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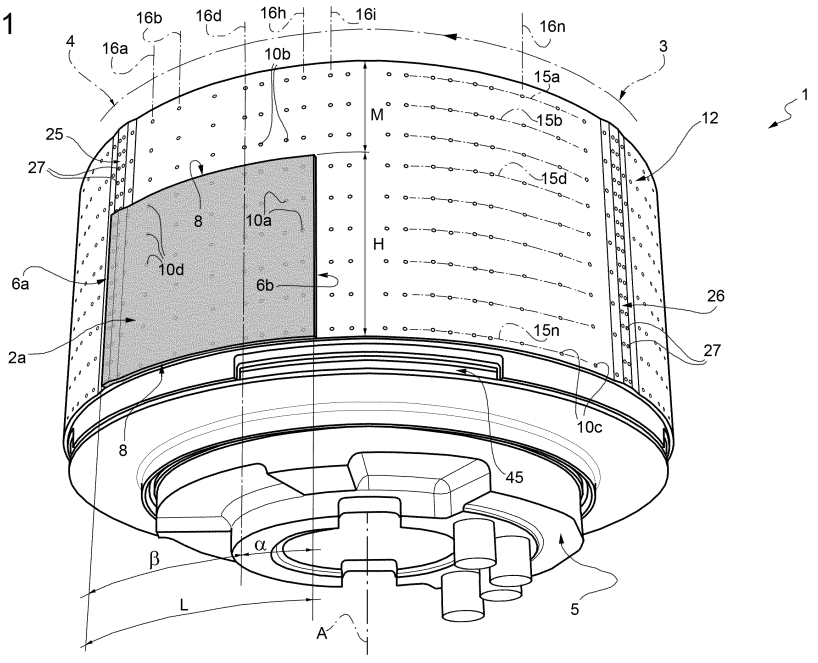
(54) A vacuum drum and a method for transferring labels

(57) There is described a vacuum drum (7) adapted to transfer at least one label (2a, 2b) along a given path (P) around a rotation axis (A), comprising: a main body (9) delimited by an outer lateral surface (11) which is adapted to receive label (2a, 2b) to be transferred; and at least one first and one second port (10a, 10b; 10c) defined by surface (11); vacuum drum (7) comprises a selectively mountable first distributor (30, 30') configured for fluidly connecting, on the basis of the format of label (2a, 2b),: first second port (10a, 10b) to a first source (22) of vacuum at a first higher degree of depression, so that a suction action is exerted by first port (10a, 10b) on label (2a, 2b), and/or second port (10c) to a second source of vacuum a second lower degree of depression, so as to selectively prevent second port (10c) from exerting a suction action on label (2a, 2b).

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a vacuum drum for transferring labels.

[0002] The present invention also relates to a method for transferring labels.

BACKGROUND ART

[0003] As it is generally known, labelling machines are used to transport, prepare and apply labels to containers, such as bottles, or articles of all sort.

[0004] Typically used with beverage bottles or vessels are tubular labels (commonly called "sleeve labels"), which are obtained by:

- cutting the web unwound from a supply roll into a plurality of rectangular or square labels;
- bending each label in a cylindrical configuration such that the opposite vertical edges overlap one another; and
- welding the overlapped edges of each cylindrical label.

[0005] Also widespread used are gluing labels, which, after being cut from a web at appropriate lengths, are glued by gluing means, such as a gluing roller, spray and injector systems or the like, and are finally transferred to respective containers or articles.

[0006] In both cases, the labels are retained on a vacuum drum by means of vacuum applied on the labels. In particular, a conventional vacuum drum has an approximately cylindrical lobed configuration and normally receives a succession of labels at an input station and, after a given rotation about its axis, transfers the labels at an output station so that they can be applied to respective articles or containers.

[0007] The vacuum drum is typically mounted, in a rotatable manner about its axis, on a stationary distributor member having first air passages connected to a vacuum source; the vacuum drum is in turn provided with second air passages, which communicate with the first air passages at certain angular positions of the drum around its axis and end into a plurality of vacuum ports formed through a drum outer lateral surface for receiving the labels.

[0008] The conventional vacuum drums are normally fabricated from monolithic aluminum castings and basically comprise a main body and a number of damping pads mounted into respective cavities formed in the peripheral portion of the main body.

[0009] The pads and the sections of the drum outer lateral surface interposed between each pair of pads are provided with the vacuum ports for retaining the labels by suction.

[0010] During transfer, each label has the leading end in the direction of rotation of the vacuum drum held on one pad, the trailing end held on another pad and the remaining part held on a section of the drum outer lateral surface comprised between the two mentioned pads.

[0011] In this way, the distance between these pads is equal to the length of the label to be processed measured along the circumference of the drum.

[0012] Furthermore, the height of the drum is equal to the height of the label to be processed measured parallel to the axis of the drum.

[0013] As a result, each format of the label calls for a vacuum drum having a given height and a given distance between the pads.

[0014] In other words, each format of the label to be transferred calls for a given format of the vacuum drum.

[0015] In order to overcome that drawback, it has been proposed in the International Application WO2012107812 in the name of the same Applicant, to use a plurality of micro-valves for selectively connecting, on the basis of the selected format of the label to be transferred, a given number of ports to the vacuum source. In detail, the control valves are associated to respective groups of ports and are controllable on the basis of the selected format of the label to allow an air flow between the vacuum source and the associated group of ports.

[0016] However, the manufacturing and the control of the micro-valves is particularly costly and complex.

[0017] A need is therefore felt to transfer different of format of labels by using the same vacuum drum, in a simpler and more economic way.

[0018] EP-B-2103530 discloses a vacuum drum which comprises a plurality of bores which extend axially through the periphery of the drum. Each bore is in fluid communication with a corresponding column of ports axially aligned and with the vacuum source.

[0019] The vacuum drum also comprises a plurality of air distributors arranged in respective bores and adapted each to selectively provide fluid communication between one or more of the ports in the corresponding column and the vacuum source through the relative bore.

[0020] In detail, each air distributor comprises an elongated body having an outer surface and a plurality of recesses formed into the outer surface. Each recess allows the fluid communication between one or more ports of the corresponding column and the vacuum source. Still more precisely, the recesses are shaped as axially slots.

[0021] When there is the need to change the format of the label, the bodies are rotated relative to their own axes, so as to connect different ports with the vacuum source.

[0022] As a result, only a given number of formats of the label may be conveyed by using the same drum.

[0023] A need is therefore felt within the industry to obtain a vacuum drum which can be used with the widest possible range of the labels to be conveyed.

DISCLOSURE OF INVENTION

[0024] It is an object of the present invention to provide a vacuum drum for use in labelling machines, which allows to meet at least one of the above need in a straightforward and low-cost manner.

[0025] This object is achieved by a vacuum drum as claimed in claim 1.

[0026] The present invention also relates to a vacuum drum as claimed in claim 11.

[0027] The present invention also relates to a method for transferring a label along a path as claimed in claim 12.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a perspective bottom view, with parts removed for clarity, of a vacuum drum in accordance with the teachings of the present invention;
Figure 2 is an exploded perspective top view of the vacuum drum of Figure 1 with a first distributor adapted to be mounted inside the vacuum drum of the present invention;
Figure 3 shows a first embodiment of a second distributor adapted to be mounted inside the vacuum drum of the present invention;
Figure 4 shows a second embodiment of the first distributor of Figure 3;
Figure 5 shows a perspective view of the vacuum drum of the present invention and fitted with the second distributor;
Figure 6 shows the vacuum drum of the present invention and fitted with the first embodiment of the second distributor and with the first distributor;
Figure 7 is a transversal section of the vacuum drum of Figure 6, with parts removed for clarity;
Figure 8 shows the vacuum drum of the present invention and fitted with the second embodiment of the second distributor and with first distributor; and
Figure 9 is a transversal section of the vacuum drum of Figure 8, with parts removed for clarity.

BEST MODE FOR CARRYING OUT THE INVENTION

[0029] Number 1 in Figure 1 indicates as a whole a vacuum drum system adapted to be used for handling and transferring labels 2a, 2b along an arc-shaped path P around an axis A to a labelling machine (known per se and not shown) for applying labels 2a, 2b to respective articles or more specifically containers, such as bottles (known per se and not shown).

[0030] Very briefly, the so-called "sleeve labeling machine" comprises:

- cutting means for cutting a web of heat-shrinkable material unwound from a supply roll into a plurality of labels 2a, 2b;
- vacuum drum system 1 for advancing each label 2a, 2b which has been previously cut;
- bending means for bending each label 2a, 2b into a tubular configuration such that the opposite edges overlap one another;
- welding means for welding the overlapped edges of each cylindrical label, so as to from a sleeve element;
- movable mandrels for moving bottles towards corresponding sleeve elements, until these bottles engage relative sleeve elements; and
- heating means for heat-shrinking the sleeve elements onto relative bottles and, accordingly, thus fixing the sleeve elements on to relative bottles.

[0031] Alternatively, the so-called "roll fed labeling machine" comprises:

- a shaft for rotatably supporting a reel off which a strip of labels 2a, 2b is unwound and fed along a feed path;
- a plurality of unwinding rollers for unwinding the backing web along a rectilinear feed path;
- a cutter for cutting a sequence of single labels 2a, 2b from the strip;
- vacuum drum system 1 for advancing each label 2a, 2b which has been previously cut; and
- a gluing drum for applying glue onto the each previously cut label 2a, 2b.

[0032] Finally, labels 2a, 2b which have been cut and covered with glue are transferred to and applied onto the relative containers.

[0033] With reference to Figures 1, 2 and 5 to 9, vacuum drum system 1 is adapted to receive a succession of labels 2a, 2b at an input station 3 and to transfer labels 2a, 2b at an output station 4 (shown in Figure 1 and 4) located at a given angular distance from the input station 3 about axis A; the labels 2a, 2b are then applied to respective articles or containers on the labelling machine.

[0034] Path P is shaped as a circular arc having the centre on the axis A and extends from station 3 to station 4 (Figure 1).

[0035] Labels 2a, 2b have a rectangular or square shape and are cut, in a known and not shown manner, from a web unwound from a supply roll.

[0036] More precisely, each label 2a, 2b has first sides 6a, 6b parallel to each other and second sides 8 parallel to each other and orthogonal with respect to sides 6a, 6b.

[0037] The extension of sides 6a, 6b parallel to axis A defines height H of label 2a, 2b while the extension of sides 8 circumferentially with respect to axis A defines length L of label 2a, 2b.

[0038] Sides 6a, 6b define respectively a leading and a trailing edge of respective labels 2a, 2b. In other words, sides 6a are the forwardmost edges of respective labels 2a, 2b and sides 6b are the rearmost edges of respective labels 2a, 2b, proceeding according to the rotation sense

of drum 7.

[0039] Length L and height H define the format of each label 2a, 2b.

[0040] In the embodiment shown, label 2a has a first format (Figure 7) whilst label 2b has a second format (Figure 9).

[0041] In detail, the length L of label 2a is smaller than length L of label 2b.

[0042] Height H of label 2a equals height H of label 2b.

[0043] As each label 2a, 2b is transferred by vacuum drum 7, sides 6a, 6b are arranged parallel to axis A and sides 8 extend along a circular arc having the centre on the axis A.

[0044] Vacuum drum system 1 extends about axis A and basically comprises (Figures 6 to 9):

- a plurality of stationary vacuum sources 22 (only schematically shown) which contains a fluid, air in the embodiment shown, at a higher degree of depression;
- a stator 5 annular about axis A and connected with a plurality of vacuum sources 22; and
- a vacuum drum 7 in accordance with the present invention, which is supported on stator 5 in a rotatable manner about axis A.

[0045] In the embodiment shown, vacuum source 22 contains air at a depression of about 0,5 bar relative to the environment pressure.

[0046] More precisely, stator 5 substantially comprises (Figures 6 and 8) an annular plate 18.

[0047] Drum 7 is independently driven by a motor (not shown), such as a brushless motor or the like, placed below the drum or is driven by the motor of the labelling machine through suitable gear of transmissions.

[0048] Drum 7 comprises:

- a cylindrical main body 9 comprising a lateral outer surface 11 extending cylindrically with respect to axis A;
- an annular base 14 arranged below body 9 and lying on a plane orthogonal to axis A; and
- a bottom plate 17 arranged on the opposite side of base 14 relative to body 9 and resting on plate 18 of stator 5.

[0049] Surface 11 receives labels 2a, 2b and comprises a plurality of vacuum ports 10a, 10b, 10c, 10d.

[0050] Ports 10a, 10b, 10c, 10d are arranged (Figure 1) along:

- a plurality of circumferential rows 15a, 15b, .. 15n parallel to each other, proceeding from the top towards the bottom of drum 7; and
- a plurality of columns 16a, 16b, .., 16n parallel to each other and orthogonal to rows 15a, 15b, .., 15n, proceeding on the opposite direction of the rotation direction of drum 7.

[0051] In the embodiment shown, rows 15a, 15b, .. 15n extend about axis A and columns 16a, 16b, .. 16n are vertical and parallel to axis A.

[0052] Furthermore, surface 11 of drum 7 comprises a plurality of sections 12 (Figures 1 and 5), four in the embodiment shown, equally spaced angularly from each other around axis A and provided each with a series of ports 10a, 10b, 10c, 10d. Each section 12 is adapted to cooperate with a respective label 2a, 2b. In this way, drum 7 can simultaneously transfer a plurality, four in the embodiment shown, of labels 2a, 2b.

[0053] Each section 12 is delimited, at the opposite angular ends, by respective damping pads 25, 26, which are carried on the periphery of drum 7 at angularly spaced regions thereof, slightly protrude from the outer lateral surface 11.

[0054] Pads 25, 26 are provided with a plurality of ports 27 extending transversally with respect to axis A and adapted to exert a suction action on labels 2a, 2b to be transferred.

[0055] Pad 25 of each section 12 engages in use, with the trailing side 6a of labels 2a, 2b to be transferred.

[0056] Column 16n is not immediately adjacent to pad 26 but is separated by pad 26 for a certain arch.

[0057] In the embodiment shown, height H of label 2a, 2b conveyed is such to cover the area defined by the intersection of rows 15d, .., 15n and columns 16a, .., 16h (Figure 1).

[0058] In greater detail, ports 10d belong to both columns 16a, .., 16c and rows 15d, .., 15n.

[0059] Ports 10a belong to both columns 16d, .., 16h and rows 15d, .., 15n.

[0060] Ports 10b belong to both columns 16d, .., 16h and rows 15a, .., 15n.

[0061] Ports 10c belong to both columns 16i, .., 16n and rows 15a, .., 15n.

[0062] Furthermore, ports 10a extend for an arch α around axis A, and ports 10d, 27 extend for an arch β around axis A.

[0063] The sum of arches α and β measured circumferentially to axis A and on surface 11 equals length L of labels 2a, 2b to be transferred.

[0064] Ports 10a extend parallel to axis A for a length which equals the height H of labels 2a, 2b to be transferred.

[0065] It goes without saying that, on the basis of the length L and height H of label 2a, 2b to be transferred, ports 10a, 10b, 10c, 10d can belong to different rows 15a, .., 15n and different columns 16a, .., 16n.

[0066] Drum 7 also comprises a plurality of cylindrical bores 13 (Figures 3, 6 and 8) defined by the periphery of body 9, extending parallel to axis A and angularly equispaced around axis A.

[0067] Each bore 13 is fluidly connected to one or more respective columns 16a, 16b, .., 16n of ports 10a, 10b, 10c, 10d or to a one or more respective columns of ports 27 through respective channels 24 orthogonal to axis A (Figures 6 and 8).

[0068] In practice, when a fluid connection is established between one bore 13 and one of the vacuum sources 22, air is suctioned from the ports 10a, 10b, 10c, 10d or from ports 27 in connection with that bore 13, so as to produce an attractive force on a relative label 2a, 2b towards the portion of outer lateral surface 11 of drum 7 where such ports 10a, 10b, 10c or 27 are formed.

[0069] Advantageously, vacuum drum 7 comprises a plurality of selectively mountable distributors 30 (Figures 3, 6 and 8), four in the embodiment shown, each of which is configured for fluidly connecting, on the basis of the format of labels 2a, 2b to be transferred,:

- ports 10a, 10b to vacuum source 22 at the higher degree of depression, so that a suction action is exerted by ports 10a, 10b on labels 2a, 2b; and/or
- ports 10c to a vacuum source 23 (only schematically shown in Fiugres 6 and 8) at a lower degree of depression, so as to prevent ports 10c from exerting any suction action on labels 2a, 2b.

[0070] In this way, only ports 10a, 10b exert a suction action on labels 2a, 2b, so that each distributor 30 is associated to a respective arch α the size of length L of labels 2a, 2b to be transferred.

[0071] It is important to stress that the connection between ports 10d, 27 to vacuum source 22 is not controlled by distributor 30, but is controlled by a different not-shown system, on the basis of the angular position of drum 7 about axis A.

[0072] In detail, distributor 30 comprises (Figures 3 and 6) :

- a plate 31; and
- a plurality of passages 32a, 32b defined by plate 31 and in fluid connection with respective bores 13.

[0073] As it will be clear from the following of the present descript, passages 32a create a fluid connection between vacuum source 22 at higher degree of depression and ports 10a, 10b while passages 32b create a fluid connection between vacuum source 23 at lower degree of depression and ports 10c.

[0074] Plate 31 is, in the embodiment shown, substantially shaped as a circular sector and comprises (Figure 3):

- a pair of walls 34 opposite to each other and lying on respective planes orthogonal to axis A;
- a pair of lateral walls 35, 36 opposite to each other, extending between walls 34 and extending radially with respect to axis A; and
- a pair of walls 37, 38 opposite to each to other, and extending between walls 34 and between walls 35, 36.

[0075] In the embodiment shown, wall 37 is radially inner relative to wall 38. Wall 37 is shaped as a circular arc.

[0076] Each passage 32a, 32b comprises:

- a groove 39a, 39b having an end in connection with respective bore 13; and
- a hole 40a, 40b having an open end on the opposite side of respective groove 39a, 39b.

[0077] Grooves 39a, 39b extend radially relative to axis A and holes 40a, 40b extend parallel to axis A, when corresponding distributor 30 has been fitted to drum 7.

[0078] In the embodiment shown, grooves 39a, 39b of each passage 32a, 32b are blind while holes 40a, 40b of each passage 32a, 32b pass through plate 31.

[0079] Grooves 39a of passages 32a have radial length greater than groove 39b of passage 32b.

[0080] Holes 40a of passages 32a are connected to vacuum source 22 through holes 41a (Figures 6 and 8) defined by plate 18. In the very same way, holes 40b of passages 32b are connected to vacuum source 23 through holes 41b (Figures 6 and 8) defined by plate 18.

[0081] Holes 40a, 41a and 40b, 41b extend parallel to axis A, and are aligned to each other parallel to axis A.

[0082] Holes 41a (Figure 8) are radially inner relative to holes 41b (Figure 6).

[0083] Holes 41a, 41b form a plurality of groups, four in the embodiment shown, angularly spaced about axis A.

[0084] Furthermore, grooves 39a, 39b of passages 32a, 32b are angularly spaced relative to axis A.

[0085] More precisely, proceeding from side 6b to side 6a along the angular direction about axis A, passages 32b precedes passages 32a.

[0086] In particular, passage 32a extends around axis A for arch α, which is smaller than length L of labels 2a, 2b to be transferred.

[0087] Furthermore, plate 18 of stator 5 defines a plurality, four in the embodiment shown, of grooves 20 and a plurality, four in the embodiment shown, of grooves 21 (Figure 6).

[0088] Grooves 20, 21 extend about axis A for respective given arches.

[0089] Grooves 20 are radially inner relative to grooves 21, with reference to axis A.

[0090] Each groove 20, 21 is connected to respective hole 41a, 41b, when label 2a, 2b is transferred by drum 7.

[0091] Each groove 20 is connected to relative vacuum source 22 (only schematically shown in Figures 6 and 8) and each groove 21 is connected to relative vacuum source 23 (only schematically shown in Figures 6 and 8).

[0092] Vacuum sources 22 are arranged, in the embodiment shown, radially inner relative to vacuum sources 23.

[0093] In the embodiment shown, vacuum source 23 contains air at a depression of about 0,25 bar relative to the environment pressure.

[0094] Furthermore, plate 18 of stator 5 defines a plurality, four in the embodiment shown, of not shown further

grooves, which are connected to a source of air at environment pressure.

[0095] The further grooves are alternate to grooves 20 around axis A.

[0096] In this way, when holes 40a, 41a are superimposed to groove 20, vacuum source 22 is fluidly connected, through passage 32a, to relative bore 13 and corresponding port 10a, 10b.

[0097] When, as a result of the rotation of drum 7, holes 40a, 41a are superimposed to the further groove, vacuum source 22 is fluidly disconnected from relative bore 13 and corresponding ports 10a, 10b.

[0098] Each distributor 30 is inserted within a relative slot 45 defined by plate 14.

[0099] Slots 45 are angularly equi-spaced about axis A and are shaped substantially as respective circular sectors having respective centers on axis A.

[0100] Slots 45 are angularly interposed with respect to axis a between pads 25 of 26 of respective section 11.

[0101] With reference to Figures 5, 6 and 8, drum 7 also comprises a distributor 60.

[0102] Distributor 60 is adapted to prevent ports 10b from exerting any suction action onto labels 2a, 2b while allowing ports 10a from exerting the suction action onto labels 2a, 2b.

[0103] Still more precisely, distributor 60 prevents all ports 10b, 10c, 10d and 27 belonging to rows 15a, .. 15d from exerting any suction action.

[0104] In detail, distributor 60 comprises (Figures 6 and 8) a base 61 and a plurality of bodies 62 which are selectively mountable inside respective bores 13.

[0105] Bodies 62 protrude orthogonally from base 61.

[0106] When bodies 62 have been fitted inside bores 13, base 61 lies on a plane orthogonal to axis A and bodies 62 extend parallel to axis A.

[0107] Advantageously, bodies 62 extend for such a length M through respective bores 13 to interrupt the fluidic connection between vacuum source 22 and ports 10b, so that suction action is exerted only by the remaining ports 10a of rows 15d, .., 15n.

[0108] In particular, length M measured parallel to axis A is smaller than the overall height of drum 7 measured parallel to axis A.

[0109] In particular, length M is enough to allow bodies 62 to cover all ports 10b.

[0110] Still more precisely, length M is enough to allow bodies 62 to cover all ports 10b, 10c, 10d belonging to rows 15a, .., 15d.

[0111] Furthermore, bores 13 comprises an outer surface 63 which is full. In other words, surface 63 does not comprise any slot.

[0112] In other words, the height H of labels 2a, 2b to be transferred corresponds to the height of ports 10a along axis A.

[0113] The operation of vacuum drum system 1 is briefly described hereafter with reference to the transfer of only one label 2a, and to only one section 12 ad to only one distributor 30.

[0114] Distributors 30, 60 are mounted on drum 7 in order to convey labels 2a (Figure 7) having all the same format, i.e. the same value of height H and length L.

[0115] On the basis of length L, distributors 30 of given format are inserted inside corresponding slots 45.

[0116] In greater detail, distributors 30 are chosen is such a way that passages 32a forms arch α which is associated to, and smaller than, length L of label 2a to be transferred. In other words, the sum of the length of arches α and β equals length L, when measured on surface 11 and circumferentially to axis A.

[0117] In this way, passages 32a establish a fluidic connection between vacuum source 22 and ports 10a, 10b and which extends for arch α about axis A.

[0118] In particular, the above-identified fluidic connection is established between groove 20 of stator 5, holes 41a, holes 40a and groove 39a of passages 32a, and bores 13.

[0119] Accordingly, ports 10a, 10b and 27 of pad 25 are fed with vacuum at the higher degree of depression.

[0120] On the contrary, passages 32b establish a fluidic connection between vacuum source 23 and ports 10c and 27 of pad 26, via groove 21 of plate 18, holes 41b, holes 40b and groove 39b of passage 32b, and bores 13 (Figure 6).

[0121] Accordingly, ports 10c are fed with vacuum at the lower degree of depression and are, therefore, prevented from exerting any suction action on label 2a to be transferred.

[0122] On the basis of height H, distributor 60 with bodies 62 having a given length M is selected and bodies 62 are inserted inside bores 13.

[0123] In this way, bodies 62 covers ports 10b, thus preventing any fluidic connection between vacuum source 22 and ports 10b.

[0124] Furthermore, length M of bodies 62 is such that they do not cover ports 10a, which can therefore exert a suction action on the labels 2a to be conveyed.

[0125] Accordingly, by selecting length M of bodies 62, it is possible to select rows 15e, .., 15n of ports 10a which remain in fluid connection with vacuum source 22 and, therefore, which can exert a suction action on label 2a.

[0126] In other words, by selecting length M of bodies 62, it is possible to select the height H of label 2a to be transferred (Figure 1).

[0127] When it necessary to transfer a label 2a of greater (smaller) length L, it is enough to replace distributor 30 with a new distributor 30 having passages 32a arranged along a greater (smaller) arch α around axis A.

[0128] In the very same way, when it is necessary to convey a label 2a of greater (smaller) height H, it is enough to replace distributor 60 with a new distributor having bodies 62 of smaller (greater) length M, so as to cover a smaller (greater) number of ports 10b.

[0129] After distributor 30, 60 have been mounted on drum 7, the latter rotates about axis A while stator 5 remains stationary relative to axis A.

[0130] When the forwardmost column of ports 27 of

pad 25 reaches input station 3, label 2a can be transferred to drum 7; in this condition, the label 2a positioned at input station 3 begins to be attracted towards drum 7.

[0131] As drum 7 continues to rotate, the other ports 10d, 10a of column 16a, .., 16e reach, one after the other, input station 3, so that whole label 2a contacts surface 11.

[0132] As ports 27 of the forwardmost column of pad 25 reach output station 4, they are disconnected from vacuum source 22. Accordingly, label 2a begins to detach from drum 7 at output station 4.

[0133] As drum 7 continues to rotate, the other ports 10d, 10a of column 16a, .., 16e reach, one after the other, output station 4, so that whole label 2a is detached from drum 7.

[0134] With reference to Figure 4, 30' indicates a second embodiment of distributor.

[0135] Distributor 30' is similar to distributor 30 and will be disclosed hereinafter only insofar as it differs from the latter; corresponding parts or equivalents of conveying units 30, 30' will be indicated, where possible, by the same reference numerals.

[0136] Distributor 30' differs from distributor 30 in that it comprises only passages 32a, which are in fluidic connection with vacuum source 22.

[0137] In other words, distributor 30' does not comprise passages 32b.

[0138] Accordingly, distributor 30' renders maximum the length of arch α and, therefore, allows drum 7 to transfer labels 2b having the maximum value of length L (Figure 9).

[0139] Furthermore, distributor 30' fluidly connects all ports 10a, 10b, 10c of section 12 to vacuum source 22.

[0140] The operation of drum 7 with distributor 30' differs from the operation of drum 7 with distributor 30 in that all ports 10a, 10b, 10c of section 11 are in fluid connection with vacuum source 22 and can therefore exert a suction action.

[0141] The advantages of vacuum drum 7 and of the method according to the present invention will be clear from the above description.

[0142] In particular, in case the length L of label 2a, 2b needs to be changed, it is necessary only to select distributor 30, 30' having passages 32a extending for arch α corresponding to length L. The greater is arch α, the greater is length L.

[0143] In the very same way, in case height H of label 2a, 2b needs to be changed, it is necessary simply to select distributor 60 having bodies 62 extending for a different length M.

[0144] In view of the above, labels 2a, 2b of different format can be transferred by using the same drum 7 without requiring complex components and, therefore, in a simple and economic way.

[0145] Furthermore, due to the fact that bodies 62 extend only for length M inside respective bores 13 and surfaces 63 are full and without slots, it is possible to use a dedicated distributor 60 for each value of height H of labels 2a, 2b to be transferred.

[0146] In particular, it is not necessary to adjust the position of bodies 62, once the latter have been inserted inside bores 13 on the basis of the value of height H.

[0147] Clearly, changes may be made to vacuum drum 7 and to the method as described and illustrated herein without, however, departing from the scope of protection as defined in the accompanying claims.

[0148] In particular, distributor 30 could comprise only passages 32b. In this case, the label 2a would be retained only by ports 10d and the length L of label 2a would be the smaller possible, i.e. length L would be equal to the length of arch β.

[0149] Furthermore, vacuum drum 7 could not comprise distributor 60. In this case, the height H of label 2a, 2b transferred would be substantially equal to the whole size of drum 7 parallel to axis A.

Claims

1. A vacuum drum (7) adapted to transfer at least one label (2a, 2b) along a given path (P) around a rotation axis (A), comprising:

   - a main body (9) delimited by an outer lateral surface (11) which is adapted to receive said label (2a, 2b) to be transferred; and
   - at least one first and one second port (10a, 10b; 10c) defined by said surface (11);

   characterized by comprising a selectively mountable first distributor (30, 30') configured for fluidly connecting, on the basis of the format of said label (2a, 2b),:

   - said first second port (10a, 10b) to a first source (22) of vacuum at a first higher degree of depression, so that a suction action is exerted by said first port (10a, 10b) on said label (2a, 2b); and/or
   - said second port (10c) to a second source (23) of vacuum at a second lower degree of depression, so as to selectively prevent said second port (10c) from exerting any suction action on said label (2a, 2b).

2. The vacuum drum of claim 1, **characterized in that** said first distributor (30, 30') comprises at least one passage (32a) which is in fluidic connection with said first port (10a, 10b) and is fluidly connectable to said first source (22) of vacuum.

3. The vacuum drum of claim 2, **characterized in that** said first distributor (30') comprises at least one second passage (32b) which is in fluidic connection with said second port (10c) and is fluidly connectable to said second source (23) of vacuum.

4. The vacuum drum of claim 3, **characterized in that** said first passage or said second passage (32a, 32b)

comprises a first portion and a second portion (39a, 39b) respectively; said first portion and second portion (39a, 39b) extending radially relative to said axis (A) for different respective radial sizes, when said first distributor (30, 30') has been coupled with said vacuum drum (7).

5. The vacuum drum of any one of claims 2 to 4, **characterized by** comprising a plurality of said first passages (32a) comprising, in turn, respective said first portions (39a); said first portions (39a) defining an arch (α) about said rotation axis (A); the size of said arch (α) being associated to a first length (L) of said label (2a, 2b).

6. The vacuum drum of any one of claims 2 to 5, **characterized in that** said first and second passage (32a, 32b) are circumferentially adjacent to each other with respect to said axis (A), when said first distributor (30) has been coupled with said vacuum drum (7).

7. The vacuum drum of claim 5 or 6, **characterized in that** said first passage (32a) comprise a second portion (40a) transversal to said first portion (39a) and connectable to said first vacuum source (22).

8. The vacuum drum of any one of the foregoing claims, **characterized by** comprising at least one slot (45) within which said distributor (30, 30') may be fitted.

9. The vacuum drum of any one of the foregoing claims, **characterized by** comprising at least two distributors (30, 30') which are angularly equi-spaced about said axis (A).

10. The vacuum drum of any one of the foregoing claims, **characterized by** comprising a plurality of bores (13) parallel to said axis (A) and a second distributor (60) selectively mountable on said body (9);
said bores (13) being fluidly interposed between respective columns (16a, .. , 16n) of said first ports and second ports (10a, 10b; 10c) aligned parallel to said axis (A) and said first vacuum source (22);
said second distributor (60) comprising a plurality of bodies (62) which may be selectively inserted inside respective said bores (13);
each said body (62) extending parallel to said axis (A) for a such second length (M) to prevent the fluidic connection between said first vacuum source (22) and at least one (10b) of said first ports (10a, 10b) of said respective column (16a, .. , 16n), so that said suction action is exerted only by the remaining first ports (10a) of said column (16a, .. , 16n);
said second length (M) being associated to the format of said label (2a, 2b) to be transferred.

11. A vacuum drum (7) adapted to transfer at least one label (2a, 2b) along a given path (P) around a rotation axis (A), comprising:

- a main body (9) delimited by an outer lateral surface (11) which is adapted to receive said label (2a, 2b) to be transferred; and
- a plurality of ports (10a, 10b; 10c) defined by said surface (11), arranged along a plurality of columns (16d, .., 16n) parallel to said rotation axis (A), and connectable to a vacuum source (22) to exert a suction action on said label (2a, 2b);
- a plurality of bores (13) which are fluidly connected to said vacuum source (22) and to respective said columns (16d, .., 16n) of said ports (10a, 10b; 10c);
- a distributor (60) which comprises a plurality of bodies (62) which may be selectively inserted inside said respective bores (13);

characterized in that each said body (62) comprises a full outer surface (63) which interrupts the fluidic connection between said bore (13) and at least one (10b) of said ports (10a, 10b) of respective said column (16a, .., 16n);
each said body (62) extending for a length (M) smaller than the size of said drum (7) parallel to said rotation axis (A), so as to allow the fluidic connection between said vacuum source (22) and at least the remaining said ports (10a) of respective said column (16a, .., 16n).

12. A method for transferring at least one label (2a, 2b) along a given path (P) around a rotation axis (A), by using a vacuum drum (7) comprising:

- a main body (9) delimited by an outer lateral surface (11); and
- a plurality of first and second ports (10a, 10b; 10c) defined by said surface (11);

said method comprising the steps of:

- driving in rotation said vacuum drum (7) about said axis (A); and
- receiving said label (2a, 2b) at said outer lateral surface (11);

characterized by comprising the step i) of fluidly connecting, on the basis of the format of said label (2a, 2b),:

- said first port (10a, 10b) to a first source (22) of vacuum at a first higher degree of depression, so that a suction action is exerted by said first port (10a, 10b) on said label (2a, 2b); and/or
- said second port (10c) to a second source (23) of vacuum at a second lower degree of depres-

sion, so as to selectively prevent said second port (10c) from exerting a suction action on said label (2a, 2b).

13. The method of claim 12, **characterized in that** said step i) comprises the steps of:

ii) fluidly connecting said first port (10a, 10b) to said first vacuum source (22); and
iii) fluidly connecting said second port (10c) to said second vacuum source (23);

said steps ii) and iii) being carried out by using the same distributor (30, 30') which may be selectively mounted on said drum (7).

14. The method of claim 12 or 13, wherein said first ports (10a, 10b) are aligned along a plurality of columns (16d, .. , 16i) parallel to said axis (A), **characterized by** comprising the steps of:

iv) selectively inserting a plurality of bodies (62) of a second distributor (60) inside respective bores (13) of said vacuum drum (7); said bores (13) being fluidly connected to said first vacuum source (22) and to a respective said column (16d, .. , 16i);
v) preventing, through each said body (62), the fluidic connection between said first vacuum source (22) and at least one (10b) of said first ports (10a, 10b) of said respective column (16d, .. , 16i); and
vi) allowing, through respective said bores (13), the fluidic connection between said first vacuum source (22) and the remaining said first ports (10a) of said respective column (16d, .. , 16i).

15. The method of claim 14, **characterized in that** aid step iv) comprises the step of selecting a length (M) of said bodies (62) on the basis of said format of said label (2a, 2b) to be transferred.

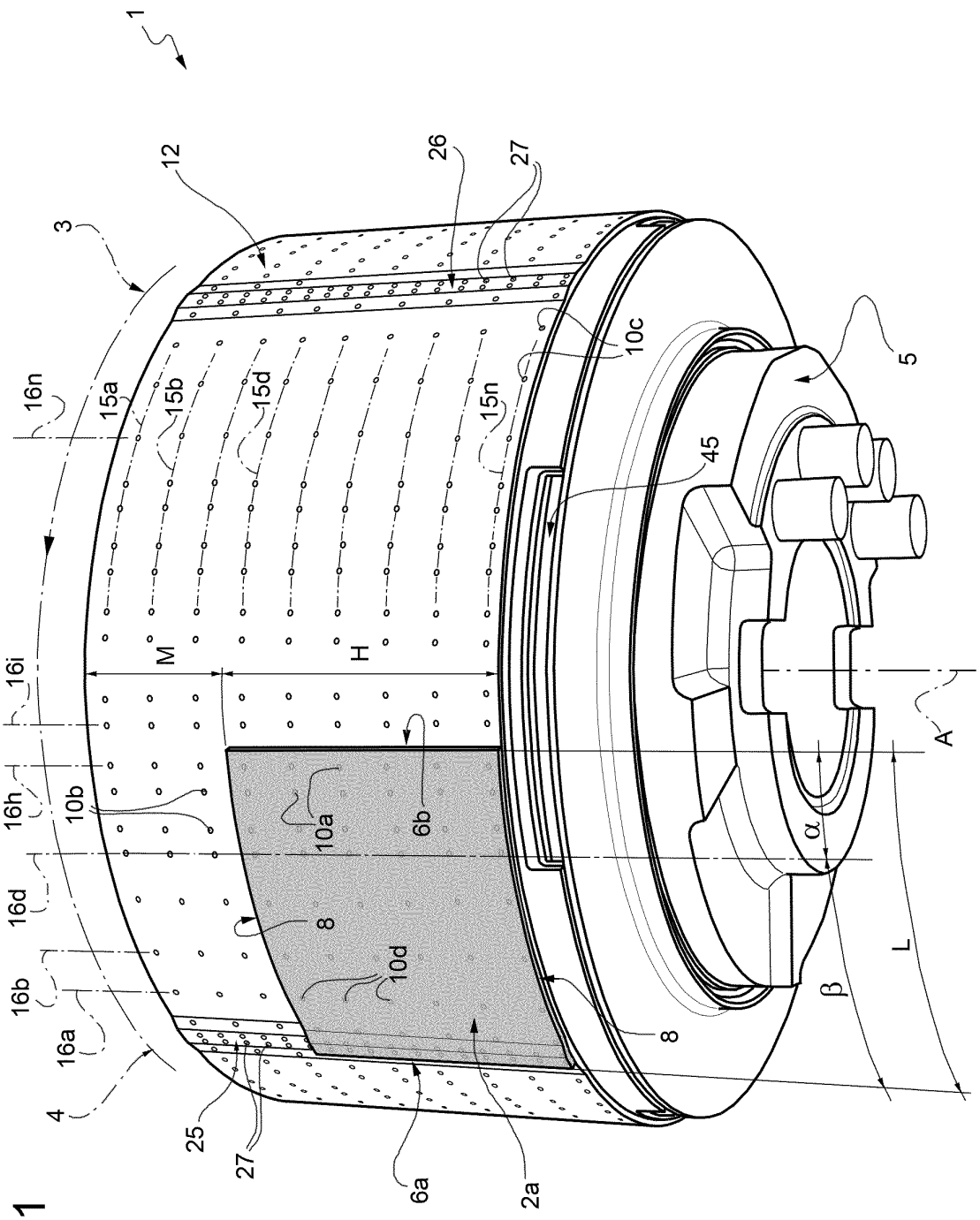
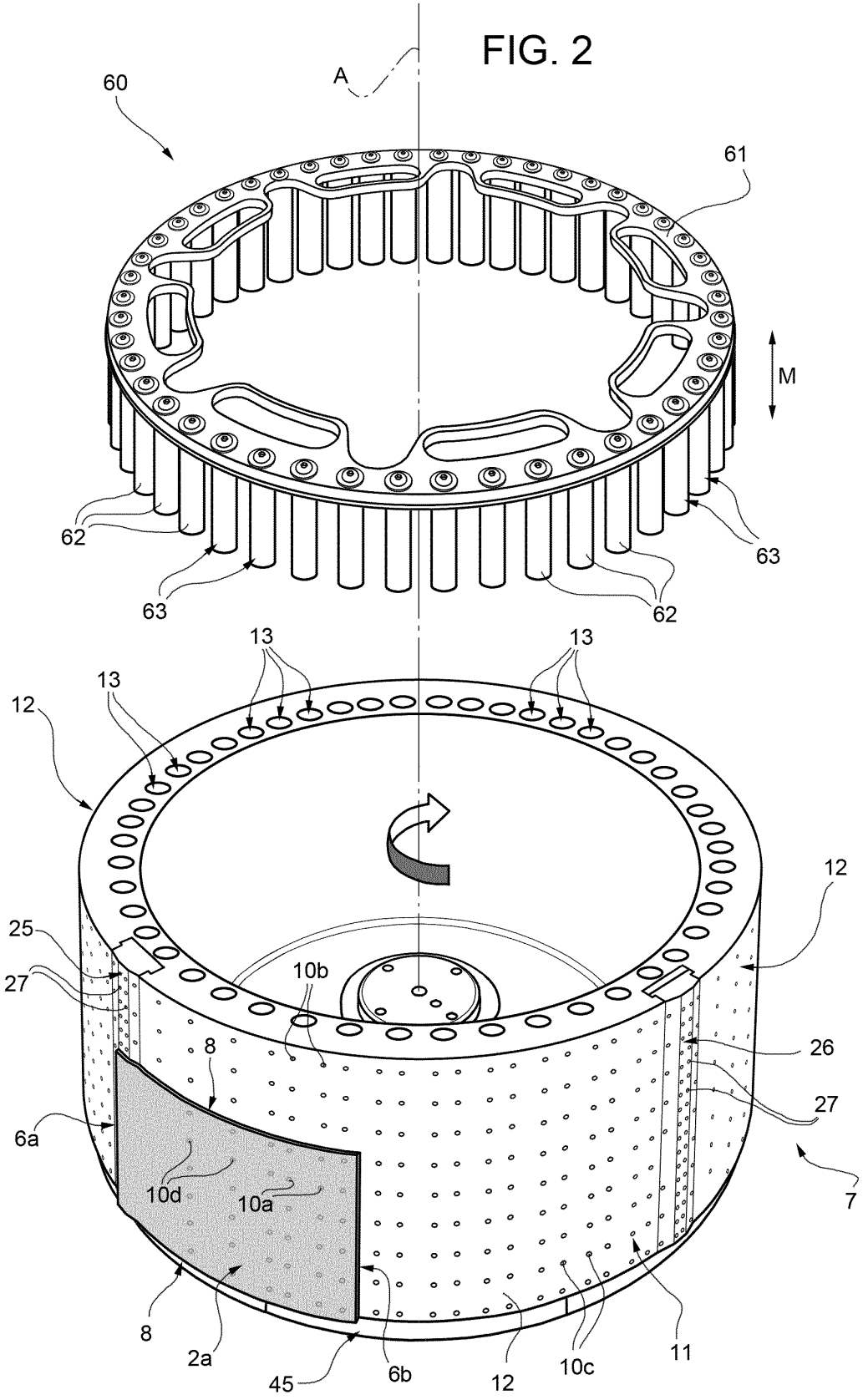

1
12
26
27
3
16n
15a
15b
15d
15n
10c
5
45
M
H
16i
16h
10b
10a
6b
A
α
16d
8
10d
16b
16a
β
L
8
4
25
27
6a
2a

FIG. 1

FIG. 2


60
A
61
M
62
63
63
62
13
13
13
12
12
25
27
10b
8
26
27
6a
10d
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8
2a
45
6b
12
10c
11

FIG. 4

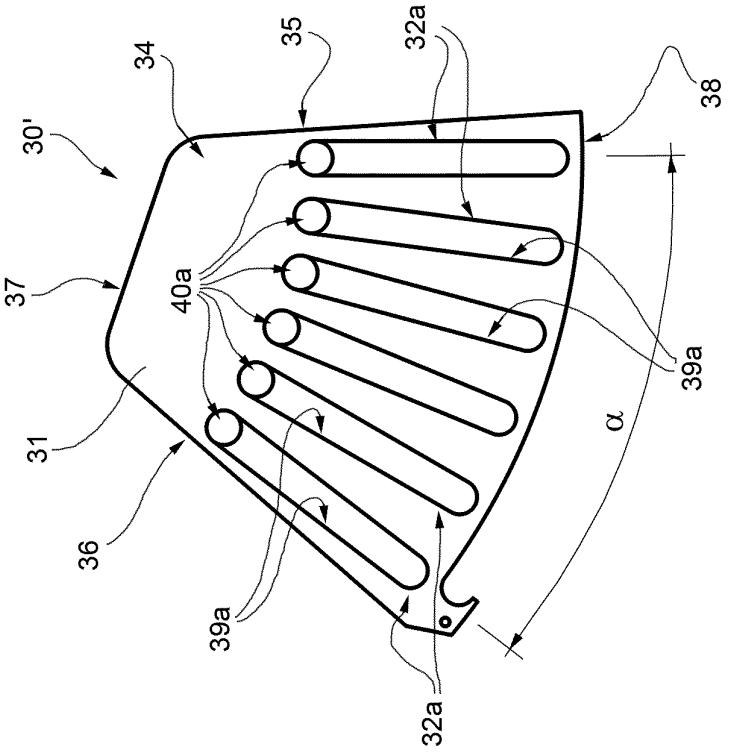
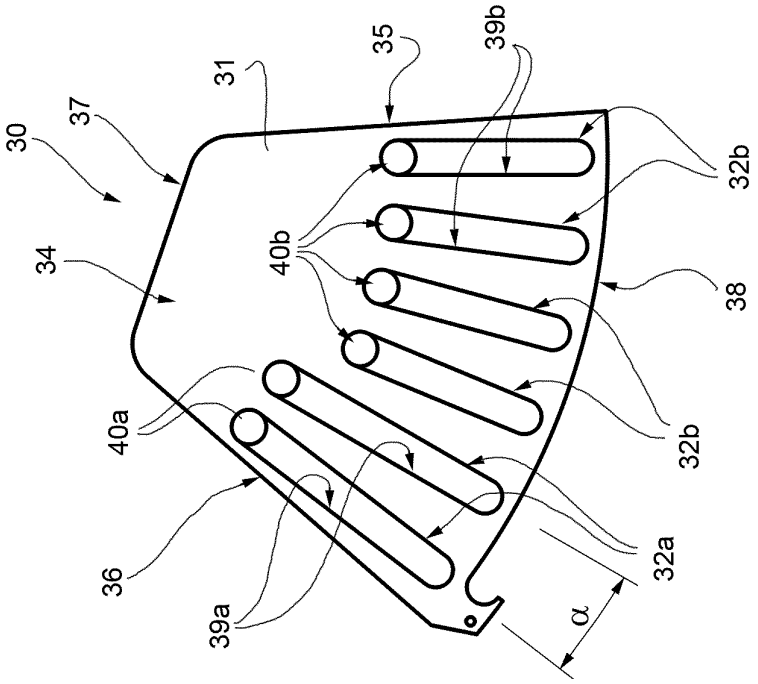

30'
34
35
32a
38
37
40a
39a
31
36
39a
α
32a

FIG. 3


30
37
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35
39b
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34
40b
38
40a
32b
36
32a
39a
α

FIG. 5

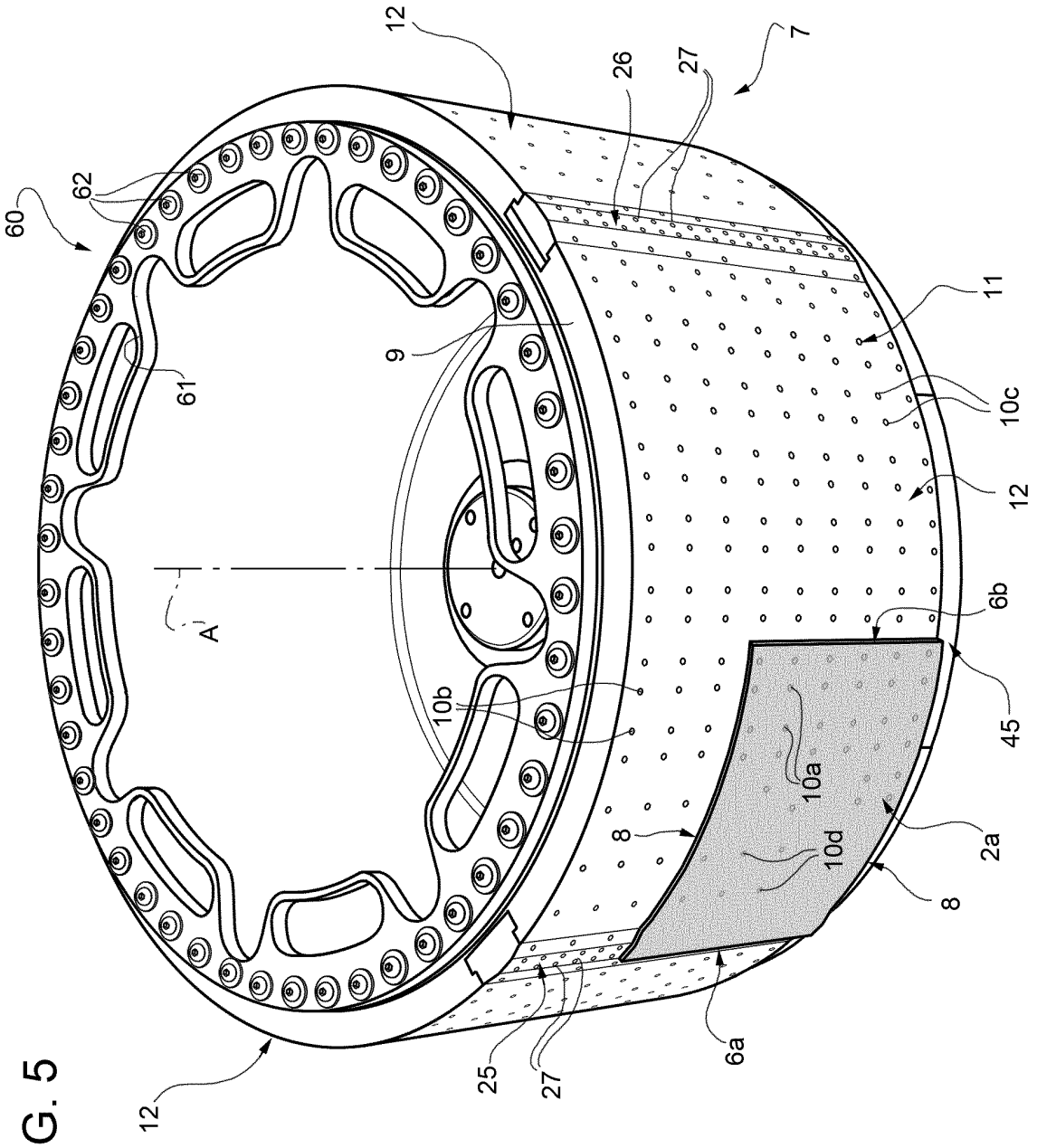


FIG. 6

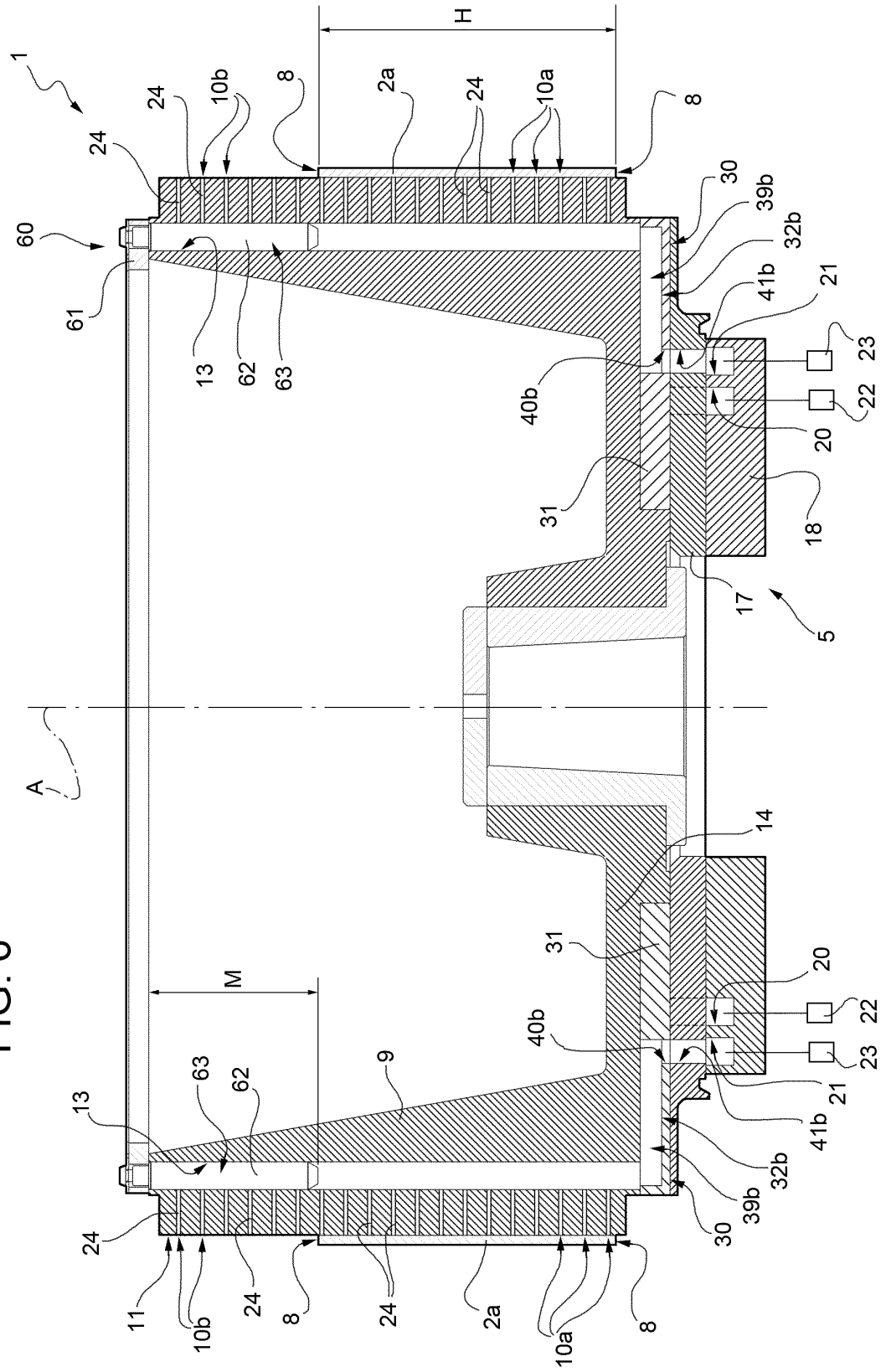

H
M
A
1
5
8
9
10a
10b
11
13
14
17
18
20
21
22
23
24
2a
30
31
32b
39b
40b
41b
60
61
62
63

FIG. 9

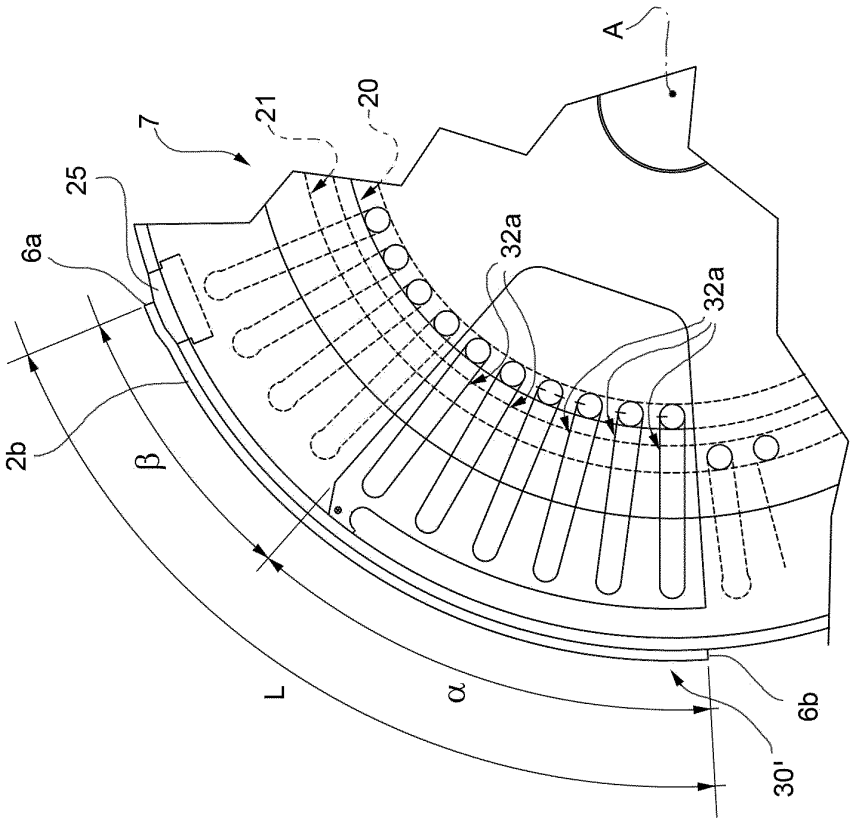

A
7
21
20
25
6a
32a
32a
2b
β
L
α
6b
30'

FIG. 7

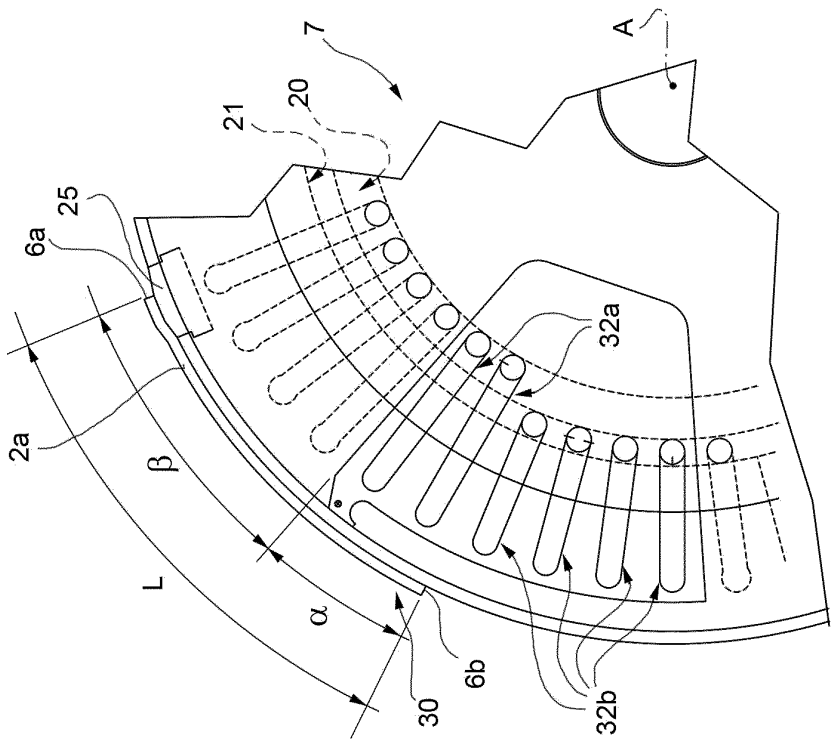
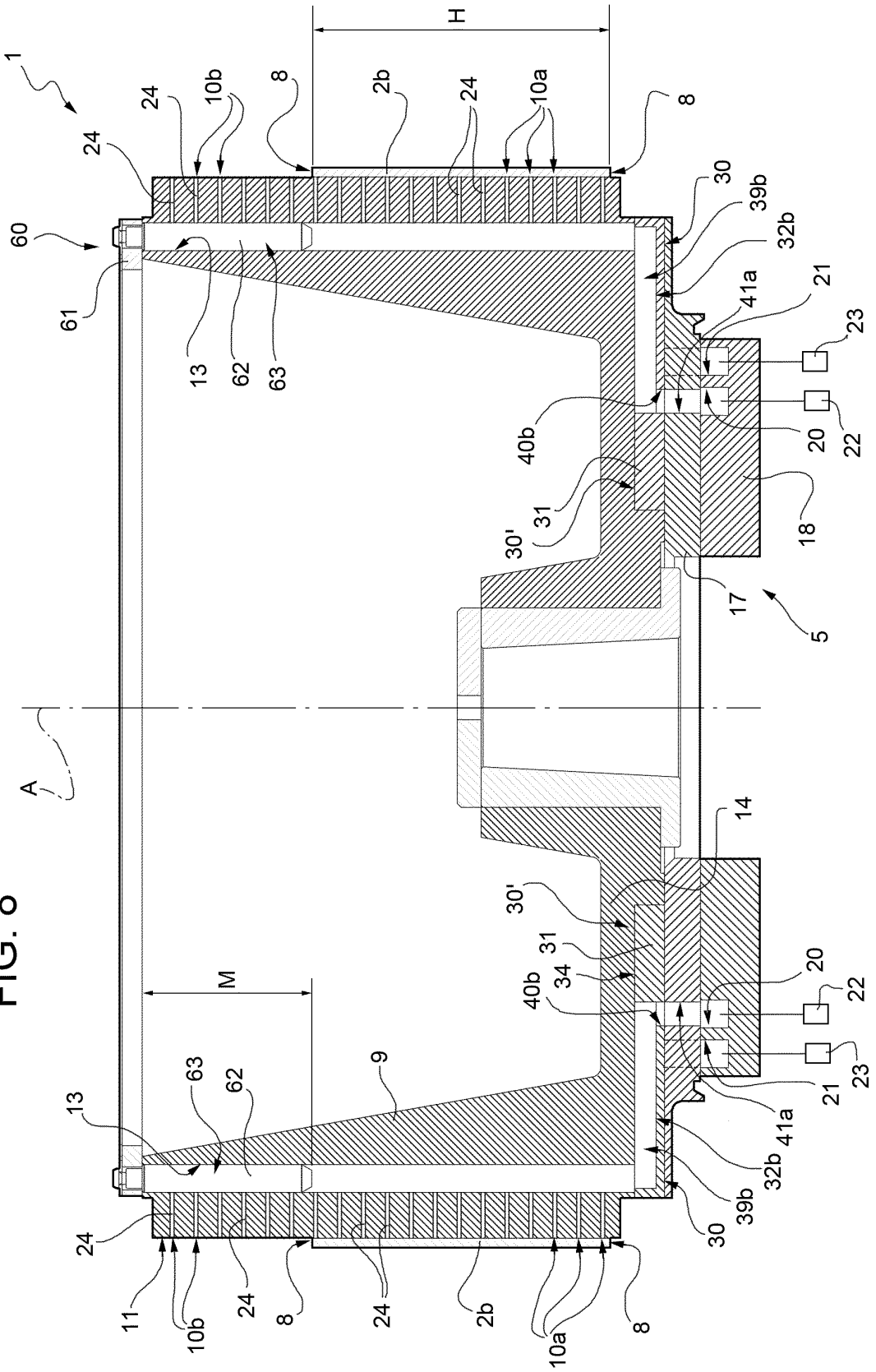

A
7
21
20
25
6a
32a
2a
β
L
α
30
6b
32b

FIG. 8


H
M
A
1
5
8
9
10a
10b
11
13
14
17
18
20
21
22
23
24
2b
30
30'
31
32b
34
39b
40b
41a
60
61
62
63

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EUROPEAN SEARCH REPORT

Application Number
EP 13 15 7331

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 2 103 530 B1 (NORDSON CORP [US]) 12 September 2012 (2012-09-12) * paragraphs [0038], [0049], [0050], [0060]; figure 10 *	1-10, 12-15	INV. B65C9/18 B65C9/14
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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	21 August 2013	Luepke, Erik

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

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Application Number
EP 13 15 7331

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-10, 12-15

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 13 15 7331

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10, 12-15

   A vacuum drum with a selectively mountable distributor to apply a higher degree of depression to first ports and a lower degree of depression to second ports.

   ---

2. claim: 11

   A vacuum drum comprising a distributor with a plurality of bodies with full outer surface which interrupt the fluidic connection of some ports with the vacuum source by being selectively inserted into bores.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 15 7331

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21-08-2013

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REFERENCES CITED IN THE DESCRIPTION

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- EP 2103530 B **[0018]**