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10-2008-0070474 21 July 2008 (21.07.2008) KR(71) Applicants (for all designated States except US): **SEO-HO ELECTRIC CO., LTD.**, [KR/KR]; 194-53, Anyang-dong, Manan-gu, Anyang-shi, Gyeonggi-do, 430-010 (KR). **KOREA OCEAN RESEARCH AND DEVELOPMENT INSTITUTE** [KR/KR]; 1270, Sa-dong, Ansan-shi, Kyunggi-do, 425-170 (KR).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **KIM, Seung-Nam** [KR/KR]; Cheongbyeoksan Apt. 102-702, Hawangsi-pi-dong, Seongdong-gu, Seoul, 133-020 (KR).(74) Agent: **YOU ME PATENT & LAW FIRM**; Seolim bldg., 649-10, Yoksam-dong, Kangnam-ku, Seoul 135-080 (KR).

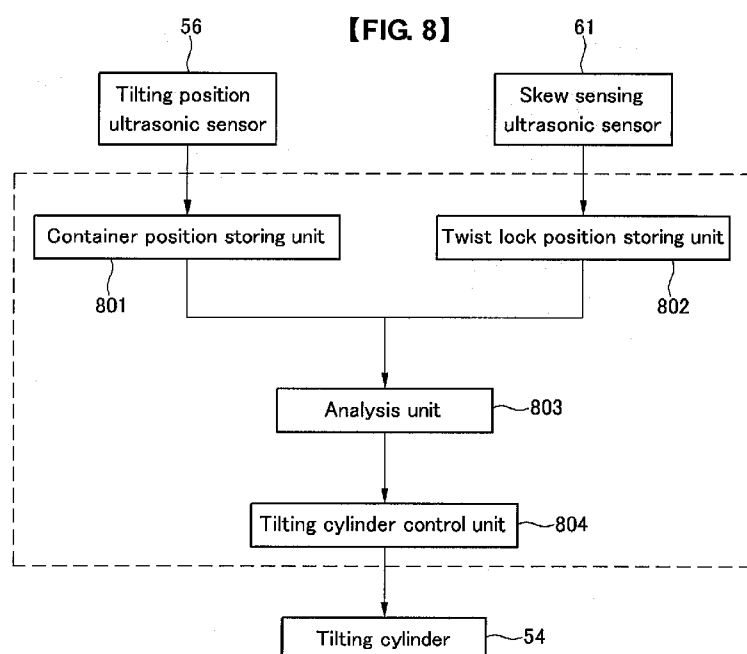
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(54) Title: APPARATUS FOR HANDLING CONTAINER AND SKEW RESISTANCE SYSTEM THEREOF



(57) Abstract: The present invention provides an apparatus for handling a container that has an improved structure of an upper arm of an apparatus for handling a container, and a skew resistance system thereof. The skew sensing system includes an improved upper arm, a skew sensing ultrasonic sensor that senses the skew of a container, and a tilting control device that calculates and adjusts the position of a twist lock. The upper arm includes a twist lock that fixes a container during pick-up, a tilting position ultrasonic sensor that senses the position of the twist lock, and a tilting cylinder that adjusts the position of the twist lock to left and right sides. Even if skew is generated due to poor alignment between a self-loading/unloading vehicle and a container, the skew sensing system allows the self-loading/unloading of a container to be stably performed by adjusting the position of the twist lock.

【SPECIFICATION】**【Invention Title】****APPARATUS FOR HANDLING CONTAINER AND SKEW RESISTANCE
SYSTEM THEREOF****5 【Technical Field】**

The present invention relates to an apparatus for handling a container. More particularly, the present invention relates to apparatus for handling a container that has an improved structure of an upper arm so as to easily load and unload a container, and a skew resistance system thereof.

10 【Background Art】

In general, in order to improve the productivity and economic efficiency of a container terminal, it is necessary to minimize the waiting time of container handling equipment and container transportation equipment. For this purpose, a multi-function apparatus for handling a container that can pick up a container
15 placed on the yard, unload a container being loaded on the ground, directly receive a container from container handling equipment, and directly pick up a container being loaded has been researched.

However, if the alignment between a vehicle and a container is poor, skew is generated, so that the multi-function apparatus for handling a container cannot
20 smoothly load and unload a container. Therefore, the apparatus needs to be improved to stably load and unload a container even if the skew of a container is generated.

【DETAILED DESCRIPTION】

【Technical Problem】

Accordingly, the present invention has been made in an effort to provide an apparatus for handling a container that can stably load and unload a container even if skew is generated due to poor alignment between a vehicle and a container, and a skew resistance system thereof.

【Technical Solution】

An exemplary embodiment of the present invention provides a skew resistance system of an apparatus for handling a container.

The skew resistance system senses the alignment between a container transportation vehicle and a container to guide loading and unloading operations.

The skew resistance system includes: a skew sensing ultrasonic sensor that senses the position of the container corresponding to the alignment of the container; a tilting cylinder that adjusts the position of a twist lock of the container transportation vehicle according to the position of the container sensed by the skew sensing ultrasonic sensor; a tilting position ultrasonic sensor that senses the position of the twist lock; and a tilting control device for comparing and analyzing positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

Another embodiment of the present invention provides an apparatus for handling a container.

The apparatus loads or unloads a container.

The apparatus includes: a twist lock that fixes the container; a tilting cylinder that adjusts the position of the twist lock to left and right sides; a skew

sensing ultrasonic sensor that senses the position of the container; a tilting position ultrasonic sensor that senses the position of the twist lock; and a tilting control device for comparing and analyzing the positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

【Advantageous Effects】

According to the embodiments, even if alignment between a self-loading/unloading vehicle and a container is poor in the apparatus for handling a container, it is possible to stably load and unload a container.

【Brief Description of the Drawings】

FIG. 1 is a view showing the entire structure of a multi-function apparatus for handling a container according to an exemplary embodiment of the present invention.

FIG. 2 is a plan view of FIG. 1.

FIG. 3 is a view showing the structure of a movable loading arm shown in FIG. 1.

FIG. 4 is a view showing an inner portion of the movable loading arm shown in FIG. 3.

FIG. 5 is a view showing the structure of an upper arm shown in FIG. 3.

FIG. 6 is a view illustrating an operation where the upper arm is rotated by an upper arm cylinder assembly so as to be folded or unfolded.

FIG. 7 is a view illustrating an operation where a tilting structure is extended and retracted by a tilting cylinder.

FIG. 8 is a view showing the structure of a skew sensing device according

to an exemplary embodiment of the present invention.

FIG. 9 is a view illustrating a process for loading a container, which is placed on the ground and has skew, by using the skew sensing apparatus according to the exemplary embodiment of the present invention.

5 **【Best Mode】**

In the following detailed description, only certain exemplary embodiments of the present invention have been shown and described, simply by way of illustration. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or
10 scope of the present invention. Accordingly, the drawings and description are to be regarded as illustrative in nature and not restrictive. Like reference numerals designate like elements throughout the specification.

It will be further understood that the terms "comprise" and/or "comprising," when used in this specification, specify the presence of stated features, integers,
15 steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

FIGS. 1 and 2 are views showing the entire structure of a multi-function apparatus for handling a container according to an exemplary embodiment of the
20 present invention.

Referring to FIGS. 1 and 2, a multi-function apparatus for handling a container according to an exemplary embodiment of the present invention includes a frame 100, movable loading arms 101 and 102 that are disposed on both ends of the frame 100 and load and unload a container, and a stationary loading arm

103 that is disposed in the middle of the frame 100 and loads and unloads a container.

As shown in FIGS. 1 and 2, the movable loading arms are movably disposed on both ends of the frame 100. Accordingly, when a container is loaded and unloaded, the movable loading arms 101 and 102 are moved and pick up the container.

The movable loading arms 101 and 102 have the same structure. Therefore, only one movable loading arm 101 will be described hereinafter.

The movable loading arm 101 is composed of loading arms 31 and 32 that face each other, and the loading and unloading of the container can be performed by the loading arms 31 and 32.

As shown in FIGS. 3 and 4, the movable loading arm 101 includes outer masters 33 that are movably mounted on the frame 100, inner masters 34 that are mounted on the inner sides of the outer masters 33 so as to move up and down, and cylinder assemblies 35 that connect the inner masters 34 with the outer masters 33 and move the inner masters 34 upward and downward.

Each of the outer masters 33 includes a lower arm 36 that is provided at the lower end thereof so as to be operated like a hinge. The lower arm 36 is connected to a lower arm cylinder assembly 37, thereby being capable of moving up and down.

That is, the upper portion of the lower arm cylinder assembly 37 is connected to a lower portion 36a of the outer master 33, and the lower portion thereof is connected to the lower arm 36.

Accordingly, when the lower arm cylinder assembly 37 is operated, the

lower arm 36 is operated up and down like a hinge, thereby supporting the bottom of a container C.

Further, an upper arm 50 is provided at the upper portion of the inner master 34, and can pick up the container. The upper arm 50 may be driven by an upper arm cylinder assembly 57. That is, the lower portion of the upper arm cylinder assembly 57 is connected to a bracket 57a of the inner master 34, and the upper portion thereof is connected to the upper arm 50.

Accordingly, when the upper arm cylinder assembly 57 is driven, the upper arm 50 can be rotated so as to be folded or unfolded as shown in FIG. 6.

As shown in FIG. 5, the upper arm 50 includes a twist lock 51 that fixes a container, a tilting cylinder 54 that adjusts the position of the twist lock 51, a tilting position ultrasonic sensor 56 that checks the position of the twist lock 51, and a landing pin 52 that is used to determine whether a container is fixed.

The twist lock 51 is inserted into a cast of a container C and fixed to the cast by being rotated, so that the container C can be picked up. It is possible to sense whether the container C is fixed or not by using the landing pin 52 that is positioned near the twist lock 51. The twist lock 51 and the landing pin 52 form one tilting structure 53, and are connected to the tilting cylinder 54 through a connecting rod 55. If the tilting cylinder 54 is driven and the connecting rod 55 is moved, the position of the twist lock 51 of the tilting structure 53 can be adjusted leftward and rightward as shown in FIG. 7. The position of the twist lock 51 can be detected using a distance sensed by the tilting position ultrasonic sensor 56 fixed to the upper arm 50. This prevents the container from not being smoothly picked up due to the skew of the container C.

As shown in FIG. 4, the skew of the container C can be sensed by measuring a distance between the movable loading arm 101 and the container C with a skew sensing ultrasonic sensor 61 fixed to the outer master 33 of the movable loading arm 101.

5 Further, a container guiding device 38 is provided at the upper portion of the inner master 34. Accordingly, when a container C is received from container loading/unloading equipment, the container guiding device guides the container to an accurate position.

Referring to FIG. 8, a tilting control device 800 includes a container
10 position storing unit 801 that stores the position of the container corresponding to the skew of the container, a twist lock position storing unit 802 that stores the position of the twist lock, an analysis unit 803 that compares the position of the container with the position of the twist lock and analyzes the positions in order to calculate a position adjustment value, and a tilting cylinder control unit 804 that
15 controls the tilting cylinder 54 so as to correspond to the calculated position adjustment value. The tilting control device 800 adjusts the position of the twist lock 51 according to the skew of the container C, and controls the tilting cylinder 54 so that the container C can be stably picked up.

It is possible to correct the skew of the container C and to stably load and
20 unload the container by the apparatus for handling a container that has the above-mentioned structure.

Hereinafter, the operation of the apparatus for handling a container according to the exemplary embodiment of the present invention will be described in detail with reference to the drawings.

When a container C placed on the ground is loaded on a vehicle by using the apparatus for handling a container as shown in FIG. 9, first, the movable loading arms are moved so that the positions of the movable loading arms 101 and 102 correspond to the size of the container C. Then, the upper arm cylinder assemblies 57 move the upper arms 50 downward. When the upper arms 50 of the movable loading arms 101 and 102 are moved downward and are ready to pick up the container, it is confirmed whether the skew of the container C is sensed by the skew sensing ultrasonic sensors 61 of the outer masters 33. Then, the tilting cylinders 54 adjust the positions of the twist locks 51 to appropriate positions.

In detail, the positions of the cast of the container C, which are sensed by the skew sensing ultrasonic sensors 61 fixed to the outer masters 33 of the movable loading arms 101 and 102, are compared with the positions of the twist locks 51 that are sensed by the tilting position ultrasonic sensors 56 of the upper arms 50, and the position adjustment values of the twist locks are analyzed so that the twist locks and the cast of the container are positioned at the same position. The analyzed adjustment values are input to the tilting cylinder control unit 804, and the tilting cylinders 54 are driven so as to correspond to the position adjustment values. The connecting rod 55 is moved due to the drive of the tilting cylinder 54, so that the tilting structure 53 is moved and the position of the twist lock 51 of the tilting structure 53 is adjusted.

If the position of the twist lock 51 is completely adjusted, the cylinder assembly 35 is moved downward until a signal is input from the landing pin 52 so that the twist lock 51 of the upper arm 50 is completely inserted into the upper

corner cast of the container C. If the twist lock 51 is completely inserted into the cast of the container C, the twist lock 51 is rotated so that the cast and the twist lock 51 may not be separated from each other.

Further, the container C is lifted as high as the cylinder assembly 35 can be moved upward and the lower arm 36 is moved downward. In this case, the tilting cylinder 54 returns the twist lock 51 to an initial position, and corrects the skew of the container C.

If the container C is moved upward to the height where the lower arm 36 can be moved downward, the lower arm 36 is moved downward so as to support the bottom of the container C and the container C is then placed thereon. Further, after the twist lock 51 of the upper arm 50 is rotated so that the cast and the twist lock 51 are separated from each other, the upper arm 50 is moved upward and the twist lock 51 is separated from the cast of the container C. Self-loading of the apparatus for handling a container is finished through these processes.

Meanwhile, the container C loaded on a self-loading/unloading vehicle is unloaded in the yard of a container terminal through the following processes.

When only the container C is unloaded, first, the upper arms 50 of the movable loading arms 101 and 102 are moved downward. Further, the skew of the container C is confirmed and the positions of the twist locks 51 are adjusted. Then, the cylinder assemblies 35 are moved downward, so that the twist lock 51 of the upper arm 50 is inserted into the corner cast of the container C.

When a signal representing the completion of downward movement is input from the landing pin 52 provided on the upper arm 50, the twist lock 51 is rotated in a clockwise direction by 90° so as to not be separated from the corner cast.

Further, the cylinder assembly 35 is moved upward to the height where the lower arm 36 can be moved upward, thereby lifting the container C.

If the container C is moved upward to the height where the lower arm 36 can be moved upward, the lower arm 36 is moved upward and the cylinder
5 assembly 35 is moved downward until a signal is input from the landing pin 52, so that the container C is unloaded in the yard of the terminal.

When a signal is input from the landing pin 52 and it is confirmed that the container C is completely placed on the ground of the terminal, the twist lock 51 is rotated in a clockwise direction by 90° and the cylinder assembly 35 is moved
10 upward, so that the twist lock 51 is separated from the corner cast. As a result, self-unloading of the apparatus for handling a container is finished.

Self-loading and unloading of the apparatus for handling a container may be finished through the above-mentioned processes.

【CLAIMS】**【Claim 1】**

A skew resistance system of an apparatus for handling a container that senses alignment between a container transportation vehicle and a container to
5 guide loading and unloading operations, the skew resistance system comprising:

a skew sensing ultrasonic sensor that senses the position of the container corresponding to the alignment of the container;

a tilting cylinder that adjusts the position of a twist lock of the container transportation vehicle according to the position of the container sensed by the
10 skew sensing ultrasonic sensor;

a tilting position ultrasonic sensor that senses the position of the twist lock;
and

a tilting control device for comparing and analyzing the positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic
15 sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

【Claim 2】

The skew resistance system of claim 1, wherein the tilting control device comprises:

20 a position analysis unit that compares the position of the container with the position of the twist lock and calculates a position to be tilted; and

a tilting cylinder control unit that drives the tilting cylinder to the position calculated by the analysis unit.

【Claim 3】

The skew resistance system of claim 2, wherein the tilting control device further comprises:

- a container position storing unit that stores the position of the container
- 5 according to the skew of the container; and
- a twist lock position storing unit that stores the position of the twist lock.

【Claim 4】

An apparatus for handling a container that loads or unloads a container,
10 comprising:

- a twist lock that fixes the container;
- a tilting cylinder that adjusts the position of the twist lock to left and right sides;
- a skew sensing ultrasonic sensor that senses the position of the container;
- 15 a tilting position ultrasonic sensor that senses the position of the twist lock;
- and
- a tilting control device for comparing and analyzing the positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

20

【Claim 5】

An apparatus for handling a container that loads or unloads a container, comprising:

- a frame;

a stationary loading arm that is fixedly disposed on the frame, is moved upward and downward below the frame, and picks up the container to load and unload the container; and

5 a pair of movable loading arms that are disposed on both ends of the frame, are moved in a horizontal direction or moved upward and downward, and that pick up the container to load and unload the container,

wherein the stationary loading arm includes an outer master fixed to the frame, an inner master that is mounted on the inner side of the outer master so as to move upward and downward, a cylinder assembly that connects the inner
10 master with the outer master and moves the inner master upward and downward, and a chain/hose assembly that serves as a passage of a hose or a cable connected to the inner master,

the inner master includes an upper arm that is provided at an upper portion thereof and picks up the container, and an upper arm cylinder assembly that
15 drives the upper arm,

the upper arm includes a twist lock that fixes the container, and

the upper arm cylinder assembly includes a tilting cylinder that adjusts the position of the twist lock to left and right sides,

and the apparatus further comprises

20 a tilting control device that includes a skew sensing ultrasonic sensor for sensing the position of the container and a tilting position ultrasonic sensor sensing the position of the twist lock, and comparing and analyzing the positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

【Claim 6】

An apparatus for handling a container that loads or unloads a container, comprising:

5 a frame;

a stationary loading arm that is fixedly disposed on the frame, is moved upward and downward below the frame, and picks up the container to load and unload the container;

10 a pair of movable loading arms that are disposed on both ends of the frame, are moved in a horizontal direction or moved upward and downward, and that pick up the container to load and unload the container;

a saddle assembly that supports the pair of movable loading arms and moves or fixes the movable loading arms on the frame; and

15 a transfer assembly that is provided on the frame and moves the saddle assembly forward or backward to move the movable loading arms,

wherein each of the pair of movable loading arms includes an outer master that is connected to the saddle assembly that is movably mounted on the frame and is moved forward and backward, an inner master that is mounted on the inner side of the outer master so as to move upward and downward, a guide roller that 20 is provided on one side of the outer master and guides the outer master moving forward and backward, a cylinder assembly that connects the inner master with the outer master and moves the inner master upward and downward, and a chain/hose assembly that serves as a passage of a hose or a cable connected to the inner master,

the inner master includes an upper arm that is provided at an upper portion thereof and picks up the container, and an upper arm cylinder assembly that drives the upper arm,

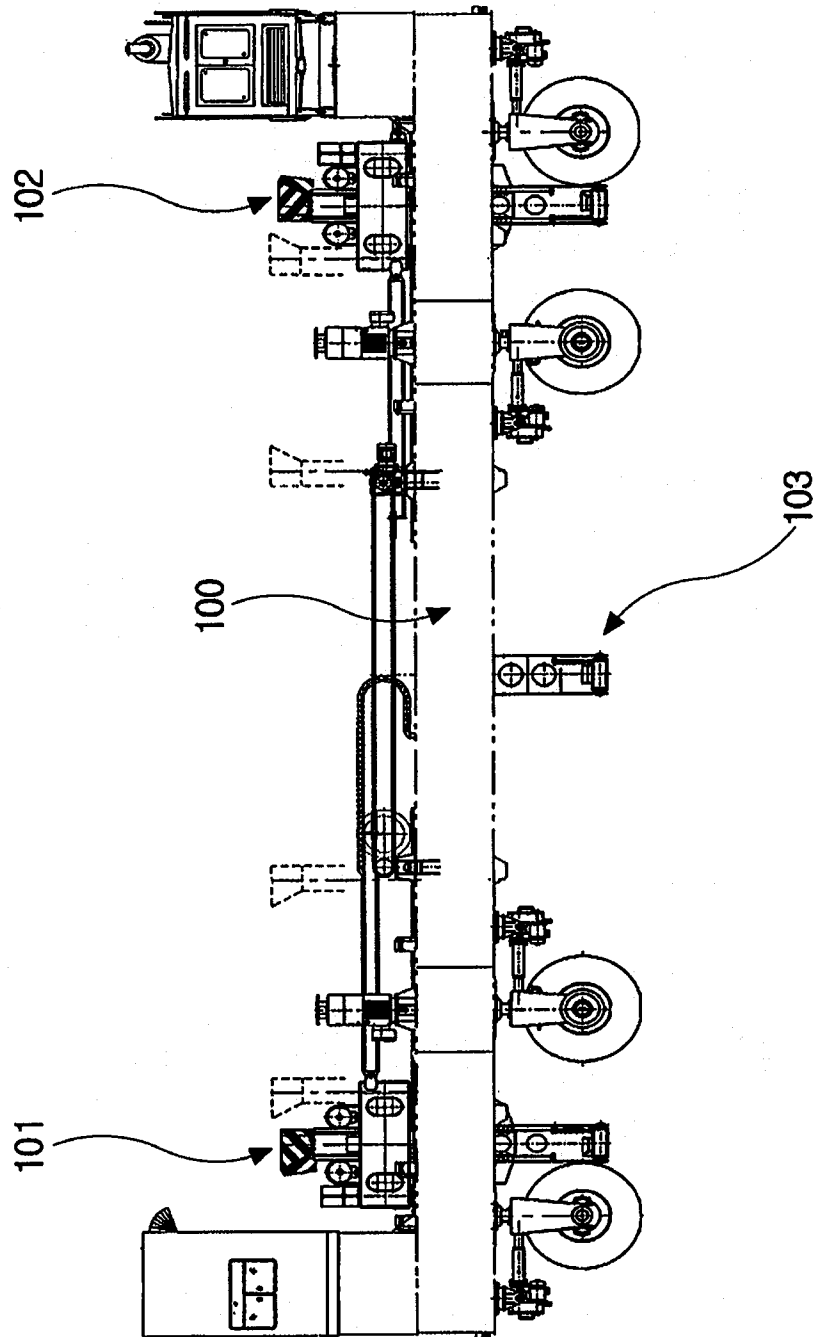
the upper arm includes a twist lock that fixes the container, and

5 the upper arm cylinder assembly includes a tilting cylinder that adjusts the position of the twist lock to left and right sides,

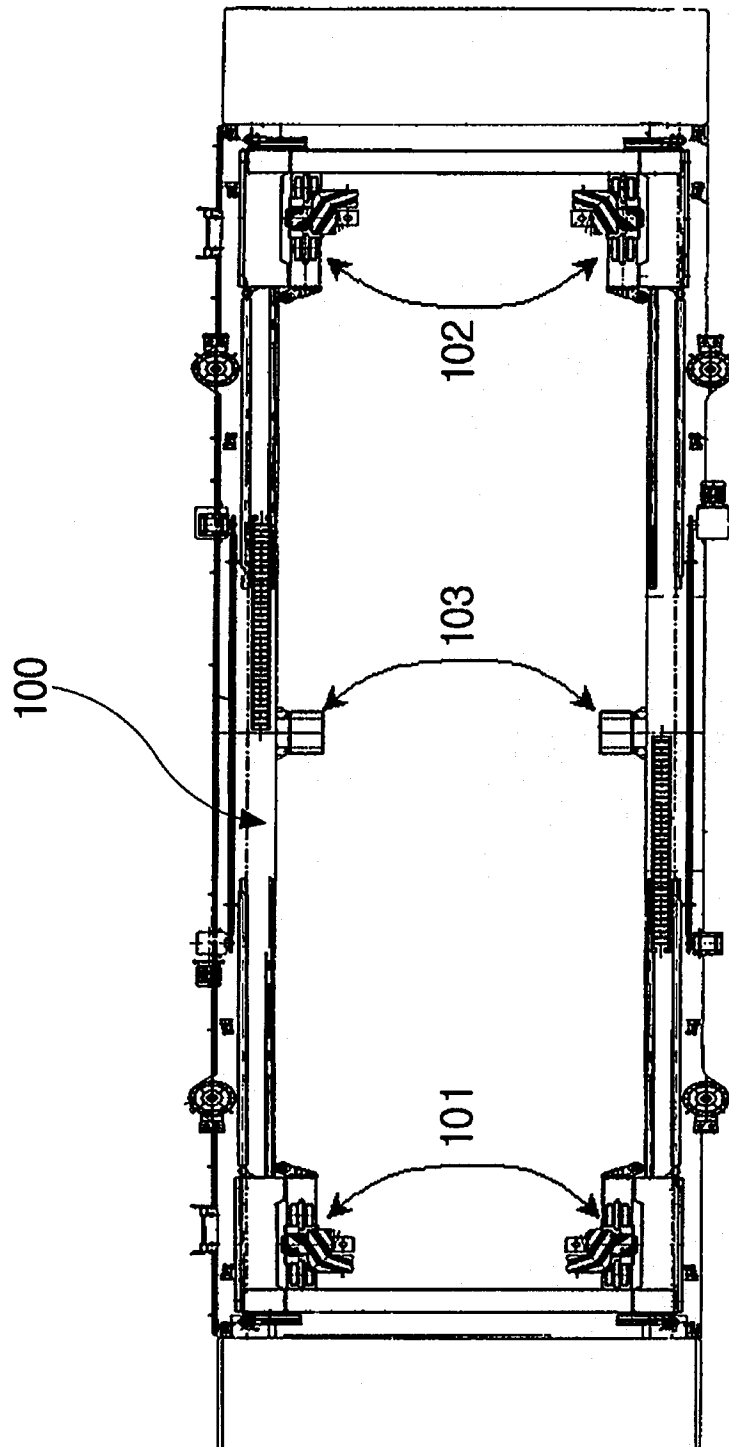
and the apparatus further comprises

a tilting control device that includes a skew sensing ultrasonic sensor for sensing the position of the container and a tilting position ultrasonic sensor
10 sensing the position of the twist lock, and comparing and analyzing the positions of the container and the twist lock, which are sensed by the skew sensing ultrasonic sensor and the tilting position ultrasonic sensor, to control the tilting cylinder.

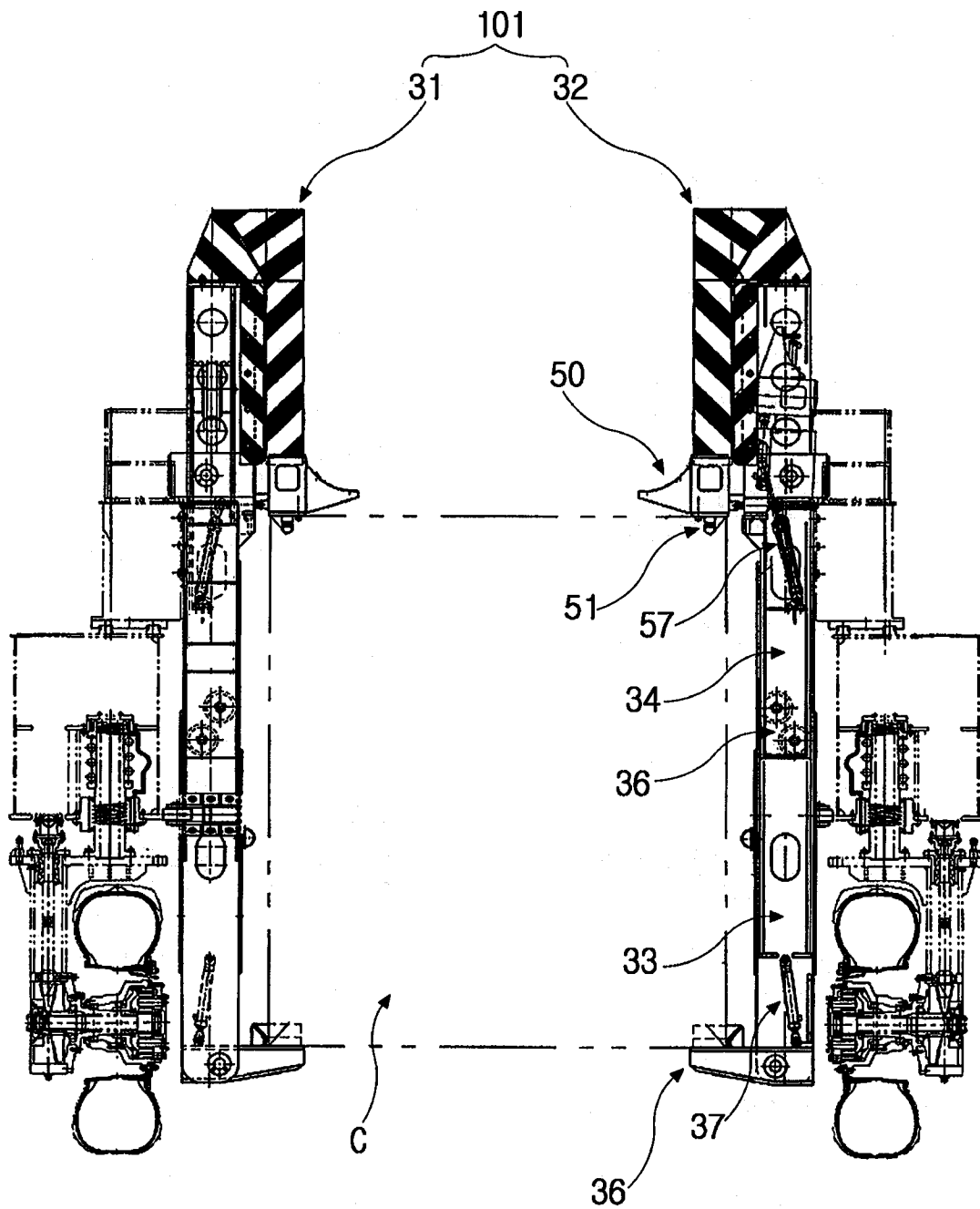
【FIG. 1】



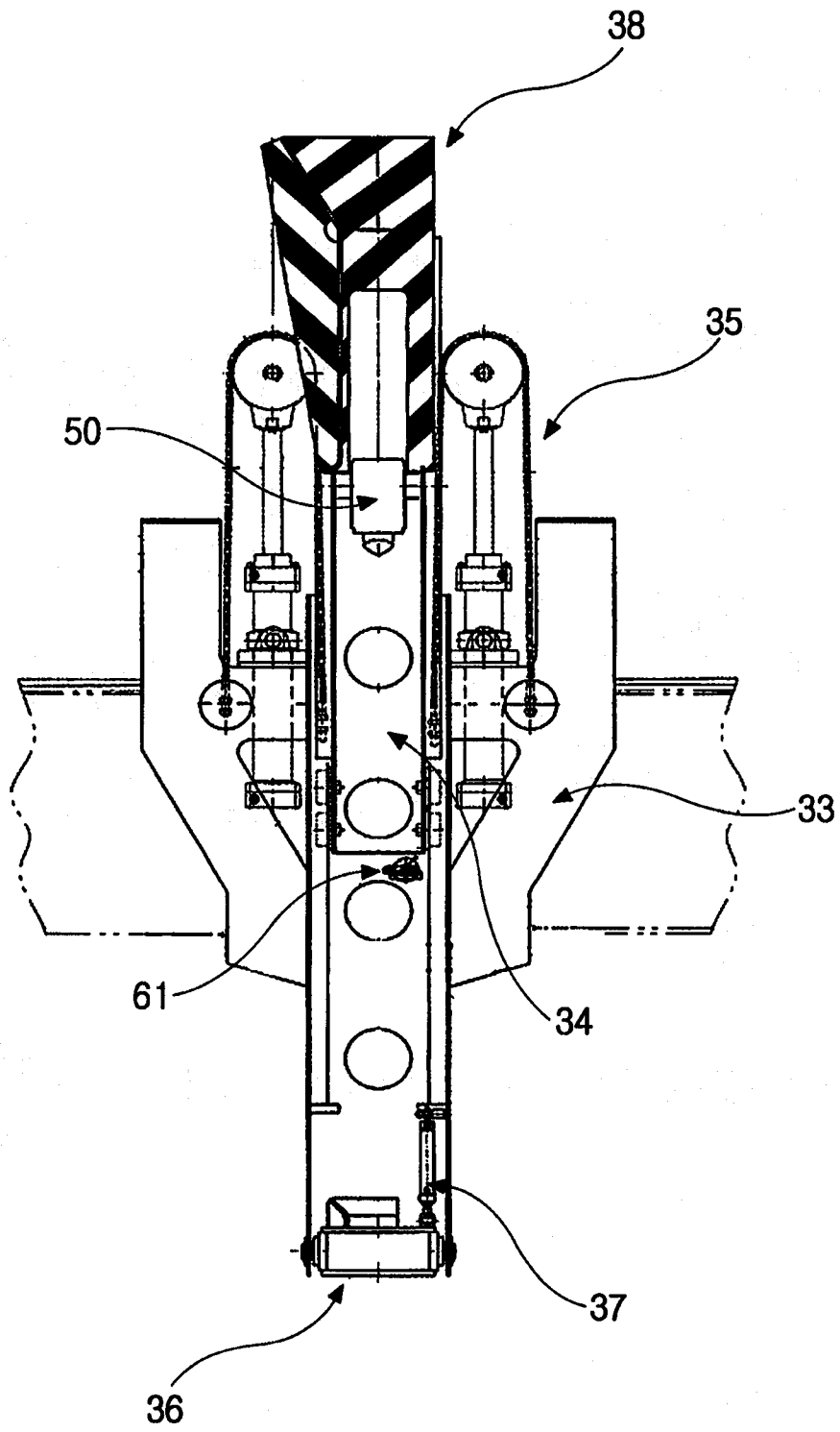
【FIG. 2】



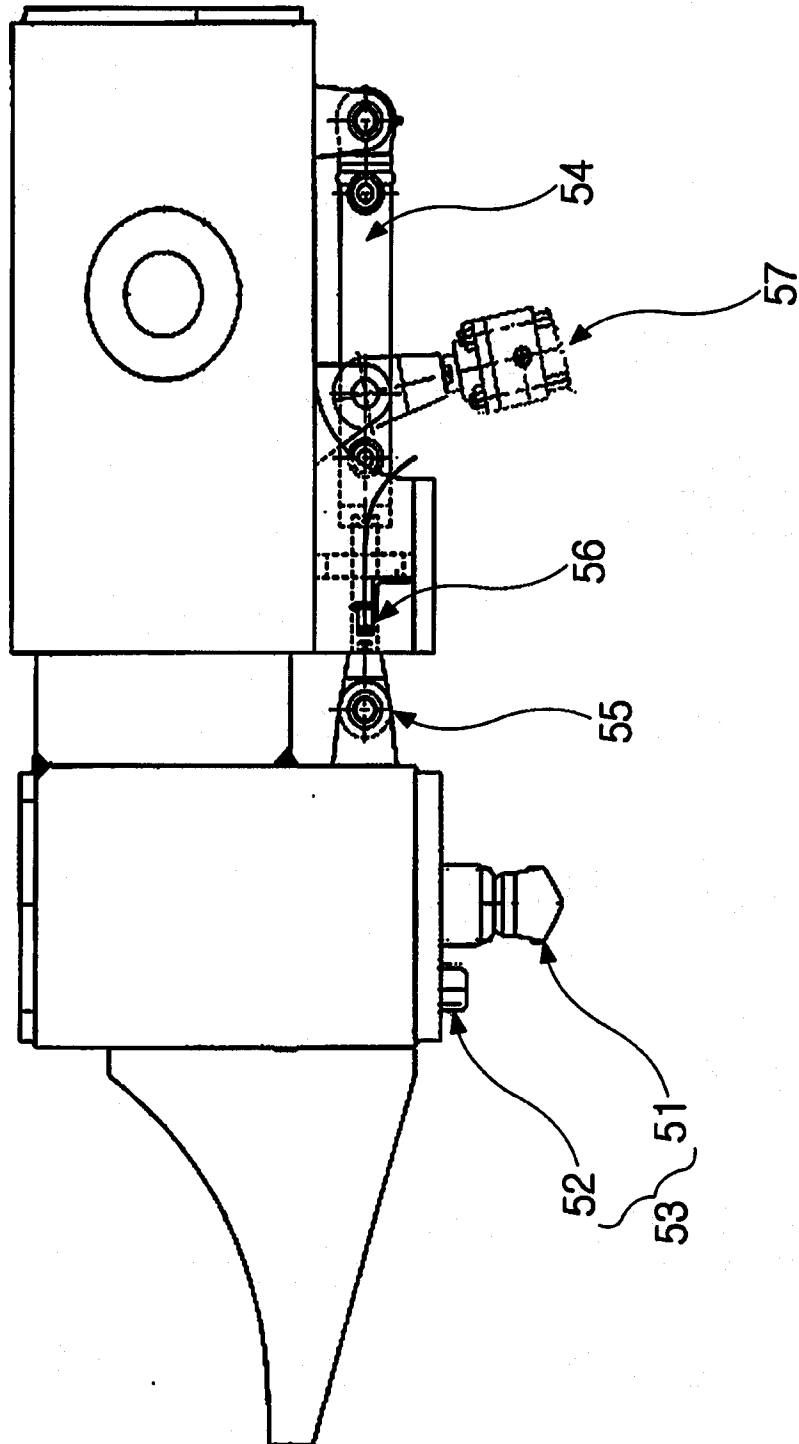
【FIG. 3】



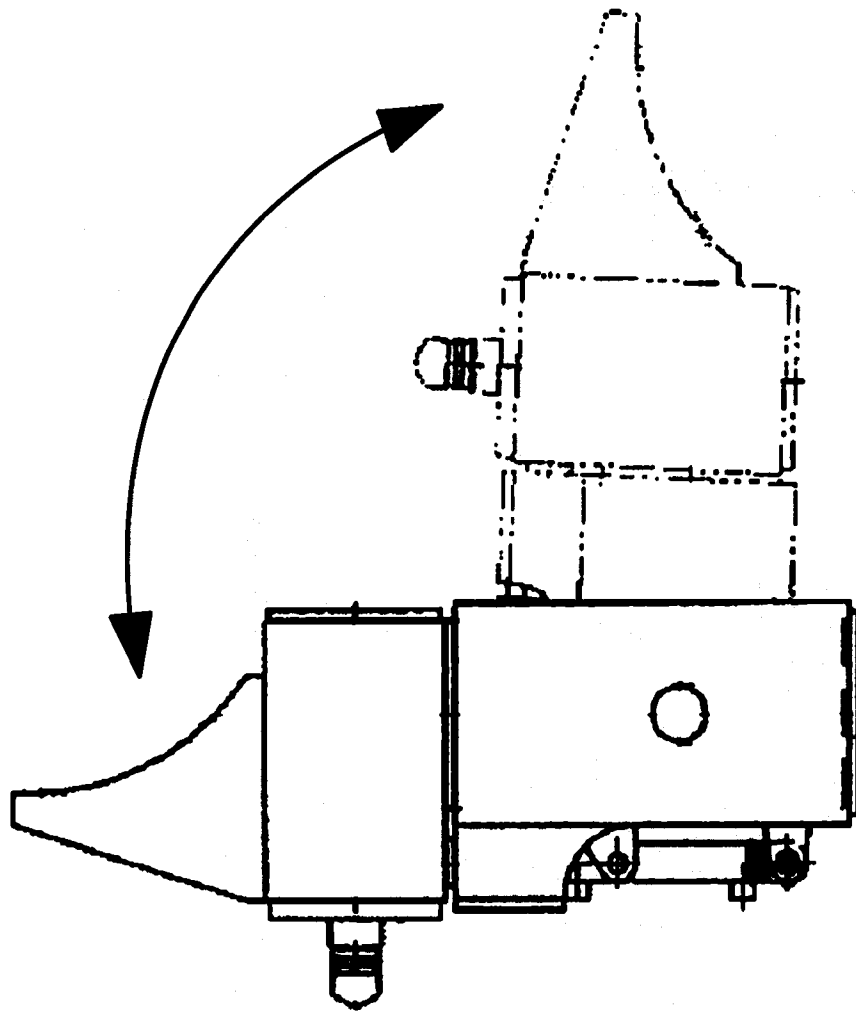
【FIG. 4】



【FIG. 5】

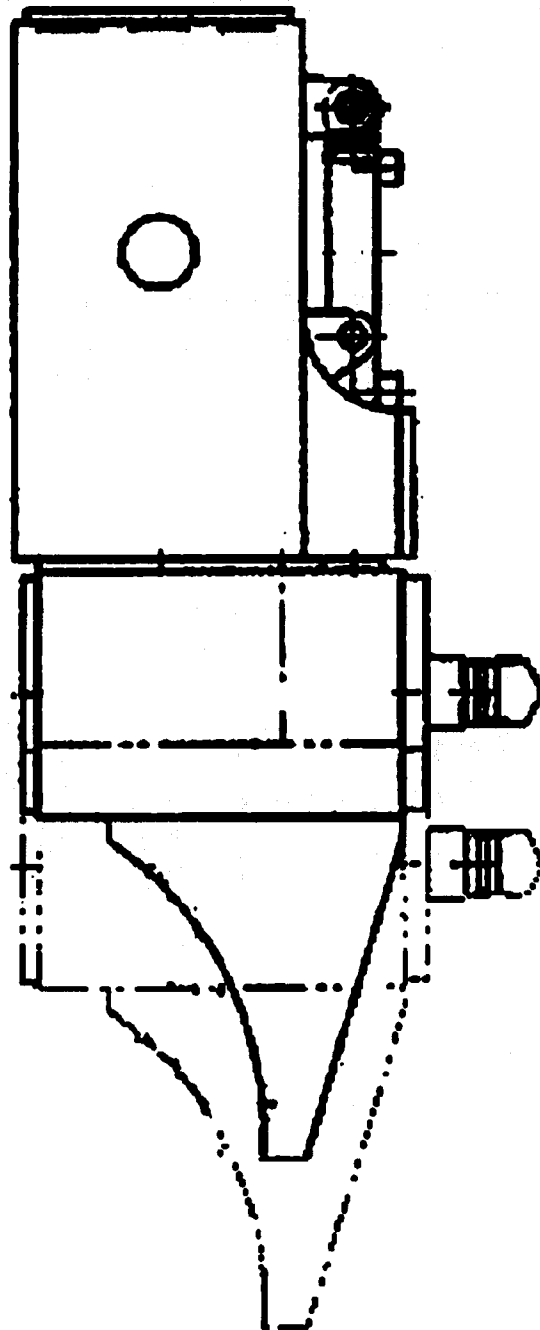


【FIG. 6】



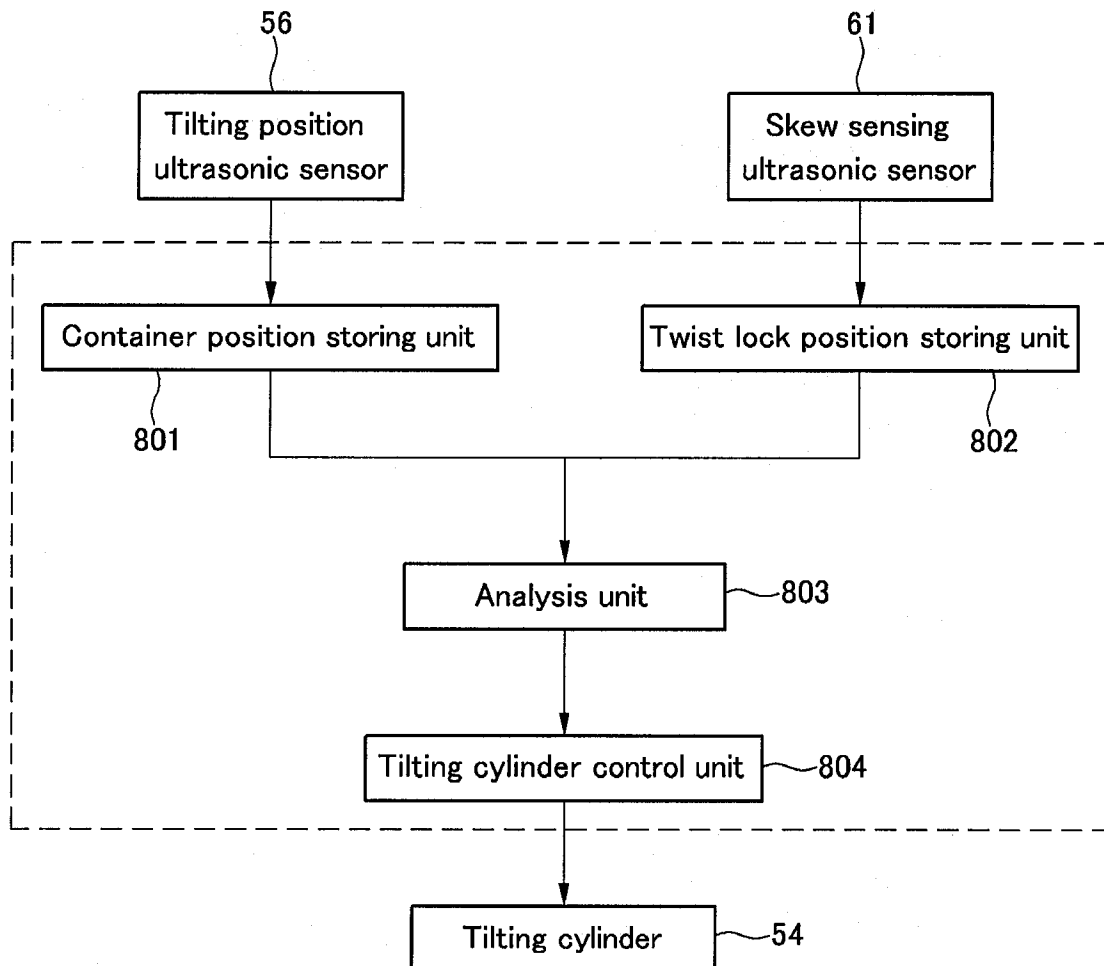
ROTATING

【FIG. 7】

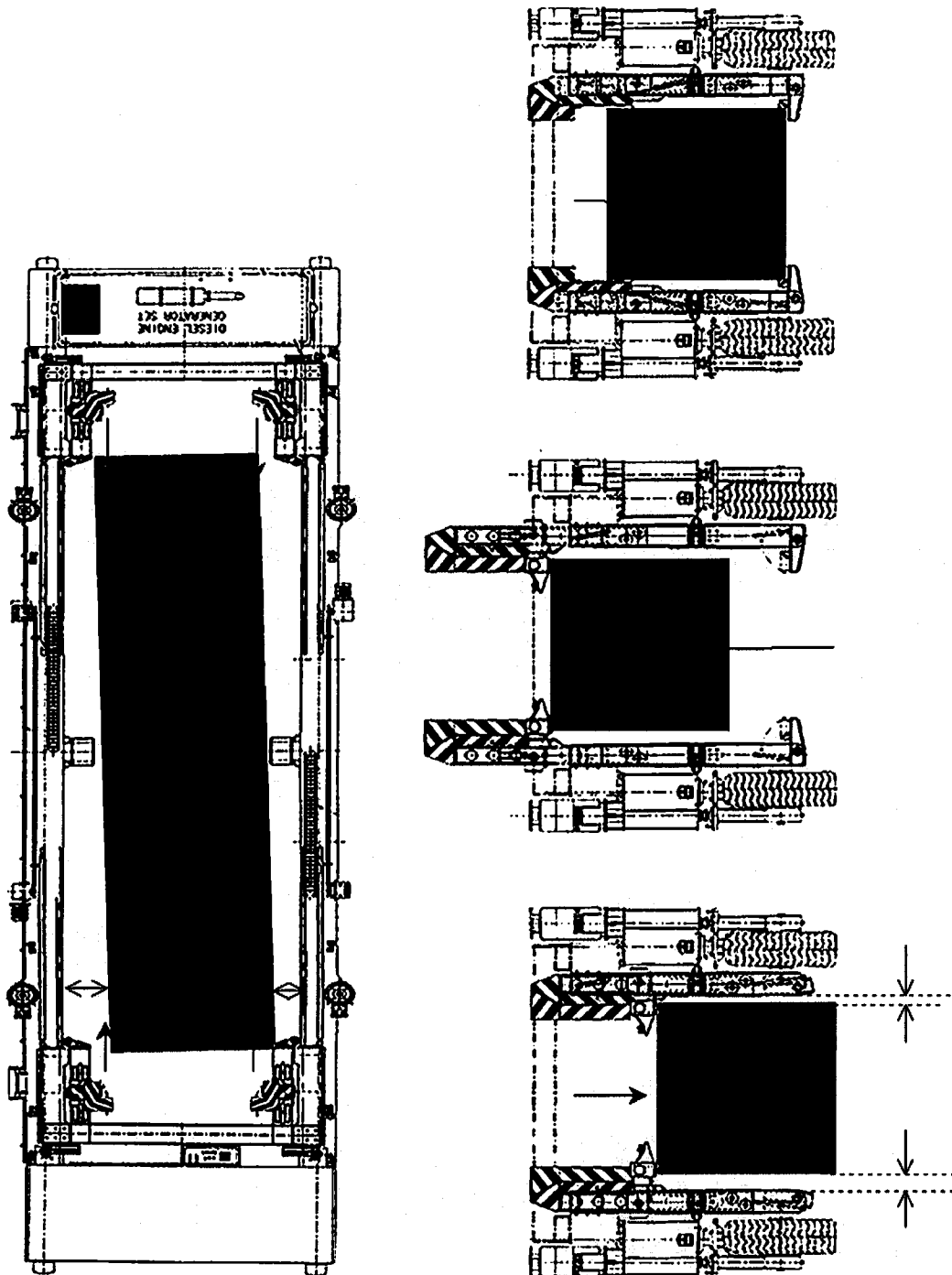


EXT/RET.

【FIG. 8】



【FIG. 9】



A. CLASSIFICATION OF SUBJECT MATTER***B65G 67/60(2006.01)i, B66C 17/20(2006.01)i***

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)

IPC 8: B65G 67/60, B66C 17/20

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

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

eKIPASS (KIPO internal) & keywords : "container", "skew"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7121782 B2 (BARRY, L. D.) 17 October 2006 See abstract and figure 4	1-5
A	US 2003/0228209 A1 (BARRY, L. D.) 11 December 2003 See abstract and figure 1	1-5
A	US 4645406 A (COOPER, A. J.) 24 February 1987 See abstract and figure 2	1-5



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 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

21 APRIL 2009 (21.04.2009)

Date of mailing of the international search report

22 APRIL 2009 (22.04.2009)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

PAEK, Jin Wook

Telephone No. 82-42-481-8458



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2008/004279**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.: 6
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:

Claim 6 includes a saddle assembly which is not shown nor explained in the description. Therefore, the saddle assembly in claim 6 is so unclear that no meaningful search could be formed.
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 fee, this Authority did not invite payment of any additional fee.
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

Information on patent family members

International application No.

PCT/KR2008/004279

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7121782 B2	17.10.2006	US 6619904	16.09.2003
		US 6652214	25.11.2003
		US 7438515	21.10.2008
		US 2004-0126211 A1	01.07.2004
		US 2004-126211 A1	01.07.2004
		US 2005-244256 A1	03.11.2005
		US 6619904 B1	16.09.2003
		US 6652214 B1	25.11.2003
US 2003-0228209 A1	11.12.2003	US 7014410	21.03.2006
		US 2003-228209 A1	11.12.2003
		US 7014410 B2	21.03.2006
US 4645406 A	24.02.1987	None	