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⑤④ **Closing device, in particular for containers of vehicles such as trucks or similar.**

⑤⑦ The invention relates to a closing device, in particular for containers of vehicles such as trucks or similar. It comprises two or more consecutively hinged rigid sheets or segments (4) and (5), the first of which, the posterior segment (4), is mounted to the container (1) by means of a group of cogged or partially cogged gearings (11) and (13) and at least one angled lever (9), said group having the function of commanding and guiding the transfer of the segments (4) and (5) from a position of hermetic closure to a completely open folded position. The activating of the angled lever (9) is performed by a hydraulic cylinder (16) which is mounted to the said posterior segment (4).

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Object of the present invention is a closing device, in particular for containers of vehicles such as trucks or similar.

The invention is of the type which comprises a cover having two or more segments or rigid sheets hinged consecutively one to the other. Prevalently but not exclusively, it finds profitable use in raisable and/or removable containers used in the transport of materials which by their nature require particular precautions when transported, such as by-products of meat processing or more generally of materials which could be termed pollutants, possibly already closed in sealed containers (for example hospital refuse) which for safety reasons must be further sealed in rigid leak-free containers. Loading of such materials is usually effected from above into appropriate containers mounted on trucks, using for said loading means which are often arranged on said trucks, or alternatively using external means such as small loading trucks, buckets, silo-type chutes etc. In each case, to permit of a rapid and functional loading, it is extremely useful if not indispensable to have, at least at the moment of loading, a container which is completely open at its top surface and without lateral or posterior obstructions, so that the loading operation can proceed without impediment.

Especially with regard to loose materials, loading on to the trucks is performed by tipping the refuse through hatches either posteriorly or laterally.

The primary condition to be satisfied is to be sure that there is a completely hermetic closure of the container for the polluting material, thus sealing it against external agents and avoiding escape of the contents, including the emanation of any toxic fumes.

The present invention aims to solve the problem of how to provide a closing (and opening) system for the container which on the one hand permits of obtaining a complete hermetic closure, while on the other hand permits of removing said closure in a way which is both simple and involves the taking up of as little space as possible, to permit of an easy and sure performance of the loading and unloading operations.

Said aim is attained by the present invention as characterised in the claims which follow.

One of the advantages provided by the invention consists in the fact that it is applicable to whatever type of container without the need for special adaptation or modification.

Further characteristics and advantages of the invention will better emerge from the detailed description which follows, of some preferred but not exclusive embodiments, illustrated in the accompanying diagrams in which:

- Figure 1 show a schematic side view in vertical elevation of a first embodiment;
- Figure 2 shows, in enlarged scale, a detail of Fig.1;
- Figures 3-4-5 show three different configurations

of the invention as in Fig.1, relative to different positions in the kinematic evolution;

- Figures 6-7 show, in side view, two different operative forms of a second embodiment of the invention of Figs. 1 and 2;

- Figure 8 shows a detail, in enlarged scale, of a different embodiment from that of Figs.1 and 3;

- Figure 9 shows, in back-view, an alternative application of the system proposed in Fig.1.

With reference to the illustrations, 1 indicates a container of a truck or trailer, and 3 indicates the cover with a plurality of segments or sheets.

The container 1 comprises a metallic tub and is equipped with a posterior hatch 28 which is openable since it is hinged to the crossbar 2, to permit of unloading. Superiorly the container 1 is equipped with a cover, here indicated in its entirety by 3, which latter is arranged to fall into a close contact position on the upper edges of the container 1, the seal being completed by the interpositioning of a continual perimetral seal 29 on said upper edges of the container 1.

In the first embodiment illustrated, the cover 3 comprises two rigid sheets or segments reciprocally hinged by means of a hinge 7. The posterior segment 4 is mounted to the container 1 by means of two parallel mechanisms each of which comprise an angled lever 9, two coupled cogged wheels 11 and 13 and a linear hydraulic actuator comprising a cylinder 16 which interacts between the angled lever 9 and the forked bracket 18 which is solid to the support 8 which is in its turn solid to the gearing 11 and the posterior segment 4. The angled lever 9 is pivoted on the pivot 12 which is parallel to the crossbar 2 of the container 1 and coaxial to the gearing 12 solid to the crossbar 2.

The angled lever 9 is furthermore hinged to the posterior segment 4 by means of a second pivot 10 which is parallel to the pivot 12 and coaxial with the gearing 11. At the joint pivot 14 the angled lever 9 is hinged to the end of the stem 15 of the hydraulic cylinder 16 whose other end is hinged to the forked bracket 18 of the support 8 by means of the pivot 17.

Gearings 11 and 13, having straight cogs, are similarly proportioned and arranged in such a way as to permit of correct meshing. The gearings, which are always enmeshed, are arranged so that gearing 11 envelops gearing 13 during rotation through the angle indicated by Ω in Fig.2, involving therefore a limited number of cogs only, for which reason the gearings could be equipped with only partial cogging.

Segment 5 is hinged consecutively to posterior segment 4 by means of a hinge 7. Said segment 5 has at its anterior end two lateral and external idle wheels 19 destined to run along the lanes 20 solid to the superior lateral edges of the container 1, into which are anteriorly sunk the oblique housings 21 destined to house the idle wheels 19, one each side, when the cover is in the closed position.

The pulling action of the hydraulic cylinder 16 and the consequent reduction of the distance between the fulcrum of pivot 17 and joint pivot 14 determines the movement from the closed configuration to the open configuration, through a kinematic evolution reported as phases A-B-C-D in figs 1-3-4-5.

The initial rotation of the posterior segment 4, induced by the start of functioning of the hydraulic cylinder 16 leads to the drawing of the anterior segment 5 and in particular determines the exit of the two idle wheels 19 from the housings 21 of the lanes 20 and their successive running along the lanes 20 up to the point indicated in Fig.3 where the idle wheels 19 enter exactly the housings 24 of the arms 22, said arms 22 being hinged to the upper edges of the container 1 by means of pivots 23. The process of the pulling action of the hydraulic cylinder 16 determines the process of the envelopment of the gearing or sector of gearing 13 by gearing or sector of gearing 11 and thus a further clockwise rotation of posterior segment 4. Said posterior segment 4, acting through segment 5, which is hinged to it, draws in rotation the arms 22, which, by climbing from the horizontal position, determine the descent of the latches 25, in this way making it impossible for the idle wheels 19 to exit from the housings 24 without blocking their relative rotation, as indicated in Fig.4. The further process of the hydraulic action of hydraulic cylinder 16 brings the isostatic system formed by segments 4 and 5 and by the arms 22 into the configuration illustrated in Fig.5, with the posterior segment 4 perfectly vertical as a result of the envelopment of the teeth, and with segment 5 also perfectly vertical since it is directed at its anterior end by the arms 22; said arms 22 are of the correct dimensions, and the pivots 23 correctly arranged so that the hinge constituted by the idle wheels 19 blocked in the housings 24 by the latches 25 is situated immediately behind the gearing or section of gearing 13 which is in the end of rotation position.

With the complete opening of container 1, the cover 3 is therefore folded and compacted into a very small space behind the posterior hatch 28, leaving the areas behind, at the side and above the container 1 completely free.

The closing manoeuvre is made with the same movements in a contrary order, by means of the extension of the hydraulic cylinder 16. The hermetic closing of the cover 3 is performed when the extension of the cover 3 on the container 1 is almost complete; at this point the idle wheels 19 are in proximity to the entrances of the housings 21, for which reason the final extension of the hydraulic cylinder 16 between the joint pivot 14 and the pivot 17 determines on the one hand the pressure of the posterior segment 4 on the seal 29, on the other hand the forcing of the idle wheels 19 into the housings 21, with a consequent pressure of the segment 5 on the seal 29.

One feature of the device illustrated is that of

forming an independent group, pre-assembled inside the support 8, and therefore particularly suited to easy installation on existing tubs or containers.

Furthermore, the system permits of reaching a configuration of complete folding of the cover with very small encumbrance, and thus not creating any obstruction to the loading manoeuvre.

The invention also has the characteristic of permitting with a single hydraulic action, and therefore with a single manoeuvre, the closing and blocking of the cover (and the same for the opening and the unblocking).

In a conceptually identical embodiment two identical groups could be used side-by-side instead of a central group, to give a better distribution of the initial loads on the support structure of the posterior segment 4.

In another embodiment, illustrated in Fig.8, the base of the hydraulic cylinder 16/1 can be anchored to the bottom of the container, in the example to the posterior hatch 28, which is in its turn hinged to the pivot or pivots 12. In this way the cover 3 interacts with the posterior hatch 28 in the sense that the said hydraulic cylinder 16/1 is able to activate the opening of the posterior hatch 28 while the cover 3 is closed, or the opening of the cover 3 while the posterior hatch 28 is closed.

The operation is made possible by the fact that in practically all applications the posterior hatch 28 has autonomous closing devices which press the hatch against the seal 30 to ensure a perfect sealed closure.

The activating of the posterior hatch 28, therefore, must be preceded by the removal of said closing devices. It is for this reason that, while these closing devices are in force, the posterior hatch 28 constitutes a contrast to the pulling action of the hydraulic cylinder 16/1 and thus the kinematic evolution of the cover 3 is made possible.

This is also the reason why, upon the removal of said closing devices, there is no impediment to the rotation of the posterior hatch 28. Such rotation is made possible by the fact that the pulling action of the hydraulic cylinder 16/1 is opposed by the joint pivot 14 in that the weight of the cover 3 provides an antagonist couple to the entire system, preventing the rotation of the gearing 11 and consequently the movement of the joint pivot 14. On the other hand, the pushing action of the hydraulic cylinder 16/1 determines a contemporaneous combined locking action of the cover 3 on the seal 29 and of the posterior hatch 28 on the seal 30, independently of whether the cylinder 16/1 performs any of the inverse manoeuvres with regard to those previously described, that is the closure of the cover 3 or the posterior hatch 28.

In another embodiment, as illustrated in Fig.9, the closing system for the container 1 can be installed on the upper edge of one of the two sides. In this embodiment, the segments have their mutual hinging axis

arranged in a longitudinal direction with respect to the container 1 itself, thus realising a lateral evolution of the device.

Finally, in another embodiment, as illustrated in figs.6-7, the above-described system with two segments, kinematically illustrated in figs 3-4-5, can be added to by a third, anterior segment 6, equipped with an autonomous folding system on segment 5, for example by means of a hydraulic system 27 or equivalent systems. Such a three-segment system could be used to permit of covering containers of greater length, without changing in any way the movement system of segments 4 and 5.

Claims

1) A closing device, in particular for containers of vehicles such as trucks or similar, comprising at least two sheets or segments hinged consecutively one to the other, having its movements of opening and closure commanded by at least one mechanism associated to said sheets or segments which comprises:

- an angled lever 9 pivoted on a pivot 12 located parallel to and in the vicinity of the posterior upper edge of the container 1; said angled lever 9 being hinged on one side to a first, posterior segment 4 by means of a pivot 10 which pivot 10 has its axis parallel to that of said pivot 12; said angled lever 9 being hinged on the other side to a stem 15 (or a base) of a hydraulic cylinder 16 or similar which hydraulic cylinder 16 has its base (or stem) mounted to a mutually solid arrangement which comprises a support 8 and the said posterior segment 4;
- Coupling means arranged to act in the opening and closure movements which means guide the posterior segment 4 to perform, with respect to the container 1, a kinematically rigid partial rotation which is the rotation of a solid cylindrical surface, coaxial to the axis of the pivot 10, on a corresponding fixed cylindrical surface coaxial to the axis of the pivot 12 and solid to the container 1.

2) A closing device as in claim 1, wherein each said hydraulic cylinder 16 has its base mounted to the posterior segment 4 with or without the interpositioning of the said support 8.

3) A closing device as in claim 1, wherein the hydraulic activation of the device is performed by a hydraulic cylinder 16/1 having the end of its stem 15 mounted to the angled lever 9 by means of a pivot joint 14 and its base mounted to a lateral or posterior wall of the container 1.

4) A closing device as in claim 3, wherein said lateral or posterior wall of the container 1 is openable and hinged superiorly to the upper edge of the con-

tainer 1.

5) A closing device as in claim 4, wherein said openable wall comprises the posterior hatch 28 of the container 1.

6) A closing device as in claim 1, wherein said coupling means comprise:

- at least a first gearing or cogged sector of gearing 13 arranged coaxially to the pivot 12 and fixed along one side of the upper edge of the container 1;
- at least a second gearing or cogged sector of gearing 11 arranged coaxially to the pivot 10 and fixed to the first, posterior segment 4 by means of the support 8; the characteristics of the external and cylindrical cogging, of said gearings or cogged sectors 11 and 13 being such as to permit of reciprocal enmeshing; said gearings or cogged sectors 11 and 13 being reciprocally arranged to permit of rigid rotation of the first, posterior segment 4, which draws said posterior segment 4 from a horizontal position of closure to a vertical position at a short distance from a lateral side of the container 1.

7) A closing device as in claim 1, wherein said coupling means comprise at least one arm 22 hinged at one of its ends to one side of the container 1, which arm 22 is arranged laterally to the cover 3; having its other end equipped with a hooking organ destined to receive one of two idle wheels 19 fixed laterally in proximity to the free end of the anterior segment 5, said anterior segment 5 being understood to mean the segment which is furthest from the rotating pivot 12; said arm 22 being free to rotate, in both directions, from a first position, where it leans on a support which is solid to the edge of the container 1, with said hooking organ in open position and positioned so as to be parallel to the edge of the container 1, along which the idle wheels 19 are guided to roll, at the beginning of the opening operation and at the end of the closure operation, to a plurality of positions at each of which positions the segments 4 and 5 assume a pre-established reciprocal position and the arm 22 keeps the idle wheels 19 hooked to it; said arm 22 being equipped and dimensioned to hold the second segment 5 in a completely open position, said segment 5 being folded parallel to the posterior segment 4, which posterior segment 4 is arranged in a practically vertical position.

8) A closing device as in claim 7, wherein said hooking organ comprises:

- a housing 24 shaped to receive internally one of the idle wheels 19;
- a closing element in the form of a latch 25 in order to prevent the exit of said idle wheel 19 from the housing 24 without blocking its relative rotation; said closing element, or latch 25 being mounted to the end of the arm 22 by means of a spring 26 whose action is such that it keeps the

said closing element in a closed position; said closing element being equipped with an appendage which interacts with a lane 20 fixed on the upper edge of the container 1 on which the arm 22 leans when in the said first position, its weight thus holding down the spring so that the latch 25 is kept in an open position so as to receive the idle wheel 19.

9) A closing device as in claim 7, wherein the said rolling organs comprise at least two idle wheels 19, mounted symmetrically to the sides of the free end of the second segment 5; each of the said two idle wheels 19 being arranged to roll on the said lane 20, which is fixed on a single upper edge of the container 1; each said lane 20 having anteriorly an oblique housing 21 for one of the idle wheels 19 which two housings 21 receive the said idle wheels 19 when the device is in the closed configuration, said segment 5 thus being forced against the underlying seal 29 and ensuring protection against accidental opening, the vertical exit of the idle wheels 19 from the housings 21 being impossible since the clockwise rotation of the segment 5 around the posterior segment 4 on the hinge 7 is not possible; only an oblique exit consequent to the rotation around the pivot 12 of the posterior segment 4 with consequent lifting of the hinge 7 with respect to the upper surface of the container 1 being possible, said action depending entirely on the activating of at least one hydraulic cylinder 16/1.

10) A closing device as in claim 1, comprising a third segment 6 hinged to the end of the second segment 5 and connected to said second segment 5 by means of a small master cylinder 27 operating between the two segments 5 and 6.

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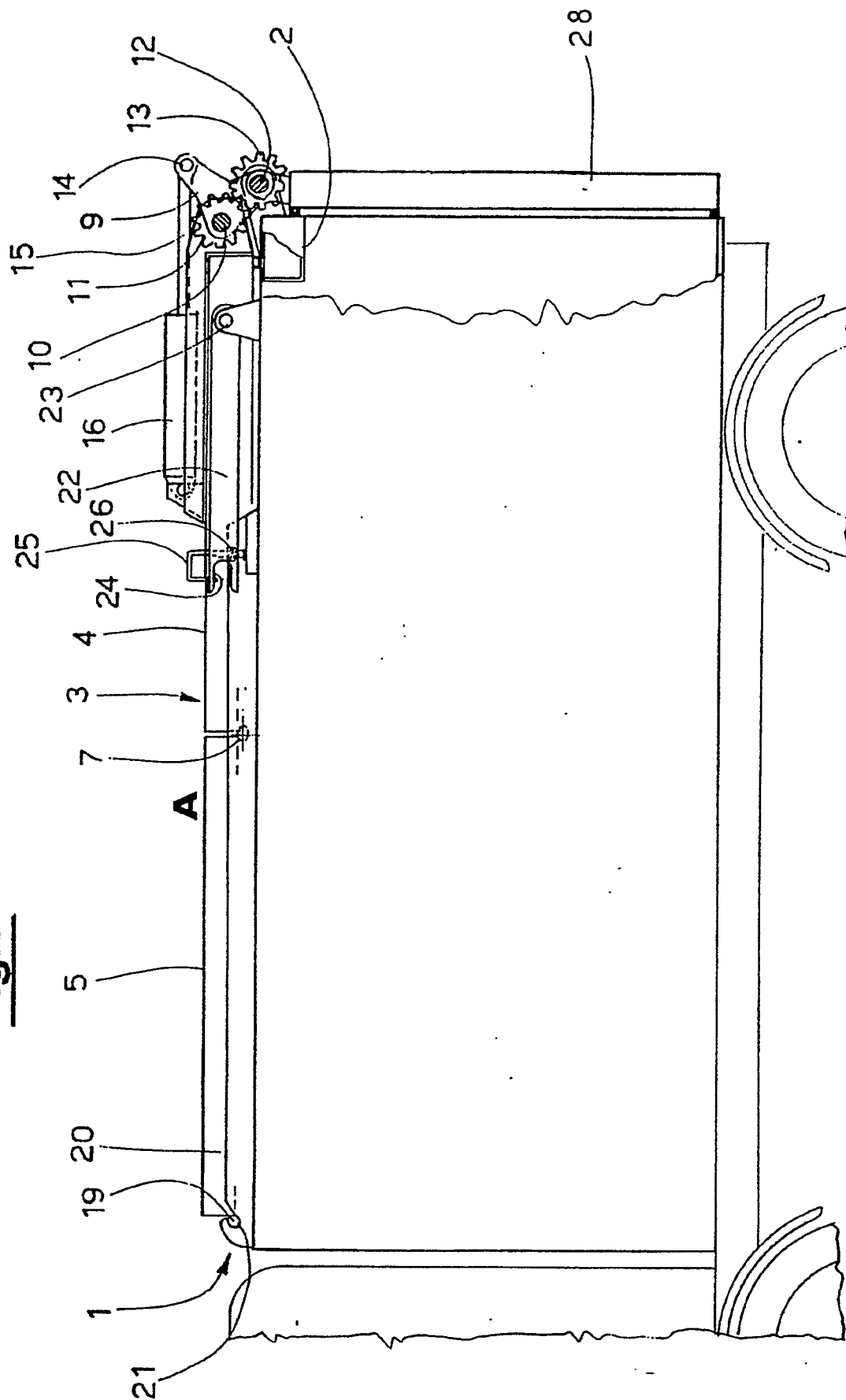
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Fig.1



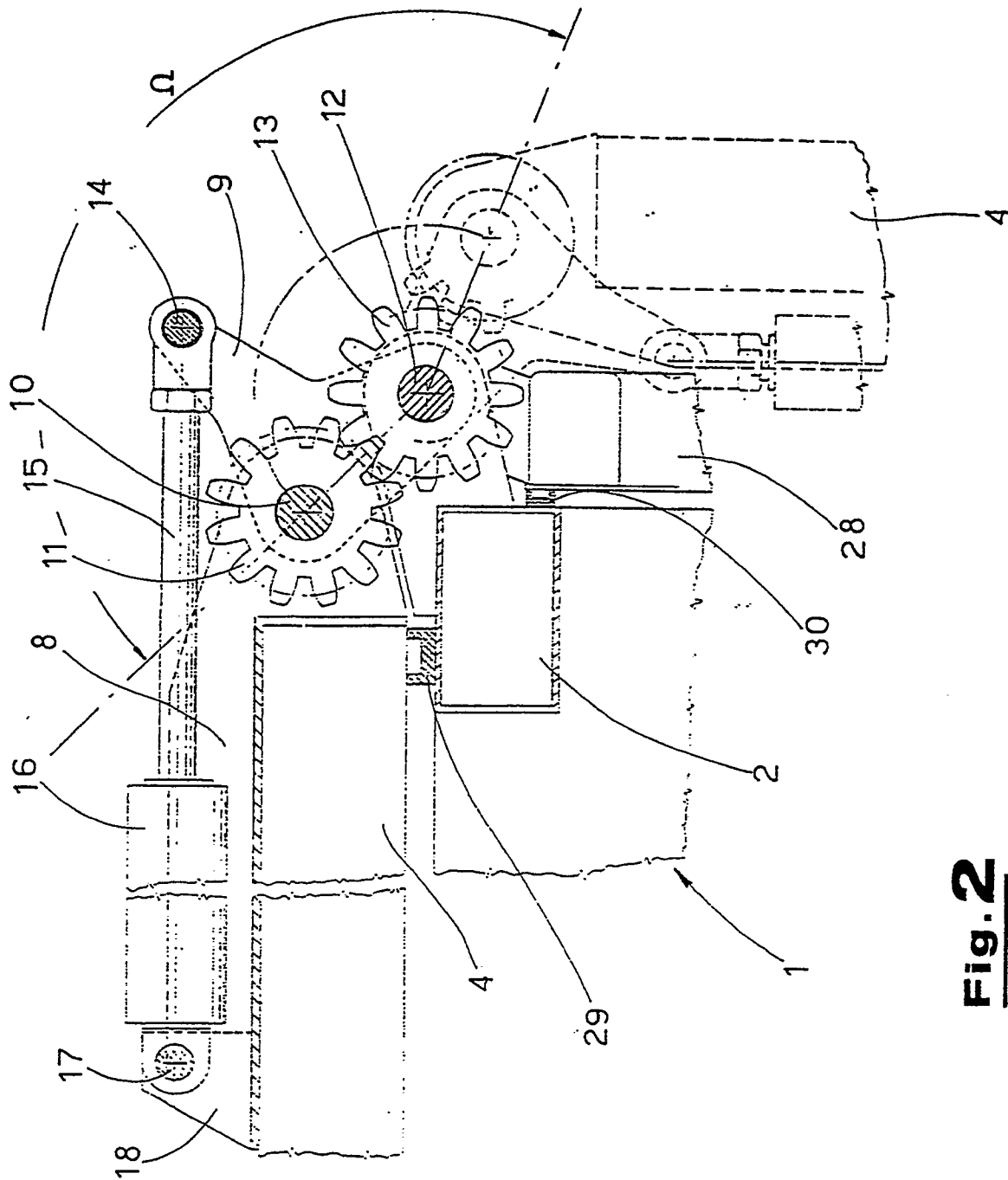


Fig. 2

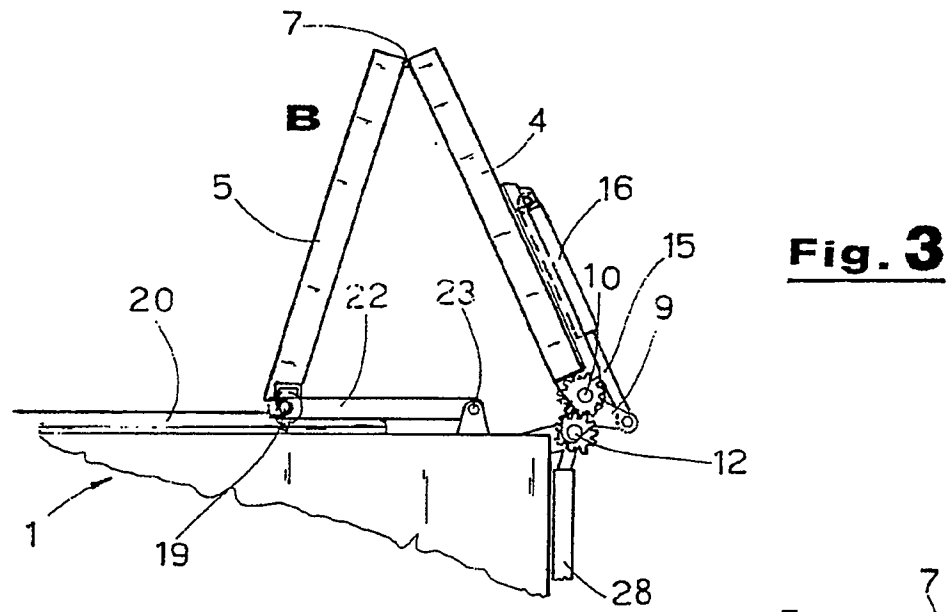
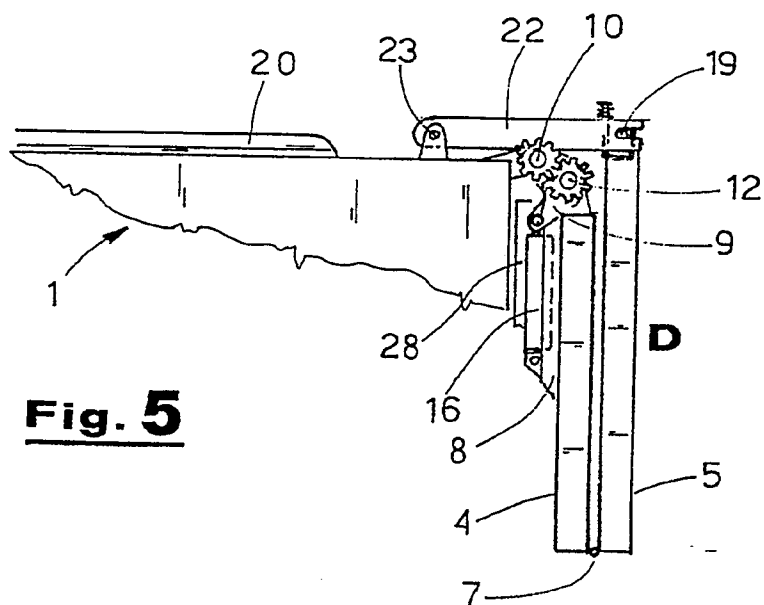
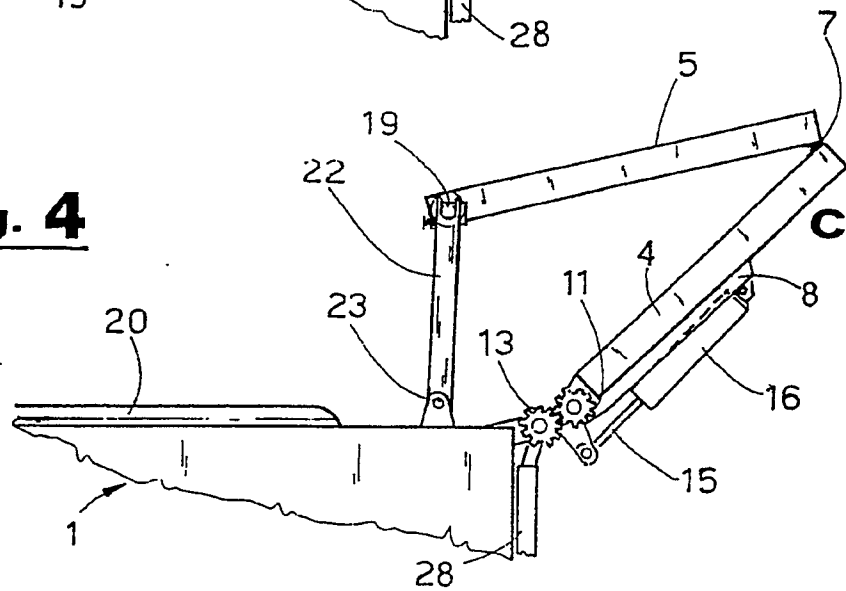


Fig. 4



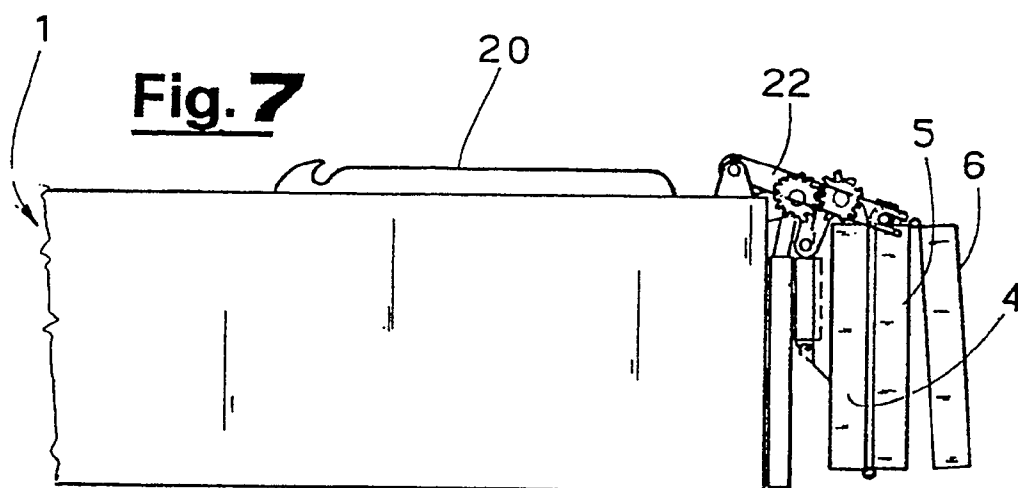
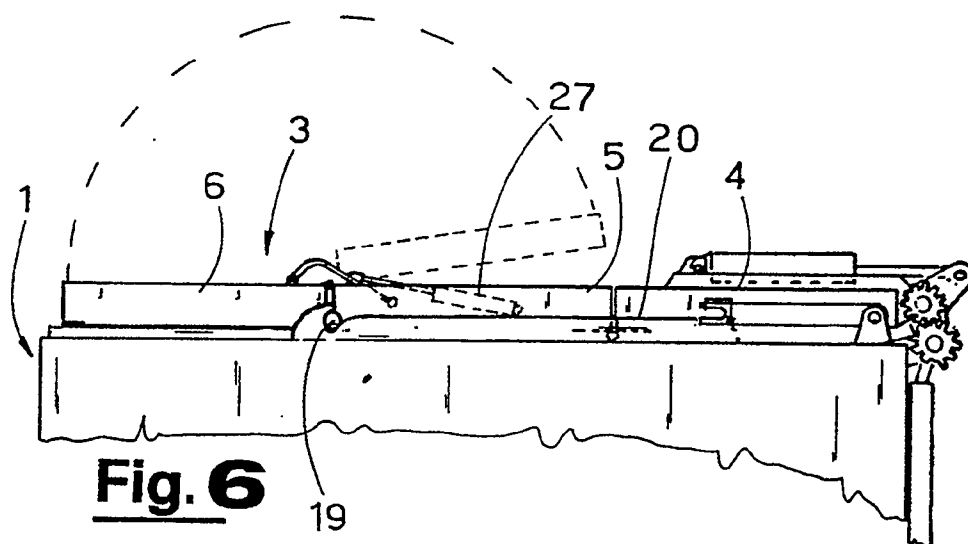


Fig. 8

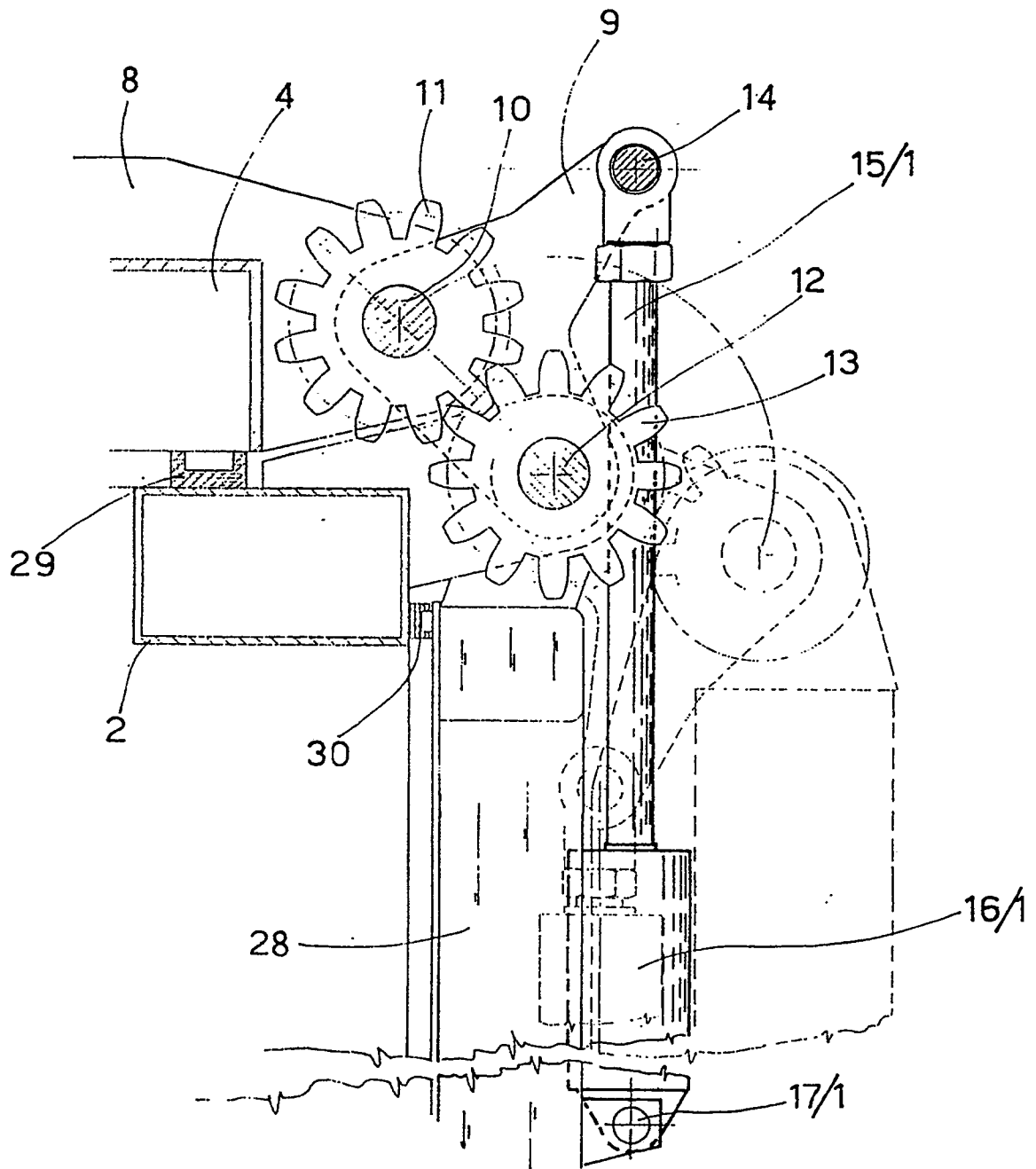
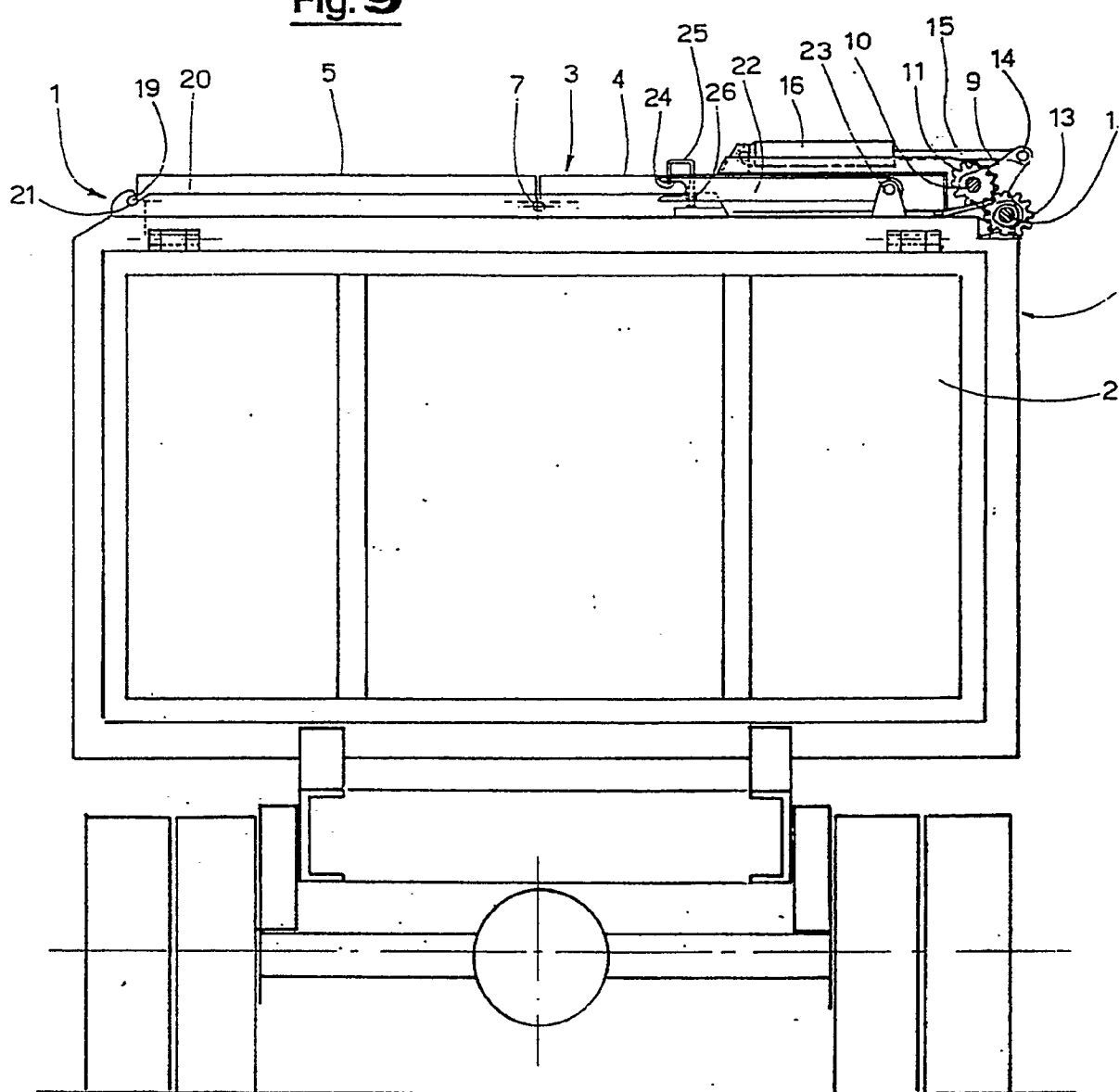


Fig. 9





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0178

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.5)
A	GB-A-1 174 541 (NIEDERSACHSISCHE WAGONFABRIK J. GRAAFF GMBH) * claims 1-6; figure 3 *	1	B65D88/12
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65D B60P
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 AUGUST 1991	Examiner BEERNAERT J. E.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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