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(54) Cutting unit for roll-fed labelling machines

(57) There is described a unit (100) for cutting a web of labelling material, comprising:
a rotary blade drum (102); a stationary blade group (105); a blow block (108) for directing a flow of air towards the labelling material web being transferred onto a vacuum drum (8); a support structure (116) for supporting the stationary blade group (105) and the blow block (108) in operative coupling with the rotary blade drum (102);
the rotation axis (H) of the rotary blade drum (102) identifying, with the rotation axis of the vacuum drum (8), a symmetry plane (S); the support structure (116) defining two seats (117a, 117b), arranged symmetrically to the symmetry plane (S) and adapted to receive either of the stationary blade group (105) and the blow block (106), so that the cutting unit (100) can be assembled in either right-hand or left-hand configuration.

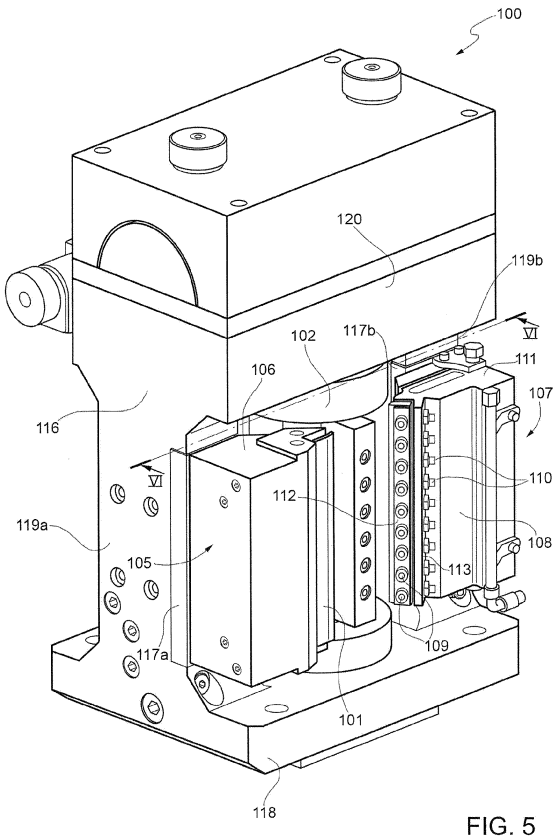

FIG. 5

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Description

TECHNICAL FIELD

[0001] The present invention relates to a cutting unit for labelling machines, particularly for the type of labelling machines comprising a reel from which the labelling material (web) is cut into lengths of a predetermined size and applied on items, namely on containers.

BACKGROUND ART

[0002] Figure 1 illustrates a typical roll-fed labelling machine 1, wherein containers 2 are carried by a carousel 3 and advanced towards a labelling station 4 along a predetermined container path. The labelling material 5, in the form of a web wound about a reel 6, is progressively advanced towards the labelling station along a respective label path, along which a cutting unit 7 is provided for cutting a length of labelling material 5 of the desired size and for transferring the resulting stripes of labelling material, typically by means of a vacuum drum 8, to labelling station 4. As the stripes of labelling material 5 are transferred from cutting unit 7 toward labelling station 4, a layer of adhesive is typically applied on its surface for subsequently securing them to the surface of containers 2 being fed to labelling station 4.

[0003] As an alternative, in a sleeve-type labelling machine, the stripes of labelling material are transferred from the cutting unit in order to be wound about rotating mandrels carried by a carousel for forming tubular lengths of labelling material which shall subsequently be applied on containers.

[0004] A cutting unit 7 generally comprises (see Figure 2) a rotary blade 9 and a stationary blade 10 - to which reference is often made also as the counterblade - which are arranged adjacent to vacuum drum 8. In use, the web of labelling material 5 is advanced between the stationary and the rotary blade of cutting unit 7, the leading edge of the web being picked, by suction, by vacuum drum 8.

[0005] Vacuum drum 8 is typically driven to rotate at a speed higher than the speed at which labelling material web 5 is advanced along the label path, whereby vacuum drum 8 applies a pulling force on the leading edge of the web. When, upon rotation, rotary blade 9 becomes contraposed to stationary blade 10, the labelling material web is cut. Typically, since there is substantially no direct interference between stationary blade 10 and rotary blade 9, the labelling material web (generally a thin, polymeric film) is weakened along the cutting line and the label is "torn" off the rest of the web by means of the pulling force applied by the vacuum drum. By appropriately setting the vacuum drum rotation speed and the speed at which the labelling material web is advanced, the label length can conveniently be adjusted.

[0006] Conventional rotary blade drums comprise a single blade arranged at the periphery thereof. More recently, rotary blade drums have been introduced which provide more than one blade (typically two) arranged equispaced about the periphery of the rotary blade drum. This arrangement makes it possible for the labelling material web to be cut in a wide range of lengths; in particular, shorter labels can be obtained and conveniently handled if only a portion of the revolution of the rotary blade drum is necessary for achieving the alignment and contraposition of the rotary blade and the stationary blade.

[0007] The lateral surface of the rotary blade drum 11 (see Figure 2) has a plurality of openings selectively connectable, during their revolution about the rotary blade drum axis: a) with a source of vacuum for holding the labelling material web as it travels and basically until it is cut; and b) with a source of a positive pressure (e.g. of compressed air), to which reference shall be made in the following as "blow-off", for facilitating the detachment of a leading portion of the labelling material web off the surface of the rotary blade drum, thereby favouring the transfer thereof onto the surface of vacuum drum 8, and under the influence of the pulling force mentioned above.

[0008] Further to a rotary blade drum and a stationary blade, cutting units for roll-fed labelling machines typically comprise blowing means for directing a flow of compressed air (a so-called "air curtain") towards the leading portion of labelling material web as it transfers onto the vacuum drum. More particularly, these blowing means consist of a so-called "blow block" 12 (see Figures 2 and 3) comprising:

- a first blower adapted to supply a first flow of compressed air directed tangentially relative to the rotary blade drum, in order to compensate for the Venturi effect potentially caused by the blow-off, which could possibly pull the labelling material web leading portion back from the vacuum drum transfer portion; and
- a second blower adapted to supply a second flow of compressed air directed onto the labelling material web while it is transferred to the vacuum drum, with a view to securing it against the lateral surface of the latter as it passes under the control of the vacuum drum suction means.

[0009] In practice, the tangential speed V2 of the vacuum drum is typically higher than the speed V1 at which the labelling material web is advanced about the rotary blade drum. Because of this speed difference, at the very point of cut (see Figure 3) the label is subjected to a virtually instantaneous acceleration, because the label mass is negligible with respect to the entity of the pulling force acting upon it.

[0010] The second flow of air supplied by the second blower is mainly intended to make sure that, despite the sudden acceleration of the newly-cut label, the trailing portion of the latter adhere to the surface of the vacuum drum so as to be properly picked by the relative suction means.

[0011] Blow block 12 is, therefore, arranged downstream from stationary blade 10 with respect to the di-

rection of advancement of the labelling material web.

[0012] Accurate synchronisation of rotary blade drum 11 and vacuum drum 8 is necessary for a good machine performance. Furthermore, care must be taken when positioning the stationary blade and the blow block relative to the rotation axis (i.e. the shaft) of the rotary blade drum.

[0013] On the labelling machine market, several different machine configurations are available for the final user (typically a company in the food or pharmaceutical industry) to choose among. In particular, as shown in Figure 4, right-hand (standard) and left-hand (non-standard) configurations are made available to the final user in order to match their needs in term of space usage. Besides, both right-hand and left-hand configurations are generally made available with either positive or negative spin. By these terms, reference is made to whether the carousel and the vacuum drum rotate about their axes in opposite directions or in the same direction, respectively. It shall be apparent that, in positive-spin configurations, at label transfer, the opposing surfaces of the carousel and of the vacuum drum move in the same direction. On the other hand, in negative-spin configurations, at label transfer, the opposing surfaces of the carousel and of the vacuum drum move in opposite directions.

[0014] Consequently, several details of a labelling machine often need to be tailored to the final user's needs. Among these are the rotary blade drum diameter, the number of blades on the rotary blade drum itself, the characteristics of the stationary blade (e.g. size, adjustability), etc.

[0015] In order to cope with the requests coming from their customers, labelling machine producers have had to multiply their design efforts to be able to provide a variety of cutting units, each of them being especially adapted for a specific machine configuration.

[0016] In particular, different cutting units with different reciprocal arrangements of the stationary blade and the blow-block are generally required to adapt a labelling unit to the final user's requirements. For a labelling machine producer, this entails not only providing different support structures for the different basic components of a cutting unit, but also different and specifically designed systems for the supply of vacuum, compressed air, etc., as well as means for adjusting the relative distance between the stationary blade and the rotary blade drum and so forth.

[0017] Not only does this make the development of new labelling machines very time-consuming and complex for labelling machine designers, but also it makes it necessary for the labelling machine producer to destine a significant space to the storage of spare cutting units for the different machine configurations.

[0018] In practice, the need to adapt the machine configuration and, consequently, the cutting unit, to the different requirements of the final users, results, for labelling machine producers, in dramatically increased costs and in an undesirably inefficient usage of storage space.

DISCLOSURE OF INVENTION

[0019] It is an object of the present invention to provide a cutting unit for roll-fed labelling machines which makes it possible to overcome the above drawbacks in straightforward and inexpensive fashion.

[0020] This object is achieved by a cutting unit for roll-fed labelling machines as claimed in claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] A non-limiting embodiment of the present invention will be described in the following by way of example and with reference to the accompanying drawings, in which:

Figure 1 shows a schematic plane view of a labelling machine;

Figures 2 and 3 show a schematic representation of the cutting unit of the labelling machine of Figure 1 in two consecutive instants during a label cutting cycle;

Figure 4 shows several examples of different configurations of the labelling machine of Figure 1;

Figure 5 shows a schematic perspective view of a cutting unit for roll-fed labelling machines according to the invention; and

Figure 6 shows a schematic section of the cutting unit of Figure 5.

BEST MODE FOR CARRYING OUT THE INVENTION

[0022] Number 100 in Figures 4 and 5 indicates as a whole a cutting unit, particularly for a roll-fed labelling machine.

[0023] Cutting unit 100 comprises a stationary blade 101 and a rotary blade drum 102 rotatable about a relative axis H and bearing at least one rotary blade 103 arranged peripherally.

[0024] In use, a web of labelling material is advanced between stationary blade 101 and rotary blade 103 of cutting unit 100, so that the leading edge of the web can be picked, by suction, by a vacuum drum 8 arranged downstream from cutting unit 100 with respect to a direction of advancement of the labelling material web.

[0025] Lateral surface 104 of rotary blade drum 102 has a plurality of openings (not shown) selectively connectable, during their revolution about axis H:

a) with a source of vacuum for holding the labelling material web as it travels and basically until is cut; and

b) with a source of positive pressure (e.g. of compressed air), to which reference shall also be made, in the following, as "blow-off" source, for facilitating the detachment of a leading portion of the labelling material web off the surface of rotary blade drum 102, thereby favouring the transfer of the labelling

material web onto the surface of vacuum drum 8, and under the influence of the pulling force mentioned above.

[0026] In some embodiments, rotary blade drum 102 may comprise a plurality (typically two) of rotary blades 103 arranged equispaced about the periphery of rotary blade drum 102.

[0027] In greater detail, cutting unit 100 comprises a stationary blade group 105, which, in turn, comprises a stationary blade block 106 for supporting stationary blade 101 in a predetermined position relative to the lateral surface of rotary blade drum 102, i.e. at a given radial distance from the relative rotation axis H.

[0028] Stationary blade 101 is preferably releasably fixed to stationary blade block 106. Even more preferably, cutting unit 100 comprises means (not shown) for adjusting the position of stationary blade 101 with respect to the lateral surface of rotary blade drum 102 - namely for adjusting the radial distance of the cutting edge of stationary blade 101 from rotation axis H of rotary blade drum 102. In some embodiments, different types of stationary blades may be mounted on stationary blade block 106, thereby making it possible to adapt cutting unit 100 to different specific needs and machine configurations.

[0029] Furthermore, cutting unit 100 comprises blowing means 107 for directing a flow of compressed air (a so-called "air curtain") towards the leading portion of labelling material web as it is transferred onto vacuum drum 8.

[0030] More particularly, blowing means 107 consist of a so-called "blow block" 108, which is arranged downstream from stationary blade 101 with respect to the direction of advancement of the labelling material web, and comprises:

- a first blower 109 adapted to supply a first flow of compressed air directed tangentially relative to rotary blade drum 102; and
- a second blower 110 adapted to supply a second flow of compressed air directed onto the labelling material web while it is transferred to vacuum drum 8.

[0031] The first flow of compressed air is intended to compensate for the Venturi effect potentially caused by the blow-off, which could possibly pull the labelling material web leading portion back from the vacuum drum transfer portion. On the other hand, the second flow of compressed air has the goal of securing the labelling material web against the lateral surface of vacuum drum 8 while the leading edge of the labelling material passes under the control of the vacuum drum suction means.

[0032] In greater detail, blow block 108 has a body 111 internally defining (see Figure 6) a first and a second plurality of ducts connectable to a source of positive pressure (not shown) and opening on respective first and second surfaces 112, 113 of body 111.

[0033] In particular, first and second plurality of ducts may either be independently connected to two separate sources or to a same source of positive pressure.

[0034] The first plurality of ducts extend, at an end portion thereof, leading to first surface 112, along an axis T substantially tangential relative to rotary blade drum 8, thereby substantially defining said first blower 109. The second plurality of ducts extend, at an end portion thereof, leading to second surface 113, along an axis P transversal to axis T, thereby substantially defining second blower 110.

[0035] In some embodiments, body 111 may define a further plurality of internal ducts, also fluidically connectable with the source of positive pressure and directed, at an end portion thereof, along an axis transversal to axis T and forming an angle α less than 90° with axis P, thereby substantially defining a further blower which aids second blower 110 in securing the labelling material web against the lateral surface of vacuum drum 8 when, in use, the leading edge of the labelling material passes under the control of the vacuum drum suction means.

[0036] Furthermore, cutting unit 100 comprises a support structure 116 for supporting stationary blade group 105 and blow block 106 in operative coupling with rotary blade drum 102.

[0037] Advantageously, rotation axis H of rotary blade drum 102 identifies, with the rotation axis of vacuum drum 8, a symmetry plane S; support structure 116 defining two seats 117a and 117b arranged symmetrically with respect to symmetry plane S and adapted to receive either of support stationary blade 101 and blow block 106, so that cutting unit 100 can be assembled in either right-hand or left-hand configuration.

[0038] More particularly, in the embodiment shown in Figures 5 and 6, support structure 116 comprises a base 118, two pillars 119a, 119b arranged symmetrically with respect to symmetry plane (S), and a top bridge structure 120 extending transversally to pillars 119a, 119b; pillars 118a, 118b defining symmetrical seats 117a, 117b respectively; base 118 and top bridge structure 120 defining centrally located seats for receiving and supporting the shaft of rotary blade drum 102.

[0039] Preferably, stationary blade group 105 and blow block 106 have a substantially symmetrical structure and are reversible, so as to be conveniently arranged and fixed in either seat 117a, 117b. In other words, stationary blade group 105 and blow block 106 are substantially interchangeable.

[0040] In greater detail, by "substantially symmetrical structure" it is meant that stationary blade group 105 and blow block 106 are reversible and, in either arrangement, operatively connectable/couplable with support structure 116 so that, from a finite number of pieces, different cutting units matching the requirements of different labelling machine configurations may conveniently be assembled with no extra effort on the part of operators.

[0041] Support structure 116 comprises first and second manifolds not shown for fluidically connecting rotary blade drum 102 and blow block 108 with the relative

sources of vacuum and/or positive pressure, respectively, according to the functional terms described above.

[0042] Advantageously, first and second manifolds are substantially symmetrical with respect to plane S and selectively connectable to either of the source of vacuum and source of positive pressure. In practice, first and second manifolds are functionally reversible.

[0043] Accordingly, no matter which seat 117a, 117b receives either of them, support stationary blade 101 and blow block 106 can conveniently be fluidically and operatively connected with the respective source of vacuum and/or source of positive pressure, so that correct operation of cutting unit 100 can be ensured, independent of the machine configuration, with the very same support structure 116, stationary blade group 105 and blow block 106.

[0044] The advantages of cutting unit 1 according to the present invention will be clear from the above description.

[0045] In particular, cutting unit 100 according to the invention makes it possible to easily assemble, from the same finite number of pieces, labelling machines having different configurations to better meet the requirements of the final user in a straightforward and relatively inexpensive manner. Besides, the symmetrical modular structure of cutting unit 100 according to the invention allows the labelling machine user to modify the configuration thereof by simply swapping support stationary blade 101 and blow block 106.

[0046] Furthermore, the modularity of cutting unit 1 makes it possible to conveniently and quickly access all parts of cutting unit 100 which may require maintenance, since virtually all modular elements forming cutting unit 100 are easy to disassemble from support structure 116 for easier access to components potentially subjected to wear, buildup of dry adhesive, etc.

[0047] Clearly, changes may be made to cutting unit 100 as described and illustrated herein without, however, departing from the scope of protection as defined in the accompanying claims.

Claims

1. A cutting unit (100) for cutting a web of labelling material fed off a roll, comprising:

   a rotary blade drum (102) rotatable about a relative axis (H) and bearing at least one rotary blade (103) arranged peripherally;
   a stationary blade group (105) supporting a stationary blade (101) in a predetermined position relative to the lateral surface of said rotary blade drum (102);
   a blow block (108) for directing a flow of compressed air towards said labelling material web as it is transferred onto a vacuum drum (8);
   a support structure (116) for supporting said stationary blade group (105) and said blow block (108) in operative coupling with said rotary blade drum (102);
   characterised in that said rotation axis (H) of said rotary blade drum (102) identifies, with the rotation axis of said vacuum drum (8), a symmetry plane (S); said support structure (116) defining two seats (117a, 117b) arranged symmetrically with respect to said symmetry plane (S) and adapted to receive either of said stationary blade group (105) and said blow block (106), so that said cutting unit (100) can be assembled in either right-hand or left-hand configuration.

2. The cutting unit according to Claim 1, **characterised in that** said support structure (116) comprises a base (118), two pillars (119a, 119b) arranged symmetrically with respect to said symmetry plane (S), and a top bridge structure (120) extending transversally to said pillars (119a, 119b); said pillars (119a, 119b) defining said symmetrical seats (117a, 117b), respectively; said base (118) and said top bridge structure (20) defining centrally located seats for receiving and supporting the shaft of rotary blade drum (102).

3. The cutting unit according to Claim 1 or 2, **characterised in that** said stationary blade group (105) and said blow block (106) have a substantially symmetrical structure and are reversible, so as to be conveniently arranged and fixed in either seat (117a, 117b).

4. The cutting unit according to any one of Claims 1 to 3, **characterised in that** said support structure (116) comprises first and second manifolds for fluidically connecting said rotary blade drum (102) and said blow block (108) with relative sources of vacuum and/or positive pressure.

5. The cutting unit according to Claim 4, **characterised in that** said first and second manifolds are substantially symmetrical with respect to said symmetry plane (S) and selectively connectable to either of said source of vacuum and source of positive pressure.

6. The cutting unit according to any one of Claims 1 to 5, **characterised in that** said blow block 108 comprises:

   a first blower (109) adapted to supply a first flow of compressed air directed tangentially relative to said rotary blade drum (102); and
   a second blower (110) adapted to supply a second flow of compressed air directed onto said web of labelling material while it is transferred to said vacuum drum (8).

7. A roll-fed labelling machine (1) comprising a cutting unit (100) according to any one of Claims 1 to 6.

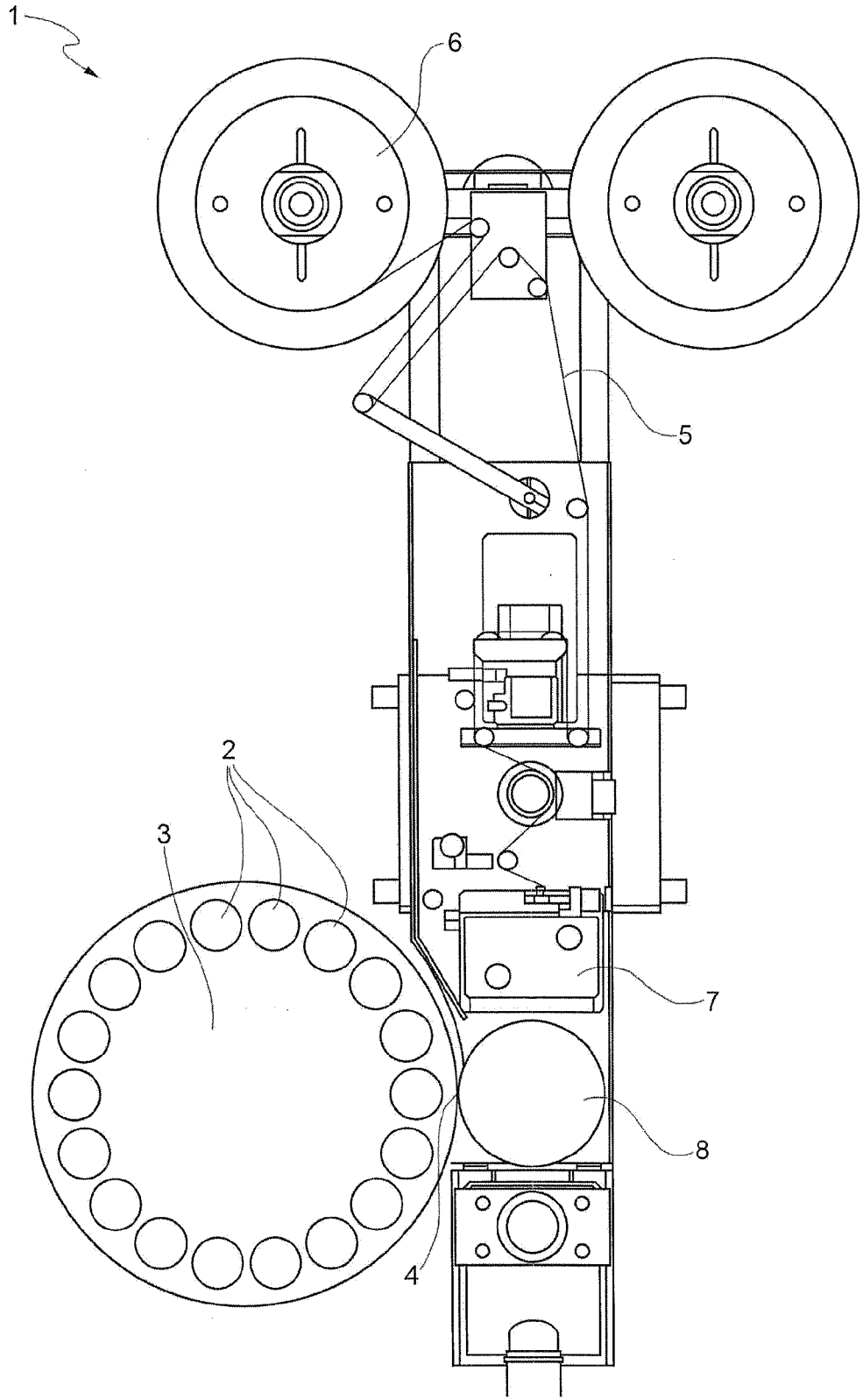


FIG. 1

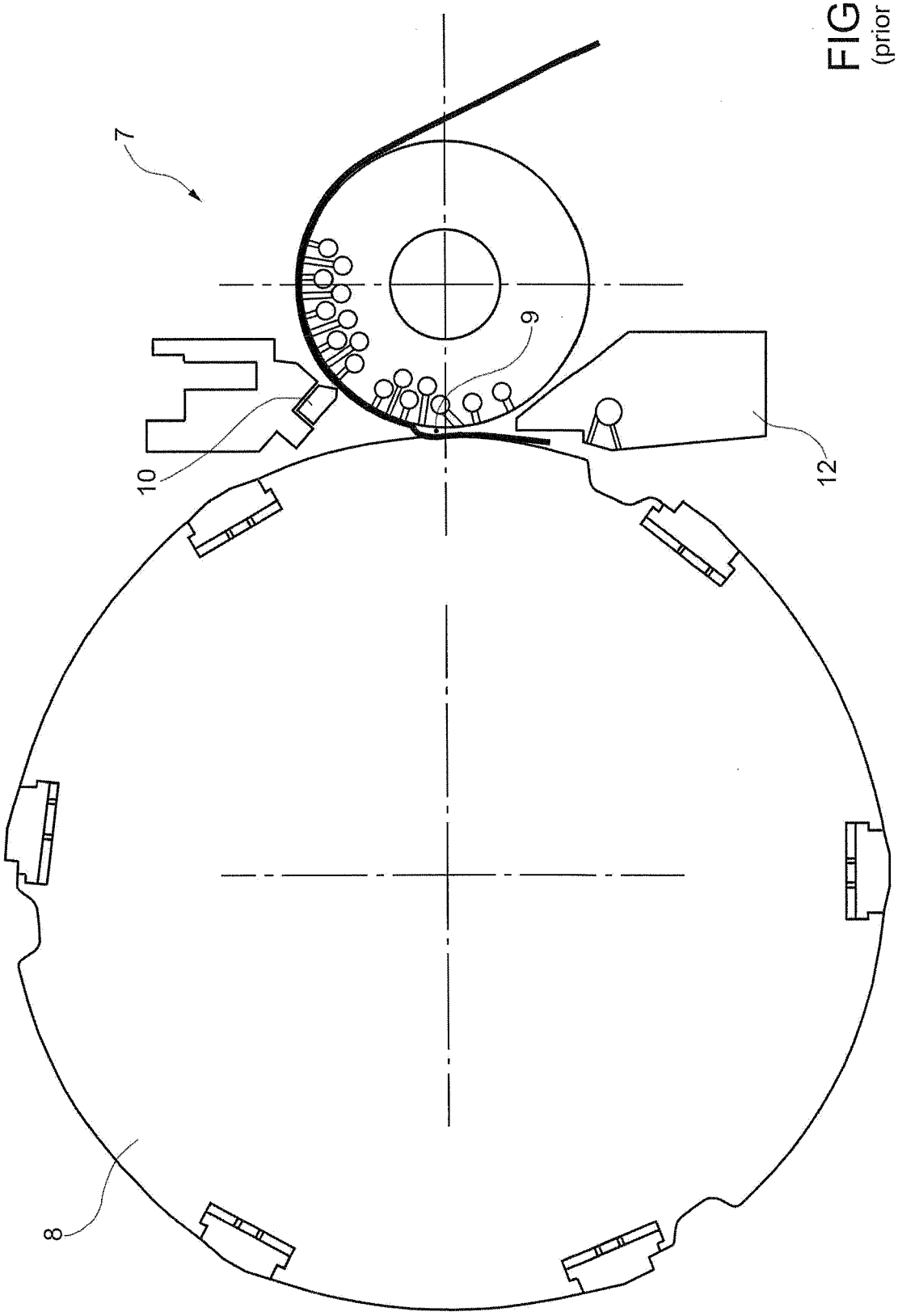


FIG. 2
(prior art)

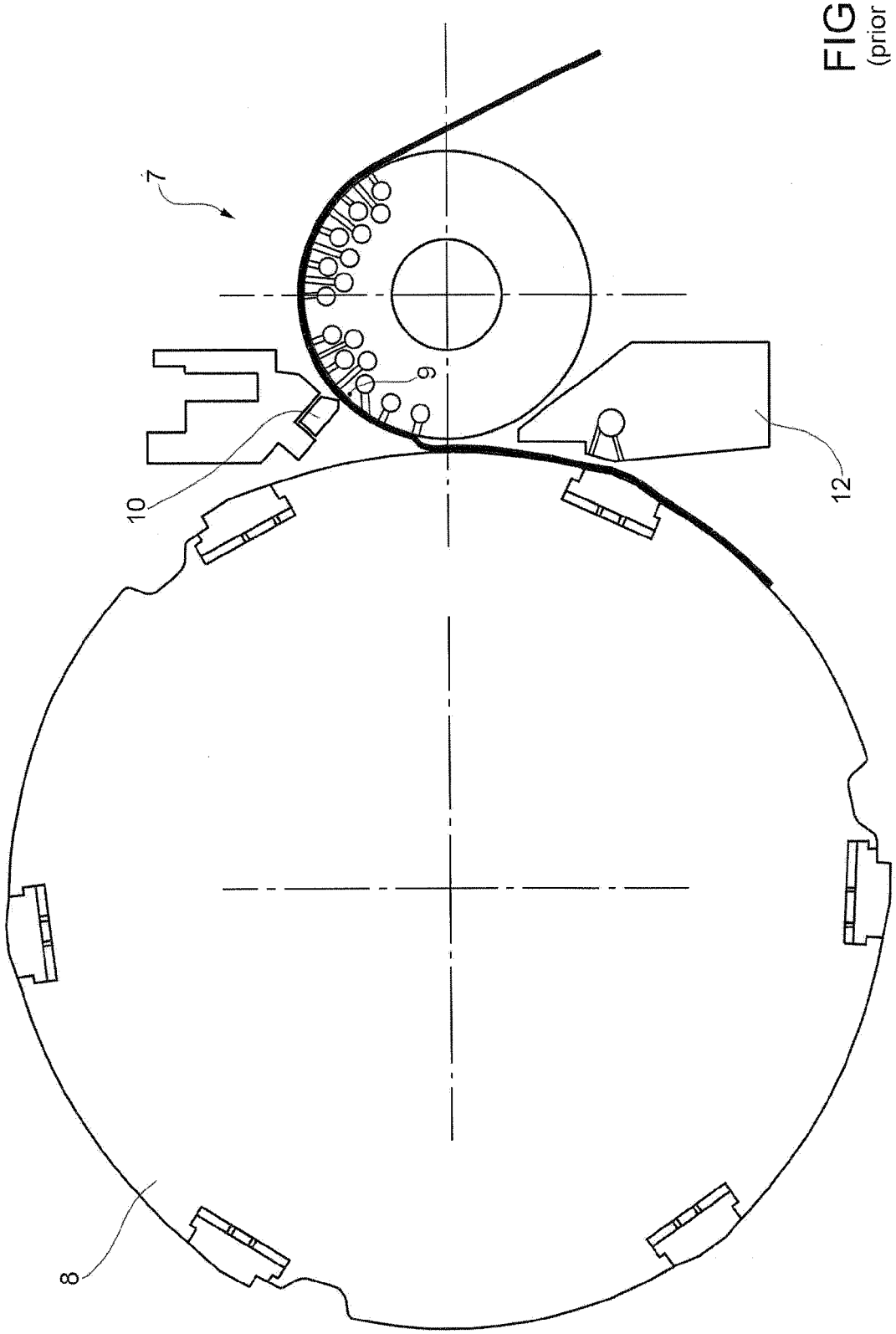


FIG. 3
(prior art)

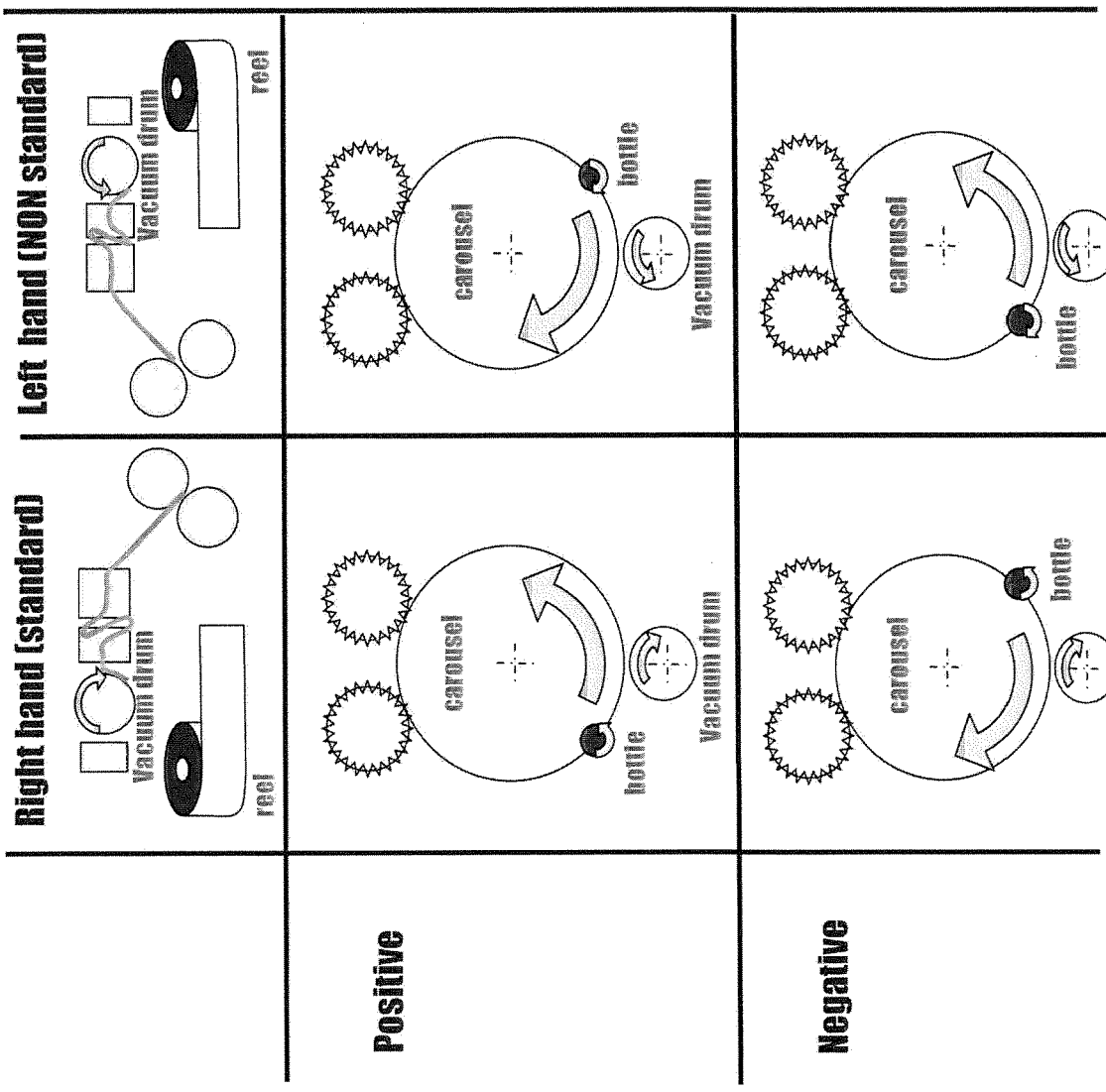

Right hand (standard)
Left hand (NON standard)
Positive
Negative
Vacuum drum
reel
carousel
bottle
Vacuum drum

FIG. 4

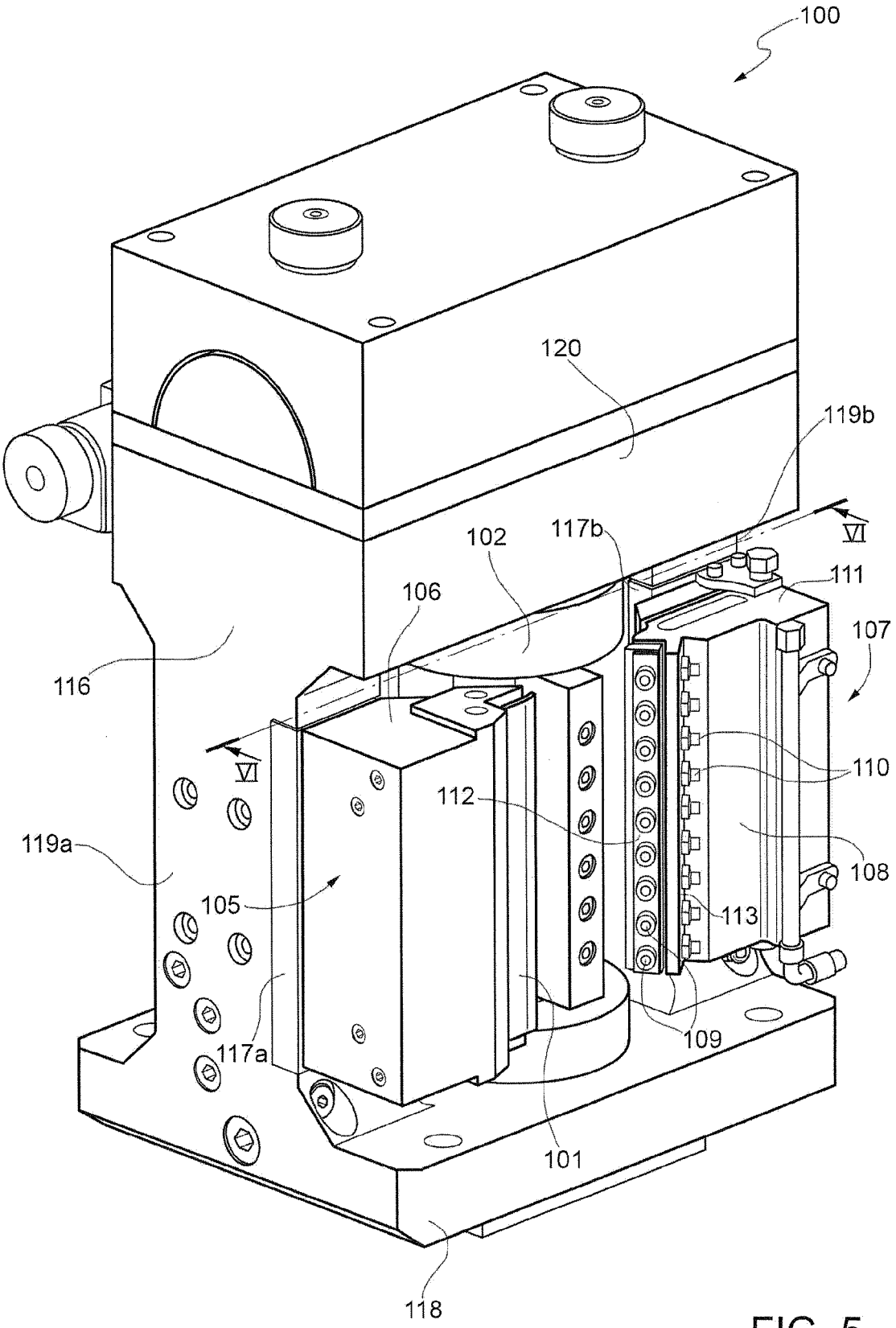
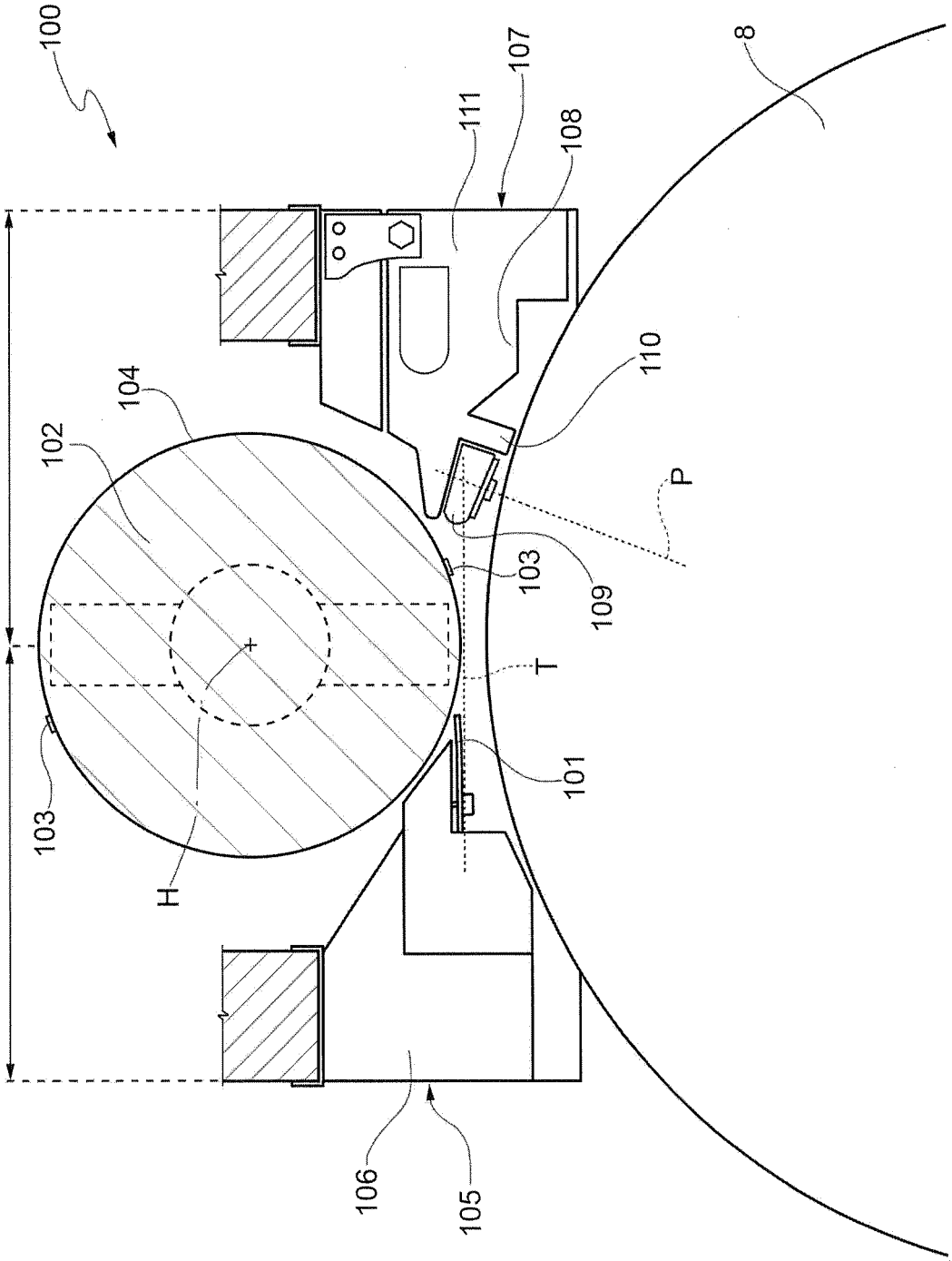

100
120
119b
VI
102
117b
111
106
107
116
VI
110
112
119a
108
105
113
109
117a
101
118

FIG. 5

FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 9785

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	EP 0 025 332 A1 (B & J MFG CO [US]) 18 March 1981 (1981-03-18) * page 8, line 10 - page 9, line 2 * * page 10, line 15 - line 24; figures 1,2 * -----	1	INV. B65C9/18 B26D1/38 B26D7/18 B26F3/00
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TECHNICAL FIELDS SEARCHED (IPC)

B65C
B26D
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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	5 April 2013	Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

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