Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2695187 A1 2008/02/21

(21) 2 695 187

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2007/08/17
(87) Date publication PCT/PCT Publication Date: 2008/02/21
(85) Entrée phase nationale/National Entry: 2010/02/02
(86) N° demande PCT/PCT Application No.: DK 2007/000376
(87) N° publication PCT/PCT Publication No.: 2008/019691
(30) Priorité/Priority: 2006/08/18 (DK PA 2006 01075)

(51) Cl.Int./Int.Cl. *B65G 47/91* (2006.01),
B66C 1/02 (2006.01)

(71) Demandeur/Applicant:
UNIVEYOR A/S, DK

(72) Inventeurs/Inventors:
CHRISTENSEN, TORBEN, DK;
KJELDGAARD HANSEN, HENRIK, DK

(74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : APPAREIL DE MANUTENTION DE COUCHES DE MARCHANDISES PALETTISEES
(54) Title: APPARATUS FOR HANDLING LAYERS OF PALLETISED GOODS

(57) Abrégé/Abstract:
An apparatus for handling layers of palletised goods, including a vertically displaceable lift head (2) with a mainly horizontal suction face which is substantially adjusted in size for a pallet, and which consists of a large number of downward open suction chambers (8) which via individual valves and an air distribution chamber is connected to a centrifugal blower (4), which is incorporated in the lift head (2) and constitutes the vacuum source of the apparatus, the suction face being arranged to be moved downwards against the upper side of an upper layer of individually or groupwise packed goods on a pallet, and where said valves are designed as ball valves with light, thin- walled spherical valve bodies (10), the valves arranged to be closed if the associated suction chamber (8) is not blocked downwards by contacting the upper side of the goods on the uppermost pallet layer, which the lift head (2) along the outer sides of the suction face comprises a vertically adjustable skirt with inflatable squeezing pads arranged for exerting an inwardly directed pressure on the outer sides of the goods of the upper pallet layer, where in connection with each valve there are provided arresting means adapted to prevent the prevent the valve balls (10) from shutting off the valves.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 February 2008 (21.02.2008)

PCT

(10) International Publication Number
WO 2008/019691 A1

(51) International Patent Classification:
B65G 47/91 (2006.01) *B66C 1/02* (2006.01)

(21) International Application Number:
PCT/DK2007/000376

(22) International Filing Date: 17 August 2007 (17.08.2007)

(25) Filing Language: Danish

(26) Publication Language: English

(30) Priority Data:
PA 2006 01075 18 August 2006 (18.08.2006) DK

(71) Applicant *(for all designated States except US)*: **UNIVEYOR A/S** [DK/DK]; Industrivej 8, DK-9510 Arden (DK).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **CHRISTENSEN, Torben** [DK/DK]; Bymarken 40, DK-9510 Arden (DK). **KJELDGAARD HANSEN, Henrik** [DK/DK]; Engstrupvej 45, DK-9700 Brønderslev (DK).

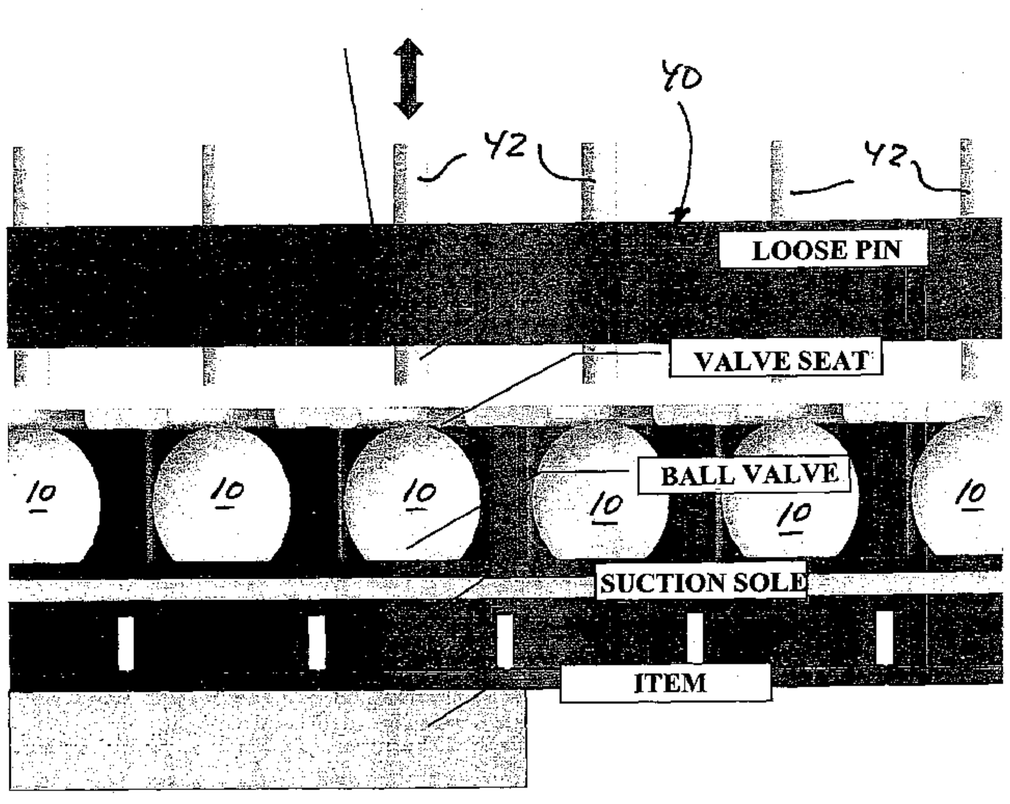
(74) Agent: **PATRADE A/S**; Fredens Torv 3A, DK-8000 Aarhus C (DK).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(54) Title: APPARATUS FOR HANDLING LAYERS OF PALLETISED GOODS



(57) Abstract: An apparatus for handling layers of palletised goods, including a vertically displaceable lift head (2) with a mainly horizontal suction face which is substantially adjusted in size for a pallet, and which consists of a large number of downward open suction chambers (8) which via individual valves and an air distribution chamber is connected to a centrifugal blower (4), which is incorporated in the lift head (2) and constitutes the vacuum source of the apparatus, the suction face being arranged to be moved downwards against the upper side of an upper layer of individually or groupwise packed goods on a pallet, and where said valves are designed as ball valves with light, thin- walled spherical valve bodies (10), the valves arranged to be closed if the associated suction chamber (8) is not blocked downwards by contacting the upper side of the goods on the uppermost pallet layer, which the lift head (2) along the outer sides of the suction face comprises a vertically adjustable skirt with inflatable squeezing pads arranged for exerting an inwardly directed pressure on the outer sides of the goods of the upper pallet layer, where in connection with each valve there are provided arresting means adapted to prevent the prevent the valve balls (10) from shutting off the valves.

WO 2008/019691 A1

Apparatus for Handling Layers of Palletised Goods

Field of the Invention

The present invention concerns an apparatus for handling layers of palletised goods and of the kind indicated in the preamble of claim 1.

Background of the Invention

In order to make effective and cheap and to simplify distribution of goods, most goods are sold on pallets, preferably the so-called EU pallets (800 x 1200 mm). Anyway, a widespread need has appeared for also dispatching orders comprising lesser amounts of goods in a correspondingly effective way. Statistically it appears that many orders for small shops actually consist of consignments of goods most often consisting of very few layers or maybe just a single layer of palletised goods.

US-A-3 406 938 and US-A-3 229 953 describe a lifting device and an item holder using relatively complicated lifting or holding faces which consist of a large number of lesser chambers that are open toward the lifting face and the holding face, respectively. For lifting or holding of e.g. plate shaped items with different outer shape or size in the printing industry it is known to use lifting or holding faces with a differentiated vacuum chamber system, i.e. with a number of uniform, but individually connected chambers, which by means of a valve system may be connected with one or more vacuum sources in such a way that sheets or plates with individual shape or size may be lifted or held fast with one and the same lifting or holding face.

WO-00/64790-A1 discloses an apparatus for handling layers of palletised goods, the apparatus comprising a vertically displaceable lift head with a horizontal suction face which in size is adapted to a pallet and consisting of a large number of downwards open suction chambers. The suction face is arranged to be moved downwards against the top side of an upper layer of individually or groupwise packed goods on a pallet, where the suction chambers via individual valves are connected with a source of vacuum

incorporated in the lift head, where the apparatus is intended for interacting with a depalletising system. The valves between the suction chambers and the source of vacuum are designed as ball valves with very light thin-walled valve bodies that are enclosed in the suction chamber by means of lateral projections or by means of a retainer net, and which interact with upper round valve openings with spherical valve seats at the bottom if the actual suction chamber is not blocked at the bottom by contacting the top side of the goods in an upper pallet layer. Along the outer sides of the suction face, the lift head comprises squeezing means adapted to exert an inwardly pressure at the outer sides of the goods in the uppermost pallet layer. The description of the previous invention is incorporated in the present application by reference.

Object of the Invention

The invention has the object of indicating a new and improved apparatus of the kind specified in the introduction, i.e. an apparatus for handling layers of palletised goods, and which enables mechanising layerwise destacking of individual articles from a pallet with greater certainty, even if the individual pallet layers include openings between the articles or include articles that are film-covered in such a way that openings in the pallet layer are formed upwards so that the shut-off valves of the suction face close where there is a hole or openings in the pallet layer, and is forced open where there is contact on the articles.

Description of the Invention

The apparatus according to the invention is characterised in that in connection with each valve there are provided arresting means adapted to prevent the valve balls from shutting off the valves. In a simple way it is hereby avoided that the shut-off valves of the suction face close at points where there are holes or openings in the pallet layer, and are forcibly opened at points where there is contact with the articles in the pallet layer. I.e. by means of simple measures there is achieved a new and improved apparatus that enables handling of many different types of palletised goods in layers with great certainty.

The apparatus according to the invention is suitably designed so that the arresting means are arranged to actuate valve balls for individual suction chambers.

Advantageously, the apparatus according to the invention may be designed so that the arresting means are constituted by bodies bluntly designed at the bottom and which are resiliently suspended for yielding to valve balls which are already in closing abutment with the valve seat of the associated suction chamber, and for preventing valve balls from getting in contact with valve seats of valves that have not been closed.

Alternatively, the apparatus according to the invention may be designed so that the arresting means are constituted by bodies bluntly designed at the bottom and which are arranged vertically displaceable in order to be displaced in height in relation to valve balls which are already in closing abutment with the valve seat of the associated suction chamber, and for preventing valve balls from getting in contact with valve seats of valves that have not been closed.

In order to ensure automatic release of the valve balls, the apparatus according to the invention may advantageously be designed so that each of the valves includes a valve seat consisting of an elastic material which is adapted to release the valve balls automatically by venting vacuum from the air distribution chamber.

With the object of achieving easier replacement of valve balls, the apparatus according to the invention may advantageously be designed so that the valve balls of each of the valves are supported at the bottom on inwards projecting edge parts consisting of elastic material.

In addition, the apparatus according to the invention may suitably be designed so that it includes a separate blower for operating the inflatable squeezing pads, and that between the blower and the inflatable squeezing pads it comprises a changeover valve adapted to connect the inflatable squeezing pads either to the suction side or to the pressure side of the blower which is preferably constituted by a side channel blower.

With regard to optimising the functions of the apparatus according to the invention, it may advantageously be designed so that it includes a pressure regulating valve between the changeover valve and the inflatable squeezing pads.

In order to achieve an additionally simple and reliable action, the apparatus according to the invention may be designed so that the pressure regulating valve includes an upper venting valve with a valve ball which is actuated by one or more upper lever arms with regulating slides.

The apparatus according to the invention is suitably further designed so that the pressure regulating valve includes a cylinder or a bellows arrangement with a piston arranged to lift one or more of the lever arms for opening the venting valve.

Short Description of the Drawing

The invention is explained more closely in the following in connection with the drawing, on which:

Fig. 1 shows a perspective view of an embodiment of a lift head for an apparatus according to the invention;

Fig. 2 shows a perspective view of the lift head shown in Fig. 1, seen from another angle and with partly open side;

Fig. 3 shows a side view of a separate side channel blower with pressure regulating valve for operating the inflatable pads in an apparatus according to the invention;

Fig. 4 shows a side view, partly in section, of an embodiment of a pressure regulating valve for an apparatus according to the invention and shown with a setting corresponding to reduced pressure in the inflatable pads;

Fig. 5 shows a side view, partly in section, of an embodiment cf. Fig. 4 of a pressure regulating valve for an apparatus according to the invention and shown with a setting corresponding to high pressure in the inflatable pads;

Fig. 6 shows a side view, partly in section, of an embodiment cf. Fig. 4 of a pressure regulating valve for an apparatus according to the invention and shown with a setting corresponding to emptying the inflatable pads;

Fig. 7 shows a perspective view of an embodiment of a side channel blower with associated changeover valve and pressure regulating valve according to the invention for an apparatus according to the invention;

Fig. 8 shows a perspective view of a pallet layer for illustrating a pallet layer with holes in the pallet layer which will require forced opening of the suction chambers of the suction sole;

Fig. 9 shows a side view of an embodiment of arresting means for an apparatus according to the invention, shown in initial position;

Fig. 10 shows a side view of arresting means, cf. Fig. 9, for an apparatus according to the invention, shown with activated vacuum;

Fig. 11 shows a side view of arresting means, cf. Fig. 9, for an apparatus according to the invention, shown with activated vacuum and lowered frame;

Fig. 12 shows a side view of arresting means, cf. Fig. 9, for an apparatus according to the invention, shown with activated vacuum, lowered frame and locked pins;

Fig. 13 shows a side view of arresting means, cf. Fig. 9, for an apparatus according to the invention, shown with activated vacuum, lowered frame and actively fixed pins;

Fig. 14 shows a side view of a second embodiment of arresting means for an apparatus according to the invention, shown without activity;

Fig. 15 shows a side view of arresting means, cf. Fig. 14, for an apparatus according to the invention, shown with activated vacuum;

Fig. 16 shows a side view of arresting means, cf. Fig. 14, for an apparatus according to the invention, shown with activated vacuum and displaced arresting means that yield where valve balls close the valves;

Fig. 17 shows a side view of arresting means, cf. Fig. 14, for an apparatus according to the invention, shown with activated vacuum and with forced opening of valve balls;

Fig. 18 shows a side view of arresting means, cf. Fig. 14, for an apparatus according to the invention, shown without vacuum and release of possibly stuck valve balls;

Fig. 19 shows a side view of arresting means, cf. Fig. 14, for an apparatus according to the invention, shown in initial position;

Fig. 20 shows a partial perspective view of an embodiment for a common activation system for arresting means, shown in inactive position;

Fig. 21 shows a partial perspective view, cf. Fig. 20, of a common activation system for arresting means, shown in active position;

Fig. 22 shows a plan view of an embodiment for a common rotary valve between suction face and air distribution chamber by an apparatus according to the invention, shown in open position;

Fig. 23 shows a plan view, cf. Fig. 22, of a common rotary valve between suction face and air distribution chamber in an apparatus according to the invention, shown in closed position;

Fig. 24 shows a perspective view of a common rotary valve, cf. Fig. 22, combined with an embodiment of a vacuum venting system, shown with open rotary valve and closed vacuum venting connection, respectively; and

Fig. 25 shows a perspective view of a common rotary valve, cf. Fig. 23, combined with an embodiment of a vacuum venting system, shown with closed rotary valve and open vacuum venting connection, respectively.

Detailed Description of the Invention

The lift head 2 shown in Figs. 1 - 2 is adapted for destacking by layers of articles from a filled pallet that e.g. is taken from a rollerway. The lift head 2 includes a vacuum source in the form of a strong centrifugal blower 4, the central suction opening of which being connected to a rectangular air distribution chamber which via a special rotary valve 6 (Figs. 22-25) is connected with a large number of suction chambers 8 that are open at the bottom and together form a suction face.

The suction chambers 8 are connected at the top with the front of the rotary valve 6 via round valve openings with spherical edges or valve seats at the bottom that fit to the outer spherical surface of rather light, thin-walled, spherical valve bodies 10 which are enclosed in each their suction chamber 8. Combined, the suction chambers 8 constitute a rectangular lower suction face 12 which in size is adapted to a standard pallet, e.g. an EU pallet or a UK pallet.

The lift head 2 includes, as with WO-00/64790 mentioned in the introduction, a special vertically adjustable, outer squeezing arrangement which at each of the outer sides of the suction face comprises a number of inflatable pads as well as an inner skirt and outer skirt. The squeezing arrangement is surrounded by an outer skirt or a casing arranged for

absorbing the reaction pressure of the squeezing pads when these are inflated and exert an inwardly directed squeeze pressure on the outer sides of the pallet layer. Vertical adjustment and thereby adjusting the squeezing arrangement in height to the actual goods in the pallet layer occurs by means of a preferably motor driven winch and lift slings at each side of the lift head 2.

The squeezing pads are inflated via a pressure regulation valve 18 and a changeover valve 20 by means of air from a side channel blower 22 (Figs. 3-7) so that the pallet layer is clamped between the squeezing pads simultaneously with activating the suction face 12. When the squeezing pressure is to be relieved subsequently, this occurs rapidly by shifting the changeover valve 20 so that the side channel blower 22 provides for rapid emptying of the squeezing pads.

The pressure regulating valve 18 includes an upper pressure regulating system 24 with two lever arms 26 that actuate a valve ball 28 in a ball valve with a valve seat 30 with a permanent downwards pressure which can be set by means of slides on the lever arms 26, as the use of one of the lever arms 26 corresponds to low pressure in the squeezing pads. At high pressure in the squeezing pads, both lever arms 26 are used.

In Fig. 5, corresponding to high pressure in the inflatable pads 16, the ball valve with the valve seat 30 is closed while the ball valve in Fig. 4 is open, corresponding to low pressure in the pads 16. Opening the ball valve with the valve seat 30 in Fig. 4 by upward movement of the lever arms 26 is effected by means of a piston 34 and a bellows arrangement 36, as a not shown solenoid valve is opened and feeds air to the bellows arrangement 36, as shown by the arrow 35.

In Fig. 6, corresponding to emptying the pads 16, the ball valve with the valve seat 30 is closed while a lower ball valve 32 is open so that air is also sucked in from the surroundings with the object of preventing that the side channel blower 22 is blocked when the squeezing pads are without air.

If the actual pallet layer to be lifted by means of the lift head 2 consists of relatively light and fragile packing items that do not stand up to lateral pressure, and which do not require very great suction pressure either, the overall suction pressure may be lowered by reducing the rotational speed of the centrifugal blower 4. Whether the valve balls 10 are closing or not is only determined by the combination of actual opening in the pallet layer and the rotational speed of the centrifugal blower 4.

In Fig. 8 is shown a pallet with an uppermost pallet layer 38 in which there is a hole or opening which is larger than 300 cm^2. This implies that to achieve a secure and rapid depalletising, it is necessary to apply forced action downwards on the valve balls 10 in order to avoid that the valve balls 10 close the associated suction chambers 8 due to false air in the pallet layer 38.

In Figs. 9-13 is shown an embodiment of an arresting system according to the invention, where a common frame 40 opposite each valve opening in the suction chambers 8 is provided with individually loose pins 42, which, however, can be locked in relation to the frame 40.

In Fig. 9, the suction face has been moved down upon a pallet layer 38 with openings so that the three left suction chambers 8 are placed upon an object that block the suction chambers 8 at the bottom, while the three right suction chambers 8 are not blocked at the bottom by an object or an article.

In Fig. 10, the suction face is also moved down upon the pallet layer 38 and vacuum is activated. The situation is changed, as the valve balls 10 to the right are now closed. I.e. the three left suction chambers 8 are communicating with the source of vacuum while the three right suction chambers 8 are now closed, because the suction face 12 is not in contact with objects or articles.

In Fig. 11, the suction face is also moved down upon the pallet layer 38 and vacuum is activated. I.e. the situation is unchanged, as the three left suction chambers 8 are

communicating with the source of vacuum while the three right suction chambers 8 are still closed, because the suction face 12 is not in contact with objects or articles. The frame 40 is now moved down so that three pins 42 to the left are in contact with the valve balls 10 in the open suction chambers 8, while three pins 42 to the right are in contact with valve balls 10 in the blocked suction chambers 8. I.e. the pins 42 to the left are farther down compared with the other three pins 42 to the right.

In Fig. 12 the situation is almost unchanged as the pins 42 are here locked in the frame 40 only.

In Fig. 13, the situation is still unchanged as vacuum is activated. Where the suction face previously had contact to article or object, by plucking a film-enveloped product there will arise a certain airflow due to forced opening by means of the pins 42, where the airflow would normally make the valve balls close, but due to the forced opening in this area the suction face will have contact to article or object anyway.

In Figs. 14-19 is shown a second embodiment of an arresting system according to the invention, where a common frame 44 opposite each valve opening in the suction chambers 8 is provided with individually rubber suspended arresting bodies 46.

In Fig. 14, the common frame 44 is in its initial position. No activity, i.e. no vacuum is activated.

Vacuum is active in Fig. 15. Valve balls 10 close where there is airflow, namely at the two middle suction chambers 8, while the outermost suction chambers are active because the suction chambers 8 are blocked at the bottom by abutting against article or object.

In Fig. 16, vacuum is still active, but here the frame 44 is displaced to the right so that the two middle arresting bodies 46 hit the valve balls 10 and are deflected to the left, as the arresting bodies 46 are rubber suspended at 48.

Vacuum is active in Fig. 17. Where the suction face previously had contact to the product, now by plucking a film enveloped product there will arise a certain airflow which normally would make the valve balls close, but due to the partitioned suction face there is now achieved forced opening of the area of the suction face previously having contact with the product.

In Fig. 18 is shown how the frame 44 after finished plucking is advanced further and presses possible stuck valve balls 10 free of the valve seat, and in Fig. 19 we are again back to the initial position.

In Figs. 20-21 is shown how a common arresting system for the entire suction face can be operated by an electric gear motor 50 which via a number of eccentric discs 52 and turning arms 54 may lift and lower a large number of arresting bodies 56 opposite each suction chamber 8. In Fig. 20, the arresting bodies 56 are lifted off the suction chambers 8, while the arresting bodies 56 in Fig. 21 are lowered into each their valve opening.

The mentioned rotary valve 6 shown in Figs. 22-23 consists of a circle of mutually separate valve openings 60 which are formed in the lower wall of the air distribution chamber, and a valve plate 62 arranged rotatably in relation thereto with a corresponding circle of valve openings 64. The valve plate 62 is arranged to be turned for opening and closing the rotary valve 6 by means of arms 66, an eccentric 68 and an electric motor.

In Figs. 24 and 25 is additionally shown that the rotary valve 6 interacts with a vacuum valve 72 which is disposed in open air and spaced apart from the rotary valve 6, namely at the end of a vertical pipe 74, however interacting with the rotary valve 6 via an actuation plate 76 and an actuation rod 78 which is connected with the vacuum valve 72. Fig. 24 shows the rotary valve 6 in open condition and the vacuum valve 72 in closed condition, while Fig. 25 shows the rotary valve 6 in closed condition and the vacuum valve 72 in open condition.

Alternatively, the arresting means may be comprised of a common plate or frame on which opposite the individual valve seats for the suction chambers 8 there are mounted individually resilient fingers which by means of the common plate or frame may be displaced across the valve openings in such a way that the resilient fingers, where the valve balls 10 are in contact with the valve seat already and shut off the suction chambers 8, will yield to the valve balls 10 and be moved down along the top side of the valve balls 10 without pressing the latter downwards, while the resilient fingers - where the valve balls 10 are not in contact against the valve seat - will be moved in under the opposite side of the valve seat and prevent the valve balls 10 from subsequently shutting off the suction chambers 8. The advantage of this alternative arrangement is that there may be attained greater distance between the valve balls 10 and their associated valve seats. I.e. there may be attained greater airflow by arrested valve balls 10.

Finally, it is to be mentioned that the suction face 12 may advantageously be built up from individual suction chambers of flexible material, e.g. in the form of loose suction chambers 8 moulded in plastic. Hereby, a significant reduction in maintenance costs may be achieved. To this is added that if the suction chambers 8 are made of flexible material with lower inwards projecting retainer members for the valve balls 10, it will be much easier to replace damaged valve balls with new valve balls, which in that case may just be pressed up into the suction chamber from below through the said inwards projecting flexible retainer members for the valve balls 10.

CLAIMS

1. An apparatus for handling layers of palletised goods, including a vertically displaceable lift head (2) with a mainly horizontal suction face (12) which is substantially adapted in size for a pallet and consists of a large number of downwards open suction chambers (8), and which via individual valves and an air distribution chamber is connected to a centrifugal blower (4), which is incorporated in the lift head (2) and constitutes the vacuum source of the apparatus, the suction face (12) being arranged to be moved downwards against the upper side of an upper layer of individually or groupwise packed goods on a pallet, where said valves are designed as ball valves with light, thin-walled spherical valve bodies (10), the valves arranged to be closed if the associated suction chamber (8) is not blocked downwards by contacting the upper side of the goods on the uppermost pallet layer, which the lift head (2) along the outer sides of the suction face comprises a vertically adjustable skirt with inflatable squeezing pads arranged for exerting an inwardly directed pressure on the outer sides of the goods of the upper pallet layer, **characterised in that** in connection with each valve there are provided arresting means adapted to prevent the valve balls (10) from shutting off the valves.

2. Apparatus according to claim 1, **characterised in that** the arresting means are adapted to actuate valve balls (10) for individual suction chambers (8).

3. Apparatus according to claim 1 and 2, **characterised in that** the arresting means are constituted by downwards bluntly designed bodies which are resiliently suspended for yielding to valve balls (10) which are already in closing abutment with the valve seat of the associated suction chamber, and for preventing valve balls (10) from getting in contact with valve seats of valves that have not been closed.

4. Apparatus according to claim 1 and 2, **characterised in that** the arresting means are constituted by downwards bluntly designed bodies which are arranged vertically displaceable in order to be displaced in height in relation to valve balls (10) which are already in closing abutment with the valve seat of the associated suction chamber, and

for preventing valve balls (10) from getting in contact with valve seats of valves that have not been closed.

5. Apparatus according to claim 1, **characterised in that** each of the valves includes a valve seat consisting of an elastic material which is adapted to release the valve balls automatically by venting vacuum from the air distribution chamber.

6. Apparatus according to claim 1, **characterised in that** the valve balls of each of the valves are supported at the bottom on inwards projecting edge parts consisting of elastic material.

7. Apparatus according to claim 6, **characterised in that** it includes a separate blower for operating the inflatable squeezing pads, and that between the blower and the inflatable squeezing pads it comprises a changeover valve adapted to connect the inflatable squeezing pads either to the suction side or to the pressure side of the blower which is preferably constituted by a side channel blower.

8. Apparatus according to claim 6, **characterised in that** the apparatus comprises a pressure regulation valve between the changeover valve and the inflatable squeezing pads.

9. Apparatus according to claim 8, **characterised in that** the pressure regulating valve includes an upper venting valve with a valve ball which is actuated by one or more upper lever arms with regulating slides.

10. Apparatus according to claim 8 and 9, **characterised in that** the pressure regulating valve includes a cylinder or a bellows arrangement with a piston arranged to lift one or more of the lever arms for opening the venting valve.

Application number / numéro de demande: **2695187**

Figures: _____

Pages: **1 - 11**

Unscannable items
received with this application
(Request original documents in File Prep. Section on the 10th floor)

Documents reçu avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au 10ème étage)