram 6 operating between a lowered position, shown in solid outline, and a raised position, shown in broken outline.

10 In the raised position of the platform 4 the row of containers 2 supported on the platform is engaged by hanging support plates 7, 8 which are hinged about horizontal axes 7A, 8A parallel to the row of containers 2. The support plates 7, 8 have respective horizontal

15 ledges 9, 10 (Figure 2) positioned so as to support the opposite ends of the horizontal containers 2, in this case, the neck and base ends respectively. Below each ledge 9, 10 each support plate 7, 8 is provided with a downwardly facing inclined face 11, 12 which is

20 engaged by the opposite ends of the row of containers 2 when the latter is raised by the elevator 3, causing the plates 7, 8 to swing apart to admit the row of containers 2 to the raised position. When the containers 2 reach the raised position the plates 7, 8 swing

25 inwardly under their own weight to their vertical supporting positions, shown in Figure 2, in which the ledges 9, 10 are located beneath the row of containers 2.

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Successive elevating strokes of the actuator 6 will bring successive horizontal rows of containers 2 into supporting engagement with the support plates 7, 8 until a vertical stack of the horizontally arranged -
5 containers is formed in a vertical channel 13 above the plates 7, 8. When this stack becomes aligned horizontally with a vertically disposed tray 1 forming one vertical side of the channel 13 a vertical pusher plate 14 is displaced horizontally by means of a horizontal actuator
10 15 to push the stack of containers 2 horizontally into the tray 1. The movement of the containers 2 into the tray 1 at the same time displaces the tray 1 horizontally into a hod 16.

The hod 16 has a raised tray-receiving position,
15 shown in Figure 2, in which an inner wall 17 of the hod is horizontal and an outer wall 18 is vertical, the hod 16 being biased into this position by a counter-weight 19, or alternatively by spring-loading. The
hod 16 is hinged to a fixed side wall of the channel 13
20 about a horizontal hinge axis 20.

When the tray 1 with its full complement of containers 2 has been displaced horizontally by the pusher plate 14 into the hod 16 the weight of the filled tray causes the hod 16 to pivot downwardly about the hinge axis
25 20 into a discharge position, shown in broken outline, in which the outer wall 18 is substantially horizontal and supports the tray 1, which in the process will have

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rotated through substantially 90^0 . In this position the tray 1 and the erect containers 2 therein can be removed, either by hand or by a further conveyor, (not shown) and passed to a wrapping station.

5 A feed conveyor 21, shown schematically in Figure 3, may be conveniently arranged for feeding each successive row of containers 2 onto the horizontal platform 4 of the elevator 3, into abutment with a stop 22. The containers 2 may, for example, be
10 arranged in an upright position after leaving a filling and sealing station, in which case the sealed containers would be tilted into the horizontal position as they are loaded onto the conveyor 21.

 A simple gravity or pneumatic feed arrangement (not
15 shown) may be provided for feeding successive empty trays 1, with their bases vertical, to the entrance of the hod 16, directly opposite the pusher plate 14.

 A trip switch (not shown) may be associated with the stop 22 at one end of the elevator platform 4 for initiating
20 automatically the extension of the elevator ram 6 when the platform 4 has received a full row of containers 2.

 Figures 4-6 illustrate another embodiment of the invention, designed specifically for the collating and packing into boxes of cylindrical articles such as
25 plastic bottles 2. The same reference numerals are used to denote parts corresponding to the machine of Figures 1-3.

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In this case the bottles 2 are delivered onto a horizontal feed conveyor 21 from a forming, printing or labelling machine. The bottles 2 may be warm and soft-walled, and to avoid distortion of the bottles 2

5 by heavy contact with each other the bottles 2 are supported on fixed horizontal guide rails upon which opposite ends of the bottles 2 rest, the bottles being made to roll along the rails by continuously moving flights 23 of the conveyor.

10 The bottle conveyor 21 delivers the bottles to the elevator platform 4 at the loading station, the platform 4 being movable vertically and cooperating with hanging support plates (not shown) similar to the plates 7, 8 described with reference to Figures 1 - 3, so that
15 after successive operations of the elevator ram 6 a vertical stack of horizontal rows of bottles 2 is formed at the loading station.

In order to ensure that a closely packed stack of bottles 2 is formed the stop 22 which arrests the bottles
20 delivered onto the platform 4 is movable horizontally by a pneumatic actuator 24 by an amount equal to approximately the diameter of one bottle 2. The stop 22 is displaced between its two positions in alternation for the formation of successive rows of bottles 2 on
25 the elevator platform 4, so that the successive superimposed rows of bottles 2 in the vertical stack interlock, the bottles in any one row resting between the bottles of the

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row immediately below.

When the stack of bottles 2 in the vertical channel 13 of the loading station has reached the top of the channel a trip valve (not shown) is operated to initiate
5 operation of the pusher actuator 15, causing the pusher plate 14 to push the stack of bottles 2 horizontally into the vertically arranged box 1. During this operation the array of bottles 2 pushed by the plate 14 slides over the bottles 2 forming the remaining lower part of
10 the stack, so that these bottles act as guides for the array of bottles displaced into the box 1.

In the machine of Figures 4-6, each successive box 1 to be filled rests on one side, with its base vertical, and is moved into position to receive an array of bottles 2 at the loading
15 station by a continuously moving horizontal conveyor consisting of parallel V-section endless belts 25. A stop 26 arrests each box 1 at the loading station, immediately before the operation of the actuator 15 to displace the bottles 2 into the box.

20 Each box 1 is guided by a horizontal guide bar 27 extending alongside the conveyor belts 25 and located a small distance above the level of the belts 25 adjacent the vertical base of the box 1. When the actuator 15 is operated to displace the array of bottles
25 2 into the box 1, the bottles impinge on the base of the box and cause the latter to tip about the horizontal guide bar 27 onto a receiving surface 28 which is

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horizontal or substantially horizontal. The surface
28 may be a conveyor for removing the box and its
contents.

To assist the tipping of the box 1 from its vertical
5 position a vertically movable ejector ram 29 may be
located below the level of the conveyor belts 25. The
ejector ram 29 is operated shortly after the pusher
actuator 15: upon operation the ejector ram 29 engages
the lowermost side wall of the box 1 in front of the
10 conveyor belts 25 and assists the tipping of the box 1
over the bar 27.

The bottles 2 are loaded into each box 1 with the
open mouths of the bottles leading, as shown in Figure
6. When the box 1 containing the bottles 2 is
15 subsequently righted on the surface 28 the bottles 2
will be arranged with their open ends lowermost, in
contact with the base of the box. This minimizes the
risk of contamination of the bottles before filling.

CLAIMS

1. A method of packing elongate articles such as plastics bottles (2) into a box or tray (1), characterised in that the articles (2) are arranged side by side in superimposed rows with their axes horizontal and are then displaced horizontally in the direction of their parallel axes into a box or tray (1) arranged on one side, the loaded box or tray being then tipped onto its base.
2. A method according to Claim 1, in which the tipping of the loaded box or tray (1) is effected by the engagement of the horizontally displaced articles with the base of the box or tray upon displacement of the articles into the box or tray.
3. A method according to Claim 1 or Claim 2, in which the articles are essentially cylindrical and are moved by rolling on their sides to a loading station where the articles are collated into superimposed rows before loading into the box or tray.
4. A method according to any one of Claims 1 to 3, in which an array of superimposed rows of articles (2) is displaced horizontally into the box or tray (1) by pushing the array over an underlying row of the articles, thereby guiding the horizontal movement of the array.
5. A machine for packing elongate articles (2) such as plastics bottles into a box or tray (1), including a conveyor (21) for conveying the articles (2) to a loading station, and collator means (4-13) at the loading station for arranging the articles in a stack of superimposed articles,
characterised in that:
the articles (2) are conveyed on the conveyor (21)

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with their longitudinal axes horizontal and transverse the direction of conveyor advance, the collator means (4-13) arranging the articles in a stack of superimposed rows;

means (14,15) are provided for displacing an array of articles (2) from the stack of articles horizontally and parallel to their longitudinal axes through the open end of a box or tray (1) arranged on one side, and means (16,17 ; 27,29) are provided for guiding or pushing the box or tray (1) when loaded so that it tips onto its base.

6. A machine according to Claim 5, including means (25) for feeding the box or tray (1), with its base vertical, to the loading station to receive an array of articles (2) from the collator means, and a trip member for initiating automatically the operation of the means (29) for displacing the array when the box or tray (1) reaches the loading station.

7. A machine according to Claim 5 or Claim 6, in which the means for pushing the loaded box or tray comprise an ejector (29) which is movable vertically to act upon the side wall of the box or tray (1) which is disposed lowermost at the loading station, causing the loaded box or tray to tip about a horizontal guide surface (27) contacting a lower part of the base of the box or tray.

8. A machine according to any of Claims 5-7, characterised by a horizontal receiving platform (4) at the loading station for receiving a row of articles (2) from the conveyor (21), and means (6) for elevating the platform to lift each row of articles successively until the array is formed.

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9. A machine according to Claim 8, characterised in that the articles forming each successive row are supported at opposite ends at the bottom of the stack by ratchet support devices (7,8) which permit the ascent of the row of articles on the receiving platform (4) but prevent their subsequent descent with the platform when the latter returns to its receiving position.

10. A machine according to Claim 9, characterised in that the ratchet support devices comprise displaceable support members (7,8) carrying at their lower ends article support ledges (9,10) with downwardly facing inclined faces (11,12) which are engaged by the row of articles (2) as the latter is elevated on the platform (4) to cause the support members to move apart, the said members returning, under a spring return force or under gravity, to rest positions in which the ledges (9,10) support the articles of the row after the platform (11) has returned to its receiving position.

11. A machine according to any one of Claims 5 to 10, in which the articles (2) are essentially cylindrical and the conveyor (21) for conveying the articles to the loading station comprise a pair of parallel rails on which opposite ends of the tubular articles can roll, and continuously moving flights (23) between the rails which engage successive articles (2) and cause them to roll on the rails.

12. A machine according to any one of Claims 5 to 11, characterised by a stop (22) at the loading station for arresting the articles (2) arriving from the article conveyor (21) to form a row of articles, and means (24) for displacing the stop (22) horizontally in the direction of conveyor movement between two positions in alternation for successive rows of articles formed on the platform (4), so that the articles in the rows interlock when the successive rows are superimposed in the collator means (4-13).

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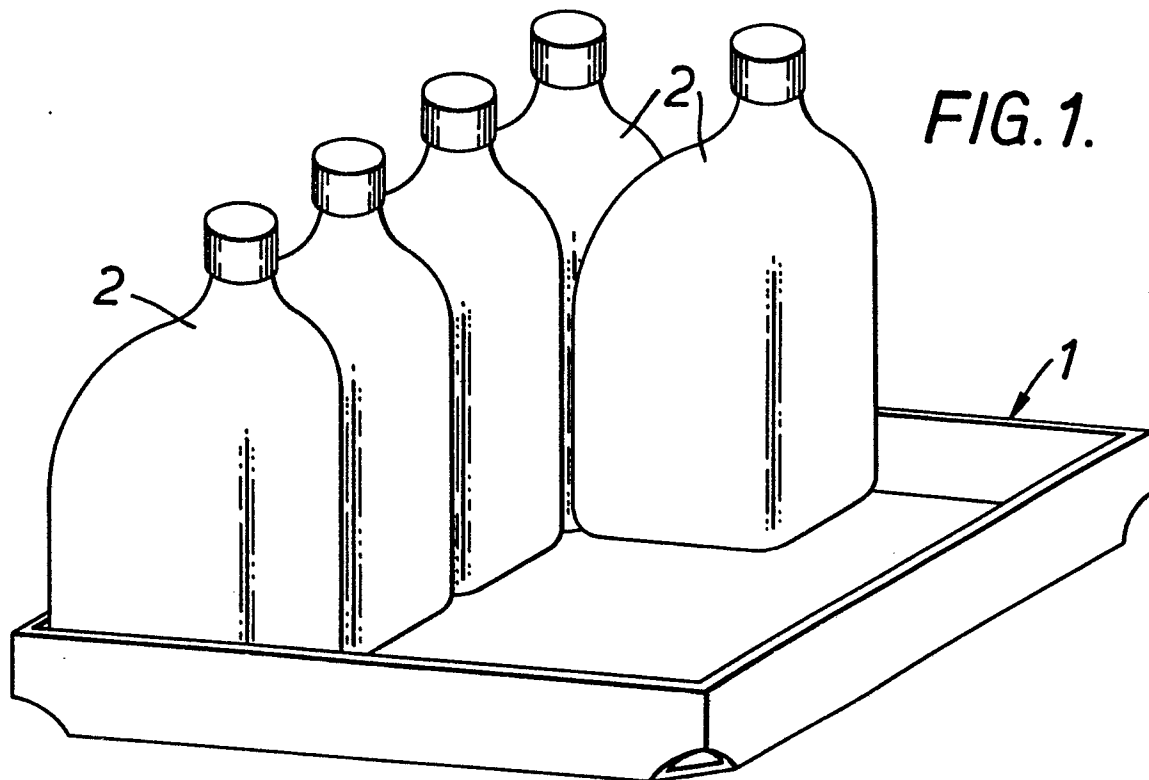
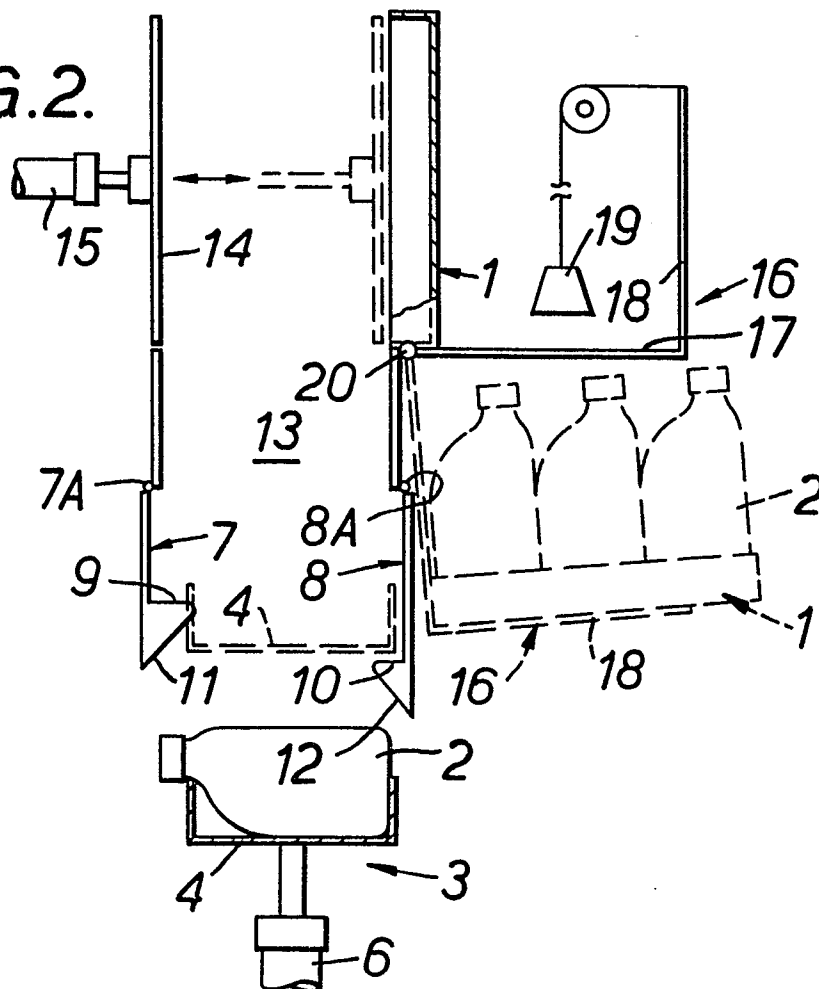
13. A box or tray filling machine characterised in that a box or tray (2) to be filled is placed on its side facing a stack of articles and an array of articles (1) is pushed from the stack horizontally into the box or tray, displacing the box or tray with the array of articles into a delivery device which turns the box or tray onto its base.

14. A machine according to Claim 13, characterised in that the delivery device comprises a hod (16) hinged about a horizontal axis (20) and having a side wall (17) adjoining the hinge axis and an end wall (10) remote from the hinge axis (20), the hod having a receiving position in which the side wall is substantially horizontal so that the box or tray (1) and the array of articles are displaced over the side wall until they are stopped by the end wall, and a delivery position in which the hod has rotated to bring the end wall into an upwardly-facing position supporting the box or tray and the article therein.

15. A machine according to Claim 14, in which the hod (16) is spring-loaded or counterweighted (19) into its receiving position but is displaced into its delivery position by the weight of the box or tray (1) and its contents.

16. A machine according to Claim 6, in which the means for feeding the box or tray (1) to the loading station comprises a conveyor (25) extending generally parallel to the conveyor (21) for the articles (2), the loading station being interposed between the two conveyors.

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**FIG. 2.**

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