APPARATUS AND PROCESS FOR FILLING CONTAINERS

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ABSTRACT

An apparatus for filling containers (B) with articles (P2), has a filling station (6), a container conveyor (3) by means of which containers (B) which are to be filled are fed into the filling station (6), at least one article conveyor (2) for conveying the articles (P2) into a region of the filling station (6), and at least one filling unit (7) by means of which a filling space of the containers (B) which are to be filled is filled with the fed articles (P2) in the filling station (6). The apparatus has filling aids (4, 5), at least in the region of the filling station (6), for at least some of the containers (B), the filling aids deforming these containers (B) before they are filled in the filling station (6) or enlarging the filling openings thereof or forming filling guides for these containers (B). This easily allows containers (B) to be completely filled even if the containers (B) have been transported in the partially filled state.
APPARATUS AND PROCESS FOR FILLING CONTAINERS

TECHNICAL FIELD

[0001] The invention relates to an apparatus and a process for filling containers with articles. The apparatus and the process are suitable, in particular, for filling erected containers.

BACKGROUND OF THE INVENTION

[0002] Apparatuses for filling containers, in particular erected cartons, with articles are known. Although they allow quick and relatively reliable filling of the containers, most of the apparatuses have the problem that the articles cannot be positioned in an optimally closely packed manner in the container. If sufficient free space is no longer present, it is barely possible for the final articles to be introduced into the containers.

[0003] There are various reasons for this, and these reasons depend, in particular, on the type of articles and containers. For example, a container is partially filled in another filling station and is then transported to an end filling station, it is possible for the articles which have been introduced to be displaced during transportation and for the free space which is actually present to become filled. If the containers are to be charged with articles in another embodiment, for example in imbricated form, this inevitably results in positioning problems in respect of the final articles. It is especially difficult to introduce articles of a second type if the containers have already been filled with articles of a different, first type.

[0004] These problems are usually solved in the prior art by the containers having a larger filling space than is effectively necessary. It is desirable, however, to minimize the container size.

[0005] Various apparatuses which erect, and simultaneously fill, folding boxes are also known. For example, DE-A-197,11,415 discloses an apparatus for forming folding boxes with curved walls. The blanks of the boxes are filled and only then are they glued. The curved shape of the folding boxes is maintained here. DE-A-195,43,719 describes a process in which products are pushed laterally into a partially erected box. Since the lateral flaps have not yet been folded over, the filling opening is maximized.

[0006] U.S. Pat. No. 5,060,451 discloses an apparatus for erecting and gluing folding cartons and for filling the same with ice-cream. Before the filling operation, flaps of the box are swung downwards in order to free the filling opening.

[0007] Furthermore, DE-A-32,09,688 discloses a process and an apparatus for filling and closing garbage containers. The garbage container is a box which is open on one side and which is produced from an elastically deformable material. The box is compressed and filled in this state. Once the box has been filled and a sealing lid has been positioned on it, the deformation pressure is eliminated. This produces a negative pressure in the interior of the garbage container, and this negative pressure is intended to prevent odors from escaping outwards.

SUMMARY OF THE INVENTION

[0008] It is an object of the invention to provide an apparatus and a process which easily allow the containers to be filled in a closely packed manner. It is a further object of the invention to provide an apparatus and a process which allow already partially filled or already more or less completely filled containers to be filled in a closely packed manner. It is also an object of the invention to allow filling with at least two types of article.

[0009] These objects are achieved by an apparatus and a process having the features of Patent claims 1 and 12, respectively.

[0010] According to the invention, the apparatus has filling aids which deform containers or form filling guides for these containers. This makes it easier for the final articles to be introduced into the still remaining or additionally enlarged filling space of the container.

[0011] If the container is temporarily deformed before the filling operation, this results in a newly created free space at a certain location of the container, and this free space can then be used for filling purposes. This improves the positioning operation and/or increases the reliability of the positioning operation. This embodiment is suitable, in particular, for the end filling of already partially filled containers. Should articles have been displaced during transportation of the container, then the newly created free space allows the container to be filled with further articles.

[0012] In a first embodiment, the containers are compressed and, in another embodiment, they are drawn apart from one another. The deformation preferably takes place by the filling aids acting in pairs on opposite sides of the container B. The deformation preferably takes place symmetrically in respect of at least one axis of symmetry.

[0013] If use is made of filling guides, then at least the final articles are directed into the container along these guides. A preferred embodiment provides guide plates which, in the filling station, rest on at least two opposite sides of each container.

[0014] The filling guides and the means for deforming the container may also be combined in the same apparatus.

[0015] Further advantageous variants of the process and advantageous embodiments can be gathered from the dependent patent claims.

BRIEF DESCRIPTION OF THE DRAWING

[0016] The subject matter of the invention is explained hereinafter with reference to preferred exemplary embodiments illustrated in the attached drawing, in which:

[0017] FIG. 1 shows a schematic illustration of the apparatus according to the invention in a first embodiment;

[0018] FIG. 2 shows a view of the detail according to FIG. 1;

[0019] FIG. 3 shows a container according to the first embodiment which has been deformed by means of two carry-along elements;

[0020] FIG. 4 shows a schematic illustration of the apparatus according to the invention in a second embodiment;

[0021] FIG. 5 shows a filling aid according to the second embodiment;
FIG. 6 shows a filling aid according to the third embodiment; and

FIG. 7 shows a cross section through the filling aid according to FIG. 6.

METHODS OF IMPLEMENTING THE INVENTION

FIG. 1 illustrates a first embodiment of the apparatus according to the invention. Containers B are fed to a container conveyor 3 on a feed conveyor 1. The conveying direction is illustrated by an arrow. The feed conveyor 1 is preferably a belt conveyor. The containers B are usually transported continuously thereon. It is also possible, however, to use other conveyors or other methods of feeding the containers B.

The containers B are completed containers in which, once they have been filled, preferably all that is still required is for the filling opening to be closed. In a preferred embodiment, the containers are erected cartons. The containers B may still be completely empty. It is preferable, however, for them already to be partially filled with articles P1 of a first type. These articles may be, for example, biscuits, chocolates or else first-packed articles.

The container conveyor 3 transports the containers B to a filling station 6. At least one article conveyor 2 ends in the region of this filling station 6, and conveys articles P2 to the filling station 6. The articles P2 may be of the same type as the first articles mentioned above. However, as is illustrated here, they may be of a second type, for example a toy.

The filling station 6 contains at least one filling unit 7 in order for the second articles P2 to be filled into the containers B individually or in groups from the article conveyor 2. The filling unit 7 preferably has a picker, in particular a so-called Delta Robot, and an optical means for detecting the articles.

The now completely filled containers B are transported further by the container conveyor 3 to a removal conveyor 8, from there they are transferred to further stations (not illustrated here) for further processing, e.g. closing, lidding, stacking or palletizing.

The conveying speeds of the individual conveyors and the functions of the filling units are controlled by a central control means S. The individual conveyors, in particular the container conveyor 3, may be operated continuously and/or cyclically step by step. It is possible for the containers B to be at a standstill, or to be transported further, as they are filled.

According to the invention, the containers B are deformed before being filled. In the exemplary embodiment illustrated here, the containers B are compressed, use being made of the container conveyor 3 for this purpose. It is also possible, however, to use other means. The container conveyor 3 is designed as a so-called LGB/PGX-conveyor, as is described, for example, in EP-A-0,496,046. The container conveyor 3 has carry-along elements 4 which circulate at predetermined spacings. The container conveyor 3 is usually arranged such that it has a top strand 30 and a bottom strand 31.

The containers B are pushed onto, or between, these carry-along elements 4 by the feed conveyor 1. As is illustrated in FIG. 2, the transfer takes place in the curved region of the container conveyor 3, that is to say in the region of transition from the bottom to the top strand 30, 31. The opening between adjacent carry-along elements 4 is at its largest in this region.

As soon as the carry-along elements 4 pass onto the top strands 31, adjacent carry-along elements 4 compress the container B located therebetween and deform it. A correspondingly deformed container B is illustrated in FIG. 3. It originally had a rectangular basic shape. Now, the container B is curved convexly outward on opposite end surfaces, with the result that a newly fillable free space F is now present on both sides.

For the purpose of deforming the containers B, the carry-along elements 4 have specially shaped, preferably curved deforming surfaces. In the example illustrated here, the carry-along elements 4 are designed as essentially L-shaped accommodation shells. A first sidewalk 40, as seen in position on the top strand 30, is oriented horizontally and a second sidewalk 41 is oriented vertically. The vertical sidewalk 41 has a curved, preferably convex, shape. It preferably has this curvature both on its inner surface and on its outer surface. The containers B are thus clamped in between their front and rear carry-along elements 4, with axially symmetrical deformation being produced in the process. Other types of deformation, however, are also possible. It would thus be possible, for example, for just one surface of the sidewalk to be curved or for two carry-along elements 4 to deform in each case just one container B rather than two containers B. It is also not necessary for adjacent carry-along elements 4 to have the same shape. It is also possible to achieve deformation via forces being introduced at at least one of the corners of the container B.

As can be seen in FIG. 1, the deformed containers B are brought to the filling station 6, filled there and then transferred to the removal conveyor 8. The transfer preferably takes place, once again, in the curved region of the container conveyor 3, that is to say in the region in which the top strand 30 passes into the bottom strand 31. During this transfer, the deformation pressure is eliminated and the container B automatically assumes its original shape again.

In the case of the re-deformation, in addition, it is possible to utilize the force of gravity in that the containers B which are being released are transferred via obliquely running guide bars, which are fitted laterally in relation to the container conveyor 3, onto the removal conveyor 8, which is arranged at a somewhat lower level.

This embodiment has the advantage that it allows deformation by way of extremely straightforward means, that the containers B need not be stopped in the filling station 6, and that the carrier-along elements 4, depending on the shape of the container B, can be easily exchanged without the rest of the apparatus having to be adapted. It is advantageous for the carry-along elements 4 for the container conveyor 3 to perform three functions: accommodating, transporting and deforming containers using just one means.

FIG. 4 illustrates a second exemplary embodiment according to the invention. In this case, the containers B are erected cartons with an upwardly directed filling opening.
and laterally arranged flap L for closing the carton. For this purpose, a support unit 5 is arranged in the region of the filling station 6. The rest of the apparatus corresponds essentially to the arrangement according to FIG. 1, it no longer being absolutely necessary for the container conveyor 3 to have carry-along elements with the deforming function. It is not imperative either for the transfer locations between the feed conveyor 1 and the container 3 and between the container conveyor 3 and the removal conveyor 8 to be located in the curved region.

[0037] The support unit 5, as is illustrated in FIG. 5, essentially comprises two vertical supports 50 on which a horizontal support 51 is arranged in a vertically displaceable manner. At least one support frame 53 is retained on the horizontal support 51. A plurality of support frames 53 are usually present in order for it to be possible for a plurality of cartons B to be filled at the same time. The support frames 53 can preferably be displaced along the horizontal support 51 and fixed in their respective position. Each support frame 53 preferably has a basic shape which corresponds to the basic shape of the container B which is to be filled but has slightly larger dimensions than the latter. Displaceable spreading elements 54 are arranged on the support frame 53. In this example, the support frame 53 has a rectangular basic shape and the spreading elements 54 are fastened in a pneumatically displaceable manner at the inner corners of the support frame 53. Each spreading element 54 has a sheet-metal angled member.

[0038] If containers B which are to be filled are located in the filling station 6, then the horizontal support 51 is lowered until the sheet-metal angled members of the spreading elements 54 are introduced into the region of the inside of the flap L of the carton B. The flaps L are then swung apart from one another in order to enlarge the filling opening. The pneumatic cylinders serving as actuators of the spreading elements 54 are mounted on the support frame 53 here. Once the container B has been filled, the spreading elements 54 are drawn back again, with the result that the carton B can assume its original shape again. The support frame 53 is raised into its starting position. The individual process steps are likewise coordinated by the control means S.

[0039] FIG. 6 illustrates a third embodiment. The apparatus corresponds essentially to the apparatus according to FIG. 4. However, it has guide plates 52, rather than support frames, which are arranged in this case on the horizontal support 51, the guide plates, in the lowered state, covering over opposite top edges of the containers B which are to be filled, and thus bridging interspaces between the individual containers B. The guide plates 52, as is illustrated in FIG. 7, are of curved design and have two legs 52 which project downward and into the containers B. These legs 52 serve as filling guides for filling the containers B with the articles P2.

[0040] In the above exemplary embodiment, cartons which have already been erected are preferably being used as the containers. Other types of container, however, are also suitable for use in the apparatus according to the invention and with the process according to the invention. According to the invention, however, use is preferably made of containers in which the filling space has already been completed. Suitable containers are, in particular, those which have a certain reversible flexibility. If flexible deformation is not possible, the original shape can also be actively reproduced. In addition, the containers preferably have a right-angled, planar base surface.

[0041] The apparatus according to the invention and the process according to the invention easily allow containers to be completely filled even if the containers have been transported in the partially filled state.

List of Designations

[0042] 1 Feed conveyor
[0043] 2 Article conveyor
[0044] 3 Container conveyor
[0045] 30 Top strand
[0046] 31 Bottom strand
[0047] 4 Carry-along element
[0048] 40 First sidewall
[0049] 41 Second sidewall
[0050] 5 Support unit
[0051] 50 Vertical support
[0052] 51 Horizontal support
[0053] 52 Guide plate
[0054] 52' Leg
[0055] 53 Support frame
[0056] 54 Spreading elements
[0057] 6 Filling station
[0058] 7 Filling unit
[0059] 8 Removal conveyor
[0060] S Control means
[0061] B Container
[0062] L Flap
[0063] F Free space
[0064] P1 Article of the first type
[0065] P2 Article of the second type

1. An apparatus for filling containers with articles, having a filling station, having a container conveyor by means of which containers which are to be filled are fed into the filling station, having at least one article conveyor for conveying the articles into a region of the filling station, and having at least one filling unit by means of which a filling space of the containers which are to be filled is filled with the fed articles in the filling station, wherein the apparatus has filling aids, at least in the region of the filling station, for at least some of the containers, the filling aids deforming these containers before they are filled in the filling station or enlarging the filling openings thereof or forming filling guides for these containers.

2. The apparatus as claimed in claim 1, wherein the filling aids act in pairs on opposite sides of the container, and/or wherein the filling aids act symmetrically in respect to at least one axis of symmetry of these containers.
3. The apparatus as claimed in claim 1, wherein the filling aids are deforming means which form the filling spaces of the containers by a pressing or spreading action.

4. The apparatus as claimed in claim 1, wherein the filling aids have deforming surfaces for deforming the containers, the deforming surfaces being of curved design.

5. The apparatus as claimed in claim 1, wherein the container conveyor has carry-along elements for accommodating and carrying along the containers which are to be filled, and wherein the carry-along elements are designed as filling aids for deforming the containers.

6. The apparatus as claimed in claim 5, wherein at least some of the carry-along elements have a side wall for butting against a wall of the container which is to be filled, and wherein at least one surface of this side wall is of convex design.

7. The apparatus as claimed in claim 6, wherein each container which is to be filled can be clamped, for deformation purposes, between a first front carry-along element and a second, rear carry-along element.

8. The apparatus as claimed in claim 6, wherein it has a feed conveyor by means of which the containers which are to be filled are fed onto the container conveyor, wherein the container conveyor has a curved region, and wherein a location at which the containers which are to be filled are transferred from the feed conveyor to the container conveyor is arranged in the curved region.

9. The apparatus as claimed in claim 1, wherein the filling aids are guide plates which, in the filling station, cover over at least two opposite sides of each container and form filling guides.

10. The apparatus as claimed in claim 1, wherein the filling aids have spreading elements, which enlarge the filling openings of the containers.

11. The apparatus as claimed in claim 1, wherein the at least one filling unit has a picker, in particular a Delta Robot.

12. A process for filling containers with articles, in which containers which are to be filled are conveyed into a filling station by means of a container conveyor, articles are conveyed, by means of at least one article conveyor, into a region of the filling station and, there, are filled individually or in groups, by means of the filling unit, in filling spaces of the containers which are to be filled, wherein the containers which are to be filled, at least in the region of the filling station, are deformed or provided with filling aids which enlarge filling openings of these containers or form filling guides for these containers.

13. The process as claimed in claim 12, wherein the filling spaces of the containers which are to be filled are at least more or less elastically deformed.

14. The process as claimed in claim 12, wherein the containers which are to be filled are conveyed to the filling station by means of carry-along elements on the container conveyor, wherein the containers are deformed by means of these carry-along elements, and wherein the containers which are to be filled are transferred to the container conveyor, and discharged therefrom, in a curved region of the same.

15. The process as claimed in claim 12, wherein the containers which are to be filled have been partially filled as they arrive in the filling station, and wherein they are completely filled in the filling station.