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BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) **Title:** CARRIER PUCK

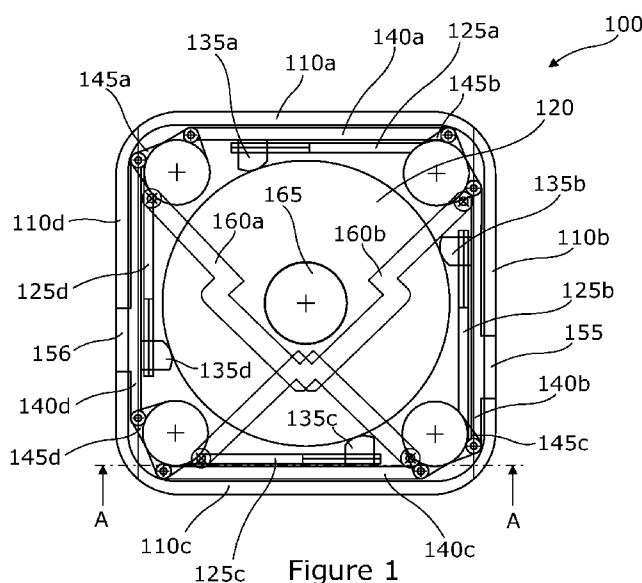


Figure 1

(57) **Abstract:** A carrier puck (100) for an article of any one of a plurality of different sizes and/or shapes, comprises: a support (105) for supporting the article thereon; and a plurality of locating members (15a, 125b, 125c, 125d) for locating the article between them on the support. A first one of the locating members (125a, 125b, 125c, 125d) is movable so as to reduce a separation distance between it and another one of the locating members.

## CARRIER PUCK

The present invention relates to carrier pucks, such as carrier pucks for receiving and supporting articles to be moved along a processing line.

5 A carrier puck may be used to receive and support an article, for instance a bottle, as it moves on a conveyor along a processing line, for instance an automatic or semi-automatic bottling line.

A conventional carrier puck may comprise a one-piece body with an aperture formed therein, the aperture being shaped and dimensioned to conform to the outer dimensions of a specific type of article which the carrier puck is designed to receive and support. For example, the aperture may have a circular cross section for receiving  
10 a cylindrical bottle.

Since the aperture of the conventional carrier puck is shaped and dimensioned for a specific type of article, each different type of article requires its own specifically designed carrier puck. Because a carrier puck cannot be reused for different types of  
15 article, there is significant wastage when a new type of article (e.g., of a new shape and/or size) is introduced. For instance if a new bottle with a square cross section replaces an existing cylindrical bottle, all of the carrier pucks used with the existing cylindrical bottles will become defunct and will likely be discarded.

Also, typically, the aperture of the conventional carrier puck is dimensioned for a  
20 loose fit of the article which the carrier puck is designed to receive and support, so that said article can be placed and removed easily. For example, the conventional carrier puck might include a cylindrical aperture with an inner diameter of 152 mm to accommodate a cylindrical bottle with an external diameter of 150 mm. Consequently, the conventional carrier puck neither supports the article in a  
25 particularly stable manner nor locates it particularly precisely.

In one aspect, the invention provides a carrier puck for an article of any one of a plurality of different sizes and/or shapes, comprising: a support for supporting the article thereon; and a plurality of locating members for locating the article between them on the support, wherein a first one of the locating members is movable so as to  
30 reduce a separation distance between it and another one of the locating members.

Optionally, a second one of the locating members is movable so as to reduce a separation distance between it and another one of the locating members. Optionally, each of the first and second locating members is movable towards the other of the first and second locating members.

- 5    Optionally, a third one of the locating members is movable so as to reduce a separation distance between it and another one of the locating members.

The plurality of locating members may further comprise a fourth locating member, and in which each of the third and fourth locating members is movable towards the other of the third and fourth locating members.

- 10    Optionally, the movable locating member, or each of the movable locating members, is pivotally connected to the support.

Optionally, the first and second locating members are pivotally connected to the support at respective positions which are equidistant from a centre of the receiving space.

- 15    Optionally, the third and fourth locating members are pivotally connected to the support at respective positions which are equidistant from a centre of the receiving space.

- 20    The carrier puck may further comprise a first linkage arranged such that actuation thereof causes the movable locating member, or each of the movable locating members, to rotate.

- 25    Optionally, the first linkage comprises a rectangular arrangement of four actuation links, the first locating member being connected to the third locating member and to the fourth locating member via first and second ones of the actuation links, respectively, and the second locating member being connected to the third locating member and to the fourth locating member via third and fourth ones of the actuation links, respectively.

The carrier puck may further comprise a clutch arranged to connect the movable locating member to, or respective clutches arranged to connect each of the movable locating members to, the first linkage.

The carrier puck may further comprise a second linkage, the second linkage comprising a coupling link arranged to couple together the first and second locating members so that displacement of the first locating member is proportional to displacement of the second locating member.

- 5 The second linkage may further comprise a second link, the second link being arranged to couple together the third and fourth locating members so that displacement of the third locating member is proportional to displacement of the fourth locating member.

10 In a second aspect, the invention provides a method of moving, along a processing line, an article of any one of a plurality of different sizes and/or shapes, comprising: providing, on a conveyor of the processing line, the carrier puck; placing the article on the support of the carrier puck; causing the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members; and advancing the conveyor to thereby move the article, supported by the  
15 puck, along the processing line.

The method may further comprise: actuating, via an actuation means of the processing line, the first linkage of the carrier puck in order to cause the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members.

- 20 The actuation means may comprise a pneumatic piston.

In a third aspect, the invention provides a processing line assembly comprising: two or more stations for processing articles; at least one of the carrier pucks; and a conveyor for transporting said at least one carrier puck between the stations.

25 The processing line may further comprise actuation means arranged to actuate the first linkage thereof in order to cause the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members. The actuation means may comprises a pneumatic piston.

30 The puck, or the method, may further comprise any one or more features or steps of the preferred embodiments of the present invention which will now be described, by way of example only, with reference to the accompanying drawings of which:

**Figure 1** is an underneath view of a carrier puck in accordance with a first embodiment of the present invention, showing four locating members thereof when retracted;

**Figure 2** is an enlarged partial section through the carrier puck of Figure 1, along the line A-A, showing a shaft to which one of the locating members is connected; and

**Figure 3** is an underneath view of the carrier puck of Figures 1 and 2, showing the four locating members thereof when pivoted inwards.

Referring mainly to Figures 1 and 3, in a first embodiment of the present invention there is a carrier puck 100 suitable for receiving and supporting an article of any one of a plurality of different sizes and/or shapes. For example, the carrier puck 100 may be used for supporting a bottle as it travels along a bottling line.

The carrier puck 100 comprises a flat, hollow, generally rectangular base 105 for supporting the article, four rectangular sidewalls 110a,b,c,d extending upwards therefrom and a flat, generally rectangular top cover 115 (see Figure 2) with a circular aperture 120 formed through it. Four arms 125a,b,c,d (other embodiments may include more or fewer arms), which act as locating members, are pivotally connected to the base 105. The four arms 125a,b,c,d can be used to locate and centre the article on the base 105.

Each of the arms 125a,b,c,d is mounted on a respective vertical shaft such that it can rotate about a vertical axis.

Referring briefly to Figure 2, each of the shafts is rotatably connected to the base 105 near a respective corner thereof. Each of the shafts is hollow and is connected to the base 105 by a respective pin which extends vertically upwards through the hollow centre of the shaft.

As shown in Figure 1, in a retracted orientation each of the arms 125a,b,c,d extends, from its respective shaft, in a direction approximately parallel to an adjacent side of the base 105. Accordingly, when retracted, the arms 125a,b,c,d bound an inner rectangular area on top of the base 105 for receiving the article.

Referring to Figures 1 and 3, a respective gripping jaw 135a,b,c,d is pivotally connected to the end of each arm, having a pivot axis which is substantially parallel to the longitudinal direction of the arm.

Each jaw 135a,b,c,d is elongate and has approximately twenty degrees of rotational travel about its pivot axis, centred at an upright orientation of the jaw 135a,b,c,d. In the upright orientation of the jaw 135a,b,c,d, the longitudinal direction of the jaw 135a,b,c,d extends in a direction approximately parallel to the pivot axis of the arm to which it is connected. In use, the jaws 135a,b,c,d will engage with the article in order to locate it on the base 105.

The carrier puck 100 comprises a first linkage by which the four arms 125a,b,c,d can be moved. The first linkage comprises four links 140a,b,c,d, each extending in a direction approximately parallel to an adjacent side of the base 105, so as to provide a generally rectangular arrangement of the links 140a,b,c,d.

Each of the links 140a,b,c,d is a flat elongate member pivotally connected at its ends to respective ones of the arms 125a,b,c,d, via respective crank mechanisms and clutches.

A respective crank 145a,b,c,d is coupled to each of the arms 125a,b,c,d, via a respective clutch 150 (see Figure 2). The pin which extends through the arm 125a,b,c,d, extends further upwards through the clutch 150 and then through the crank 145a,b,c,d. Each of the cranks 145a,b,c,d is pivotally connected to two of the links 140a,b,c,d, at respective connection points which are offset from the arm's vertical axis of rotation; the two links are angularly offset by ninety degrees.

Two of the links 140b,d, which extend in parallel directions, include outwardly projecting portions 155,156. The first linkage can be actuated via one of the outwardly projecting portions 155 in order to move the arms 125a,b,c,d in a first direction of rotation, into the inner rectangular region (as shown in Figure 3) so as to reduce a separation distance between the locating members, thereby to grip and centre the article on the base 105. The first linkage can be actuated via the other one of the outwardly projecting portions 156 in order to move the arms 125a,b,c,d in the opposite direction of rotation, out of the inner rectangular region and back towards the retracted orientations, so as to release the article.

As noted above, each of the arms 125a,b,c,d is rotatable by the linkage via a respective friction clutch 150. The friction clutches 150 provide torque control in order to prevent the arms 125a,b,c,d exerting too much force on the article as they move into the inner rectangular region to grip and centre the article on the base 105.

Since the friction clutches allow the arms 125a,b,c,d to slip relative to the first linkage, there is no need to take account of the size of the article when actuating the first linkage. That is, because of the friction clutches 150 the first linkage can be actuated through its full range of travel, in order to move the arms 125a,b,c,d into the inner rectangular region to grip and centre the article on the base 105, irrespective of the size of the article supported on the base 105 (e.g., the bigger the article, the more the arms 125a,b,c,d will slip relative to the first linkage).

Also, the clutches potentially allow each of the arms 125a,b,c,d to be in a different orientation, since the arms 125a,b,c,d can potentially slip by different amounts relative to the first linkage, thereby allowing different shapes of articles to be gripped by the arms 125a,b,c,d.

The carrier puck 100 comprises a second linkage for coupling the arms 125a,b,c,d together into diagonal pairs. Accordingly, when moved by the first linkage, both arms in a pair move in the same direction of rotation and by substantially the same amount. This can help centre the article at a centre point of the inner rectangular region. As will be appreciated from Figures 1 and 3, the arms 125a,b,c,d are pivotally connected to the base 105 at respective positions which are equidistant from the centre point.

The second linkage comprises two coupling links 160a,b, a respective one for each of the diagonal pairs of the arms 125a,b,c,d. Each of the coupling links 160a,b extends inside the base 105 and is pivotally connected at each of its ends via a respective upwardly extending pin to a respective one of the arms 125a,b,c,d in its pair. Since the second linkage couples the arms 125a,b,c,d together into pairs, rather than coupling all four arms together, the carrier puck 100 is able to centre irregularly shaped articles, such as oval bottles.

Each of the coupling links 160a,b is a flat elongate member which passes through opposite right angles such that it has a laterally offset middle portion. Accordingly, the coupling links do not obstruct a central aperture 165 through the base 105, through which a label can be applied, from below, to the bottom of the article in situ.

The present invention may be embodied in different carrier pucks.

In one embodiment a carrier puck similar to that of the first embodiment has three arms, instead of four, which are pivotally connected to the base at respective points which form the corners of an equilateral triangle. In that embodiment, the first

linkage comprises three links in a generally triangular arrangement. That embodiment may be more suitable than the first embodiment for supporting an article having a triangular or hexagonal shape, for example.

5 In some embodiments, only one of the arms is movable, in which case the movable arm can locate the article against a fixed locating member. The fixed locating member may be another arm, or may be some other part of the carrier puck such as an inner surface of a sidewall thereof.

In another aspect of the present invention, a carrier pack according to a preferred embodiment of the invention may be used in a processing line (not shown).

10 Accordingly, the invention provides a processing line assembly comprising a plurality of stations for processing articles. In one example, the articles are bottles and a first one of the stations is for filling the bottles, with a second one of the stations being for capping the bottles. There may be other stations, e.g. for applying labels to the bottles. The assembly includes at least one carrier puck 100 according to preferred  
15 embodiments of the invention, for supporting the bottles, and a conveyor for transporting the bottles, in the carrier pucks 100, between the stations.

Operation of the processing line assembly involves providing, on the conveyor, one of the carrier pucks 100. One of the bottles is then placed in the carrier puck 100, and the conveyor is advance until the bottle, in the carrier puck 100, reaches a station for  
20 locating and centring the bottle. The locating and centring station comprises a proximity sensor which detects the presence of the bottle, in the carrier puck 100, and halts the conveyor. The locating and centring station further comprises actuation means, which in this case includes a pneumatic cylinder, which is actuated in order to cause the, or each, movable locating member of the carrier puck 100 so as to reduce a  
25 separation distance between it and another one of the locating members, thereby to locating and centring the bottle. The conveyor is then advanced to move the bottle, supported by the puck, along the processing line to be processed at the next one of the stations.



## CLAIMS

1. A carrier puck for an article of any one of a plurality of different sizes and/or shapes, comprising: a support for supporting the article thereon; and a plurality of  
5 locating members for locating the article between them on the support,  
wherein a first one of the locating members is movable so as to reduce a separation distance between it and another one of the locating members.
2. A carrier puck according to claim 1 in which a second one of the locating  
10 members is movable so as to reduce a separation distance between it and another one of the locating members.
3. A carrier puck according to claim 2 in which, each of the first and second  
15 locating members is movable towards the other of the first and second locating members.
4. A carrier puck according to claim 2 or claim 3 in which a third one of the  
20 locating members is movable so as to reduce a separation distance between it and another one of the locating members.
5. A carrier puck according to claim 4 in which the plurality of locating members  
further comprises a fourth locating member, and in which each of the third and fourth  
25 locating members is movable towards the other of the third and fourth locating members.
6. A carrier puck according to any foregoing claim in which the movable locating  
member, or each of the movable locating members, is pivotally connected to the  
support.
- 30 7. A carrier puck according to claim 6, when dependent on claim 2, in which the first and second locating members are pivotally connected to the support at respective positions which are equidistant from a centre of the receiving space.

8. A carrier puck according to claim 6 or claim 7, when dependent on claim 5, in which the third and fourth locating members are pivotally connected to the support at respective positions which are equidistant from a centre of the receiving space.
- 5 9. A carrier puck according any one of claims 6 to 8 further comprising a first linkage arranged such that actuation thereof causes the movable locating member, or each of the movable locating members, to rotate.
- 10 10. A carrier puck according to claim 9, when dependent on claim 5, in which the first linkage comprises a rectangular arrangement of four actuation links, the first locating member being connected to the third locating member and to the fourth locating member via first and second ones of the actuation links, respectively, and the second locating member being connected to the third locating member and to the fourth locating member via third and fourth ones of the actuation links, respectively.
- 15 11. A carrier puck according to claim 9, or claim 10, further comprising a clutch arranged to connect the movable locating member to, or respective clutches arranged to connect each of the movable locating members to, the first linkage.
- 20 12. A carrier puck according to claim 2, or any claim dependent thereon, further comprising a second linkage, the second linkage comprising a coupling link arranged to couple together the first and second locating members so that displacement of the first locating member is proportional to displacement of the second locating member.
- 25 13. A carrier puck according to claim 12, when dependent on claim 5, in which the second linkage further comprises a second link, the second link being arranged to couple together the third and fourth locating members so that displacement of the third locating member is proportional to displacement of the fourth locating member.
- 30 14. A method of moving, along a processing line, an article of any one of a plurality of different sizes and/or shapes, comprising:  
providing, on a conveyor of the processing line, a carrier puck according to any foregoing claim;  
placing the article on the support of the carrier puck;

causing the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members; and

advancing the conveyor to thereby move the article, supported by the puck, along the processing line.

5

15. A method according to claim 14 in which said carrier puck is a carrier puck according to claim 9, or any of claims 10 to 13 when dependent thereon, further comprising:

10 actuating, via an actuation means of the processing line, the first linkage of the carrier puck in order to cause the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members.

16. A method according to claim 15 in which the actuation means comprises a pneumatic piston.

15

17. A processing line assembly comprising: two or more stations for processing articles; at least one carrier puck according to any of claims 1 to 13; and a conveyor for transporting said at least one carrier puck between the stations.

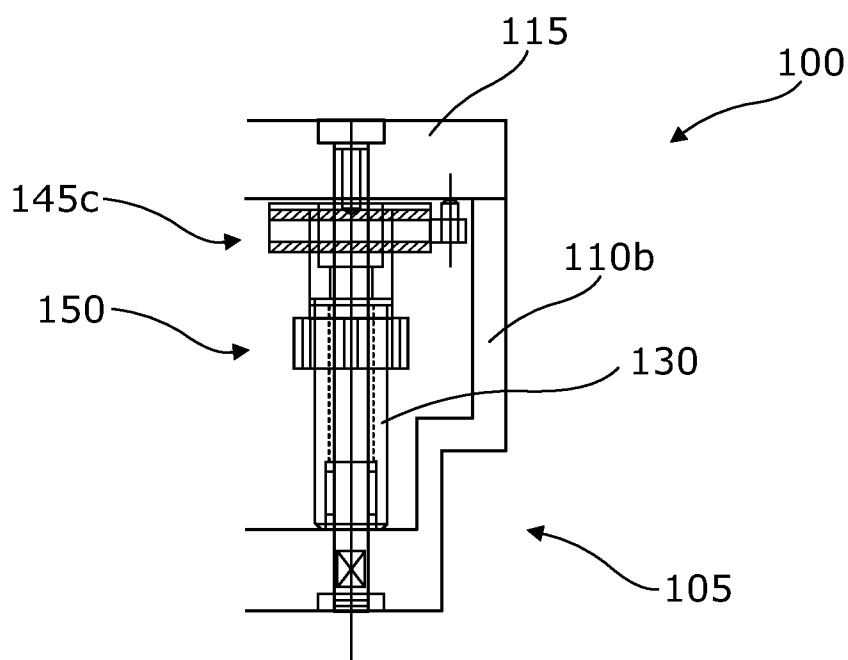
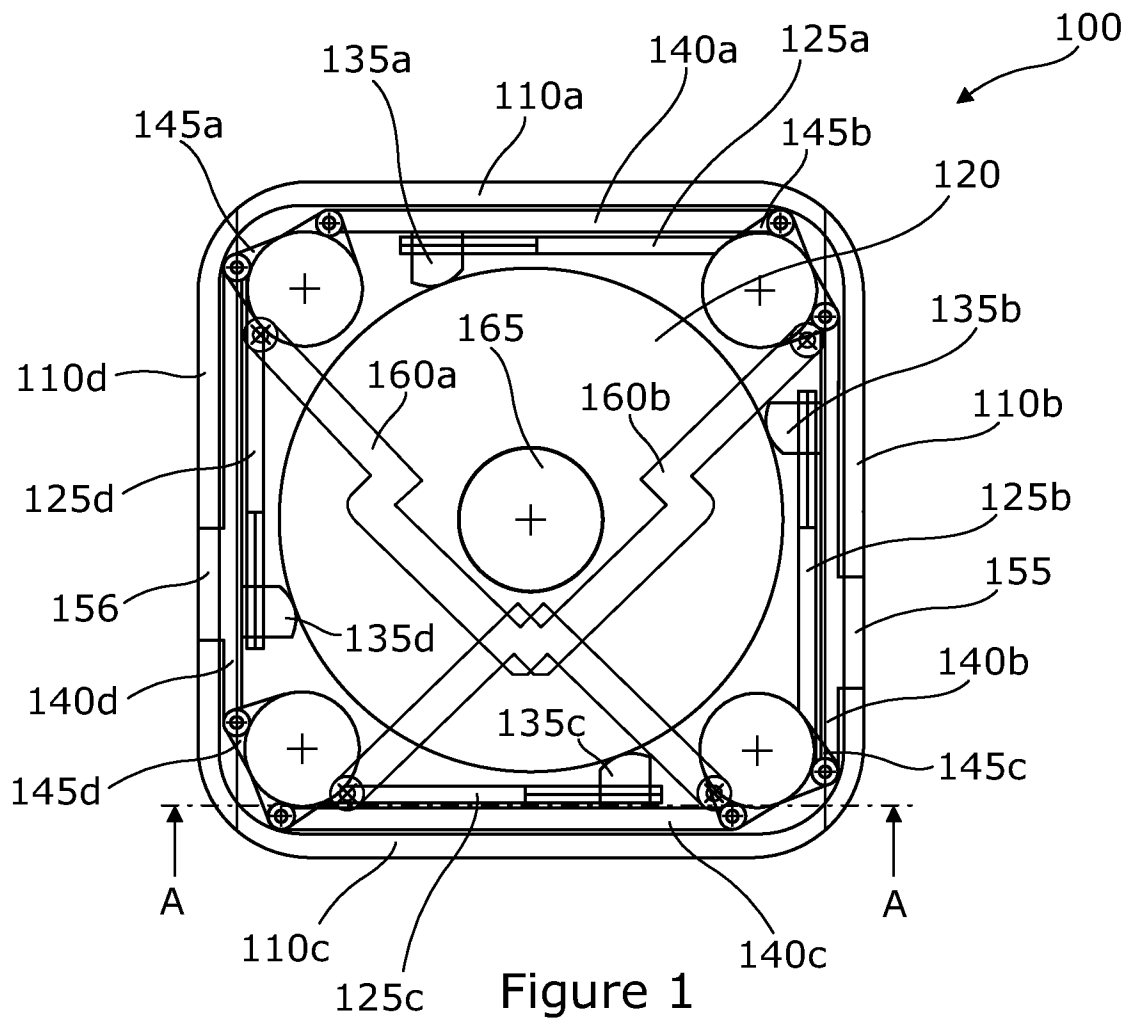
20 18. A processing line assembly according to claim 17, comprising at least one carrier puck according to claim 9, or any of claims 10 to 13 when dependent thereon, and comprising actuation means arranged to actuate the first linkage thereof in order to cause the, or each, movable locating member to move so as to reduce a separation distance between it and another one of the locating members.

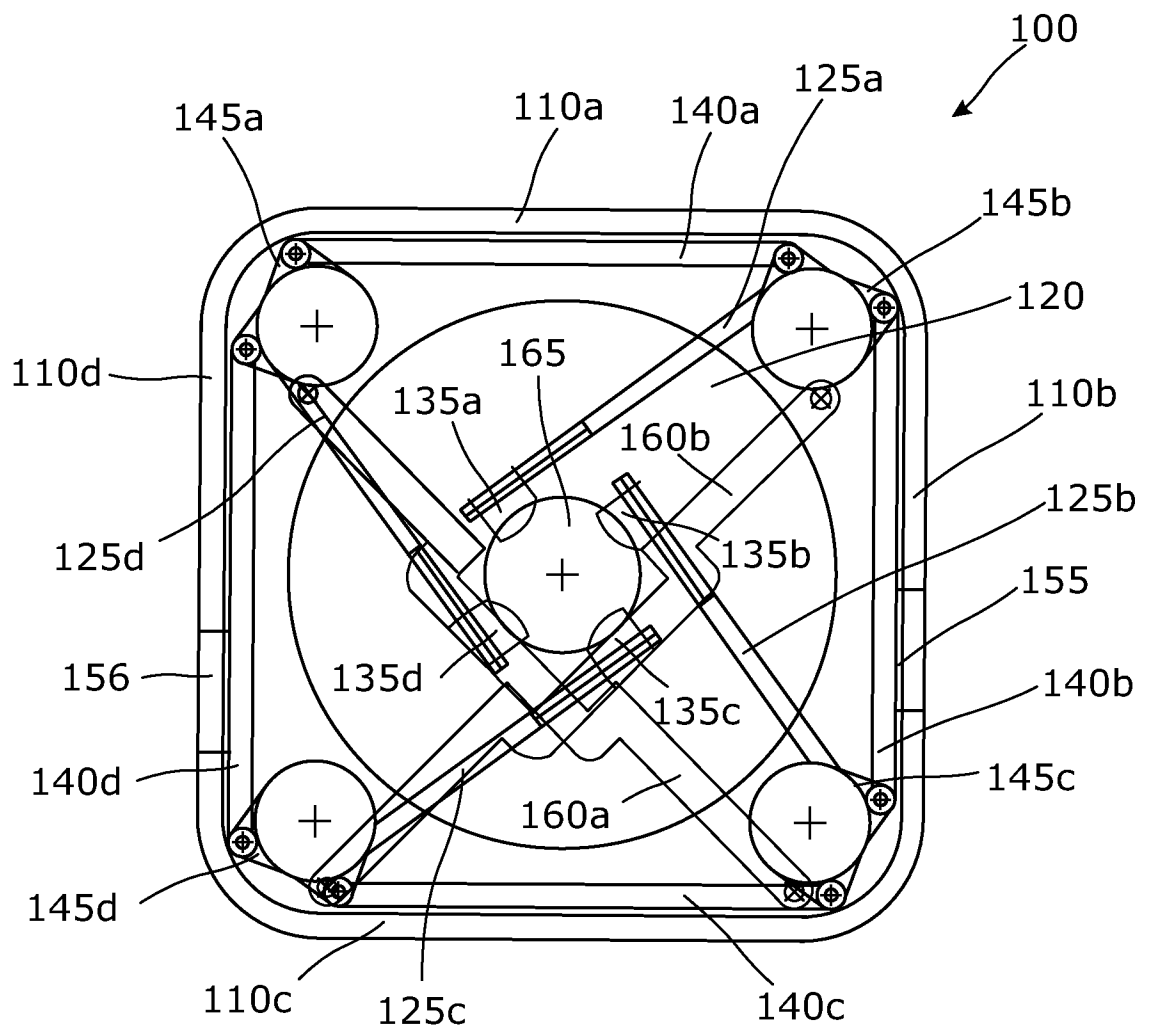
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19. A processing line assembly according to claim 18 in which the actuation means comprises a pneumatic piston.

20. A carrier puck substantially as described herein with reference to the  
30 accompanying drawings.

1/2





### Figure 3

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2013/050033

A. CLASSIFICATION OF SUBJECT MATTER  
INV. B65G17/32 B65G17/02  
ADD.

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

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
B65G B65C

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

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

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 941 366 A (QUINLAN MICHEL G [CA] ET AL) 24 August 1999 (1999-08-24) column 4, line 7 - line 16; figures 1,3A,3B	1-19
X	----- WO 2008/043394 A1 (DACHI S R L [IT]; PEDRAZZINI GIANANDREA [IT]) 17 April 2008 (2008-04-17) page 3, line 28 - page 4, line 1	1-19
X	----- US 4 159 762 A (BULWITH JOSEPH P) 3 July 1979 (1979-07-03) column 5, line 65 - column 6, line 22; figure 1	1-19
X	----- EP 2 113 463 A1 (INDAG GMBH [DE]) 4 November 2009 (2009-11-04) claim 1; figure 1 ----- -/-	1-19



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 August 2013

Date of mailing of the international search report

05/09/2013

Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2013/050033

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 20  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2013/050033

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/091109 A1 (MARTI MERCADE ALEX [ES]) 6 November 2003 (2003-11-06) abstract -----	1-19
X	US 5 244 082 A (TOGASHI YASUO [JP]) 14 September 1993 (1993-09-14) claim 1; figure 1 -----	1-19
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Information on patent family members

International application No

PCT/GB2013/050033

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		US 5248155 A	28-09-1993
US 2007267096	A1	22-11-2007	NONE
US 5154380	A	13-10-1992	NONE
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

Continuation of Box II.2

Claims Nos.: 20

Claim 20 has not been searched as it does not fulfil the requirements of Rule 6.2 PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.