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(54) Refuse vehicle hoist

(57) A container hoist for a refuse vehicle (10), the hoist comprising two spaced upright guides (12) for attachment to the structure of a refuse vehicle and a beam (14) extending between these guides and movable vertically thereon, the hoist further comprising an actuating mechanism for the beam, the actuating mechanism comprising two lower links (16) adapted to be pivotally anchored (17) at one respective end relative to the vehicle structure and extending towards each other to respective swivels (18), and upper links (21) extending respectively from said swivels and away from each other to spaced pivoting attachments of said beam, an actuator (19) being provided between said links and operable to move said swivels together and apart, thereby to lower and raise said beam with respect to said uprights.

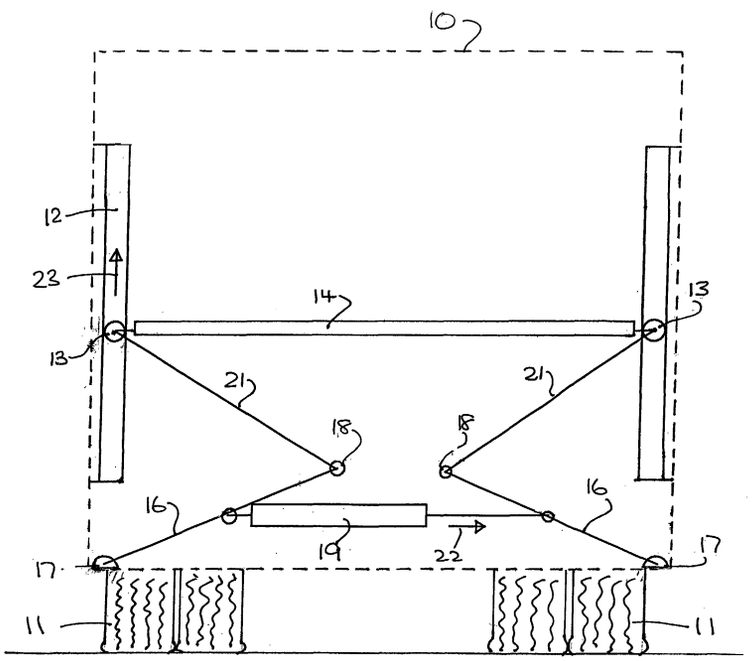

Fig 1

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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 over a hopper so that refuse in the container is deposited under the force of gravity. The lifting sequence is reversed in order to lower the empty container to the ground.

[0003] Many kinds of waste containers 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 one or more 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] It will be understood that such hoists are somewhat complex, both mechanically and hydraulically. The operating environment is severe because of exposure to dirt and dust, and because collection vehicles operate in all weathers. Furthermore the hoist is exposed at the rear of the vehicle where it may be subject to damage due to collision, particularly in reversing. Finally, the numerous relatively movable elements pose a severe problem to designers in ensuring adequate shielding against inadvertent trapping of an operator's limb or clothing.

[0005] What is required is a simplified hoist mechanism which is capable of meeting the operational requirements.

[0006] According to the invention there is provided a container hoist for a refuse vehicle, the hoist comprising two spaced upright guides for attachment to the structure of a refuse vehicle and a beam extending between these guides and movable vertically thereon, the hoist further comprising an actuating mechanism for the beam, the actuating mechanism comprising two lower links adapted to be pivotally anchored at one respective end to the vehicle structure adjacent a lower portion of a respective upright, and extending towards each other to respective swivels, and upper links extending respectively from said swivels and away from each other to spaced pivoting attachments of said beam, an actuator being provided between said links and operable to move said swivels together and apart, thereby to lower and raise said beam with respect to said uprights.

[0007] Such an arrangement provides for a single actuator to lift and lower the beam on which the gripping elements can be mounted, and avoids the problems of synchronisation inherent in separate lifting actuators for each side of the beam. Furthermore, the actuator is positioned between the uprights and thus away from the corners of the vehicle where collision damage is more likely.

[0008] Preferably the actuator is provided between the lower links, and in a preferred embodiment is a fluid operated actuator, particularly a hydraulic actuator. The fluid operated actuator may be single or double acting, but in any event the number and vulnerability of fluid connections is reduced compared with lifting actuators at either side of the beam. Preferably the fluid operated actuator is double acting so as to both lift and lower the waste container under control of suitable valves. During lowering the degree of power assistance is reduced owing to the weight of the container, and returning fluid may be directed via a restrictor in order to reduce the speed of container descent.

[0009] In the preferred embodiment the lower links are adapted to be anchored in vertical alignment with the uprights, and the upper links are pivotally attached to the beam also in vertical alignment with the uprights. In the lowermost position, the swivels are immediately adjacent and the upper and lower links may be substantially horizontal.

[0010] The actuator is preferably operable between the mid points of the lower links.

[0011] A particular advantage of the link mechanism is that container upward speed reduces as the end of travel is approached. This in turn ensures that the container is brought to a halt relatively slowly, thus reducing shock loadings inherent in the use of fixed end stops. As a result the service life of the hoist can be increased, and damage to containers is reduced.

[0012] In the preferred embodiment the upper and/or lower links may be of variable length in order to permit adjustment of the hoist on installation and in service on a vehicle.

[0013] Preferably the hoist further includes a cam mechanism to pivot the beam at the upper end of the travel thereof. Such an arrangement ensures precise and controllable upending of the container, and utilising the single actuator of the hoist.

[0014] The cam mechanism preferably comprises a roller fixed relative to one upright and having an axis substantially parallel to the beam, and a cam pivotally mounted on a carrier slidable in the upright for progressive engagement with said roller as said beam is raised, the cam and roller co-operating in use to pivot said cam in the upper portion of travel of said beam, the beam being mounted for pivoting and the cam having a link to said beam whereby pivoting of said cam results in corresponding pivoting of said beam.

[0015] The cam preferably comprises a fork engageable with said roller, the carrier having a pivot for the cam, and the pivot being arranged such that engagement of the base of the fork with the roller results in piv-

oting of the cam about the carrier, and consequent pivoting of the beam.

[0016] Preferably the actuator is a telescopic fluid ram arranged to extend during raising of the beam.

[0017] The profile of the cam may be chosen to give a suitable acceleration characteristic to the pivoting beam thereby to encourage emptying of waste material from the container into the vehicle hopper.

[0018] A forked cam ensures controlled pivoting movement of the beam in both directions of movement. The link between the cam and the beam can be of any suitable kind, but is preferably of adjustable length in order to permit adjustment of the mechanism.

[0019] In the preferred embodiment, the beam is mounted on the guides by means of a roller at the respective ends thereof, the rollers defining a pivoting axis of the beam and being also movable in translation as the beam is raised and lowered. The guide preferably comprises 'C' shaped channel sections having the open sides facing towards each other and within which the rollers are guided for vertical movement.

[0020] In a preferred embodiment a respective roller and cam is provided for each upright.

[0021] 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 illustration of a hoist according to the invention

Fig.2 is a partial transverse cross section through a guide on an enlarged scale.

Fig.3 is a schematic illustration of a beam pivoting mechanism;

Figs.4-6 illustrate an alternative beam tipping mechanism; and

Fig.7 illustrates stages in the container emptying cycle.

[0022] Fig.1 is a schematic rear elevation of a refuse collection vehicle represented by a collection body 10 mounted on a chassis having the usual axle having twin rear wheels 11.

[0023] Upright guides 12 are fixed to either side of the body 10 and comprise open 'C' shaped channels in which travel guide wheels 13 for a transverse beam 14. Fig.2 shows a schematic arrangement of one end, the guide wheel 13 being mounted on an axle 15 of the beam 14. The guide wheels 13 permit the beam 14 to move in translation, and to be pivoted about the wheel axis.

[0024] A linkage for lifting and lowering the beam comprises lower links 16 respectively anchored at one end to pivots 17 adjacent the lower carrier of the vehicle body 10, and extending towards each other to respective swivels 18. An hydraulic ram 19 is coupled between the lower links so that operation thereof causes the swivels to approach and separate as the links 16 move arcuately about their respective pivots 17.

[0025] Respective upper links 21 are connected between the swivels 18 and pivot points at the opposite ends of the beam 14, thereby raising and lowering the beam in a kind of scissors motion as the actuator is operated. Extension of the actuator, represented by arrow 22 causes the beam to be raised, represented by arrow 23. As illustrated the connection between the upper links and the beam 14 is coincident with the guide wheels 13, but it need not be.

[0026] This arrangement is particularly compact, and the actuator 19 is in a relatively protected position at the centre of the vehicle, and in practice somewhat inboard of the beam 14 and container gripping apparatus. Accordingly the hydraulic connections are not vulnerable to contact damage. The guides 12 and links 16,21 are of relatively simple form and easy to replace in the event of damage or wear. Furthermore, the stroke of the beam and lever ratio can be selected or modified to suit different vehicles and vehicle bodies by altering the length of the links 16,21 the attachment points of the links 16,21 and the attachment positions and stroke of the actuator 19.

[0027] A tilting mechanism for the beam 14 is illustrated schematically in Fig.3 which shows guide 12, guide wheel 13 and beam 14. The beam is pivotable about the axis of guide wheel 13. A frame 25 couples a second guide wheel 24 also slidable in the guide 12. The second guide wheel 24 comprises a carrier which supports a cam plate 27 pivotable about the axis of the wheel 24.

[0028] A roller 26 is fixed relative to the guide rail 12 by means not shown and has an axis of rotation parallel to the axes of guide wheels 13 and 24. The cam plate 27 includes a fork 28 adapted to engage the roller on upward movement of the beam 14 and frame 25. A pull rod 29 pivotally connects the lower end of the cam plate 27 with the beam 14 as illustrated.

[0029] In operation, the mechanism is adjusted so that a suitable under stop holds the beam 14 horizontal. The length of the pull rod is adjusted to align the fork 28 with the fixed axis roller 26.

[0030] In use upward movement of the beam 14, by virtue of operation of actuator 19, causes the frame 25 and rollers 13,24 to move up the guide until the roller 26 engages the lower end of the fork 28. Further upward movement causes the cam plate 27 to pivot clockwise about the axis of guide wheel 24 thus pulling the pull rod and causing anticlockwise pivoting of the beam 14 about the axis of guide wheel 13. As a result a container attached to the beam 14 can be partially upended over a hopper of the refuse vehicle body.

[0031] For reasons of simplicity, Fig.3 shows the pivoting axis of the cam plate to be coincidental with the axis of guide wheel 24. However it need not be, and can be selected according to design requirements.

[0032] This motion is further illustrated in the example shown in Figs.4-6, which has a slightly different configuration.

[0033] Fig.4 shows the fork 28 prior to engagement with the roller 26. The beam 14 is in the returned position in which a waste container can be moved vertically.

[0034] Fig.5 shows the fork 28 engaged with the roller 26 and partially rotated in the clockwise direction. The pull rod 29 has partially rotated the beam as can be seen by comparison of the lower mounting bracket 31 of the pull rod.

[0035] Fig.6 shows an end condition in which the fork 28 has been rotated by about 100° as the beam reaches the end of its permitted travel. The pull rod 29 has continued pivoting of the beam 14, and the bracket 31 is substantially vertical.

[0036] The relatively fixed roller 26 may be mounted on an adustable frame so as to ensure accurate alignment with the fork 28, and to provide precise initiation of the tilting motion at the desired height.

[0037] It will be appreciated that the open channel of the guide 12 faces inwardly (Fig.2) and does not pose a significant danger to operators. The tilting mechanism (Fig.3) is compact and can be shielded relatively easily, for example by a guard which travels up and down with frame 25. Separate tilting actuators are not required, and consequently there is no need for additional fluid connections, hoses and the like.

[0038] Fig.7 illustrates schematically a container 30 being lifted from the ground 31 by a beam 14 slidable vertically in a guide 12. At the top of the guide 12, the beam is tilted sufficiently to upend the container 30 so as to permit waste to be deposited in a hopper 32 of a refuse vehicle

Claims

1. A container hoist for a refuse vehicle, the hoist comprising two spaced upright guides for attachment to the structure of a refuse vehicle and a beam extending between these guides and movable vertically thereon, the hoist further comprising an actuating mechanism for the beam, the actuating mechanism comprising two lower links adapted to be pivotally anchored at one respective end relative to the vehicle structure and extending towards each other to respective swivels, and upper links extending respectively from said swivels and away from each other to spaced pivoting attachments of said beam, an actuator being provided between said links and operable to move said swivels together and apart, thereby to lower and raise said beam with respect to said uprights.

2. A hoist according to claim 1 wherein said actuator is provided between the lower links

3. A hoist according to claim 1 or claim 2 wherein said actuator is operable between the mid points of the lower links.

4. A hoist according to any preceding claim wherein said upper and/or lower links are of variable length.

5. A hoist according to any preceding claim wherein lower links are anchored to said uprights,.

6. A hoist according to any preceding claim wherein said upper links are pivotally attached to the beam in alignment with said uprights.

7. A hoist according to any preceding claim and further including a cam mechanism to pivot the beam at the upper end of the travel thereof.

8. A hoist according to claim 7 wherein said cam mechanism comprises a roller fixed relative to one upright and having an axis substantially parallel to the beam, and a cam pivotally mounted on a carrier slidable in the upright for progressive engagement with said roller as said beam is raised, the cam and roller co-operating in use to pivot said cam in the upper portion of travel of said beam, the beam being mounted for pivoting and the cam having a link to said beam whereby pivoting of said cam results in corresponding pivoting of said beam.

9. A hoist according to claim 8 wherein said cam comprises a fork engageable with said roller, the carrier having a pivot for the cam, and the pivot being arranged such that engagement of the base of the fork with the roller results in pivoting of the cam about the carrier, and consequent pivoting of the beam.

10. A hoist according to claim 9 wherein said beam is mounted on the guides by means of a roller at the respective ends thereof, the rollers defining a pivoting axis of the beam and being also movable in translation as the beam is raised and lowered.

11. A hoist according to claim 10 wherein said guide comprises 'C' shaped channel sections having the open sides facing towards each other and within which said rollers are guided for vertical movement.

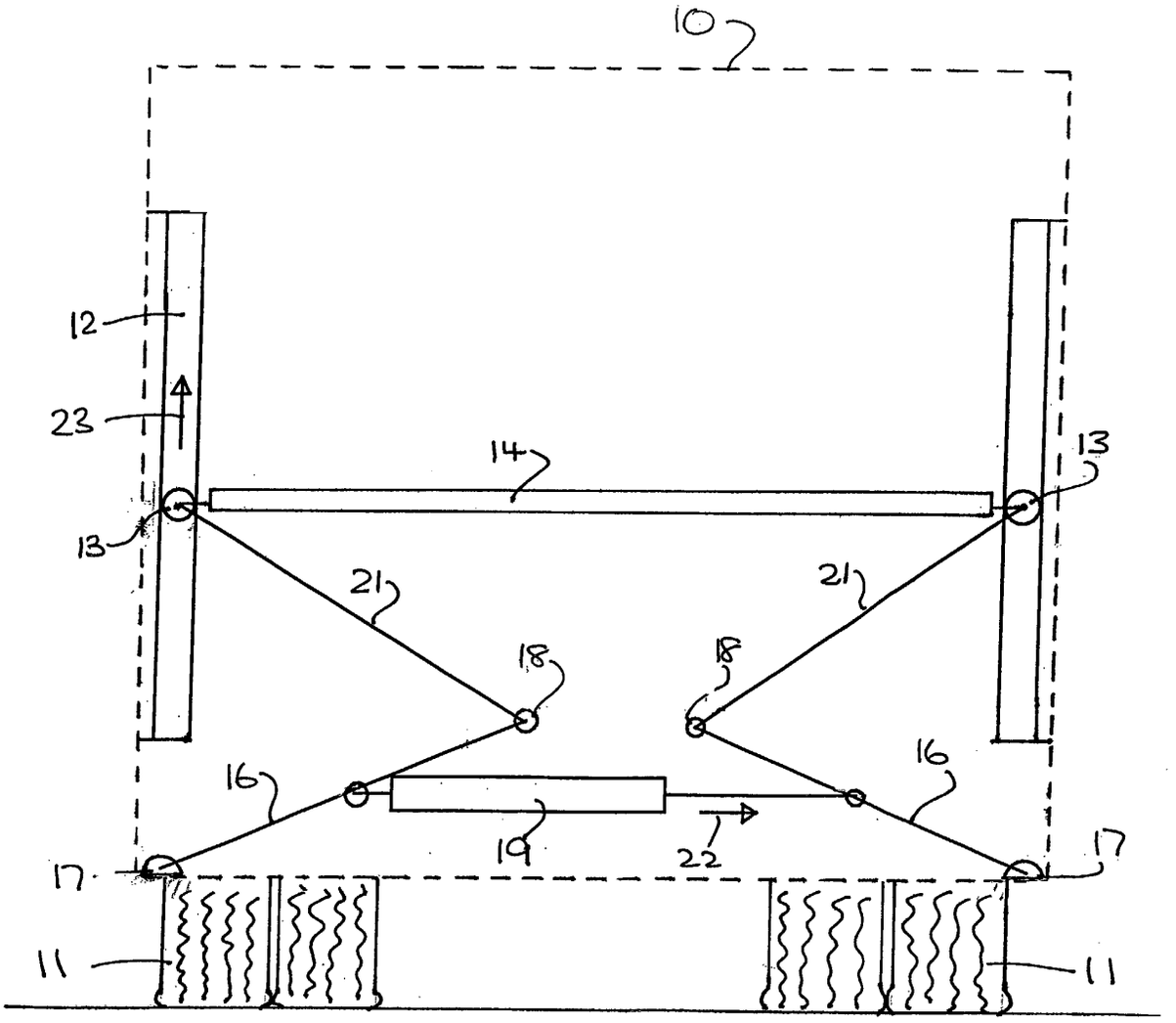

Fig 1

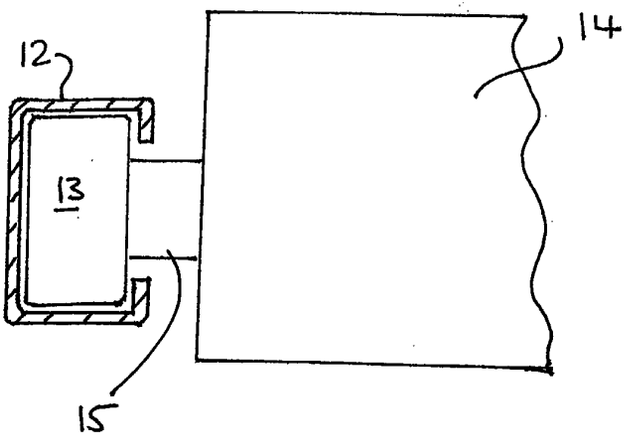

Fig 2

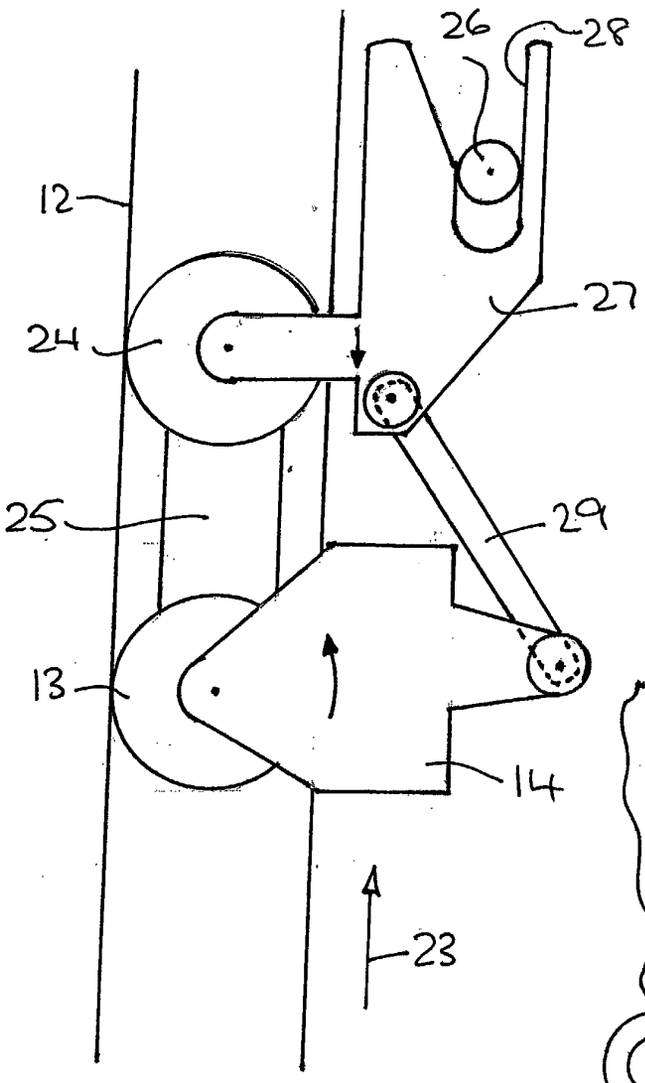

Fig 3

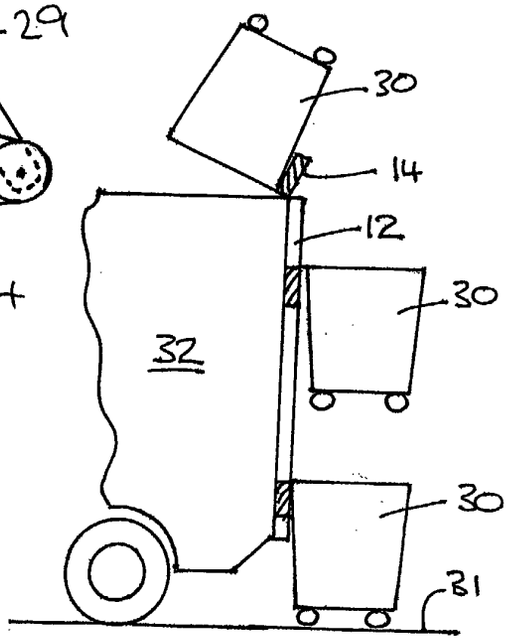

Fig 7

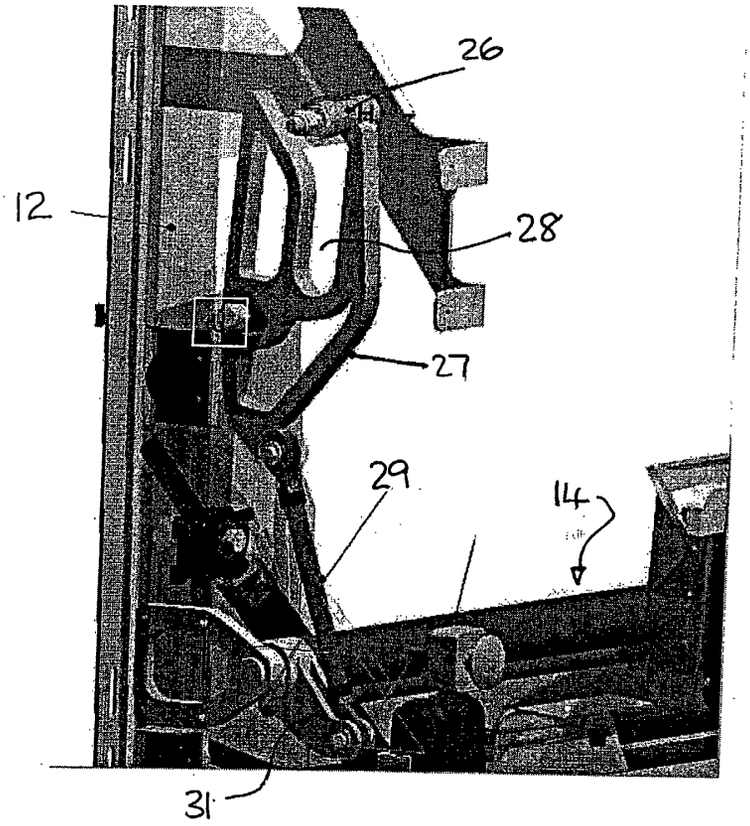

Fig 4

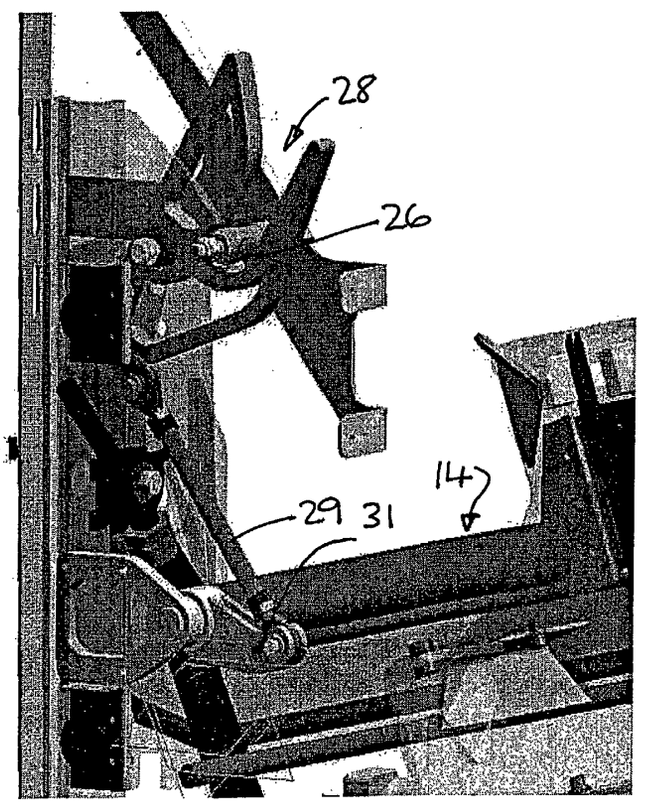

Fig 5

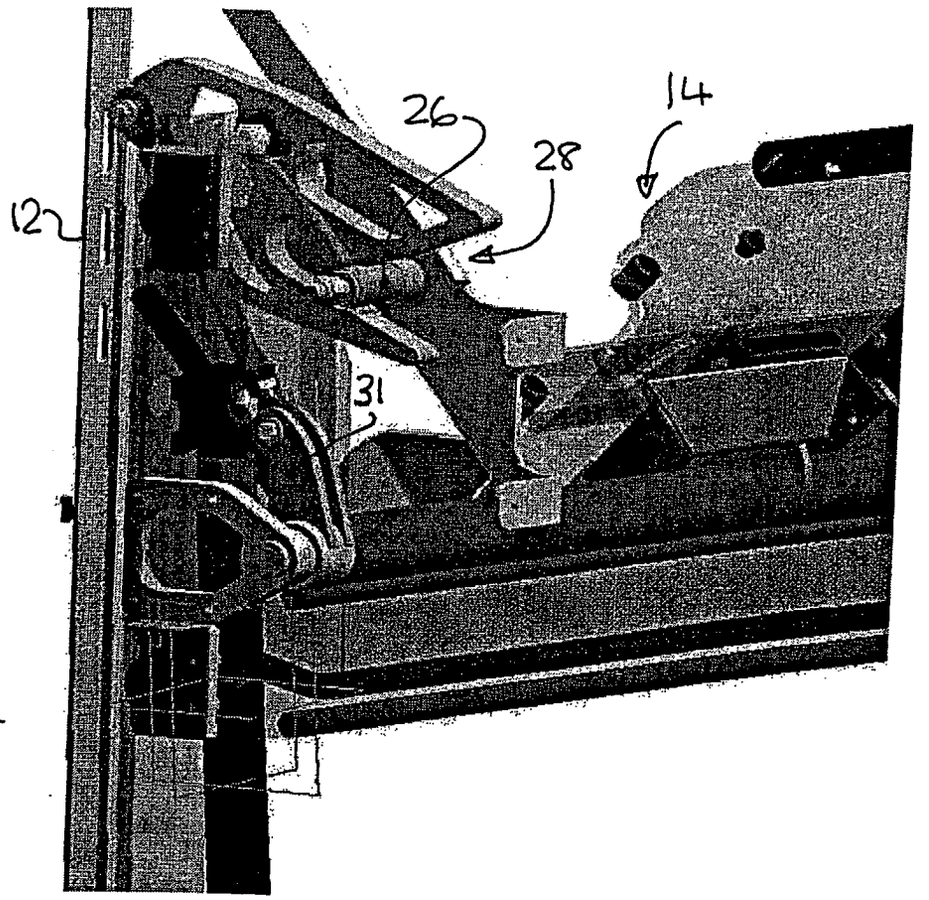

Fig 6

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EUROPEAN SEARCH REPORT

Application Number
EP 02 25 2994

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 September 2002	Smolders, R

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