Title: SYSTEM FOR UNLOADING OR LOADING OF CARGO

Abstract: The present invention concerns a system (1) for unloading or loading cargo, e.g. cargo packed in boxes (16), and including first transport means (5) with a handling apparatus (6) and a second longitudinally variable transport means (8), which first transport means (5) is adapted for transporting cargo (16) to and from the second transport means (8), and which handling apparatus (6) includes a conveyor (19) adapted for transporting cargo (6) to or from the first transport means (5), and where the handling apparatus (6) furthermore includes a movable handling means (13) that interacts with the conveyor (19), and which is adapted for engaging the cargo (16).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
SYSTEM FOR UNLOADING OR LOADING OF CARGO

Field of the Invention

The present invention concerns a system for loading or unloading general cargo, e.g. cargo packed in boxes, and of the kind specified in the preamble of claim 1.

Background of the Invention

As the shipping rates on cargo in e.g. containers have dropped sharply during the last decade, it is now economically profitable for firms to produce cargo in a country where e.g. the workforce is cheap, the expertise/know-how is found or the materials are readily accessible, and then subsequently to send the cargo to the country where the cargo is to be sold or used.

In order to fully utilise the capacity of e.g. a container, the producer has packed the cargo in a very compact way in the container. When the container is emptied at the recipient, problems may arise. It may e.g. be difficult to get the cargo out of the container because the container has been packed very hard, or because the individual piece of cargo may be very heavy or have an unmanageable shape so that it will require more than one person to lift the cargo. Hence, the unloading work is demanding in time and resources.

In order to solve the above problems by unloading e.g. a container, a trailer or a lorry, various apparatuses may be used which entirely or partly can empty a container, a trailer or a lorry.

US-A-5 524 747 describes a method and an apparatus for collecting packages where the apparatus includes a mobile frame with collecting means and a receiving table, and where the collecting means may rotate a package by means of a number of pressing members and/or conveyor belts, so that the conveyor belt can be inserted under the bottom of the package in order to move the package to the receiving table.

WO-A1-96/30287 describes a method and a mobile apparatus for mechanical unloading and loading of objects where the apparatus includes an approximately wedge-
shaped insert means with a number of rollers and a conveyor belt. The insert means is pressed in under the object, and the rollers advance the object to the conveyor belt.

EP-A1-0571 084 describes an apparatus and a method for loading and unloading a transport container, where the apparatus includes a telescopic conveyor belt which at a front end is provided with a collecting arrangement in the shape of a gripper arm which is controlled by a person in the driver’s cabin. Thereby, the gripper arm may get hold of bags and/or packets and dispose them on the inlet of the telescopic conveyor belt.

Object of the Invention
It is the object of the present invention to indicate a system for unloading or loading of general cargo, which system is to ensure a simple, efficient, easy and rapid handling of individual pieces of cargo, and where typically only one person is to be used for operating the system.

Description of the Invention
This is achieved with a system as described in the preamble of claim 1, and where the handling apparatus furthermore includes a movable handling means that interacts with the conveyor and which by means of a number of engagement means is adapted for engaging the cargo.

In connection with using the term “conveyor” it is to be noted that a conveyor in the present invention may be conveyor belts, conveyor rollers or slide rails.

In connection with using the term “cargo” is to be noted that cargo in connection with the present invention may be boxes, bags, plastic packed products and/or items with at least one approximately flat surface.

In order to ensure an efficient, simple, easy and rapid handling of the individual pieces of cargo and to ensure that only one person is to operate the system, the system includes a first conveyor means with a handling apparatus providing for removal of the cargo from the container or placing it in the container.
The system furthermore includes a second longitudinally variable transport means conveying cargo to or from the first transport means to or from a permanently installed conveyor in the receiving station in the company.

The first transport means is adapted to transport cargo to and from the second conveyor means.

The handling apparatus includes a conveyor adapted to transport cargo to or from the first transport means and includes a movable handling means that interacts with the conveyor and which is adapted to engage the cargo.

In a preferred embodiment of the invention, the handling apparatus is arranged at an end part of a second longitudinally variable transport means so that cargo unloaded from the container is transported continuously from the handling means and further on the said first and second transport means.

The handling means interacting with the conveyor is movable so that a person standing beside the handling apparatus may readily move the handling means in front of a piece of cargo and thereby cause engagement with the cargo.

In an embodiment of the present invention, the handling means includes a number of engagement means which are adapted to engage the cargo so that the cargo can be securely moved by means of the handling means.

The engagement means may be a vacuum controlled suction cup that sucks onto a side of the cargo so that the cargo can be moved. Alternatively, the engagement means may be one or more conveyor belts, sticky plates, hooks, barbs or similar.

In order to pull a piece of cargo out of a tightly packed container, the engagement means of the handling means are to get hold of an end/side face of the cargo and hold fast thereon, while the engagement means are moving away and thereby pull the cargo out upon a conveyor.
In an embodiment of the invention, the handling means is connected with a moving means that moves the engagement means between an active engagement position at a front end of the conveyor and an inactive waiting position at a rear end of the conveyor.

In this way, it is possible to maintain the position of the handling means while the moving means moves the engagement means into an active engagement position, where they come to contact an end/side face of a piece of cargo. Subsequently, the moving means is moved backwards in the direction of the conveyor so that the cargo is pulled out on the conveyor, which is then moving the cargo from the engagement means that are released simultaneously. In order that the cargo may pass the engagement means, the moving means may be moved so that the engagement means are disposed in inactive waiting position at a rear end of the conveyor whereby the cargo can pass across the engagement means.

In an embodiment of the invention, the moving means is disposed in connection with the conveyor of the handling apparatus so that it divides the conveyor into two parts running at each their side of the moving means.

The moving means may be a belt, a chain or a conveyor belt, which may be arranged at an underlying plane relative to the surface of the conveyor, entailing that the cargo is not transported across the moving means but is supported by the surface of the conveyor instead.

If the moving means is in the same plane as the surface of the conveyor, it is important that the moving means has the same texture as the lateral surface of the conveyor. If the surface does not have the same texture as the lateral surface, it is to have a very smooth surface upon which the cargo can slide without appreciable resistance. This ensures that the cargo is not damaged when moved across the conveyor/moving means.

In an embodiment of the present invention, the conveyor and moving means are pow-
ered by the same drive unit, e.g. a motor, so that they move with equal speed. In an alternative embodiment of the present invention, the conveyor and moving means are powered by each their drive unit so that they run with different speeds.

If the moving means is running faster than the conveyor, the engagement of the engagement means with the cargo will cause the cargo to be pulled in onto the conveyor, and only when the engagement means release the engagement with the cargo, the conveyor will co-act to transport the cargo further on.

If the moving means run more slowly than the conveyor, the conveyor will grip the cargo and assist in pulling the cargo out from the container and out upon the conveyor. Only when the engagement means disappear in the inactive waiting position it is possible for the cargo to be conveyed onwards.

For easy and rapid unloading/loading of a container, a trailer or a lorry, the said handling apparatus is built up as a mobile unit and includes a first conveyor with a free end which is movable in horizontal and vertical directions, and the handling means is found at the free end.

The handling apparatus is a mobile unit as e.g. wheels are mounted on the handling apparatus, entailing that it is easy to move the handling apparatus preferably in the longitudinal direction of the container, depending on how far the unloading/loading of the cargo has advanced. The movable handling means may thereby always be disposed most suitably in relation to the stacked cargo in the container.

The first conveyor is provided with a free end which is connected with the handling means and which is movable in horizontal and vertical direction, entailing that the handling means can be disposed in an arbitrary position in the container; in front of or at the side of a piece of cargo.

For easy and rapid operation of the handling means, this may be provided with a handle so that a person can move around with the handling means in vertical and horizontal direction.
A handle in connection with the handling means implies that a person has to stand close to the handling means in connection with unloading/loading of a container. This is an evident advantage, as secure positioning of the handling means is achieved so that a secure grip is achieved in a piece of cargo, thereby reducing the risk of destroying the cargo during unloading/loading.

The alternative to a handle in connection with the handling means is that the first conveyor is provided with motors that may move the free end of the conveyor in horizontal and vertical directions. These motors may be connected to a control box which is cable connected or wirelessly connected with the motors so that a person standing at the side of the handling apparatus may control the movement of the free end of the conveyor and thereby the handling means.

In an embodiment of the present invention, the handling apparatus is constructed as a mobile unit and includes a second conveyor interacting with the longitudinally variable transport means.

The first conveyor is used for laying off/collecting cargo by means of the handling means and may, as mentioned, be moved in vertical and horizontal directions. In order to transport cargo to or from the first conveyor, the handling apparatus includes a second conveyor which interacts with the first conveyor at one end and interacts with the longitudinally variable transport means at an opposite end.

In an embodiment of the present invention, the longitudinally variable transport means includes a number of conveyor carriages, each provided with a short conveyor and forming a link in the longitudinally variable transport means.

Each conveyor carriage is designed with a conveyor that may be motorised, so that the cargo is moved on to the next conveyor, or it may be a downstream conveyor so that friction from the cargo causes moving of the said conveyor, whereby the cargo is automatically moved on to the next conveyor.
A longitudinally variable transport means may thereby have a number of conveyors which are all motorised or have a combination of conveyors with motor and conveyors without motor. The length of the longitudinally variable transport means depends on how many conveyors that are connected in series.

Since it is important to ensure that a continuous and secure transport of the cargo occurs along the longitudinally variable transport means, for a longitudinally variable transport means combined with conveyors with motor and conveyors without motor, it will be the length of the cargo pieces or the power of the conveyor motors that will decide how many conveyors without motor can be placed between conveyors with motors.

An alternative to using a longitudinally variable transport means with a number of conveyor carriages is for example:

- a conveyor comprising a number of telescoping links where the handling apparatus is connected with the outermost telescoping link;
- modular laying conveyors where a number of modules form a transport path from the handling apparatus to a permanently installed conveyor;
- a telescoping conveyor including a number of conveyor modules which are rolled up in a cabinet and connected with the handling apparatus. Such a conveyor is described in WO-A1-01/51356.

In order to adjust the length of a longitudinally variable transport means, the means includes a number of conveyor carriages, each designed with a short conveyor and forming a link in the longitudinally variable transport means, and the longitudinally variable transport means including a cabinet in which the conveyor carriages can be stacked in inclining position.

This implies that conveyor carriages not forming the transport means are stacked obliquely in the cabinet so that the cargo may be moved freely to or from a permanently installed conveyor and to or from the handling apparatus.

If the cabinet is open upwards, the conveyor carriages are designed so that the short
conveyor is accessible along the end parts of the conveyor carriages, implying that stacked conveyor carriages may also be used for transporting cargo.

In order to transport the cargo to or from the longitudinally variable transport means to or from a permanently installed conveyor, the cabinet is provided with a conveyor having one end interacting with the conveyor carriages, where the conveyor in a preferred embodiment of the present invention is arranged at an upper side of the cabinet and thereby forms a connecting link between conveyor carriages of the longitudinally variable transport means and the permanently installed conveyor.

By using the upper side of the cabinet to move a conveyor, the minimum length required of the longitudinally variable transport means is reduced, and the cargo is furthermore led up to a level above floor level whereby the cargo e.g. may be handled further with a permanently installed conveyor, sorted on a sorting table or similar.

All transitions between conveyor carriages, cabinet conveyor and/or the handling apparatus conveyors are to be designed so that the cargo, irrespectively whether it is moved forward or backward by the conveyors, is not moved up over an edge in order to pass a transition. An edge increases the risk that cargo is accumulated on the conveyors of the system, which may cause the cargo to be destroyed or fall off the conveyors.

In order for the system to take up as little space as possible when not in use, the handling apparatus is adapted to be placed over the cabinet. This means that the system is only taking up space that is equal to length x width of the handling apparatus.

The receiving stations of the firms typically include several unloading or loading gates, so that the firm can operate with continuous flow of cargo/products to and from the firm.

Depending on the number of unloading or loading gates, there may e.g. be provided a system according to the present invention in front of each unloading or loading gate so that cargo can be transported to and from all unloading or loading gates at the same
If the receiving station of the firm includes many unloading or loading gates, it may be a great economical strain if a system according to the present invention is disposed in front of each unloading or loading gate. The system may in a way known per se be adapted to be laterally displaced in relation to the unloading or loading gates, so that a system according to the invention may serve several unloading or loading gates.

In a preferred embodiment, the system according to the invention may be designed so that the handling apparatus includes a conveyor with a number of narrow conveyor belts, and that the moving means are constituted by pivotable arms disposed between the conveyor belts, the arms including the engagement means in the form of suction cups at their outer ends, the cups being arranged to assume an extended active position at the front end of the handling apparatus or an inactive downwards pivoted position down under the conveyor belts.

The system according to the invention may suitably furthermore be designed so that the pivotable arms for the suction cups are mounted on a common transverse support arm, which is pivotally mounted on a central pivoting shaft, and which is are adapted to be angled by means of control wires connected to opposing ends of the common support arm and to peripheral points of a turning disc at the rear end of the first transport means. In a very simple is hereby ensured that the suction cups are always correctly directed forward, i.e. also even if the handling apparatus is angled relative to sidewalls of e.g. a container.

It may be further advantageous that the handling apparatus at a sectionally divided front edge is provided with narrow positively driven rollers which are suspended on a non-linear shaft and which are drivingly connected with a number of the conveyor belts.

The system according to the invention is suitably designed so that springs are interposed between the suction cups and the pivotable arms, and that the suction cups are functionally divided into several groups that may be connected to each their vacuum
source.

The system according to the invention is preferably designed so that the longitudinally variable conveyor includes a number of rolling conveyors which at a rear end are provided with legs with travel wheels, and which at a front end are provided with a support roller which is adapted to interact with inclining rails running upwards/forwards and which are arranged to support the front end of the rolling conveyors.

Description of the Drawing

The invention is explained below with reference to the drawing, where:

Fig. 1 shows a side view of an embodiment of a system according to the invention;

Fig. 2 shows a side view of the system shown in fig. 1 in another operative situation;

Fig. 3 shows a side view of a system, cf. Fig. 1, shown partly inserted into a container;

Fig. 4 shows a side view of a system, cf. Fig. 1, shown further inserted into a container;

Fig. 5 shows a perspective view of an embodiment of a handling means for a system according to the invention, shown with the suction cups in foremost active position;

Fig. 6 shows a perspective view of a handling means, cf. Fig. 5, shown the suction cups in an inactive, retracted position;

Fig. 7 shows a perspective view of a preferred embodiment of a system according to the invention;

Fig. 8 shows a simplified side view of the system according to the invention shown in Fig. 7;

Fig. 9 shows a perspective view of a front part of the system according to the invention shown in Fig. 6;

Fig. 10 shows a plan view of the system according to the invention shown in Fig. 6, as seen from above, and with the front part of the system turned to the right;

Fig. 11 shows a perspective side view of the foremost handling apparatus for a system according to the invention;
Fig. 12 shows a plan view of the handling apparatus, cf. Fig. 11;
Fig. 13 shows a side view, partly in section, of the handling apparatus, cf. Fig. 11;
and
Fig. 14 shows a perspective view of the handling apparatus, cf. Fig. 11.

**Detailed Description of the Invention**

Fig. 1 shows a system 1 in an inactive position. The system 1 is disposed opposite a container 2 which is arranged via bellows 3 in front of a loading/unloading gate 4. The system 1 includes a mobile first transport means 5 with a handling apparatus 6 including a conveyor belt 7 which is adapted for transporting cargo (not shown) to or from the first transport means 5. The system 1 furthermore includes a second longitudinally variable transport means 8 which includes a number of transport carriages 9, a cabinet 10 and an upper conveyor 11, where the not used transport carriages 9 are stacked inclining in the cabinet 10. The first transport means 5 is mobile and provided with wheels 12 and arranged so that the first transport means 5 in an inactive position can be placed across the cabinet 10. The handling apparatus 6 includes a movable handling means 13 that interacts with the conveyor belt 7, and which is adapted to engage the piece of cargo (not shown). The handling apparatus 6 further includes a pivotable conveyor belt 14 which is raised in the inactive position. The conveyor carriages 9 are each provided with a short conveyor 22.

Fig. 2 shows system 1 where the first transport means 5 is rolling into the container 2. The pivotable conveyor belt 14 is lowered and interacts with the upper conveyor 11 on the cabinet 10. The second longitudinally variable transport means 8 is not yet put into use and the conveyor carriages 9 are therefore stacked inclining in the cabinet 10.

Fig. 3 shows system 1 where the first transport means 5 is disposed in the container 2. The pivotable conveyor belt 14 interacts with foremost conveyor carriage 9 of the second longitudinally variable transport means 8, and the foremost conveyor carriage 9 interacts with the upper conveyor 11 on the cabinet 10, so that a piece of cargo can be transported continuously to and from the first transport means 5 via the foremost conveyor carriage 9 and the upper conveyor 11. The handling apparatus 5 is constructed as a mobile unit and includes a first conveyor 7 with a free end which is movable in
horizontal and vertical directions, and a handling means 13 is provided at the free end.

Fig. 4 shows a system where the first transport means 5 is placed in the container 2, and where a person 15 is standing beside the first transport means 5 and moves the first conveyor 7, so that handling means 13 can be placed opposite a piece of cargo 16.

Fig. 5 shows a handling means 13 which includes a moving means 17 on which engagement means 18 are arranged. It is here shown in active engagement position at a foremost end of a bipartite conveyor 19. The moving means 17 may move engagement means 18 back along the bipartite conveyor 19 via tracks 20. Engagement means 18 are shown as suction cups provided with vacuum from manifold 21.

Fig. 6 shows a handling means 13 where the moving means 17 have moved engagement means 18 into inactive waiting position at the rear end of the two-part conveyor 19, so that cargo (not shown) can be moved past the engagement means 18.

In the preferred embodiment of a system 23 according to the invention shown in Figs. 7-14 it appears clearly that a handling apparatus 24 includes a handling means in the form of a conveyor 25 with a number of narrow conveyor belts 26, and that the moving means are constituted by pivotable arms 27 interposed between the conveyor belts 26, where outer ends of the arms 27 include said engagement means in the form of suction cups 28 which are adapted to assume an advanced active position (Figs. 11, 12) at the front end of the handling apparatus 24, or and inactive downwards pivoted position (Fig. 13) down under the conveyor belts 24.

With the intention of automatically controlling the direction of the pivotable arms 17 for the suction cups 28, the pivotable arms 27 are mounted on a common transverse support arm 29 which is pivotably mounted on a central pivoting shaft. The support arm 29 is adapted to be angled (pivoted) by means of control wires connected with opposing ends of the common support arm 29 and with peripheral points of a turning disc at a rear end of the first transport means 5, 7.

The common support arm 29 is moved back and forth in the handling apparatus 29 by
means of not shown drive belts arranged along opposing inner sides of the handling apparatus 24, as the pivoting movement itself of the common support arm 29 for suction cups 28 in relation to the top side plane of the handling apparatus 24 occurs by means of a not shown common electric motor with belt drive.

As it appears from Fig. 8, the second transport means 30 consists of a number of conveyors 31 which at a rear end are provided with legs 32 and travel wheels 33, and which at a front end are provided with support rollers 34 adapted to interact with inclining rails 35 extending upwards/forwards, and which are adapted to support the front end of the rolling conveyors 31.

Besides, in Fig. 10 is clearly seen that the handling apparatus 24 interacts at the rear with a belt conveyor 36, which is rigidly connected laterally with the handling apparatus 24, i.e. following its pivoting movement both in vertical and horizontal direction, as the handling apparatus 24 may be elevated in relation to a carriage frame 37 by means of a strong spindle unit 38 with associated electric gear motor 39.

As it most clearly appears from Fig. 14, at a foremost, sectionised edge the handling apparatus 24 is provided with actively powered, narrow rubber rollers 40, which are mounted on a co-driven non-linear shaft 41 which is drivingly connected with at least the two central conveyor belts 26, and which has the purpose of assisting with getting hold of cardboard boxes placed on the floor of a container.
CLAIMS

1. A system (1) for unloading or loading cargo, e.g. cargo packed in boxes (16), and including first transport means (5,7) with a handling apparatus (6) and a second longitudinally variable transport means (8), which first transport means (5,7) are adapted for transporting cargo (16) to and from the second transport means (8), and which handling apparatus (6) includes a conveyor (19) adapted for transporting cargo (6) to or from the first transport means (5, 7), characterised in that the handling apparatus (6) furthermore includes a movable handling means (13) that interacts with the conveyor (19), and which by means of a number of engagement means (18) are adapted for engaging the cargo (16).

2. System (1) according to claim 1, characterised in that the handling means (13) includes a number of moving means (17), which are arranged to move the engagement means (18) between an active engagement position at a front end of the conveyor (19) and an inactive waiting position at a rear end of the conveyor (19).

3. System (1) according to claim 1 - 2, characterised in that the handling apparatus (6) is constructed as a rolling unit with travel wheels (12), that a free end of one of the first transport means (7) is movable in horizontal and vertical direction, and that the handling means (13) is provided at the free end.

4. System (1) according to claim 1 - 3, characterised in that the rolling handling apparatus (6) includes a further conveyor (14) interacting with the longitudinally variable transport means (8).

5. System (1) according to claim 1 and 4, characterised in that the longitudinally variable transport means (8) includes a number of rolling conveyors (9), each designed with a conveyor (22) and each forming a link in the longitudinally variable transport means (8), where the rolling conveyors (9) are adapted to be grouped together in mutually inclining positions when not in use.
6. System (23) according to claim 1-2, characterised in that the handling apparatus (24) includes a conveyor (25) with a number of narrow conveyor belts (26), and that the moving means are constituted by pivotable arms (27) disposed between the conveyor belts (26), the arms (27) including the engagement means in the form of suction cups (28) at their outer ends, the cups (28) being arranged to assume an extended active position at the front end of the handling apparatus or an inactive downwards pivoted position down under the conveyor belts (26).

7. System (23) according to claim 1 and 6, characterised in that the pivotable arms (27) for the suction cups (28) are mounted on a common transverse support arm (29), which is pivotably mounted on a central pivoting shaft, and which is adapted to be angled by means of control wires connected to opposing ends of the common support arm (29) and to peripheral points of a turning disc at the rear end of the first transport means (5, 7).

8. System (23) according to claim 1, characterised in that the handling apparatus (24) at a sectionally divided front edge is provided with narrow positively driven rollers (40) which are suspended on a non-linear shaft (42) and which is drivingly connected with a number of the conveyor belts (26).

9. System (23) according to claim 1 and 6, characterised in that springs are interposed between the suction cups (28) and the pivotable arms (27), and that the suction cups (28) are functionally divided into several groups that may be connected to each their vacuum source.

10. System (23) according to claim 1 and 5, characterised in that the longitudinally variable conveyor (30) includes a number of rolling conveyors (31) which at a rear end are provided with legs (32) with travel wheels (33), and which at a front end are provided with a support roller (34) which is adapted to interact with inclining rails (35) running upwards/forwards and which are arranged to support the front end of the rolling conveyors (31).
**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/DK2006/000239

### A. CLASSIFICATION OF SUBJECT MATTER

**IPC:** see extra sheet  
According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

**IPC:** B65G, B64F  
Minimum documentation searched (classification system followed by classification symbols)

SE, DK, FI, NO classes as above

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

**EPO-INTERNAL, WPI DATA, PAJ**

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search  
23 August 2006

Date of mailing of the international search report  
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International patent classification (IPC)

*B65G 67/08 (2006.01)*

*B64F 1/32 (2006.01)*

*B65G 21/14 (2006.01)*

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Cited literature, if any, will be enclosed in paper form.
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