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(54) Grip arm mechanism

(57) A grip arm mechanism for a refuse vehicle and adapted to cylindrical drum waste containers (13), the mechanism comprising a telescopic arm (11), an actuator (18,19) within said arm and having the operative ends (22,23) thereof attached to the outer ends of said arm whereby operation of the actuator causes telescopic movement of said arm, one end of said arm being adapted for pivotal attachment (15) to the hoist of a refuse vehicle, the other end of said arm having a freely pivotable shoe (24) for engaging the side of said container, and a fixed length link (21) pivotally connected to the inner end (20) of the outer telescopic member (17) and adapted for pivotal connection (14) to said hoist inboard of said pivotal attachment whereby operation of said actuator causes said telescopic arm to extend whilst first pivoting outwardly of the vehicle and then pivoting inwardly.

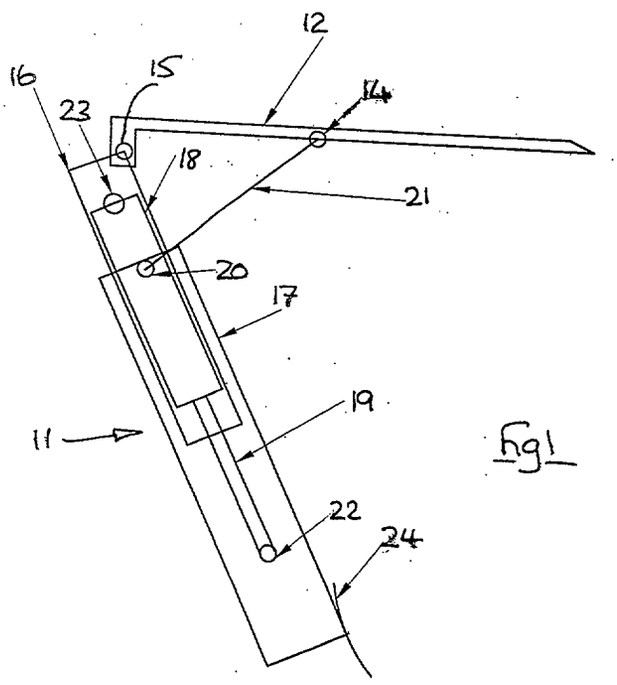

Fig 1

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Description

[0001] This invention relates to a hoist for refuse vehicles, and particularly to a hoist suitable for lifting and upending refuse containers so that refuse contained therein is deposited in a hopper at the rear of the vehicle refuse body.

[0002] Many kinds of hoist have been proposed for lifting and upending refuse containers. Typically the container is gripped at ground level, lifted vertically to a predetermined height and then partially upended so that refuse in the container is deposited into the hopper under the force of gravity. This sequence is reversed in order to lower the empty container to the ground.

[0003] Many kinds of waste container are known, and the hoist must be adaptable to all types, even though not all vehicle installations have the features which permit the lifting of all kinds of container. In order to improve adaptability a typical hoist may comprise a generally horizontal beam on which container gripping elements are mounted. The beam is itself arranged for a vertical movement, for example on generally upright guides. Vertical movement of the beam is generally controlled by hydraulic actuators, and other actuators may effect pivoting of the beam and operation of the gripping elements.

[0004] One kind of gripping element is for engaging upright cylindrical waste containers of the type generally known as a PALADIN. Such containers are typically about a metre in diameter, about 2 metres tall and have castors to permit movement thereof. PALADIN containers are usually of metal and galvanised.

[0005] PALADIN containers do not have a specialised lifting attachment but are held against a lifting plate of the hoist by a pair of arms which close around the body thereof. These arms grip the container with sufficient force to permit lifting and upending. PALADIN containers have the advantage that they can be lifted in any orientation.

[0006] In the operative condition PALADIN grip arms protrude to the rear of the refuse vehicle. Accordingly such grip arms must be stowable when the refuse vehicle is in transit, but easily movable to the operative condition when containers are to be emptied. These grip arms must also be as small as conveniently practicable because the refuse vehicle hoist will typically have other gripping elements, such as a comb lift attachment, for other kinds of refuse container. Speed of movement from the stowed to the active condition is an important feature since it has an effect on the time to complete an average bin emptying cycle.

[0007] One aim of the present invention is to provide a grip arm mechanism which is relatively small in the stowed condition, has adequate power and is relatively simple in construction.

[0008] According to the present invention there is provided a grip arm mechanism for a refuse vehicle and adapted to cylindrical drum waste containers, the mechanism comprising a telescopic arm, an actuator within said arm and having the operative ends thereof attached to the outer ends of said arm whereby operation of the actuator causes telescopic movement of said arm, one end of said arm being adapted for pivotal attachment to the hoist of a refuse vehicle, the other end of said arm having a freely pivotable shoe for engaging the side of said container, and a fixed length link pivotally connected to the inner end of the outer telescopic member and adapted for pivotal connection to said hoist inboard of said pivotal attachment whereby operation of said actuator causes said telescopic arm to extend whilst first pivoting outwardly of the vehicle and then pivoting inwardly.

[0009] Such an arrangement provides for continuous smooth movement of the arm from the stowed condition, through the open condition to the gripping condition. As the arm moves away from the stowed condition it also extends to the normal working length. The operator may pause movement of the actuator in order to position the container into the open condition of the arm, before continuing unidirectional movement of the actuator until the container is gripped.

[0010] The invention avoids the prior art arrangement whereby the actuator moves in one direction to move the arm from the stowed to the open condition, and in the opposite direction to move the arm from the open condition to the gripped condition. Accordingly the invention requires only half the number of reversals of the prior arrangement, with consequent benefits of reduced valve and actuator wear.

[0011] Furthermore the mechanism ensures that the arm automatically extends to the desired working length as it moves from the stowed to the operating condition. This is a significant advantage over prior arms which either have a fixed length, and thus requires greater stowing volume, or requires to be manually extended and retracted.

[0012] In this invention, the stowed condition the arm is short, and accordingly the necessary pair of arms can be accommodated on a lifting beam without overlap.

[0013] Preferable the actuator is an hydraulic cylinder, the piston rod of which is connected to the outer telescopic member. Such an arrangement allows the full piston area of the actuator to be used in the container gripping direction, the annulus around the piston rod being used only for the return motion of the actuator.

[0014] In the preferred embodiment, the actuator is housed within the telescopic arm, which preferably comprises two tubes. Such an arrangement protects the actuator from the environment, and particularly the piston rod and fluid seals.

[0015] In one embodiment of the invention, two grip arm mechanisms are provided and mounted one at each side of a vehicle hoist, the hoist having a buffer against which the arms are adapted to press a container.

[0016] In a preferred embodiment the hoist includes a lifting beam, and grip arm mechanisms are mounted at either end of said lifting beam, the pivoting axis of said

telescopic arm being more rearward, in use, than the pivoting axis of said fixed length arm on said beam.

[0017] Other features of the invention will be apparent from the following description of a preferred embodiment shown by way of example only in the accompanying drawings in which:

Fig.1 is a schematic plan view of one grip arm mechanism according to the present invention;
Fig.2 illustrates the mechanism of Fig.1 in the stowed condition;
Fig.3 illustrates the mechanism of Fig.1 in the half deployed condition;
Fig.4 illustrates the mechanism of Fig.1 in the fully deployed condition;
Fig.5 illustrates the mechanism in the fully clamped condition.

[0018] With reference to Fig.1 a grip arm mechanism comprises a telescopic arm 11 mounted by pivot 15 to a beam 12 which forms part of a container hoist of a refuse vehicle (only one end of the beam 12 is illustrated). Fig.1 is not drawn to scale, and certain features are exaggerated in order to clearly illustrate the principle of operation. The arm is illustrated in the half clamped condition.

[0019] The telescopic arm 11 comprises an inner tube 16 mounted to the beam 12 and an outer tube 17 slidable thereon by means of suitable bearings (not shown).

[0020] A telescopic ram comprises a body 18 secured relative to the inner tube 16 at 23, and a piston rod 19 secured to the outer tube at 22 whereby extension of the piston rod causes extension of the telescopic arm, and vice versa. The end 20 of the outer tube closest to the pivot 15 is pivotally connected via a fixed length link arm 21 to the beam 12 at a point 14 inboard of the pivot 15. This arrangement provides that extension of the telescopic arm 11 causes the arm to swing about the pivot 15 in a manner controlled by the link arm 21.

[0021] An arcuate shoe 24 is pivoted to the outermost portion of the arm 11, as illustrated.

[0022] In a practical embodiment, a mirror image arm 11 is provided at each end of the beam 12 so as to engage a container at both sides. The arms 11 are in use pivoted below the beam 12 for stowing purposes, as will become apparent.

[0023] Figs. 2-5 illustrate the operation of a typical grip arm mechanism according to the invention, in sequence. Certain features are omitted from the sequential drawings in order to improve clarity. A PALADIN container 13 is indicated in chain-dot outline in Fig. 5.

[0024] Fig.1 shows the container in the almost gripped condition, a mirror image telescopic arm being provided on the other side, but not illustrated. Slight further extension of the arm 11 causes the container to be firmly gripped for lifting and emptying (Fig. 5).

[0025] Figs. 2-5 show various angles of link arm 21 consequent upon progressive extension of the telescopic arm 11, from a stowed position of Fig.2. By reference to the drawings it can be seen that the shoe 24 moves leftwards (as viewed) to Fig.4, and then progressively rightwards to the clamped position of Fig.5.

[0026] In a practical embodiment, the arm will be allowed to pause in the position of Fig.4 to permit a container to be rolled into approximate position against the beam 12, and then reactivated to grip the container for lifting.

[0027] Release of the container is by reverse motion to the position of Fig.4, in which another container may be brought into position against the beam, or the arm 11 may be returned to the stowed condition.

[0028] It will be appreciated that the position of the pivots and the length of the link arm 21 will be selected to give a favourable motion of the telescopic arm, according to the dimensions of the lifting beam and the gripping positions of the container. It will also be understood that careful positioning of the pivot points on the beam is required in order to avoid locking of the telescopic arm 11 and the link 21 on a coincident axis. The latter can be avoided by ensuring a small angle between the arm and link in the stowed condition, for example by placing the pivot of the arm 11 behind the pivot of the link 21 as illustrated. A helper spring may be provided to assist initial movement of the telescopic arm away from the stowed condition, and a latch mechanism may also be provided to secure the arm in the stowed position when not required.

Claims

1. A grip arm mechanism for a refuse vehicle and adapted to cylindrical drum waste containers, the mechanism comprising a telescopic arm, an actuator within said arm and having the operative ends thereof attached to the outer ends of said arm whereby operation of the actuator causes telescopic movement of said arm, one end of said arm being adapted for pivotal attachment to the hoist of a refuse vehicle, the other end of said arm having a freely pivotable shoe for engaging the side of said container, and a fixed length link pivotally connected to the inner end of the outer telescopic member and adapted for pivotal connection to said hoist inboard of said pivotal attachment whereby operation of said actuator causes said telescopic arm to extend whilst first pivoting outwardly of the vehicle and then pivoting inwardly.

2. A mechanism according to claim 1 wherein the actuator is an hydraulic cylinder.

3. A mechanism according to claim 2 wherein the actuator comprises a piston rod connected to the outer telescopic member.

4. A mechanism according to any preceding claim wherein said actuator is housed within the telescopic arm.

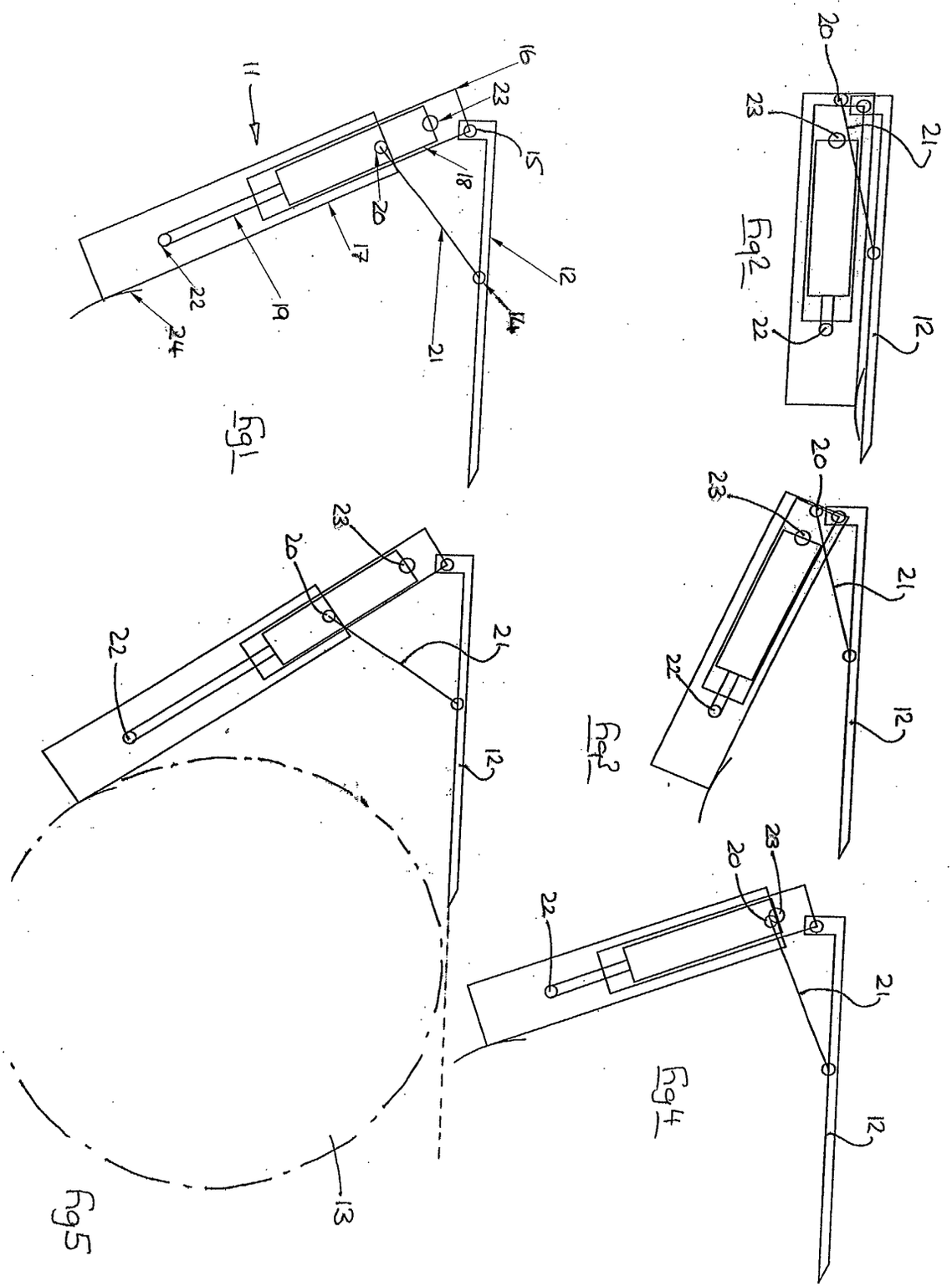
5. A mechanism according to any preceding claim wherein said actuator comprises two tubes.

6. A vehicle hoist comprising a substantially horizontal lifting beam, and grip arm mechanisms according to any preceding claim mounted at either end of said lifting beam.

7. A hoist according to claim 6 wherein the pivoting axis of the respective telescopic arms is more rearward, in use, than the pivoting axis of the respective fixed length arms on said beam.

8. A grip arm mechanism substantially as described herein with reference to the accompanying drawings.

9. A vehicle hoist substantially as described herein with reference to the accompanying drawings.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PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 02 25 2995

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	US 5 562 386 A (D. BROWNING) 8 October 1996 (1996-10-08) * column 3, line 19 - column 4, line 23 * * figures 1-5 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65F

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

8,9

Reason for the limitation of the search:

Rule 29(6) EPC.

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 July 2002	Smolders, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 25 2995

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82