(57) Abstract: Described herein is a conveying apparatus (7, 7', 7'', 7''') for receptacles (3) comprising an annular path (16), a cart (17, 17', 17'') coupled to the annular path (16), a control device configured to control the advance of said cart (17, 17', 17''), and an actuation device (19, 19', 19'', 19''') adapted to interact with at least a portion of said cart (17, 17', 17''). The cart (17, 17', 17'') comprises a rotary pedestal (12) configured to support a respective receptacle (3), and an interaction assembly (23) coupled to said pedestal (22) and configured to interact, in use, with said actuation device (19, 19', 19'', 19'''). The interaction assembly (23) and the actuation device (19, 19', 19'', 19''') are shaped so that the interaction between said interaction assembly (23) and said actuation device (19, 19', 19'', 19''') determines, in use, rotation of the pedestal (22).

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TITLE: "CONVEYING APPARATUS AND LABELLING MACHINE PROVIDED WITH SUCH A CONVEYING APPARATUS"

DESCRIPTION

The present invention relates to a conveying apparatus for conveying receptacles, in particular bottles, more in particular bottles that are to be filled or that are filled with a pourable product.

In particular, the present invention also regards a labelling machine having at least one conveying apparatus.

Various technologies are known for applying labels on a succession of receptacles, such as bottles, containers or the like.

One of these technologies envisages conveying a web of labelling material, cutting the web to obtain individual labels, applying the labels thus obtained on respective receptacle during advancement of the receptacles themselves along a predetermined conveying path, and rotating the receptacles around their own longitudinal axis during application of the label. These labels are known as "roll-fed labels".

Application of the labels according to this technology is obtained by using automatic labelling machines.

A typical labelling machine comprises:
- a conveying apparatus for conveying the receptacles along the conveying path; and
- a labelling apparatus for applying at least one label on each receptacle during the receptacles advancement along at least a portion of the conveying path.

A typical conveying apparatus comprises a conveying carousel adapted to rotate about a respective rotation axis, and a plurality of retaining units arranged on a peripheral portion of the conveying carousel. The retaining units are equally spaced from one another about the rotation axis of the conveying carousel, and each being adapted to hold a respective receptacle while the latter is being conveyed along the conveying path. Moreover, each retaining unit is configured to at least allow and/or bring about a rotation of the respective receptacles about the respective longitudinal axis during application of the respective label.

A typical labelling machine further comprises an input conveyor for supplying the receptacles to be labelled to the conveying apparatus, in particular to the conveying carousel, and an output conveyor for receiving the labelled receptacles from the conveying apparatus, in particular from the conveying carousel.

A drawback of the known conveying apparatus lies in the fact that the distance between one retaining unit and another is fixed, a fact that in particular may create problems if, there are voids in the succession of receptacles, (i.e., no
respective receptacle is present). In these cases, these retaining units concerned with the aforesaid voids are without the respective receptacle. However, the labelling apparatus is configured to supply at least one label to each retaining unit. In order to prevent supply of a label to a respective retaining unit in the case of absence of the respective receptacle and considering the inertia of the labelling apparatus, safety devices have been developed for preventing delivery of the respective label. However, the safety devices introduce a further complexity in the control of the labelling machine.

A further drawback lies in the fact that the distance between adjacent receptacles must be kept constant, thus limiting flexibility of the labelling machine.

In the sector, there is consequently felt the need for an improvement of the conveying apparatus, in particular to overcome at least one of the drawbacks mentioned above.

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The aim of the present invention is to provide a conveying apparatus that will allow to overcome, in a simple and economically advantageous way, at least one of the drawbacks mentioned above.

A further aim of the present invention is to provide a
labelling machine that will allow to overcome, in a simple and economically advantageous way, at least one of the drawbacks mentioned above.

The aforesaid aim is achieved by the present invention in so far as it regards a conveying apparatus for receptacles, as defined in the independent claim.

Alternative preferred embodiments are protected in the dependent claims.

For a better understanding of the present invention, various preferred embodiments thereof are described in what follows, purely by way of non-limiting examples and with reference to the attached drawings, wherein:

- Figure 1 is a schematic illustration in top plan view of a portion of a labelling machine having a conveying apparatus according to the present invention, with parts removed for reasons of clarity;

- Figure 2 is a top plan view of a detail of a first embodiment of the conveying apparatus of Figure 1, with parts removed for reasons of clarity;

- Figure 3a is a cross section taken along the line III-III of Figure 2, according to a first embodiment of the detail of Figure 2 itself;

- Figure 3b is a cross section taken along the line III-III of Figure 2, according to a second embodiment of the detail of Figure 2 itself;
- Figure 4 is a top plan view of a detail of a second embodiment of a conveying apparatus according to the present invention, with parts removed for reasons of clarity;
- Figure 5a is a cross section taken along the line V-V of Figure 4, according to a first embodiment of the detail of Figure 4 itself;
- Figure 5b is a cross section taken along the line V-V of Figure 4, according to a second embodiment of the detail of Figure 4 itself;
- Figure 6 is a top plan view of a detail of a third embodiment of a conveying apparatus according to the present invention, with parts removed for reasons of clarity;
- Figure 7a is a cross section taken along the line VII-VII of Figure 6, according to a first embodiment of the detail of Figure 6 itself;
- Figure 7b is a cross section taken along the line VII-VII of Figure 6, according to a second embodiment of the detail of Figure 6 itself;
- Figure 8 is a top plan view of a detail of a fourth embodiment of a conveying apparatus according to the present invention, with parts removed for reasons of clarity;
- Figure 9a is a cross section taken along the line IX-IX of Figure 8, according to a first embodiment of the detail of Figure 8 itself;
- Figure 9b is a cross section taken along the line IX-
IX of Figure 8, according to a second embodiment of the
detail of Figure 8 itself; and

- Figure 10 is a schematic illustration in top plan view of a portion of an alternative embodiment of a labelling machine having a conveying apparatus according to the present invention, with parts removed for reasons of clarity.

With reference to Figure 1, designated as a whole by referral number 1 is a labelling machine for applying labels 2 on a succession of receptacles, such as bottles 3, containers or the like.

The following description will without any limitative scope refer to a machine 1 adapted to apply labels 2 on receptacles that can be filled or are filled with a pourable product, in particular a pourable foodstuff product, for example, carbonated liquids (sparkling water, non-alcoholic beverages, beer, etc.), non-carbonated liquids (natural water, fruit juice, wine, etc.), emulsions, suspensions, high-viscosity liquids, and beverages containing pulp.

Moreover, the following description will without any limitative scope refer to bottles 3, in particular made of a thermoplastic polymer, such as polyethylene terephthalate. However, the bottles 3 may also be made of a different material, for example glass, aluminium, etc.

Each bottle 3 extends along a longitudinal axis A and comprises a hollow body 4 delimited by a bottom wall 5, in
particular substantially perpendicular to the axis A, and by a top neck 6, in particular substantially coaxial to axis A. More specifically, neck 6 delimits an opening for pouring the contents of bottle 3 opposite to bottom wall 5.

With particular reference to Figure 1, machine 1 comprises:

- a conveying apparatus 7 for conveying bottles 3 along a conveying path P; and

- a labelling apparatus 8 for applying at least one label 2 to each bottle 3 at a labelling station 9 during advancement of bottles 3 along at least one active portion PI of conveying path P.

In a preferred non-limiting embodiment, labelling machine 1 also comprises an input conveyor 10, for example a star wheel, for supplying bottles 3 (to be labelled) to conveying apparatus 7 at a receiving station 11, and an output conveyor 12, for example a star wheel, for receiving bottles 3 (labelled) from conveying apparatus 7 at an output station 13.

In greater detail, labelling apparatus 8 is configured to convey a web of labelling material along a respective predetermined path, cutting the web of labelling material during its advancement along the respective predetermined path so as to obtain the individual labels 2, and applying each label 2 on the respective bottle 3 at labelling station
In a preferred non-limiting embodiment, labelling apparatus 8 is also configured to apply glue on at least a portion of the individual labels 2 and/or on at least a portion of the bottles 3.

In particular, the web of labelling material is made of a polymeric or a paper material. Even more in particular, the web of labelling material comprises a repeated decorative pattern, each repetition substantially corresponding to the extension of a single label 2.

With particular reference to Figures 2 and 3a, conveying apparatus 7 comprises:

- at least one endless track 16 (only partially illustrated in Figures 1 and 2 to the extent necessary for the understanding of the invention);

- a plurality of carts 17, each of which is coupled to endless track 16, is configured to advance, in particular in a way substantially independent of the other carts 17, along an endless advancement path Q defined by endless track 16, and is in particular also configured to support a respective bottle 3 during advancement of bottle 3 itself along at least active portion PI, preferably along path P; and

- a control device (not illustrated) configured to control (and to determine) advancement of each cart 17, in particular in a way substantially independent of the other carts 17, along advancement path Q.
Advantageously, conveying apparatus 7 also comprises at least one actuation device 19 arranged adjacent, and in the area of at least one operative section 20 of endless track 16 and adapted to interact with at least a portion of each cart 17, in particular for determining a rotation of the respective bottle 3, preferably of at least 180°, more preferably of at least 210°, even more preferably of at least 360°, around the respective rotation axis A.

It is to be noted that, as will be explained in greater detail hereinafter, operative section 20 is defined by actuation device 19. In particular, during advancement of a cart 17 along operative section 20, a treatment is carried out, in use, in particular application of at least one label 2, on the respective bottle 3. In order to enable wrapping of the label 2 around the respective bottle 3 it is necessary to rotate the bottle 3 around the respective longitudinal axis A.

In greater detail, operative section 20 is located at labelling station 9.

More specifically, endless track 16 also comprises at least one return section 21 for advancing carts 17 from the end of operative section 20 to the beginning of operative section 20.

According to the non-limiting embodiment shown, endless track 16 has linear portions and curved portions. For
instance, endless track 16 could have an elliptical shape, but could also have a more complex shape.

In an alternative embodiment (not illustrated), endless track 16 could also have a circular shape.

With particular reference to Figure 3a, each cart 17 comprises at least one retaining unit configured to retain at least one respective bottle 3, in particular in a rotatable manner around the respective longitudinal axis A and with a vertical orientation, during its advancement along conveying path P.

 Preferably, the retaining unit comprises at least one pedestal 22 rotatable around a main rotation axis B, in particular having a vertical orientation, and configured to support one respective bottle 3, in particular in a coaxial manner, during its advancement along conveying path P.

In greater detail, each pedestal 22 is configured so that the respective bottom wall 5 rests, in use, on the pedestal 22 itself. In particular, the respective bottle 3 is coaxial to the respective pedestal 22.

 Advantageously, each cart 17 also comprises at least one interaction assembly 23 coupled to the respective pedestal 22 and configured to interact, in use, with actuation device 19 during advancement of cart 17 itself along operative section 20.

 Advantageously, actuation device 19 and each
interaction assembly 23 are designed such that the interaction with one another determines, in use, a rotation of the respective pedestal 22, preferably of at least 180°, more preferably of at least 210°, even more preferably of at least 360°, around the respective rotation axis B. Preferably, in this way, in use, rotation of the bottle 3 about the respective axis A is carried out during application of the respective label 2.

Preferably but not necessarily, each cart 17 comprises a base structure 24, which carries at least the respective pedestal 22 and the respective interaction assembly 23 and is coupled (or is configured to be coupled) in a mobile (and preferably removable) way to endless track 16.

Even more preferably, each cart 17 also comprises a plurality of wheels 25 connected to the respective base structure 24 and configured to guide advancement of the respective cart 17 itself along endless track 16. In particular, each wheel 25 is in contact with a respective contact surface of endless track 16 and is configured to advance, in use, along the respective contact surface.

In greater detail and with particular reference to Figure 3a, interaction assembly 23 comprises at least one interaction element 26, which is configured to interact with actuation device 19 and is rotatable around an auxiliary rotation axis C, in particular parallel to, even more in
particular coaxial to, the rotation axis A.

Preferably, each interaction element 26 is configured so that, in use, a rotation of interaction element 26 about the respective rotation axis C is determined by the interaction between interaction element 26 itself and actuation device 19 in order to produce in turn rotation of the respective pedestal 22 about the respective rotation axis B.

According to a preferred non-limiting embodiment, each interaction element 26 is fixedly connected to the respective pedestal 22.

According to a preferred but non-limiting embodiment, each cart 17 also comprises at least one bearing assembly 27 for coupling the respective interaction element 26 and/or the respective pedestal 22 in a rotatable manner to the respective base structure 24. Preferably but not necessarily, each bearing assembly 27 comprises at least one bearing, in the specific case two, in particular positioned coaxial to the respective pedestal 22 and/or to the respective interaction element 26.

With particular reference to Figures 2 and 3a, actuation device 19 comprises a mechanical coupling assembly 31, extending adjacent and in a position corresponding to at least operative section 20 and configured to determine, in use, a mechanical coupling between each interaction element
26 and actuation device 19, in particular of coupling assembly 31 itself, during advancement of the respective cart 17 along operative section 20.

In particular, it is to be noted that operative section 20 of endless track 16 is defined by the extension of actuation device 19, in particular of coupling assembly 31, in so far as it is the interaction between actuation device 19, in particular coupling assembly 31, and interaction assemblies 23, to cause the respective pedestals 22 to rotate around the respective axes of rotation B to obtain a rotation of the respective bottles 3 about the respective longitudinal axes A.

Preferably but not necessarily, actuation device 19 comprises at least one damping element 32 for damping the interaction force between coupling assembly 31 and interaction elements 26. In this way, it is possible to limit impact on coupling assembly 31 and on interaction elements 26.

According to the non-limiting embodiment illustrated in Figures 2 and 3a, each interaction element 26 is a respective toothed wheel rotatable about the respective rotation axis C, and coupling assembly 31 comprises at least one toothed bar 33, for example a round or linear rack, extending substantially parallel to operative section 20.

According to a non-limiting embodiment (not
illustrated), conveying apparatus 7 also comprises a positioning device configured to control, and/or modify, and/or define the position of at least a portion of actuation device 19, in particular of coupling assembly 31, preferably relative to endless track 16 so as to define the position of operative section 20.

According to a preferred non-limiting embodiment, conveying apparatus 7 also comprises a plurality of retaining assemblies (not illustrated), each associated to, and/or comprised by, a respective cart 17, in particular to the respective retaining unit, and configured to retain and/or centre the respective bottle 3 on the respective pedestal 22, in particular so as to stabilise the respective bottle 3. For instance, each retaining assembly may comprise a gripping element for gripping the respective bottle 3, in particular around its neck 6.

In greater detail, the control device is configured to advance each cart 17 along path Q through receiving station 11 and output station 13.

According to a preferred non-limiting embodiment, the control device is configured to vary the advancement speed of each cart 17 independent of the other carts 17 and, preferably also the relative position between successive carts 17, in particular to respond to the distribution of bottles 3 that are, in use, supplied to conveying apparatus
Moreover, the independent control enables operation also at various speeds depending upon the supply rate of bottles 3 to conveying apparatus 7.

In a preferred non-limiting embodiment, the control device is configured to control the advancement speed of each cart 17, in particular along operative section 20; each cart 17 is in turn configured to control the rotation velocity of the respective pedestal 22.

According to a preferred non-limiting embodiment, the control device comprises an induction assembly (not illustrated) for selectively generating a magnetic field, which is in turn configured to control advancement of the plurality of carts 17. Preferably, each cart 17 comprises at least one magnetic or ferromagnetic element (not illustrated) for interacting with the magnetic field generated by the induction assembly.

More specifically, the induction assembly comprises a plurality of coils distributed along, and/or within, the endless track 16 and configured to generate the magnetic field, in particular a plurality of selectively controllable local magnetic fields.

In use, machine 1 applies at least one respective label 2 to each bottle 3 at labelling station 9.

In greater detail, the labelling process, in particular during operation of machine 1, comprises at least the
following steps:

- advancing bottles 3 to be labelled along conveying path P;
- supplying labels 2 to labelling station 9; and
- applying at least one respective label 2 to each bottle 3 during advancement of each bottle 3 along active portion P1.

According to a preferred non-limiting embodiment, operation of machine 1 also comprises the following steps:

- transferring a respective bottle 3 (to be labelled) to carts 17 at receiving station 11; and
- unloading the respective (labelled) bottles 3 from carts 17 at output station 13.

In further detail, during the step of advancing, conveying apparatus 7 advances bottles 3 along conveying path P. In particular, each bottle 3 is supported by the respective pedestal 22 of the respective cart 17. More in particular, the respective bottom wall 5 rests on the respective pedestal 22.

Advantageously, each cart 17 advances along endless track 16. In particular, advancement of each cart 17 is controlled by the control device, in particular so that the respective advance speed is controlled independently of the other carts 17. Preferably but not necessarily, also the relative distances between carts 17 are controlled by the
control device.

Preferably, during the step of advancing, bottles 3 turn, at least during advancement along active portion PI, about the respective longitudinal axis A, in particular to enable wrapping of the respective label 2 around the respective bottle 3.

In particular, rotation of bottles 3 is obtained by means of rotation of the respective pedestal 22, which is in turn obtained by the interaction between the respective interaction assembly 23 and the actuation device 19 during advancement of the respective cart 17 along the operative section 20.

In further detail, the respective interaction element 26 is in mechanical contact with coupling assembly 31, and continuous advancement of cart 17 along operative section 20 causes rotation of interaction element 26 about the respective rotation axis C; the latter rotation results in rotation of the respective pedestal 22 around the rotation axis B.

During the step of supplying, labelling apparatus 8 feeds labels 2 to labelling station 9. In particular, labelling apparatus 8 conveys the web of labelling material along a respective predetermined path and cuts the web of labelling material for labels during its advancement for obtaining the individual labels 2.
Preferably but not necessarily, labelling apparatus 8 applies the glue onto at least a portion of the individual labels 2 and/or on at least a portion of bottles 3.

With particular reference to Figures 4 and 5a, indicated by 1' is a second embodiment of a conveying apparatus according to the present invention. Conveying apparatus 1' is similar to conveying apparatus 7 and, for this reason, to the following description is limited to the differences with respect to conveying apparatus 7 itself, parts that are the same as or equivalent to parts already described being designated by the same reference numbers.

In particular, conveying apparatus 1' differs from conveying apparatus 7 in that it comprises actuation device 19' and carts 17'.

Actuation device 19' is similar to actuation device 19 and carts 17' are similar to carts 17 and for this reason the following description is limited to the differences with respect to actuation device 19 and to carts 17 themselves and parts that are similar or equivalent to parts already described are indicated by the same reference numbers.

In particular, carts 17' differ from the carts 17 in that the respective interaction element 26 is a wheel, in particular having a lateral interaction surface, even more in particular having a rubberised lateral interaction surface.
In particular, actuation device 19' differs from actuation device 19 in that the mechanical coupling assembly 31 comprises at least one interaction surface 34, in particular substantially being smooth and extending substantially parallel to operative section 20 and in that, preferably, rotation of interaction elements 26 around the respective axes of rotation C is produced by the forces of friction that arise due to the interaction between interaction surface 34 and the respective interaction elements 26 during advancement of the respective carts 17' along operative section 20.

Preferably but not necessarily, coupling assembly 31 comprises an interaction belt 35, having (defining) interaction surface 34. In particular, interaction belt 35 extends substantially parallel, and adjacent, to operative section 20.

Operation of machine 1 having conveying apparatus 1' is similar to operation of machine 1 having conveying apparatus 7 and, for this reason, is described in what follows limitedly to the differences with respect to operation of the latter machine.

In particular, the difference lies in operation of conveying apparatus 7', more in particular in the way in which coupling assembly 31, in particular interaction belt 35, and interaction elements 26 of carts 17' interact with
one another for obtaining rotation of the respective pedestal 22. In particular, interaction belt 35 and the interaction elements 26 interact on the basis of the forces of friction.

With particular reference to Figures 6 and 7a, indicated by the number 7'' is a third embodiment of the conveying apparatus according to the present invention. Conveying apparatus 7'' is similar to conveying apparatus 7', and, for this reason, the following description is limited to the differences with respect to conveying apparatus 7' itself parts similar or equivalent to parts already described are indicated by the same reference numbers.

In particular, conveying apparatus 7'' differs from conveying apparatus 7' in that it comprises actuation device 19''.

Actuation device 19'' in turn differs from actuation device 19' in that the respective mechanical coupling assembly 31 also comprises a driving assembly 36 for determining advancement of interaction belt 35 along a respective conveying path R.

In particular, interaction surface 34 is defined by a portion of interaction belt 35, which advances, in use, along the respective conveying path R.

Preferably but not necessarily, driving assembly 36 is configured to control the advancement speed of interaction
belt 35 so as to control the velocity of rotation of pedestals 22 around the respective axes of rotation B.

In greater detail, driving assembly 36 comprises at least two rollers 37, each rotatable around a respective rotation axis, in particular parallel to rotation axis B, of which one roller 37 is motor-driven for determining, via its own rotation, advancement of interaction belt 35 along path R.

In a preferred non-limiting embodiment, driving assembly 36 also comprises at least one tensioning element 38 for controlling the tension of interaction belt 35.

Operation of machine 1 having conveying apparatus 1’’ is similar to operation of machine 1 having conveying apparatus 7’, and, for this reason, the following description to the differences with respect to operation of the latter machine .

In particular, the difference lies in operation of conveying apparatus 7’’, more in particular in the fact that interaction belt 35 is conveyed along path R by means of driving assembly 36. In particular, by means of a variation of the advancement speed of the interaction belt 35 it is possible to vary also the rotation velocity of the pedestals 22.

As has been described, conveying apparatuses 7, 7’, and 1’’ are all provided with respective actuation devices 19,
19', and 19'', which comprise a respective mechanical coupling assembly 31.

As will be described in the following, it is also possible for the interaction between the respective actuation device and the carts to be obtained in a non-mechanical manner, but in particular by means of electromagnetic interactions.

With particular reference to Figures 8 and 9a, designated by the number 7''' is a further embodiment of a conveying apparatus according to the present invention. Conveying apparatus 7''' is similar to conveying apparatuses 7, 7', and 7'', and, for this reason, the following description to the differences with respect to conveying apparatuses 7, 7', 7'' themselves, using the same reference numbers for parts that are the similar or equivalent to parts already described.

In particular, conveying apparatus 7''' differs from conveying apparatus 7 in that it comprises actuation device 19''' and carts 17''''.

Actuation device 19''' comprises a generating assembly 39 for generating a respective magnetic control field, in particular at operative section 20, and the respective interaction element 26 of each cart 17''' comprises at least one magnetic or ferromagnetic element 40, preferably a plurality of magnetic or ferromagnetic elements 40, for
interacting with said magnetic control field, which is in turn configured to bring about rotation of the respective interaction element 26 about the respective rotation axis C during advancement of the respective cart 11’’ along operative section 20.

In the disclosed non-limiting embodiment, each interaction element 26 and the respective pedestal 22 are distinct.

In an alternative non-limiting embodiment, each pedestal 22 may coincide with the respective interaction element 26. In other words, each pedestal 22 comprises the respective magnetic or ferromagnetic elements 40.

It is to be noted that the magnetic control field generated, in use, by generating assembly 39 defines operative section 20 of endless track 16. In other words, a different positioning of generating assembly 39 relative to endless track 16 would create a different position of the magnetic control field.

In a preferred non-limiting embodiment, each interaction element 26 is a wheel. Preferably, the magnetic or ferromagnetic elements 40 of each interaction element 26 are arranged at equal angular distances apart from one another about the respective rotation axis C.

In a preferred non-limiting embodiment, the generating assembly 39 comprises a plurality of magnets 41 arranged
substantially parallel to the endless track 16 at operative section 20. In particular, magnets 41 are arranged in succession. In this embodiment, the magnetic control field is constant, i.e., not variable.

In an alternative non-limiting embodiment (not illustrated), generating assembly 39 comprises a plurality of coils configured to generate a variable magnetic control field.

Operation of machine 1 having conveying apparatus 7''' is similar to operation of machine 1 having conveying apparatus 7, 7', or 1'', and, for this reason, the following description is limited to the differences with respect to operation of the latter machine.

In particular, the difference lies in operation of conveying apparatus 1''', more in particular in the way in which actuation device 19''', in particular generating assembly 39, and interaction elements 26 of carts 17''' interact. In particular, generating assembly 39 creates the magnetic control field, which interacts with the magnetic or ferromagnetic elements 40 for driving rotation of the respective interaction elements 26 about the respective axes of rotation C.

With particular reference to Figure 10, designated by 1' is a second embodiment of the labelling machine according to the present invention. Machine 1' is similar to machine
1 and, for this reason, the following description is limited to the differences with respect to machine 1 itself, using the same reference numbers for similar or equivalent parts.

With particular reference to Figures 1 and 3b, machine 1’ differs from machine 1 in that each cart 17 of conveying apparatus 7 comprises a receiving assembly 45 and in that conveying apparatus 7 further comprises at least one energy-transfer device 46 for transferring energy in contactless mode to each receiving assembly 45, which, in particular, is configured to generate electrical energy during advancement of the respective cart 17 along at least one transfer section 47 of endless track 16.

In the embodiment illustrated in Figure 10, transfer section 47 and operative section 20 are distinct from one another. In an alternative embodiment (not illustrated), operative section 20 and transfer section 47 may at least partially coincide.

Preferably but not necessarily, transfer device 46 is arranged adjacent, and in the area of transfer section 47. In particular, the position (and extension) of transfer device 46 defines transfer section 47.

In particular, transfer device 46 extends parallel to transfer section 47.

In a preferred non-limiting embodiment, transfer device 46 and the receiving assemblies 45 are designed so that the
energy is transferred by means of induction.

Preferably but not necessarily, transfer device 46 comprises a plurality of magnets 48, in particular arranged in succession, configured to generate a magnetic field at transfer section 47.

Alternatively or in addition, transfer device 46 could comprise a plurality of transfer coils, in particular arranged in succession, for generating an electromagnetic field.

Preferably but not necessarily, each receiving assembly 45 comprises at least one respective coil 49 for interacting with the magnetic field and for generating electrical energy.

In a preferred non-limiting embodiment, receiving assembly 45 further comprises at least one energy accumulator (not illustrated) for storing at least a portion of the energy transferred.

In a preferred non-limiting embodiment, each cart 17 comprises one or more electrical elements (not illustrated), and, preferably, the respective receiving assembly 45 is configured to supply at least a portion of the transferred energy to the respective electrical element or elements. Preferably but not necessarily, the energy with which, in use, the electrical element or elements is/are supplied comes directly from the respective coil and/or from the energy accumulator.
In a preferred non-limiting embodiment, at least a portion of each receiving assembly 45, for example, the respective coil 49 and/or the respective energy accumulator, are/is supported by the respective base structure 24.

Preferably but not necessarily, the electrical elements are chosen from among:

- a monitoring unit, a sensor, or a video camera, for example for monitoring a treatment of the respective bottle 3, or for determining the presence of a respective bottle 3, or for a quality control;

- an electric motor, for example for determining rotation of the respective pedestal 22 or for varying the position in height of the respective pedestal 22;

- a control unit, for example for controlling operation of the respective retaining unit;

- a transmitting module, for example for sending data from the respective retaining unit;

- a handling assembly, for example gripping elements, for handling and/or retaining the respective bottle 3; or

- a memory module.

Alternatively or in addition, each cart 17 could comprise at least one electric motor coupled to the respective pedestal 22 and configured to determine a rotation of the respective pedestal 22 around the respective rotation axis B, and the respective receiving assembly 45 could be
configured to supply at least a portion of the electrical energy transferred to the respective electric motor.

In a preferred non-limiting embodiment, the respective electronic element or elements of each cart 17 is/are supported by the respective base structure 24.

Operation of machine 1’ is similar to operation of machine 1 and, for this reason, is described in the following limited to the differences with respect to operation of machine 1.

In particular, operation of machine 1’ differs from that of machine 1 in that it also comprises a step of energy transfer, during which energy is transferred in a contactless manner to carts 17, in particular to the respective receiving assemblies 45.

Even more particularly, energy transfer is obtained by induction.

In even greater detail, during advancement of carts 17 along transfer section 47, the respective receiving assemblies 45 interact with the magnetic field generated by energy-transfer device 46 to generate electrical energy on carts 17 themselves.

Even more particularly, the respective coil of each receiving assembly 45 interacts with the magnetic field generated for generating, by means of induction, electrical energy, which is supplied to the respective electrical
element and/or elements, and/or to the respective energy accumulator.

It is to be noted that machine 1' may also comprise another one of conveying apparatuses 7', 1'', and 1'''. In these cases, the respective carts 17' (see Figures 5b and 7b) and 11''' (see Figure 9b) each also comprises a respective receiving assembly 45 and, preferably, also at least one respective electrical element or a plurality of electrical elements.

The advantages of conveying apparatuses 7, 7', 7'', and 1''' according to the present invention result evidently from an examination of the characteristics of conveying apparatuses 7, 7', 1'', and 1''',

In particular, conveying apparatuses 7, 1', 1'', 7'' enable, in a simple and economically advantageous manner, a flexible advancement of bottles 3. In particular, the relative positions of carts 17, 17', and 11''' may be varied, and this in turn enables synchronisation of conveyance of bottles 3 along conveying path P on the basis of the supply of bottles 3 to receiving station 11. In this way, it is also possible to compensate for the absence of at least one bottle 3 in the succession of bottles 3 that is supplied to the respective conveying apparatus 7, 1', 1'', 1'''

A further advantage lies in the fact that it is possible to obtain rotation of bottles 3 at labelling station 9. In
particular, by means of interaction between the respective actuation device 19, 19', and 19''' with the respective interaction assemblies 23 a rotation is obtained that enables application of labels 2 around bottles 3, in particular to get the initial edge and the final edge to overlap.

Finally, it is clear that modifications and variations may be made to conveying apparatuses 7, 7', 7'', 7''' described and illustrated herein, without thereby departing from the scope of protection defined by the claims.

In particular, it is to be noted that conveying apparatuses 7, 7', 7'', 7''' may also be applied in other machines for treating bottles 3, for example in filling machines configured to fill the bottles 3 or in machines configured to carry out a surface treatment on the bottles 3 themselves.
CLAIMS

1. A conveying apparatus (7, 7', 7'', Ί '') for conveying receptacles (3) along a conveying path (P) comprising:

- at least one endless track (16);
- at least one cart (17, 17', 17''') coupled to the endless track (16) and configured to advance along an advancement path (Q) defined by the endless track (16);
- a control device configured to control the advancement of said cart (17, 17', 17''') along said advancement path (Q); and
- at least one actuation device (19, 19', 19'', 19'''') arranged in the area of at least one operative section (20) of said endless track (16) and adapted to interact with at least a portion of said cart (17, 17', 17''');

wherein said cart (17, 17', 17''') comprises:

- at least one pedestal (12) rotatable around a main rotation axis (B) and configured to support a respective receptacle (3) during its advancement along said conveying path (P); and
- an interaction assembly (23) coupled to said pedestal (22) and configured to interact, in use, with said actuation device (19, 19', 19'', 19''') during advancement of said cart (17, 17', 17''') along the operative section (20);

wherein the interaction assembly (23) and the actuation...
device (19, 19', 19'', 19'''') are designed such that the interaction between said interaction assembly (23) and said actuation device (19, 19', 19'', 19''') determine, in use, a rotation of the pedestal (22) around said main rotation axis (B).

2.- The apparatus according to Claim 1, wherein said interaction assembly (23) comprises an interaction element (26), which is configured to interact with said actuation device (19, 19', 19'', 19''') and being rotatable around an auxiliary rotation axis (C); wherein the interaction element (26) is configured such that, in use, a rotation of said interaction element (26) about said auxiliary rotation axis (C) is determined by the interaction between said interaction element (26) and said actuation device (19, 19', 19'', 19''') to cause rotation of said pedestal (22) about the main rotation axis (B).

3.- The apparatus according to Claim 2, wherein the interaction element (26) is fixedly connected to said pedestal (22), and said auxiliary rotation axis (C) is coaxial to said main rotation axis (B).

4.- The apparatus according to any one of the preceding claims, wherein said interaction assembly (23) comprises at least one interaction element (26) and wherein said actuation device (19, 19', 19'', 19''') comprises a mechanical coupling assembly (31) extending at least along said operative section.
and configured to obtain, in use, a mechanical coupling between said interaction element (26) and said mechanical coupling assembly (31) during advance of said cart (17, 17', 17'') along said operative section (20).

5.- The apparatus according to Claim 4, wherein said interaction element (26) is a toothed wheel rotatable around an auxiliary rotation axis (C) and said mechanical coupling assembly (31) comprises at least one toothed bar (33) extending substantially parallel to the operative section.

6.- The apparatus according to Claim 4 or 5, wherein said interaction element (26) is a wheel rotatable about an auxiliary rotation axis (C) and said mechanical coupling assembly (31) comprises at least one interaction surface (34) extending substantially parallel to said operative section (20).

7.- The apparatus according to Claim 6, wherein said mechanical coupling assembly (31) comprises an interaction belt (35), defining the interaction surface (34), and a driving assembly (36) for determining advancement of said interaction belt (35) along a respective path (R).

8.- The apparatus according to Claim 7, wherein said driving assembly (36) is configured to control an advancement speed of said interaction belt (35), which is in turn configured to control a rotation velocity of said pedestal (22).
9.- The apparatus according to any one of Claims 4 to 8, wherein said actuation device (19, 19', 19'', 19''') comprises at least one damping element (32) for damping the interaction force between said mechanical coupling assembly (31) and said interaction element (26).

10.- The apparatus according to any one of Claims 1 to 3, wherein said actuation device (19''') comprises a generating assembly (39) for generating a respective magnetic control field, and the interaction assembly (23) comprises at least one interaction element (26) rotatable about an auxiliary rotation axis (C) and provided with at least one magnetic or ferromagnetic element (40) for interacting with said magnetic control field, which is in turn configured to determine a rotation of said interaction element (26) around said auxiliary rotation axis (C).

11.- The apparatus according to Claim 10, wherein said generating assembly (39) comprises a plurality of coils and/or a plurality of magnets (41) arranged substantially parallel to the endless track (16) in the area of the operative section (20).

12.- The apparatus according to any one of the preceding claims, wherein said control device comprises an induction assembly for generating a magnetic field, which is in turn configured to control advancement of said cart (17, 17', 17'''), and wherein said cart (17, 17', 17''') comprises at
least one magnetic or ferromagnetic element for interacting with said magnetic field.

13.- The apparatus according to any one of the preceding claims, wherein said control device is configured to control an advancement rate of said cart (17, 17', 17''), which is in turn configured to control a rotation velocity of said pedestal (22).

14.- The apparatus according to any one of the preceding claims, further comprising a positioning device for controlling the position of at least a portion of said actuation device (19, 19', 19'') relative to the endless track (16) so as to define a positioning of said operative section (20).

15.- A labelling machine (1, 1') for applying labels (2) on receptacles (3), comprising:

- a conveying apparatus (7, 7', 7'', 7''') according to any one of the preceding claims for advancing the receptacles (3) along a conveying path (P); and

- a labelling apparatus (8) for applying at least one label (2) on each receptacle (3) during advancement of the receptacles (3) along at least one active portion (P1) of said conveying path (P);

wherein said active portion (P1) is substantially parallel to said operative section (20).
INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/065482

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65C9/04 B65G54/02

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65C B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-International, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>EP 1 616 798 A1 (GLOBAL PACKAGING SOLUTIONS S R [IT]) 18 January 2006 (2006-01-18)</td>
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