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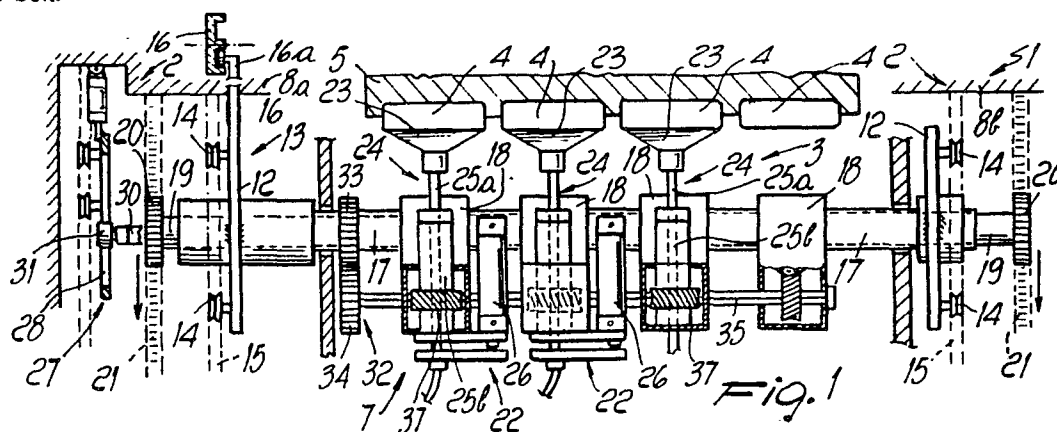
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(54) Manipulator device, in particular for soap-moulding machines.

(57) A manipulator device for extracting products (4) from a mold (5) and for arranging them on a conveyor belt, in particular for soap-molding machines or the like. The device comprises a main frame (2) which supports grip means (3) engageable with the products (4) to be extracted from a mold (5) and actuation means which act on the grip means to move them from a first position, in which they are arranged facing the mold, to a second position, in which they are arranged facing a conveyor belt. The actuation means comprise actuator means (7) which partially rotate the grip means about an axis which is substantially perpendicular to the plane of the face of the products which is engaged with the grip means to correctly position the products on the conveyor belt.

EP 0 322 563 A2



MANIPULATOR DEVICE, IN PARTICULAR FOR SOAP-MOLDING MACHINES OR THE LIKE

The present invention relates to a manipulator device for extracting products from a mold and for arranging them on a conveyor belt, in particular for soap-molding machines or the like.

Soap-molding machines are known, generally constituted by a supporting structure for one or more cylindrical drums which are arranged horizontally and have, on their lateral surface, at least one mold for forming soap-cakes or pieces of soap in general. More particularly, each drum has two diametrically opposite molds, each whereof has a plurality of cavities shaped appropriately to allow the simultaneous molding of several pieces of soap. These machines also comprise a counter-mold which is arranged facing the lateral surface of each drum and is controllably movable towards or away from said drum. Each drum can rotate about its own axis so as to arrange a mold facing the counter-mold, and the soap to be molded, which is in a plastic state, is fed between the mold and the counter-mold. The soap-cakes are molded by moving the counter-mold into contact with the mold; after the mold has re-opened, the drum is rotated about its axis so as to arrange the counter-mold facing the other mold.

On the opposite side with respect to the counter-mold, the drum faces a device which extracts the molded soapcakes, which are still retained within their mold, and deposits them on a conveyor belt which advances in a direction which is parallel to the axis of the drum so that they are conveyed to a packaging machine.

The device which extracts the soap-cakes from the mold generally has suckers which adhere to the soap-cakes and deposit them on the conveyor belt, rotating them about an axis which is parallel to the axis of the drum to move the face of each soap-cake which is engaged with a sucker from a vertical plane in the mold to a horizontal plane on a conveyor belt.

In the case of substantially parallelepipedal soap-cakes, i.e. soap-cakes with a substantially rectangular base face, some packaging machines require the longer sides to be arranged transversely to the direction of advancement of the conveyor belt.

In view of the fact that said longer sides must be arranged in the mold parallel to the axis of the drum due to aesthetical requirements, particularly if it is necessary to mold soap with veins of different colors extending longitudinally with respect to the plastic vein of soap which flows in a direction parallel to the axis of the drum, the soap-cakes are unloaded onto the conveyor belt with their longer

sides arranged parallel to the direction of advancement of the belt, and a positioning device which correctly orientates the soap-cakes is provided ahead of the packaging machine.

The need to provide two devices, one for extracting the soap-cakes and one for correctly positioning them in input to the packaging machine, has some disadvantages.

More particularly, a crowding of incoming soap-cakes may occur ahead of the positioning device, causing undesirable contacts between the soap-cakes with consequent damage.

The operating speeds of known positioning devices are furthermore considerably lower than packaging speeds and therefore do not allow the full exploitation of the productive potentiality of current packaging machines.

The aim of the present invention is to obviate the above described disadvantages by providing a device which simultaneously extracts the soap-cakes and correctly positions them on a conveyor belt which directly feeds a packaging machine.

Within this aim, an object of the invention is to provide a device which has high speed in its operating cycle so as to adequately feed fast packaging machines.

Another object of the invention is to provide a device which is highly reliable in operation without requiring frequent interventions for maintenance.

This aim, as well as these and other objects which will become apparent hereinafter, are achieved by a device for extracting products from a mold and for arranging them on a conveyor belt, in particular for soap-molding machines or the like, comprising a main frame which supports grip means engageable with the products to be extracted from a mold and actuation means which act on said grip means to move them from a first position, in which they are arranged facing the mold, to a second position, in which they are arranged facing a conveyor belt, characterized in that said actuation means comprise means for actuating a partial rotation of said grip means about an axis which is substantially perpendicular to the plane of the face of said products which is engaged with said grip means.

Further characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of the device according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a schematic partially sectional top plan view of the device according to the invention;

figure 2 is a partially sectional schematic front view of the device according to the invention;

figure 3 is a sectional enlarged view of a detail of figure 2;

figure 4 is a schematic perspective view of part of the device according to the invention;

figure 5 is a top plan view of a soap-molding machine and of a conveyor belt which can be fitted with the device according to the invention;

figures 6 and 7 are schematic views of the grip means and of part of the actuation means according to the invention during the extraction of a product from the mold;

figures 8 and 9 are schematic views of the grip means and of part of the actuation means according to the invention while the product is being positioned on the conveyor belt.

With reference to the above described figures, the device according to the invention, generally indicated by the reference numeral 1, comprises a main frame 2 on which grip means 3 are mounted and are controllably engageable with the products 4 to be extracted from a known mold 5. The device according to the invention has actuation means to move the grip means 3 from a first position, in which they are arranged facing the mold 5, to a second position, in which they are arranged facing a conveyor belt 6 having spaced pockets.

According to the invention, the actuation means comprise actuator means 7 which partially rotate the grip means 3 about an axis which is perpendicular to the plane of the face of the products 4 which is engaged with the grip means 3.

More particularly, the main frame comprises a pair of uprights 8a and 8b which support a drum 9 so that it is rotatable about its own axis; said drum 9 has its axis arranged horizontally and has, on its lateral surface, at least two diametrically opposite molds 5. By intermittently rotating the drum 9 about its own axis, a mold 5 is moved to face a counter-mold 10 and subsequently the grip means 3 of the device according to the invention. The soap 11 to be molded is fed in a known manner in a direction which is parallel to the axis of the drum 9 between the mold 5 and the counter-mold 10, while the soap-cakes 4 are unloaded by the grip means onto the conveyor belt 6, which has a direction of advancement substantially parallel to the soap feeding direction.

The grip means 3 are mounted on a secondary frame 12 which is controllably movable by virtue of the action of first means 13 for moving towards and away from the mold 5. More particularly, the secondary frame 12 has wheels 14 which are slideable along guides 15 fixed to the uprights 8a and 8b of the main frame, and the first movement means may be constituted for example by a cam 16 which

can be synchronized with the rotation of the drum 9 and moves a cam follower 16a fixed to the secondary frame.

The secondary frame 12 rotatably supports a first shaft 17 which has its axis arranged horizontal and parallel to the axis of the drum 9. At least one supporting element 18 is mounted on the first shaft 17, which is arranged facing the mold 5 on the opposite side with respect to the counter-mold 10; said element 18 is rigidly associated with said shaft 17 in its rotation about its axis and supports the grip means 3. In the illustrated case, four supporting elements 18 are provided, one for each product to be extracted from the mold 5. The movement of the secondary frame 12 causes a translatory motion of the first shaft 17 transversely to its axis so as to move the grip means 3 away from or towards the mold 5.

In order to keep the shaft 17 parallel to the axis of the drum during this translatory motion, a guiding shaft 19 is rotatably accommodated within the first shaft 17 and protrudes therefrom with its ends. Toothed wheels 20 are keyed onto the opposite ends of the guiding shaft 19 and mesh with racks 21 which are arranged horizontally and perpendicular to the axis of the shaft 17 and are fixed to the uprights 8a and 8b of the main frame.

Advantageously, second translatory means 22 controllably act on the grip means 3 in order to move them towards or away from the conveyor belt 6 relatively to the supporting element 18. More particularly, the grip means are constituted by suckers 23, each whereof is mounted at the end of a connecting shaft 24 supported by the supporting element 18 perpendicular to the axis of the first shaft 17. The connecting shaft 24 is advantageously constituted by two parts, of which a first one 25a is internally hollow and is accommodated in an axially slideable manner in the second part 25b which is supported so as to be rotatable about its axis by the supporting element 18. The sucker 23 is associated with an end of the first part 25a, which is rigidly associated in rotation with the second part 25b, while the other end is connected to a controllably activatable known suction device which is not illustrated for the sake of clarity.

Said second translatory means 22 may be constituted by fluidodynamic pistons 26 which controllably act on the first part 25a, moving it axially relatively to the second part 25b in a direction which is perpendicular to the axis of the first shaft 17. The actuation means according to the invention comprise guiding means 27 which are operatively connected to the first shaft 17 to rotate it partially about its own axis when the secondary frame 12 moves towards or away from the mold 5 to transfer the grip means 3 from their first position to the second position or vice versa.

Advantageously, the guiding means 27 are constituted by an actuation plate 28 which is supported by one of the uprights of the main frame and defines a shaped path 29 slideably engaging an arm 30, fixed to the first shaft 17 and in case provided with a roller 31. The shaped path 29 is constituted by a first portion which extends perpendicular to the plane of arrangement of the mold 5 in its unloading position and by a second portion in the shape of an arc of a circle which is connected to the first portion. The roller 31, pushed along the second portion of the shaped path 29, causes a partial rotation, through 90° in the illustrated case, of the shaft 17 about its axis and therefore a partial rotation of the grip means about said axis.

The actuator means 7 according to the invention advantageously comprise connecting means 32 which are interposed between the first shaft 17 and the grip means 3 so as to obtain, simultaneously with the partial rotation of the shaft 17, also a partial rotation of the suckers 23 about the axis of the related connecting shaft 24, i.e. about an axis which is perpendicular to the face of the soap-cake which is engaged with the grip means.

The connecting means 32 are constituted by a first toothed wheel 33 which is arranged about the first shaft 17 and is rotatable with respect thereto, and is fixed to the secondary frame 12; the first toothed wheel 33 meshes with a second toothed wheel 34 which is keyed on a second shaft 35 which extends parallel to the first shaft 17 and is supported by the supporting elements 18 so as to be rotatable about its own axis. Said second shaft 35 has a third toothed wheel 36, one for each connecting shaft 24, which meshes with a fourth toothed wheel 37 keyed on the second part 25b of the connecting shaft 24. The transmission ratio between the toothed wheels is kept equal to 1 so that a 90° rotation of the first shaft 17 corresponds to a 90° of the connecting shaft 24.

Conveniently, the device also comprises safety means 38 which can be activated so as to act on the actuation plate 28 to move it away from the mold 5 so as to keep the arm 30 engaged with the first portion of the shaped path 29. With this movement the first shaft and therefore the grip means 3 are prevented from partially rotating during the spacing of the secondary frame 12 from the mold 5. More particularly, the actuation plate 28 is mounted by means of wheels 39 on guides 40 which are fixed to one of the uprights of the main frame and are parallel to the guides 15. The safety means 38 can be constituted by a fluidodynamic cylinder 41 which is interposed between the actuation plate 28 and the main frame and is actuated when, due to the requirements of the packaging cycle, it is necessary to not unload the soap-cakes onto the con-

veyor belt 6. In this case the soap-cakes are still extracted from the mold 5 but are allowed to drop by the grip means 3 outside the conveyor belt 6 and are recovered in a known manner.

The operation of the device according to the invention is as follows.

After molding the soap, the drum 9 is rotated and the mold 5 is arranged facing the grip means 3. The suckers 23, due to the action of the first movement means 13, are moved into contact with the soap-cakes 4, and the suction device is activated so as to engage the soap-cakes with the suckers 23. At this point, again due to the action of the first movement means 13, the soap-cakes 4 are extracted from the mold 5 and the further spacing of the secondary frame 12 causes the spacing of the grip means from the mold 5. When the arm 30 engages the second portion of the shaped path 29 the supporting elements 18 and therefore the grip means 3 are rotated through 90° about the axis of the first shaft 17. Due to this rotation, the suckers 23 are rotated through 90° about the axis of the connecting shaft 24 by virtue of the connecting means 32. In this manner the soap-cakes 4 are positioned correctly above the conveyor belt 6. If said belt has mutually spaced pockets, as usually occurs, the soap-cakes 4 are released by the grip means when an empty pocket is located at a sucker 23. Before releasing the soap-cake 4, the related sucker 23 can be moved closer to the conveyor belt 6 by actuating the related piston 26.

After the soap-cakes have been unloaded, the secondary frame 12 is again moved towards to the mold 5 and, due to this motion, the grip means 3 are returned to their initial position.

In practice it has been observed that the device according to the invention fully achieves the intended aim and objects since by virtue of the partial rotation of the grip means in the plane of the face of the products which is engaged with said grip means it is possible to vary the orientation of the products so as to arrange them correctly on the conveyor belt, i.e. in the specific case it is possible to arrange the soap-cakes with the longer dimensions of their base face transversely to the direction of advancement of the conveyor belt, though they are orientated differently in their mold. This fact avoids the use of a positioning device and therefore allows the direct feeding of a packaging machine.

Another advantage is that it is possible to correctly feed conveyor belts having pockets which are differently spaced from one another by appropriately varying the release times of the soap-cakes on the part of the grip means.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; fur-

thermore all the details may be replaced with other technically equivalent elements.

In practice, the materials employed, as well as the shapes and dimensions, may be any according to the requirements and to the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Manipulator device for extracting products from a mold and for arranging them on a conveyor belt, in particular for soap-molding machines or the like, comprising a main frame (2) which supports grip means (3) which are engageable with the products (4) to be extracted from a mold (5) and actuation means (27) acting on said grip means to move them from a first position, in which they are arranged facing said mold, to a second position, in which they are arranged facing a conveyor belt (6), characterized in that said actuation means comprise means (7) for partially rotating said grip means about an axis which is substantially perpendicular to the plane of the face of said products (4) which is engaged by said grip means (3).

2. Device according to claim 1, characterized in that it comprises a first shaft (17) arranged facing said mold (5) and supporting said grip means (3) mounted on a supporting element (18) which is rigidly associated in rotation with said first shaft (17), a secondary frame (12) being provided which rotatably supports said first shaft and is movable therewith relatively to said main frame transversely to the axis of said first shaft towards or away from said mold due to the action of first movement means (16).

3. Device according to claims 1 and 2, characterized in that it comprises second movement means (22) which controllably act on said grip means (3) to move them towards or away from said conveyor belt (6) relatively to said supporting element (18).

4. Device according to one or more of the preceding claims, characterized in that said actuation means comprise guiding means (27) which are operatively connected to said first shaft to partially rotate said first shaft about its axis upon the movement of said secondary frame towards or away from said mold to move said grip means from said first position to said second position or vice versa.

5. Device according to claim 4, characterized in that said guiding means comprise a shaped path (29) defined in an actuation plate (28) which is associated with said main frame and is arranged perpendicular to the axis of said first shaft, said first shaft having an arm (30) coupled to said shaped path (29) which is constituted by at least one first portion which extends substantially perpendicular to the plane of arrangement of said mold and by at least one second portion in the shape of an arc of a circle connected to said first portion.

6. Device according to one or more of the preceding claims, characterized in that said means for rotating said grip means are actuator means (7) comprising connecting means (32) interposed between said first shaft (17) and said grip means (3) to partially rotate said grip means about said axis which is substantially perpendicular to the plane of said face of the products upon the partial rotation of said first shaft about its own axis.

7. Device according to one or more of the preceding claims, characterized in that said grip means (3) comprise at least one sucker (23) mounted at an end of a connecting shaft (24) which is rotatably supported by said supporting element (18) and is arranged perpendicular to said first shaft.

8. Device according to one or more of the preceding claims, characterized in that said connecting means (32) comprise a first toothed wheel (33) arranged around said first shaft and rotatable with respect thereto and fixed to said secondary frame, said first toothed wheel meshing with a second toothed wheel (34) which is keyed onto a second shaft (35) which is rotatably supported by said supporting element parallel to said first shaft, said second shaft having at least one third toothed wheel (36) which meshes with a fourth toothed wheel (37) keyed on said connecting shaft.

9. Device according to one or more of the preceding claims, characterized in that said connecting shaft (24) is internally hollow and is connected, at its end opposite to said sucker (23), to a controllably activatable suction device.

10. Device according to one or more of the preceding claims, characterized in that said connecting shaft (24) is provided in two coaxial parts (25a, 25b) rigidly associated in rotation, one (25a) of said two parts being controllably slideable axially with respect to the other.

11. Device according to one or more of the preceding claims, characterized in that it comprises safety means (38) which controllably act on said actuation plate (28) to move it away from said mold (5) to keep said arm (30) of said first shaft in said

first portion of the shaped path (29) when said secondary frame moves relatively to said mold.

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