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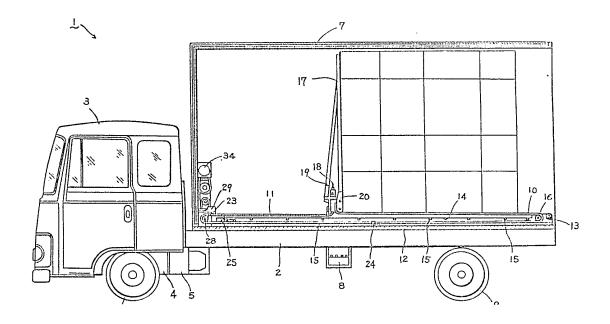
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- (71) ApplicantTeruo Kashihara,2-10 Nishikujo 5-chome, Konohana-ku, Osaka-shi, Japan
- (72) Inventor Teruo Kashihara
- (74) Agent and/or Address for Service Jensen & Son, 8 Fulwood Place, High Holborn, London WC1V 6HG

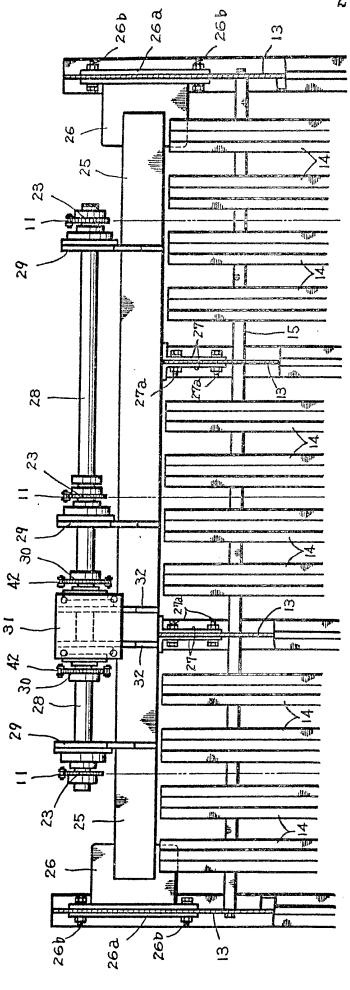
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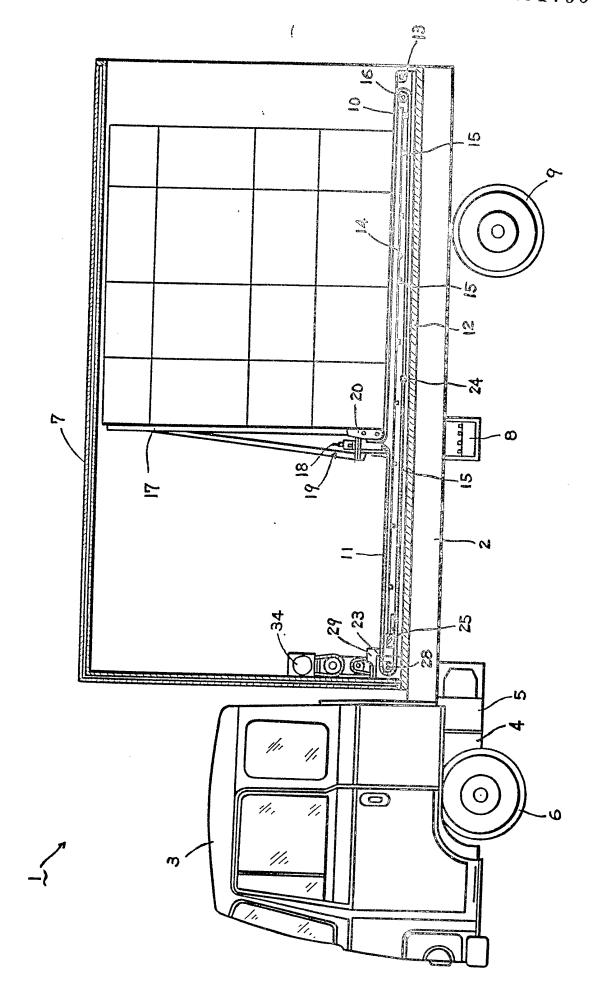
## (54) A cargo-handling apparatus

(57) A cargo-handling apparatus comprises load-supporting belts (10) and load-chains (11) connected together (at 24) to form endless members and to a partition (17). The chains are driven by motors (34) to carry loads the belts which are supported on a frame comprising a plurality of major longitudinally extending bars (13) spaced apart at the widths of the belts and a plurality of minor longitudinally extending bars (14) beneath the belts (10) and disposed between the major bars (13). The frame including a plurality of transverse bars (15) and a chassis (25) on which the motors (34) and a speed-reducing means (33) are mounted. The drive to the belts (10) and the chains (11) may include a torque-regulating device and means (18, 19) are provided for maintaining the tension between the load chains (11) and the partition (17) by which the load supporting belts (10) and the chains (11) are maintained under constant preload.

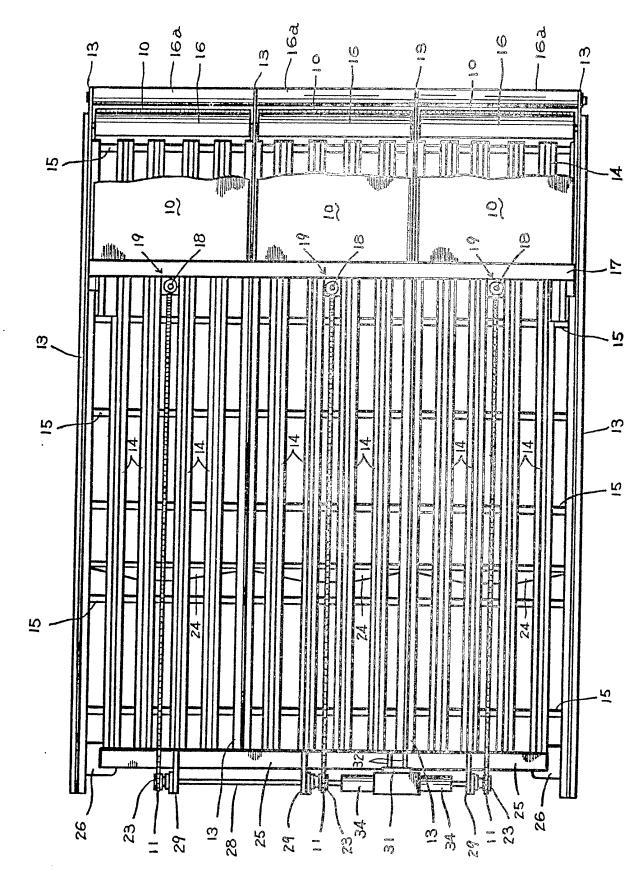




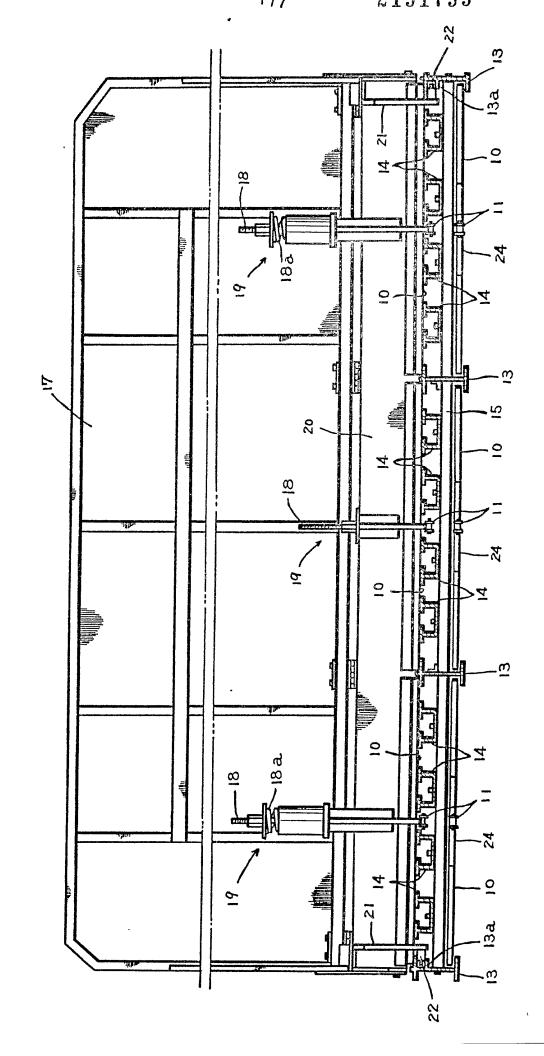
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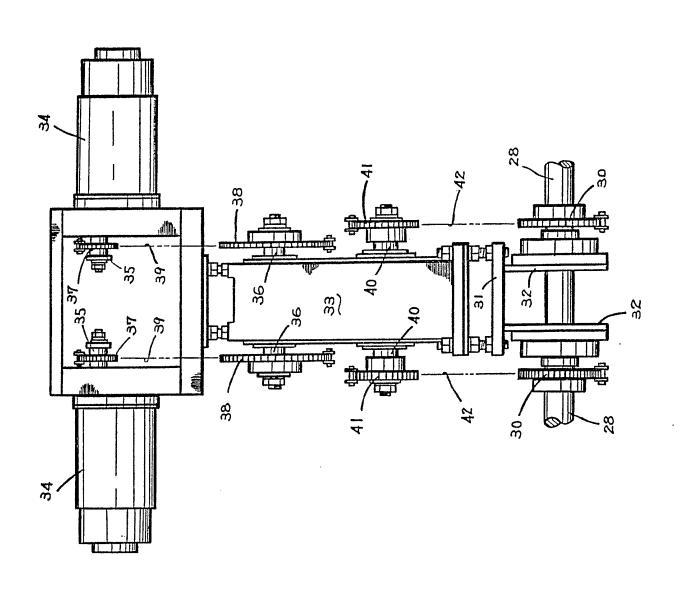
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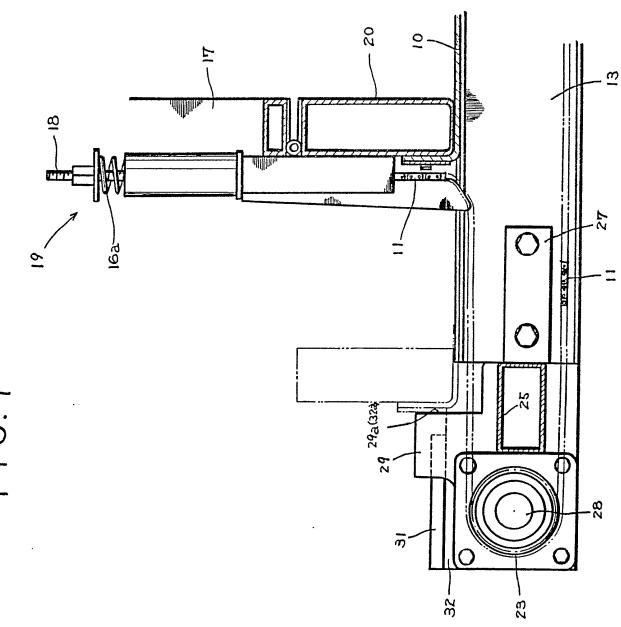


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F16.5





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#### **SPECIFICATION**

## An apparatus for loading or unloading cargoes

- 5 This invention relates to an apparatus for loading or unloading cargoes, for example into or from a truck, since the apparatus is able to be installed in a load-carrying vehicle or truck, the loading and unloading efficiency is greatly improved.
- 10 As disclosed in Japanese Utility Model Registration Publication No sho 54-6166, an apparatus for loading cargoes by the use of a belt moving on a frame by the pull of load chains connected thereto in an endless manner is known.
- 15 However, the disclosed arrangement required a large number of rollers and frames to support a belt, consequently, the structure was so complex that assembling the apparatus was complex and difficult, additionally it was undesirably heavy and it was 20 difficult to cut down on the production cost thereof.

The present invention is the result of an intensive study and seeks to provide a solution which can eliminate the known drawbacks.

The present invention seeks to provide a
25 cargo-handling apparatus in which the parts can be
assembled or dismounted with ease and accuracy,
while also providing such an apparatus which
requires a lower cost of construction and in which
weight can be saved. The invention also seeks to
30 enable the functional assembly of the load-carrying
belts to the apparatus to be simplified, particularly

belts to the apparatus to be simplified, particularly where the belts cooperate with a partition retaining the load supported on the belts.

According to the present invention, there is
35 provided a cargo handling apparatus comprising a
plurality of belts and load-chains endlessly
connected to one another so as to carry cargoes on a
frame and a partition for retaining loads resting on
the said belts which is located at the connection

- 40 between said belts and said load-chains, wherein the apparatus includes a prime mover means and a frame comprising a plurality of major longitudinally extending bars spaced side by side at the same interval as the width of the individual belts and a
- 45 plurality of minor longitudinally extending bars for supporting said belts which are disposed between two adjacent major longitudinal bars in parallel therewith and supported by a plurality of lateral bars, a chassis for mounting the prime mover and a
- 50 change-speed means which is transversely fixed to one end of said major longitudinal bars, a bracket for joining said chassis to said major longitudinal bars on both sides and a bracket for bearing a driving shaft for said belts.
- 55 An embodiment of the invention will now be described by way of an example hereinafter with reference to the accompanying drawings, in which:-

Figure 1 is a plan view of a driving part of a cargo-handling apparatus, constructed in

60 accordance with the invention;

Figure 2 is a side view of a vehicle incorporating the apparatus of this invention;

Figure 3 is a plan view of the load-carrying region of the vehicle shown in Figure 2;

65 Figure 4 is a cross-sectional view of the apparatus,

looking towards the rear;

Figure 5 is a diagram illustrating the attachment of a chassis;

Figure 6 shows the method of mounting of driving 70 motors; and

Figure 7 is a side view of the driving part shown in Figure 1.

In Figures 1 to 4, the numeral 1 denotes a truck for carrying loaded cargoes. In the front part of the truck

- 75 chassis 2 are a driver's cab 3, an engine 4, a power transmission unit 5 and front wheels 6. The rear part of the chassis 2 supports a box-shaped carrier 7, a battery 8 and right and left rear wheels 9. The numeral 10 denotes belts for carrying cargoes into or
- 80 out of the truck which extend in the longitudinal direction of the carrier 7. A certain length of load-chains 11 are provided to pull the belts 10. Major longitudinal bars 13 and minor belt-supporting bars 14 are arranged a certain
- distance above the floor 12 of the carrier 7; in this example, four belt-supporting bars 14 are placed at an equal interval between every two of four equally spaced bars 13, the belt-supporting bars 14 and the longitudinal bars 13 are fixed together in parallel
- 90 with each other by means of lateral bars 15 so as to make up a frame.

A part of each of the belts 10 on which cargoes are supported when the apparatus is in operation is arranged to slide along the major longitudinal bars

- 95 13, being also supported by sliding contact with the minor bars 14. To facilitate this, a return pulley 16 is rotatably supported at the rear end of the longitudinal bars 13, over which the belts 10 are guided in such a way that a further part of the belt 10
- 100 is passed through the space between the lateral bars 15 and the floor 12 of the carrier 7. A tubular guard 16a for protecting the return pulley 16 is provided to the outside of each return pulley 16, between every two of the major longitudinal bars 13.
- A joint base 20 supporting a partition 17 pivotable between the vertical or horizontal positions and which extends laterally across the belts 10, is connected to the load-chains 11 by means of a tension-adjusting device 19 with a spring 18a and an adjusting bolt 18.

As seen in Figure 4, the joint base 20 has a pair of arms 21, 21 on both sides of the partition; additionally, the lower part of each arm is provided with a projection 22, which can slide freely back and

- 115 forth on inner guide rails 13a, 13a of the two outer longitudinal bars 13, 13 in engagement with each other. The joint base is joined, on the other hand, to an end of the belts 10. Consequently, the belts 10 and the load-chains 11 are connected together with the
- 120 adjusting bolt 18 of the tension adjusting device 19 to which the partition 17 is pivotally connected.

Placed near the front end of the carrier 17 is a sprocket 23 for driving the load-chains 11, by means of which the chains 11 are guided back under the

125 lateral bars 15. The free ends of the belts 10 and the load-chains 11 are connected each other by means of a fixing element 24 under the lateral bars 15. In this way, the belts 10 and the load-chains 11 make a tensioned endless loop guided on the sprocket 23

130 and the return pulley 16.

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A chassis 25 is located transversely on the front end of the longitudinal bars 13 as shown in Figures 1 and 5. The ends of the chassis 25 are supported with fixing brackets 26, 26 fastened to the vertical sides of 5 the outer major longitudinal bars 13 with washers 26a and bolts 26b. Provided on the chassis 25 are two mutually spaced pairs of brackets 27, 27 to which the two inner longitudinal bars 13, 13 are fixed with bolts 27a. A chain-driving shaft 28 on which the sprocket 10 23 is fitted is supported by a plurality of shaft-bearing brackets 29, 29 so as to project backward from the chassis 25. Provided on the chain-driving shaft 28 are a mutually spaced pair of sprockets 30, 30 between which a base plate 31 for motors is placed on a pair of

15 base brackets 32, 32 fixed to the chassis 25.
As shown in Figure 6, a pair of driving motors 34,
34 with a speed reduction apparatus 33 are placed on the base plate 31. An output shaft 35 with a torque limiter which transmits rotational power of less than
20 a given magnitude and an input shaft 36 of the speed reduction apparatus 33 are connected by means of a pair of output sprockets 37, 37 of the motors, input sprockets 38, 38 of the speed reduction apparatus and power transmission chains 39, 39. Furthermore,
25 output shafts 40, 40 of the speed reduction apparatus

and the chain-driving shaft 28 are connected by means of a pair of output sprockets 41, 41 of the speed reduction apparatus, sprockets 30, 30 of the chain-driving shaft and power transmission chains 42, 42. The power transmission system is such that the two motors 34, 34 can move the endless loop comprising the belts 10, the joint base 20 and the

comprising the belts 10, the joint base 20 and the partition 17 by way of the chain-driving shaft 28, the sprockets 23 and the load-chains 11.

35 As shown in Figure 7, a step or abutment is formed at the front of the shaft-bearing brackets 29 and the base brackets 32. The step serves to limit the forward travel of the joint base 20 and the partition 17 followed by the belts 10. It also serves to prevent the 40 joint base 20 and the partition 17 from derailing out of the outer longitudinal bars 13, 13 or bumping against the various driving elements mentioned above located on the forward side of the arrangement if for any reason the motors should be 45 out of control.

The construction of the invention is such that when cargoes are loaded into a truck, for example, the motors 34, 34 are started in order to pull the load-chains 11, together with the joint base 20, the partition 17 and the belts 10 towards the forward end of the carrier 7. Cargoes are put on the belts 10 one after another and carried to the inside of the carrier. On the other hand, when cargoes are to be unloaded from the truck, the motors 34, 34 are run in the opposite direction, which moves the joint base 20,

opposite direction, which moves the joint base 20, the partition 17 and the belts by means of the load-chains 11 to the rear of the carrier 7; thus, cargoes put on the belts can be unloaded easily.

The longitudinal bars 13 and the belt-supporting
60 bars 14, laid in parallel, extend in line with the
moving direction of the belts 10, so that the surface
of the moving belts is free from undulation;
moreover, because the under surface of the belts
occupies space between the belt-supporting bars a
65 little, cargoes on the moving belts can move in a

straight line, without rolling or tilting to either side.
Furthermore, because the load-chains 11 are
connected to the belts 10 with the tension-adjusting
device and the partition 17 located between them,
70 contact of the belts with the belt-supporting bars 14
is limited to only to the region behind the partition
17, so that the friction on the contact area is reduced
to a minimum extent; therefore, the force required to
drive the belts 10 can be substantially reduced. The
75 load-chains 11 and the belts 10 being connected to
each other with the tension-adjusting bolt 18, the

75 load-chains 11 and the belts 10 being connected to each other with the tension-adjusting bolt 18, the structure of the tension adjusting device can be considerably simplified, nevertheless, the tension adjustment can be made over a wide range by

0 increasing the length of the tension-adjusting bolt 18; also, since tension pulleys and the like are not needed under the lateral bars 15, the top of the load-carrying belts does not have to be raised, which makes loading or unloading easier. The load-chains
5 11 and the belts 10 are tensioned at a constant load with which the joint base 20 is pressed against the step 29a, 32a at the front end of the shaft-bearing brackets 29 and the base brackets 32.

The under surface of the belts 10 occupies space 90 between the belt-supporting bars 14 a little, so that the rolling of cargoes on the moving belts can be avoided; in this way, safe and smooth loading or unloading can be carried out. The major longitudinal bars 13 can be joined simply to the chassis 25 by 95 means of the fixing brackets 26, 27, consequently, the assembling of a frame with the longitudinal bars 13 and belt-supporting bars 14 can be made quickly and with high accuracy. In addition, by the effective utilization of the shaft-bearing brackets 29, the 100 production of the lightweight chassis 25 and the reduction of the production cost of the apparatus can be realised with ease. In spite of that, the apparatus can still preserve its essential function of cargo handling and yet is able to locate and guide the belts 105 and the partition positively.

## **CLAIMS**

1. A cargo-handling apparatus comprising a 110 plurality of belts and load-chains endlessly connected to one another and driven by a prime mover means so as to carry cargoes on a frame and a partition for retaining loads resting on the said belts which is located at the connection between said belts 115 and said load-chains, wherein the apparatus includes a frame comprising a plurality of major longitudinally extending bars spaced side by side at the same interval as the width of said individual belts and a plurality of minor longitudinally extending 120 bars for supporting said belts which are disposed between two adjacent major longitudinal bars in parallel therewith and supported by a plurality of lateral bars, a chassis for mounting the prime mover and a change-speed means which is transversely 125 fixed to one end of said major longitudinal bars, a bracket for joining said chassis to said major longitudinal bars on both sides and a bracket for

An apparatus according to claim 1, wherein
 the prime mover means comprises at least one drive

bearing a driving shaft of said belts.

motor.

- 3. An apparatus according to claim 1 or claim 2, wherein the prime mover means comprises at least one reversible drive motor.
- An apparatus according to any one of claims 1 to 3, wherein the change-speed means comprises a speed-reduction device.
  - 5. An apparatus according to any one of claims 1 to 4, wherein a torque limiting means is disposed
- 10 between the prime mover means and the change-speed means.
- An apparatus according to any one of the preceding claims, wherein the connection between the load chains and the partition includes a tension
   adjusting device.
  - 7. An apparatus according to any one of the preceding claims, wherein the partition is pivotable about an axis between a horizontal and an upright position.
- 8. A cargo-handling apparatus substantially as hereinbefore described and with reference to the accompanying drawings.

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