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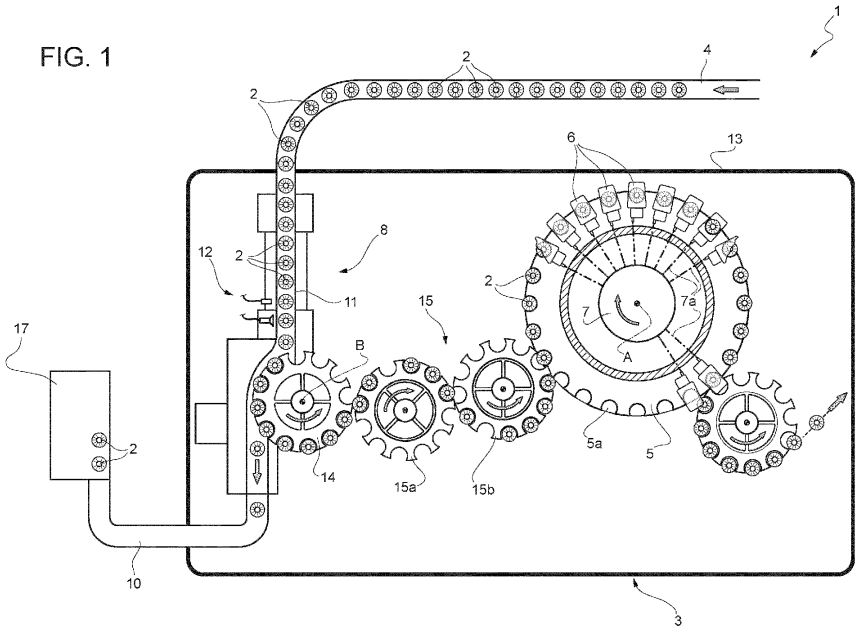
(54) **FILLING MACHINE WITH INSPECTION SYSTEM AND PACKAGING APPARATUS COMPRISING SUCH FILLING MACHINE**

(57) There is described a filling machine (3) for filling containers (2) with a pourable product, the filling machine (3) comprises a carousel (5) for advancing the containers (2) along a filling path; a plurality of filling devices (6) carried by the carousel (5) and configured to feed a predetermined amount of pourable product into the containers (2) advanced by the carousel (5); an inspection device (8) arranged operatively upstream of the carousel (5), and configured for inspecting a quality degree or level of each container (2) and for either releasing the containers (2) towards the carousel (5), if the quality degree or level of the inspected containers (2) is above a predetermined threshold degree or level, or feeding the containers (2) towards a discard line (10), if the quality degree or level of the inspected containers (2) is below the predetermined threshold degree or level; the filling machine (3) further includes a housing (13) containing and surrounding the carousel (5), the inspection device (8) is at least partially located within the housing (13).

FIG. 1



EP 4 253 309 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a filling machine for filling containers, such as glass or plastic bottles, with a pourable product, preferably a pourable food product.

[0002] The present invention also relates to a packaging apparatus for packaging the pourable product into the containers, in particular for packaging a pourable product with containers.

BACKGROUND ART

[0003] Packaging apparatuses for packaging a pourable product, preferably a pourable food product like water, alcoholic beverages, soft drinks, milk, juice or similar, into containers are known.

[0004] Such packaging apparatuses comprise a number of units or machines, each configured to carry out a specific operation during a packaging process of the aforementioned pourable product into the containers.

[0005] For example, in the case of plastic containers, such as plastic bottles, a packaging apparatus typically comprises:

- a blower machine configured to form plastic containers starting from known preforms;
- a filling machine configured to fill the containers with a predetermined amount of pourable product;
- a capping machine configured to apply one cap to each filled container; and, preferably
- a labelling machine configured to apply labels onto the filled and capped containers.

[0006] In case the containers are made of glass, such as glass bottles or glass jars, the packaging apparatuses typically do not include any blower machine and comprise, instead of this latter, a rinsing machine configured to rinse the glass bottles with a rinsing fluid (such as water) prior to the filling, capping and labelling operations.

[0007] Filling machines are known which typically comprise a conveyor, generally of the rotary type, usually in the form of a carousel rotatable about a vertical axis, a reservoir or tank containing the pourable product, and a plurality of valve filling devices peripherally carried by the carousel, connected to the reservoir by means of respective circuits or ducts (and through a manifold) and conveyed by the carousel itself along an arc-shaped filling path.

[0008] More precisely, the containers to be filled are fed in use to the carousel at an input station thereof, then are conveyed along the arc-shaped filling path, which defines a filling angle with respect to the carousel axis, so as to be filled with the pourable product by the respective filling devices, and then exit the carousel at an output station thereof.

[0009] The need for protecting the filling machine, and in particular the carousel and the filling devices, from the external environment is known in the field.

[0010] To this end, the filling machines typically include a protective housing which surrounds and contains the carousel and the filling devices (and in some cases also the reservoir).

[0011] The need to ensure adequate aseptic and/or sterile conditions of the filling operation is also known in the field.

[0012] To this end, the filling machines typically include an isolation chamber configured to delimit and contain a controlled atmosphere to be controlled in aseptic and/or sterile conditions.

[0013] In this case, the housing is sealed from the external environment in order to define such isolation chamber.

[0014] It is further known in the field the need for a control of the quality degree or level of the containers prior to the filling thereof with the pourable product.

[0015] For example, it is expedient to perform a quality control on possible defectiveness of the structure of the containers and/or on a cleanliness level thereof prior to feed such containers to the carousel.

[0016] To this end, packaging apparatuses of the aforementioned type further comprise an inspection device, usually known as "empty bottle inspector" or "EBI", which is configured to perform a quality control on, i.e. to inspect a quality degree or level of, each container before the filling thereof.

[0017] Typically, the inspection device includes inspection means (e.g. sensors) for detecting a quality degree or level of the containers.

[0018] Generally, in use, if a container has a quality degree or level above a predetermined threshold, such container is fed towards the filling machine by the inspection device; if a container has a quality degree or level below the predetermined threshold, it is fed to a discard conveyor for the discard thereof.

[0019] For protection purposes, the inspection device typically includes a protective housing which surrounds the inspection means and the other components of the inspection device.

[0020] Consequently, such inspection device is arranged upstream of the filling machine, outside of the housing of this latter.

[0021] More precisely, the packaging apparatus typically comprises a convey line (usually in the form of a single-line belt conveyor) which is apt to feed the containers to be filled, capped, etc. through the apparatus and towards the filling machine (and the other machines).

[0022] The inspection device is arranged along such convey line upstream of the filling machine.

[0023] The Applicant has observed that one of the most critical points of the packaging apparatus, where the majority of efficiency losses occur, is located between the inspection device and the filling machine. In fact: a buffer

is usually needed between these two components, in order to always ensure a stable production rate; an active control on the carousel or inspection device is needed, in order to match and respect the production rate in case of discard of some containers; accordingly, an infeed conveyor, such as a single-line belt conveyor, between the inspection device and the filling machine is also needed, along which the risk of bottle scuffing is high.

[0024] The need is therefore felt for an improvement in the packaging apparatuses of the aforementioned type as per the quality control operation of the containers.

DISCLOSURE OF INVENTION

[0025] It is therefore an object of the present invention to provide a filling machine for filling containers with a pourable product, which is designed to overcome at least one of the above-mentioned drawbacks in a straightforward and low-cost manner.

[0026] This object is achieved by a filling machine as claimed in claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic top-view, with parts removed for clarity, of a packaging apparatus including a filling machine according to a first embodiment of the present invention; and

Figure 2 is a schematic top-view, with parts removed for clarity, of a packaging apparatus including a filling machine according to a second embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0028] With reference to Figure 1, number 1 indicates as a whole a packaging apparatus for packaging a pourable product, preferably a pourable food product such as water, milk, beer, wine, soft drinks, juice or similar, into containers 2, such as plastic or glass bottles or jars, which the present description will refer to without however losing generality.

[0029] Packaging apparatus 1 comprises:

- a filling machine 3 for filling containers 2 with the pourable product; and
- a convey line 4 for advancing containers 2 to be filled towards filling machine 3. Preferably, packaging apparatus 1 comprises a number of further machines (known per se and not shown), each configured to carry out a specific operation during a packaging process of the aforementioned pourable product into containers 2.

[0030] In particular, in the case of containers 2 made of plastic, e.g. PET bottles, packaging apparatus 1 comprises:

- a blower machine configured to form plastic containers starting from known preforms and arranged, along convey line 4, operatively upstream of filling machine 3;
- a capping machine configured to apply one cap to each filled container 2 and arranged, along convey line 4, operatively downstream of filling machine 3; and
- a labelling machine configured to apply labels onto the filled and capped containers 2 and arranged, along convey line 4, operatively downstream of the capping machine.

[0031] Hence, in Figure 1 only a portion of convey line 4 located immediately upstream of filling machine 3 is shown.

[0032] In case of containers 2 made of glass, e.g. glass bottles or glass jars, packaging apparatus 1 do not include any blower machine and comprise, instead of this latter, a washing machine (not shown) configured to wash the glass bottles with a washing fluid (such as water) prior to the filling, capping and labelling operations, and therefore arranged operatively upstream of filling machine 3.

[0033] Preferably, convey line 4 comprises, in particular is defined by, a single-line belt conveyor, onto which containers 2 are to be advanced in line, one after the other.

[0034] Filling machine 3 comprises:

- a carousel 5 rotatable about a longitudinal axis A, preferably vertical, and configured to retain and advance a sequence of containers 2 along an arc-shaped filling path;
- a plurality of filling devices or filling valves 6, which are peripherally carried by carousel 5 and which are configured to dose a predetermined amount of pourable product into containers 2 while these latter are advanced along the filling path; and
- a reservoir 7 for containing the pourable product and fluidly connected with the filling devices 6 (by means of respective circuits or ducts 7a) for feeding them with the pourable product.

[0035] In use, empty containers 2 are fed to carousel 5 and are retained by this latter at respective peripheral seats 5a thereof. The filling path defines a filling angle with respect to axis A, along which containers 2 are conveyed by rotation of carousel 5. At the same time, each filling device 6, which is preferably located above one respective seat 5a, feeds the pourable product into the respective container 2 retained by such seat 5a.

[0036] Filling machine 3 further comprises an inspection device 8 arranged operatively upstream of carousel 5 and configured for inspecting a quality degree or level

of each container 2 and for either releasing containers 2 towards carousel 5, if the quality degree or level of the inspected containers 2 is above a predetermined threshold degree or level, or feeding containers 2 towards a discard line 10, if the quality degree or level of the inspected containers 2 is below the predetermined threshold degree or level.

[0037] Preferably, discard line 10 is part of packaging apparatus 1 and is defined by a single-line belt conveyor.

[0038] Inspection device 8 defines a so-called "empty bottle inspector" or "EBI" of the type described above, and which is therefore configured to perform a quality control on each container 2 before the filling thereof.

[0039] Inspection device 8 comprises an inspection conveyor 11 and detection means 12.

[0040] The convey line 4 provides the inspection device 8 with the advanced containers.

[0041] In particular, inspection conveyor 11 is configured to receive empty containers 2 from convey line 4. Accordingly, inspection conveyor 11 preferably defines a continuation of convey line 4.

[0042] Detection means 12 comprise a number of sensors for detecting the quality degree or level of each container 2 while such container 2 is supported by inspection conveyor 11.

[0043] For example, detection means 12 can include a vision or optical sensor and/or a mechanical sensor, for evaluating the structural integrity of each container 2 and/or a cleanliness level of each container 2.

[0044] Accordingly, the aforementioned quality degree or level is defined by a defectiveness degree of the structure of containers 2 or by a cleanliness level of containers 2.

[0045] As visible in Figure 1, filling machine 3 includes a housing 13 containing and surrounding carousel 5.

[0046] In detail, housing 13 extends around carousel 5, and therefore around filling devices 6, for accommodating these latter therein.

[0047] Inspection device 8 is synchronized with the carousel 5. Therefore, the inspection device 8 can be closer to the carousel 5, and/or the filling machine 3 can be configured so that there isn't any buffer between the inspection device 8 and the carousel 5. In this way, the filling machine 3 is more compact.

[0048] According to the invention, inspection device 8 is at least partially located within housing 13.

[0049] In this preferred embodiment, inspection device 8 is completely located inside housing 13.

[0050] In greater detail, housing 13 is of the known type and defines a structure for protecting carousel 5 and inspection device 8 from an external environment, i.e. from the environment which is external to the housing 13 itself.

[0051] In one embodiment, housing 13 defines a sealed isolation chamber apt to contain an atmosphere controllable in aseptic and/or sterile conditions.

[0052] In practice, inspection device 8 is an integral component of filling machine 3.

[0053] Thanks to the above configuration:

- space outside housing 13, i.e. outside filling machine 3, can be saved, which can therefore be used for arranging other machines, such as a reordering machine (not shown) for reordering containers 2;
- structural complexity of filling machine 3, and therefore of apparatus 1, is reduced, since carousel 5 and inspection device 8 do not need dedicated protection, but share a common housing 13;
- the overall structure is more compact, because inspection device 8 is closer to carousel 5.

[0054] Conveniently, inspection device 8 is arranged upstream of discard line 10.

[0055] In detail, discard line 10 extends partially within housing 13 and partially outside housing 13, so as to convey the discarded containers 2 outside of housing 13.

[0056] Preferably, convey line 4 is located externally with respect to housing 13.

[0057] Inspection device 8 comprises a distribution member 14. The distribution member 14 is synchronized with the carousel 5. The distribution member 14 advantageously comprises, in particular is defined by, a starwheel conveyor. The distribution member 14 is configured for receiving the inspected containers 2 from the inspection conveyor 11 and to either release containers 2 towards carousel 5 or discard line 10, selectively and based on the quality degree or level detected, as explained above.

[0058] The starwheel conveyor of the distribution member 14 is synchronized with the carousel 5.

[0059] Distribution member 14 is rotatable about an axis B, preferably vertical.

[0060] Filling machine 3 further comprises an input conveyor 15 arranged within housing 13 and operatively interposed between distribution member 14 and carousel 5. Input conveyor 15 is configured to receive from distribution member 14 inspected containers 2 having a quality degree or level above the predetermined threshold degree or level and to feed such containers 2 to carousel 5.

[0061] The distribution member 14 is synchronized with the input conveyor 15.

[0062] The filling machine 3 can comprise a pitching conveyor which is operatively positioned between the distribution member 14 and the input conveyor 15, to adapt the pitch of the distribution member 14 to the pitch of the input conveyor 15.

[0063] Conveniently, input conveyor 15 comprises at least one starwheel 15a, 15b.

[0064] In the embodiment shown in Figure 1, input conveyor 15 comprises two successive starwheels 15a, 15b, each rotatable about a preferably vertical axis.

[0065] Thanks to the fact that distribution member 14 and input conveyor 15 comprise starwheels, together with the inspection device 8 being located at least partially within housing 13, the overall effectiveness of filling machine 3 and of apparatus 1 is improved. In fact, no buffer is needed between inspection device 8 and carousel 5,

thereby simplifying the machine architecture. Moreover, no long and cumbersome infeed conveyor, such as a single-line belt conveyor, between inspection device 8 and carousel 5 is needed. This also result in a reduced risk of bottle scuffing.

[0066] Moreover, the number of starwheels present in input conveyor 15 can be adequately adjusted and/or selected in order to mutually adapt the directions of rotation of distribution member 14 and carousel 5 to one another.

[0067] More precisely, if distribution member 14 rotates in the same direction of carousel 5, i.e. clockwise, then input conveyor 15 will be provided with only one starwheel as shown in Figure 2, or with an odd number of starwheels. Conversely, if distribution member 14 rotates in the opposite direction of carousel 5, i.e. counterclockwise, then input conveyor 15 will be provided with at least two starwheels as shown in Figure 1, or with an even number of starwheels.

[0068] Hence, flexibility of filling machine 3 and apparatus 1 is improved.

[0069] Advantageously, input conveyor 15 is arranged downstream of discard line 10, relative to the direction of advancement of distribution member 14, in particular relative to the direction of rotation of the starwheel defining distribution member 14.

[0070] In other words, discard line 10 is located operatively upstream of input conveyor 15.

[0071] In this way, it is ensured that only inspected containers 2 with a quality degree or level above the predetermined threshold degree or level are advanced towards carousel 5 and along input conveyor 15.

[0072] Advantageously, distribution member 14 is coupled to carousel 5 and/or to input conveyor 15 so that distribution member 14 is driven by carousel 5 and/or by input conveyor 15, or so that carousel 5 and/or input conveyor 15 is driven by distribution member 14.

[0073] The coupling between the distribution member 14 and the carousel 5 and/or the input conveyor 15 allows to obtain the synchronization between the distribution member 14 and the carousel 5. Said coupling can be a mechanical coupling. Said coupling can be a mechanical contact coupling. Said coupling can be a contactless coupling, like a magnetic coupling.

[0074] In particular, the relative speed between inspection device 8 and carousel 5, i.e. which can correspond to the relative angular speed between distribution member 14 and carousel 5 / input conveyor 15), is constant.

[0075] More in particular, the aforementioned mechanical coupling can be performed by kinematically coupling distribution member 14 and carousel 5 (and/or input conveyor 15) with gears or other mechanical transmission means, such as pulleys and belts.

[0076] The coupling allows for the removal of complicated electronic control system for adapting carousel speed and inspection device speed to one another in order to maintain the desired production rate. This is possible also thanks to the fact that inspection device 8 is synchronized with the carousel 5 and/or is housed in housing 13, and therefore is arranged close to carousel 5. Hence, a more simple and reliable system is provided.

[0077] In one embodiment, inspection device 8 is located only partially within housing 13, as shown in Figure 2.

[0078] In detail, in this case inspection device 8 has at least one portion which is arranged externally relative to housing 13, such as a portion of inspection conveyor 11.

[0079] This configuration may facilitate access to some parts of inspection device 8, thereby reducing maintenance effort and time, while ensuring adequate protection of inspection device 8 and structural simplification of filling machine 3 and apparatus 1.

[0080] In one embodiment, discard line 10 comprises at least one stretch 10a which is located within housing 13 and which is closer to carousel 5 than inspection device 8. This configuration is shown in Figure 2.

[0081] The Applicant has observed that this peculiar feature allows for a further structural simplification of filling machine 3.

[0082] As visible in Figure 1, packaging apparatus 1 may comprise a discard table 17 apt to receive discarded containers 2 from discard line 10.

[0083] In more detail, discard line 10 is configured to feed the containers 2 it has received from distribution member 14, i.e. containers 2 which have a quality degree or level below the predetermined threshold degree or level, to discard table 17.

[0084] Preferably, discard table 17 is placed outside housing 13, and is arranged for allowing an operator to check the discarded containers 2 and evaluate a re-inserting of the containers on the convey line 4.

[0085] Otherwise, discard table 17 serves as a temporary storage for the discarded containers 2.

[0086] In one embodiment, packaging apparatus 1 may comprise a further machine 18 for improving the quality degree or level of containers 2.

[0087] Accordingly, discard line 10 is configured to feed the further machine 18 with the containers 2 received from inspection device 8.

[0088] This configuration is shown in Figure 2.

[0089] For example, further machine can be defined by a washing machine 18 for washing containers 2.

[0090] In this case, the quality degree or level is defined by a cleanliness level of containers 2.

[0091] Preferably, packaging apparatus 1 may include a return line (not shown) downstream of washing machine 18 and configured for feeding washed containers 2 back to convey line 4 to recirculate such containers 2 through inspection device 8.

[0092] In this way, an automated cycle for quality control and filling readiness of containers 2 can be implemented in an easy and simple manner.

[0093] The advantages of filling machine 3 according to the present invention will be clear from the foregoing description.

[0094] In particular, a more compact, simple and reli-

able system for inspecting the quality control of containers 2 to be filled is provided, while simplifying the structure of filling machine 3 and packaging apparatus 1.

[0095] Moreover, the risk of bottle scuffing is reduced, if not eliminated, which is particularly advantageous in case of glass containers 2.

[0096] Finally, the flexibility of filling machine 3 is improved.

[0097] Clearly, changes may be made to filling machine 3 as described herein without, however, departing from the scope of protection as defined in the accompanying claims.

[0098] In particular, features of the different embodiments of filling machine 3 and packaging apparatus 1 as shown in Figures 1 and 2 can be combined with one another without departing from the scope of protection as defined in the claims.

[0099] For example, a discard table 17 can be provided together with a stretch 10a and/or together with a washing machine 18.

Claims

1. Filling machine (3) for filling containers (2) with a pourable product, the filling machine (3) comprising:

- a carousel (5) for advancing the containers (2) along a filling path;
- a plurality of filling devices (6) carried by the carousel (5) and configured to feed a predetermined amount of pourable product into the containers (2) advanced by the carousel (5);
- an inspection device (8) arranged operatively upstream of the carousel (5), and configured for inspecting a quality degree or level of each container (2) and for either releasing the containers (2) towards the carousel (5), if the quality degree or level of the inspected containers (2) is above a predetermined threshold degree or level, or feeding the containers (2) towards a discard line (10), if the quality degree or level of the inspected containers (2) is below the predetermined threshold degree or level;

wherein the filling machine (3) further includes a housing (13) containing and surrounding the carousel (5),
and wherein the inspection device (8) is synchronized with the carousel (5).

2. Filling machine as claimed in claim 1, wherein the inspection device (8) is at least partially located within the housing (13).

3. Filling machine as claimed in claim 1 or 2, wherein the housing (13) defines a structure for protecting the carousel (5) and the inspection device (8) from an external environment,
and/or wherein the housing (13) defines a sealed isolation chamber apt to contain an atmosphere controllable in aseptic and/or sterile conditions.

4. Filling machine as claimed in any of the previous claims, wherein the inspection device (8) is completely located within the housing (13).

5. Filling machine as claimed in any one of the foregoing claims, wherein the inspection device (8) comprises an inspection conveyor (11) and detection means (12),
the detection means (12) being configured to detect the quality degree or level of each container (2) while such container (2) is supported by the inspection conveyor (11) .

6. Filling machine as claimed in claim 5, wherein the inspection device (8) further comprises a distribution member (14) for receiving the inspected containers (2) from the inspection conveyor (11), the distribution member (14) being configured to release the containers (2) towards the carousel (5) or the discard line (10), selectively;
the distribution member (14) being synchronized with the carousel (5).

7. Filling machine as claimed in claim 6, wherein the distribution member (14) comprises a starwheel conveyor, the starwheel conveyor being synchronized with the carousel (5).

8. Filling machine as claimed in claim 6 or 7, and comprising an input conveyor (15) arranged within the housing (13) and operatively interposed between the distribution member (14) and the carousel (5), the input conveyor (15) being configured to receive from the distribution member (14) the inspected containers (2) having a quality degree or level above the predetermined threshold degree or level and to feed such containers (2) to the carousel (5), the distribution member (14) being synchronized with the input conveyor (15).

9. Filling machine as claimed in claim 8, wherein the input conveyor (15) comprises at least one starwheel (15a, 15b).

10. Filling machine as claimed in claim 8 or 9, wherein the input conveyor (15) is arranged downstream of the discard line (10), relative to the direction of advancement of the distribution member (14).

11. Filling machine as claimed in any of claims 8 to 10, wherein the distribution member (14) is coupled to the carousel (5) and/or to the input conveyor (15) so that the distribution member (14) is driven by the

carousel (5) and/or by the input conveyor (15), or so that the carousel (5) and/or the input conveyor (15) is driven by the distribution member (14).

12. Filling machine as claimed in claim 11, wherein the coupling between the distribution member (14) and the carousel (5) and/or the input conveyor (15) is a mechanical coupling.

13. Filling machine as claimed in any one of the foregoing claims, wherein the quality degree or level is defined by a defectiveness degree of the structure of the container (2) or by a cleanliness level of the container (2) .

14. Packaging apparatus (1) for packaging a pourable product into containers (2), the packaging apparatus (1) comprising:

- a filling machine (3) as claimed in any one of the foregoing claims;
- a convey line (4) for advancing containers (2) to be filled towards the filling machine (3), to provide the inspection device (8) with the advanced containers;
- a discard line (10) for receiving and advancing the containers (2) discarded by the inspection device (8) ;

wherein the inspection device (8) is arranged upstream of the carousel (5) and upstream of the discard line (10).

15. Packaging apparatus as claimed in claim 14, wherein the convey line (4) is located externally with respect to the housing (13).

16. Packaging apparatus as claimed in claim 14 or 15, wherein the discard line (10) comprises at least one stretch (10a) which is located within the housing (13) and which is closer to the carousel (5) than the inspection device (8).

17. Packaging apparatus as claimed in any of the claims 14 to 16, and comprising a further machine (18) for improving the quality degree or level of the containers (2);
wherein the discard line (10) is configured to feed the further machine (18) with the containers (2) received from the inspection device (8).

18. Packaging apparatus as claimed in claim 17, wherein the further machine is defined by a washing machine (18) for washing the containers (2),
and wherein the quality degree or level is defined by a cleanliness level.

19. Packaging apparatus as claimed in in any of the claims 14 to 16, and comprising a discard table (17) for allowing an operator to check the discarded containers (2) and evaluate a re-inserting of the containers (2) on the convey line (4),
wherein the discard line (10) is configured to feed the received containers (2) to the discard table (17).

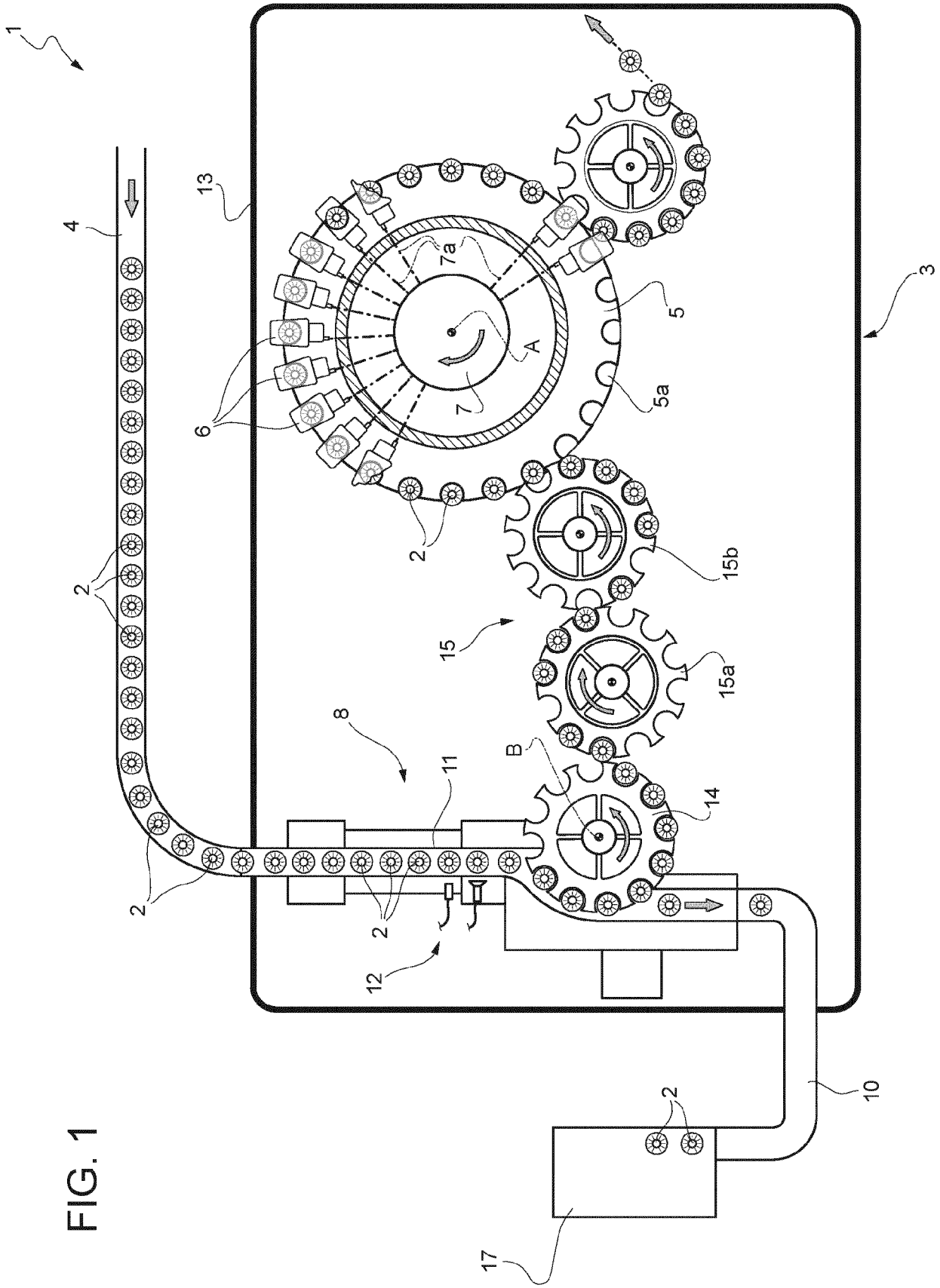
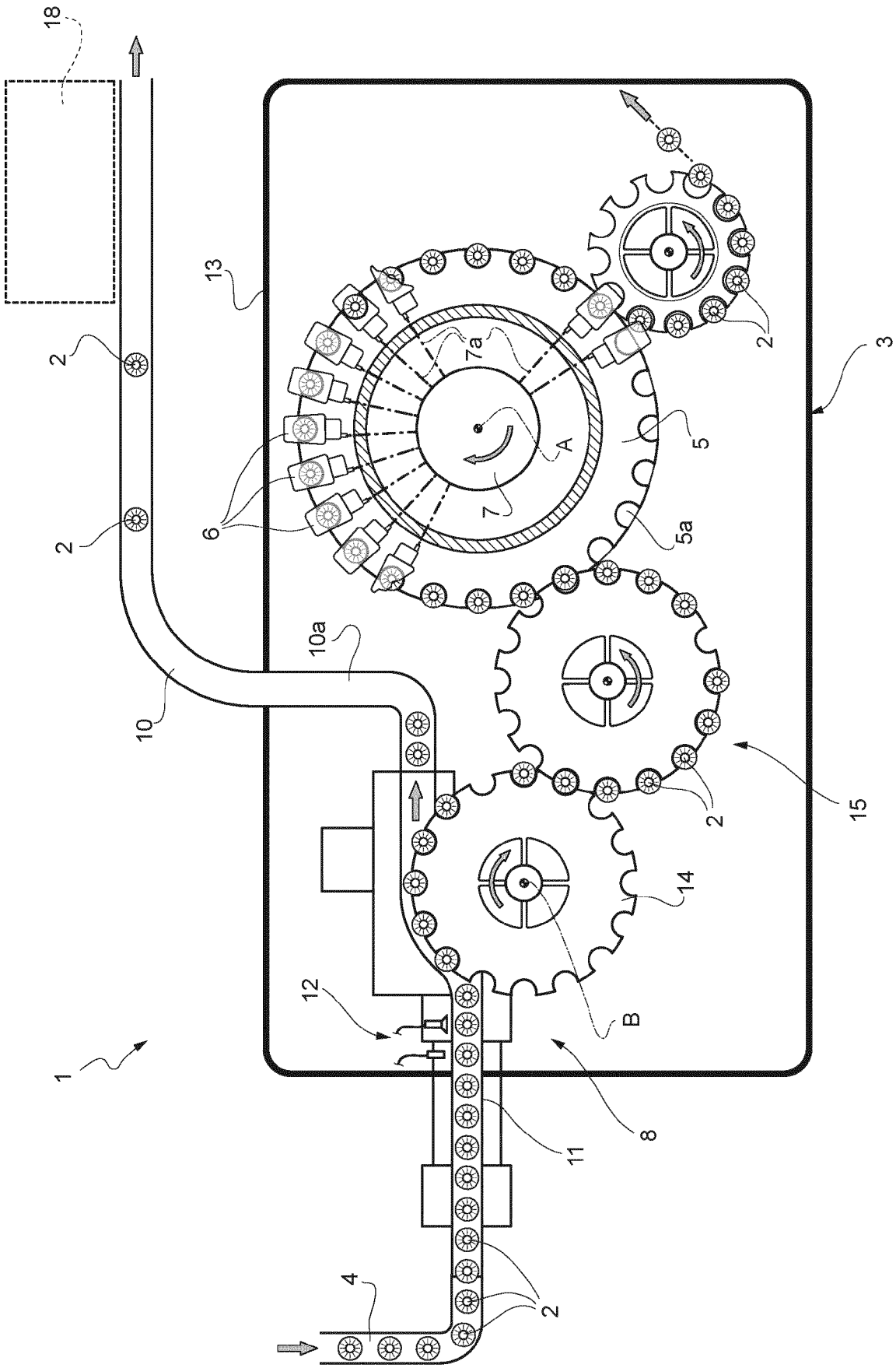


FIG. 1

FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 5727

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 3 584 181 A1 (DAINIPPON PRINTING CO LTD [JP]) 25 December 2019 (2019-12-25) * paragraphs [0092] - [0094]; figure 6 *	1-17,19 18	INV. B67C3/00 B67C7/00
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A	US 2 606 657 A (WALTER BERTHELSEN) 12 August 1952 (1952-08-12) * column 2, line 46 - column 3, line 6; figure 1 *	1-19	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 September 2022	Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 16 5727

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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