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(54) **CAM CONTROLLED SYSTEM**

(57) A cam controlled system is provided. The cam controlled system comprises a cam curve (1, 5, 15, 17) adapted to receive a number of rollers (2). The rollers (2) are fed along the cam curve (1, 5, 12, 15). One or more elevators (3, 6, 10, 13, 16) comprising cam sections (4,

7, 11, 14, 17) are arranged to temporary connect one of said cam sections (4, 7, 11, 14, 17) with the cam curve (1, 5, 12, 15). The rollers (2) are moved along the cam curve (1, 5, 12, 15) and the cam sections (4, 7, 11, 14, 17) by means of a carousel.

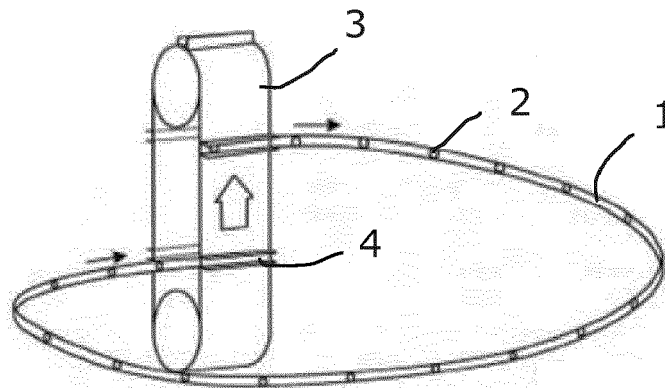


Fig. 1

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Description

Technical Field

[0001] The present solution relates to a cam controlled system, having rollers advanced along a cam curve.

Background

[0002] In for instance filling machines it is common to advance containers in a circular motion at different stations. A common technology of controlling position and create motions in a rotational system is use of cam curves and rollers. By using rollers high friction is avoided and low wear is given. To advance the rollers, often having a bearing, along the cam curve a carousel could be used. A carousel is a rotary device having a plurality of receiving devices arranged at its periphery. The carousel is normally configured to rotate at a constant speed. As the carousel rotates, position and motion up and down of the rollers follow the cam curve fixated in space. But if the angle of pressure of the cam curve gets too high, then the pressing force on the roller gets too high. Normally an angle above 45° is not recommended. That means that a shift in height has to have a certain travel distance in horizontal plane. If the travelling time cannot be used for any useful tasks then the travelling time, or length, lowers the efficiency of the rotary system. The longer the vertical motion the longer horizontal motion will be needed. A common solution for fast transition is to control each station individually using linear motion equipment (servo, pneumatic or hydraulic cylinders). This carries a cost for each station.

Summary

[0003] According to one aspect of the present invention a cam controlled system comprising a cam curve is provided. The cam curve is adapted to receive a number of rollers, which rollers are fed along the cam curve. One or more elevators comprising cam sections are arranged to temporary connect one of said cam sections with the cam curve.

[0004] By using an elevator comprising a belt, wire or chain, a straight piece of a cam curve can be lifted to a new level creating a vertical motion while the equipment is rotating. The belt, wire or chain is synchronised with the motion of the rollers advanced by the carousel. The motion of the belt, wire or chain can be ranging from continuous motion to intermittent standing still each cycle. The vertical transition can be one or multiple.

[0005] Further objects and advantages of the present invention will be obvious to a person skilled in the art when reading the detailed description below.

Brief Description of the Drawings

[0006] The present solution will be described further

by way of example and with reference to the enclosed drawings. In the drawings:

Fig. 1 is a schematic view of a cam curve arrangement of a filling machine,

Fig. 2 is a schematic view of another embodiment of a cam curve arrangement of a filling machine,

Fig. 3 is a detailed view of a part of an elevator of a filling machine, and

Fig. 4 is a detailed view corresponding with Fig. 3 of an alternative embodiment.

Detailed Description

[0007] The present solution is mainly developed in connection with filling machines for filling a fluid into packages. However, it may also be used in connection with other types of machinery using cam curves.

[0008] The present solution is directed to machines having cam curves 1, 5 and where rollers 2 are adapted to follow the cam curves 1, 5. The rollers 2 are connected to or form part of receiving devices, which receiving devices are to receive different parts depending on intended function. A mandrel used as a mould part for moulding a plastic top onto a package could for instance be attached to each roller 2. The rollers 2 are arranged on a rotating carousel by which the rollers 2 are moved along the cam curve 1, 5. Each roller 2 is fixed to a separate part of the carousel in a way that allows vertical movement. Such an arrangement with a carousel is well known to a person skilled in the art.

[0009] In the embodiment of Fig. 1 the cam curve 1 extends between a high level and a low level. The high and low levels of the cam curve 1 are located at opposite sides of an elevator 3. The elevator 3 comprises a number of cam sections 4. The carousel is working continuously at a fixed speed, moving the rollers 2 along the cam curve 1. The elevator 3 is working intermittently with intermittent standing still during each cycle. The distance between the cam sections on the elevator 3 is adapted to the speed of the carousel. In use, one of the cam sections 4 of the elevator 3 is placed in line with the cam curve 1, in order to feed a roller 2 into said cam section 4 of the elevator 3. When the roller 2 has entered the cam section 4 the elevator 3 is started and moves the cam section 4 upwards and when it has reach the high level, it is stopped in line with the cam curve 1. The cam sections 4 are placed with even spacing in such a way that when one cam section 4 is at the high level of the cam curve another cam section 4 is at the same time at the low level of the cam curve 1. The speed at which the elevator 3 moves the cam section 4 is adapted to the speed of the roller 2 in such a way that the roller 2 will leave the cam section 4 as soon as the cam section 4 is in line with the cam curve at the higher level. This embodiment is adapted to sterilization, whereby a container is slowly lowered out from a sterilization tool.

[0010] In the embodiment of Fig. 2 a cam curve 5 is

shown placed in a horizontal plane. A first elevator 6 and a second elevator 10 are provided, each comprising a number of cam sections 7, 11. The first elevator 6 is working in a direction upwards, while the second elevator 10 is working in a direction downwards. Upwards in this context is defined as the direction to which the arrow depicted in the first elevator 6 is pointing and downwards the direction in which the arrow depicted in the second elevator 10 is pointing. An elevated cam part 8 and a non-elevated cam part 9 are placed at different levels between the elevators 6, 10. The non-elevated cam part 9 is placed in the same horizontal plane as the cam curve 5. The distance between the elevated cam part 8 and the non-elevated cam part 9 corresponds to the distance between two adjacent cam sections 7, 11 of respective elevator 6, 10. In the same way as described above, the carousel moving the rollers 2 is run continuously while the elevators 6, 10 are run intermittently. At the end of each step of the elevators 6, 10, a cam section 7, 11 of respective elevator 6, 10 is in line with the elevated cam part 8 and the non-elevated cam part 9. In use, the first elevator 6, working upwards, is at a standstill with one of its cam sections 7 in line with the cam curve 1. When a roller 2 has been fed into said cam section 7 of the elevator 6, the elevator 6 is started and run until the cam section 7 holding the roller 2 is in line with the elevated cam part 8, placed between the two elevators 6, 10. During the movement of the elevator 6 the roller 2 is fed along the cam section 7. When the cam section 7 is in line with the upper elevated cam part 8 the elevator 6 is stopped at the same time as the roller 2 is fed along the elevated cam part 8 into one of the cam sections 11 of the elevator 10. The second elevator 10 is then run downwards until the cam section 11 holding the roller 2 is in line with the non-elevated cam part 9 and the roller 2 goes over into the cam curve 5. In practice the two elevators 6, 10 will be run simultaneously if the distance between them equals the distance of the rollers 2 times and integer n , i.e. $n = 1, 2, 3, 4$ and so on. The non-elevated cam part 9 is used to feed failed packages through. This embodiment could for instance be used for moulding plastic tops to packages. The direction of movement of respective elevator 6, 10 is dictated by the intended function and the design of the machine comprising the cam curve 5.

[0011] In a further embodiment (not shown) only one elevator is arranged with a horizontal cam curve 5, as shown in Fig. 2. It would also be possible to have one elevator arranged with two horizontal cam curves (not shown).

[0012] In the embodiments indicated in Figs. 3 and 4, the elevator is run continuously, often at different speeds during one cycle. In Figs. 3 and 4 the same cam section is shown both in a position for receiving a roller 2 and a position in which the roller leaves the cam section. This is indicated with the dashed and dotted lines.

[0013] In the embodiment schematically shown in Fig. 3 a cam curve 12 has a curved section 12a leading to an elevator 13. By means of said curved section 12a a roller

2 is accelerated before entering a cam section 14 of the elevator 13. The roller 2 is also accelerated when leaving the cam section 14 of the elevator 13 at a higher level, by means of a bent section 12b of the cam curve 12, in which cam curve 12 the roller 2 continues. Thus, in this embodiment the rollers are accelerated just before entering the elevator 13 and just after leaving the elevator 13. The form of the curved section 12a before the elevator 13 and the curve section 12b after the elevator 13 and the speed of the elevator 13 is adapted to the speed of the carousel. In use, the speed of the elevator 13 is reduced when the roller 2 is to enter and leave the cam section 14, respectively.

[0014] In the embodiment schematically shown in Fig. 4, the rollers 2 are accelerated as they are lifted by means of an elevator 16. The rollers 2 are fed to the elevator 16 along a cam curve 15. The elevator 16 comprises a number of cam sections 17, having curved sections 17a, 17b at opposite ends. As the rollers 2 enter the elevator they are accelerated along one of said curved sections 17a. Then the rollers 2 continue along a straight section of the cam section 17. The rollers 2 are then accelerated again along the other of said curved sections 17b before leaving the elevator 16 and entering the cam curve 15 on the other side of the elevator 16. The forms of the curved sections 17a, 17b of the cam section 17 and the speed of the elevator 16 is adapted to the speed of the carousel. In use, the speed of the elevator 16 is reduced when the roller 2 is to enter and leave the cam section 17, respectively.

[0015] In the embodiments shown, the elevators have the form of belts receiving cam sections. In other embodiments, wires or chains are used to hold the cam sections.

[0016] In a further embodiment, the elevator may be used for ejecting packages that have failed in some way. In this latter case a pin attached to the belt may be used, which pin is to project outside of the belt to catch the failed package.

[0017] The elevators of the different arrangements are arranged to go either upwards or downwards, depending on the design of respective machinery and the intended function.

[0018] The different parts of the described and shown embodiments may be combined in many different ways. Thus, the invention is not restricted to the embodiments shown and described and is only restricted to the subject matter as defined in the claims.

50 Claims

1. A cam controlled system comprising a cam curve (1, 5, 12, 15) adapted to receive a number of rollers (2), which rollers (2) are fed along the cam curve (1, 5, 12, 15), **characterized in that** one or more elevators (3, 6, 10, 13, 16) comprising cam sections (4, 7, 11, 14, 17) are arranged to temporarily connect one of said cam sections (4, 7, 11, 14, 17) with the cam

- curve (1, 5, 12, 15), wherein the cam curve (1) runs between a high level and a low level at opposite sides of one elevator (3).
2. The system of claim 1, wherein the rollers (2) are fed continuously along the cam curve (1, 5, 12, 15) and the cam sections (4, 7, 11, 14, 17) by means of a carousel. 5
3. The system of claim 1 or 2, wherein the elevator (3) configured to be run intermittently and the cam sections (4) of the elevator (3) are arranged at a mutual distance to each other in such a way that a cam section (4) is at the high level of the cam curve (1) at the same time as another cam section is at the low level of the cam curve (1) and wherein the elevator (3) is configured to be stopped with a cam section (4) at the high and low level, respectively, of the cam curve (1). 10
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4. The system of claim 1 or 2, wherein the cam curve (1) is arranged in a horizontal plane.
5. The system of claim 1 or 2, comprising one or more additional cam curves all arranged in horizontal planes, the horizontal planes being parallel to the horizontal plane of the cam cover (1). 25
6. The system of claim 4 or 5, wherein two elevators (6, 10) are arranged acting in opposite directions and wherein an elevated cam part (8) and a non-elevated cam part (9) extends between the two elevators (6, 10). 30
7. The system of claim 6, wherein the elevators (6, 10) are run intermittently and the cam sections (7, 11) of the elevators (6, 10) are arranged at a mutual distance to each other in such a way that a cam section (7, 11) is at the elevated cam part (8) at the same time as another cam section (7, 11) is at the non-elevated cam part (9). 35
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8. The system of claim 1 or 2, wherein the cam curve (12) has curved sections (12a, 12b) adjacent to opposite sides of the elevator (13). 45
9. The system of claim 1 or 2, wherein the cam sections (17) on the elevator (16) have curved sections (17a, 17b) at opposite ends of the cam sections (17). 50
10. The system of claim 8 or 9, wherein the elevator (13, 16) is run continuously at varying speed.
11. The system of any of the previous claims, wherein each elevator (3, 6, 10, 13, 16) has the form of a belt, chains or wires on which the cam sections (4, 7, 11, 14, 17) are fastened. 55
12. The system of any of the previous claims, wherein it is a part of a filling machine.

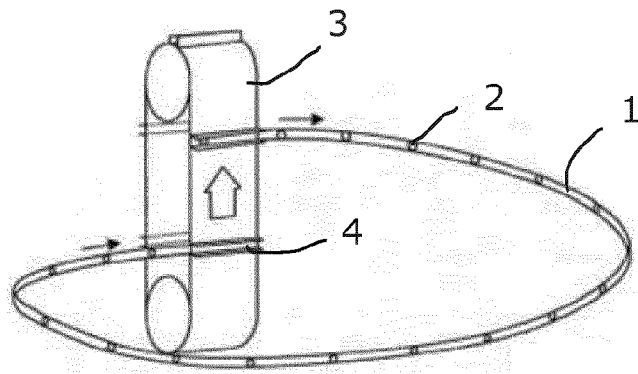


Fig. 1

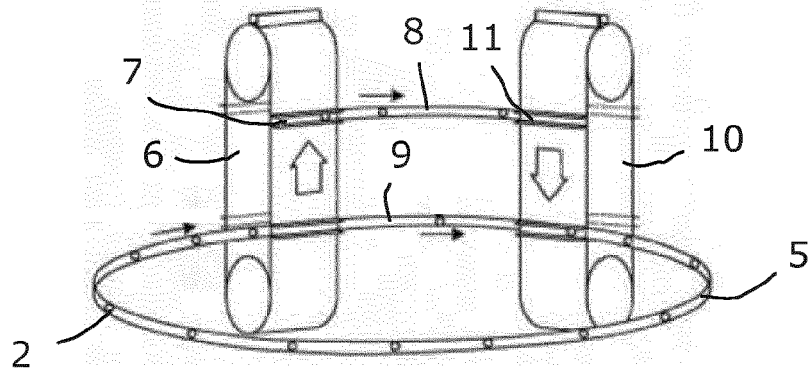


Fig. 2

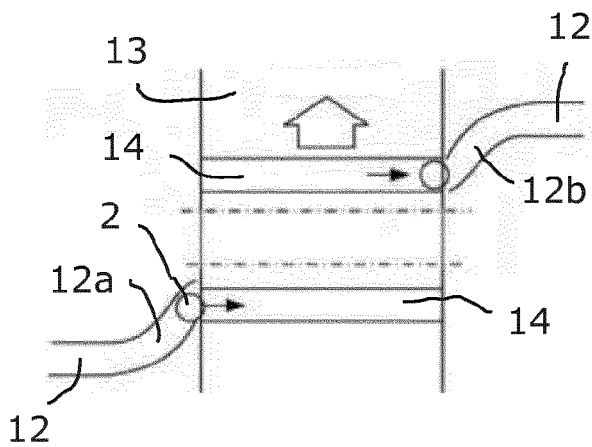


Fig. 3

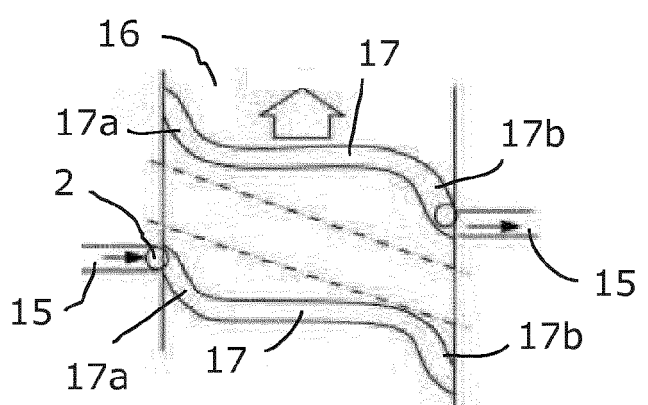


Fig. 4



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Application Number
EP 18 18 0970

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 November 2018	Examiner Wartenhorst, Frank
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