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(54) Lifting apparatus

(57) The lifting apparatus (1) comprises articulated-frame means (100) comprising arm means (7) hinged on further arm means (6), fluid-dynamic actuating means associated with said articulated-frame means (100) in such a way as to angularly move said arm means (7) in relation to said further arm means (6); heat-exchanging means (200) connected to said fluid-dynamic actuating means, said heat-exchanging means (200) being fitted to said articulated-frame means (100).

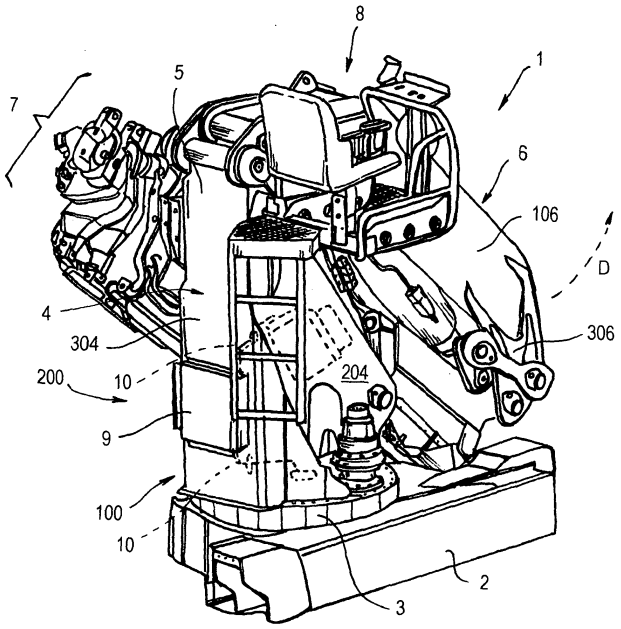

Fig. 1

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Description

[0001] The present invention relates to a lifting apparatus.

[0002] Lifting apparatuses have been known and used for some time that are fitted to vehicles and are provided with a work platform on which one or more operators can be stationed.

[0003] These lifting apparatuses comprise a base fifth wheel that is fixed to a frame of the vehicle, a first element protruding vertically from the fifth wheel and fixed to the latter and a series of reciprocally hinged arms that extend upwards for work interventions or are grouped below in a rest position for transfers of the vehicle.

[0004] The arms are moved by a hydraulic circuit, normally supplied with oil, that supplies the various linear actuators that raise or return the arms.

[0005] The oil, during operation of the lifting apparatus, overheats and for this reason a heat exchanger is fitted to the vehicle to enable the constant cooling thereof.

[0006] According to the prior art, the exchanger is fitted to the vehicle chassis, in particular to the crosspiece that carries the stabilisers thereof or on a side of the crosspiece, by means of suitable supports provided for the purpose.

[0007] This location has a series of drawbacks.

[0008] A first drawback is that often the assembly position on the crosspiece, or on a side thereof, causes interference between the exchanger and the arms during movement thereof.

[0009] A second drawback is that as the assembly position of the exchanger is located in a low zone of the vehicle, in order to obtain movement of the oil in the hydraulic circuit, it is also necessary to fit a pump of suitable power, with noticeable increase of the costs of the lifting apparatuses. A further drawback is that the lower location position of the exchanger encourages blockage of the exchange surface due to the dust and detritus that are moved by the lifting apparatus during work.

[0010] Another drawback is that for assembly of the heat exchanger it is necessary to dispose of supports that are specifically designed to such a use, with further increase, of production costs.

[0011] The technical aim of the present invention is to improve the prior art.

[0012] A first object of the invention is to eliminate any interference between the heat exchanger and arms of the lifting apparatus.

[0013] Another object of the invention is to eliminate the need to assemble a pump to enable correct operation of the hydraulic circuit that supplies the actuators that move the arms of the lifting apparatus.

[0014] Another object of the invention is to prevent any clogging of the exchange surface of the heat exchanger.

[0015] Another object of the invention is to eliminate the use of specific supports for fitting the heat exchanger.

[0016] According to the invention, a lifting apparatus is provided comprising articulated-frame means comprising arm means hinged on further arm means, fluid-dynamic actuating means associated with said articulated-frame means in such a way as to angularly move said arm means in relation to said further arm means; heat-exchanging means connected to said fluid-dynamic actuating means, characterised in that said heat-exchanging means fitted to said articulated-frame means are fitted to said articulated frame means.

[0017] Further features and advantages will be clearer from the disclosure of a preferred embodiment of a lifting apparatus, illustrated by way of non-limitative example in the attached tables of drawings in which:

Figure 1 is a right-hand rear-lateral perspective view of a lifting apparatus;
Figure 2 is a perspective view of a column element constituting the lifting apparatus in Figure 1;
Figure 3 is a left-hand rear-lateral perspective view of the lifting apparatus in Figure 1.

[0018] With particular reference to Figure 1, 1 indicates a lifting apparatus that can be fitted to a chassis 2 of a vehicle (the latter not being illustrated for the sake of simplicity) and which comprises an articulated-frame means 100 that comprises in turn arm means 7 hinged on further arm means 6.

[0019] The arm means 7 and the further arm means 6 are actuated by fluid-dynamic actuators (not visible in the drawings) associated with the articulated-frame means 100 in such a way as to angularly move the arm means 7 in relation to the further arm means 6.

[0020] The lifting apparatus 1 also comprises heat-exchanging means 200 that is connected to fluid-dynamic actuating means.

[0021] The articulated-frame means 100 comprises a base fifth wheel 3 and a column 4 that rises up from the latter.

[0022] At the top 5 of the column 4, which has a box shape, an end 206 of a first arm 106 is hinged that is comprised in the further arm means 6 of the lifting system 1.

[0023] With reference to Figures 1 and 3, at the opposite end 306 of the arm 106 the arm means 7 is articulated, which, in the Figures, is maintained in a folded position, in a compact configuration, such as to enable travels of the vehicle.

[0024] In Figures 1 and 3 it is also visible that the whole 106 of the arm means 7 is positioned parallel to a side 104 of the column 4 and it is intuitive that the arm 106 and the arm means 7, in order to extend upwards, rotate in a direction indicated by the arrow D and on a plane that are both parallel to the side 104.

[0025] A side of the column 4 opposite the side 104, shown in the Figures as 204, is arranged for the assembly of an operating station 8, preferably in a top zone thereof.

[0026] On a transverse wall of the column 4 that is indicated as 304 and connects together the sides 104 and 204, more precisely on a face of the wall 304 that

faces the opposite way to the direction of movement of the arm means 7 and of the further arm means 6 in relation to the column 4, a heat exchanger 9 is fitted that is comprised in the heat-exchanging means 200 and is connected to the actuators of the lifting apparatus 1 by pipes 10 that are contained inside the column 4 and which traverse the wall 304 by openings obtained in the latter.

[0027] Accordingly, the heat exchanger 9 is fitted in a surface zone of the lifting apparatus 1 that is completely outside the movement zone of the further arm means 6 and of the arm means 7 and that remains outside said movement means even during rotation of the fifth wheel 3 as the heat-exchanging means 200 rotates together with the latter and the column 4. Furthermore, the position of the heat-exchanging means 200 is noticeably raised in relation to the vehicle chassis 2 and for this reason the hydraulic circuit that connects it with the linear actuators that move the arm means 7 and the further arm means 6 is noticeably simpler and therefore shorter; for this reason, assembly of a pump that pushes the oil from bottom to top is not required to reach the linear actuators fitted between the arm means 7 and the further arm means 6, as required in known lifting apparatuses.

[0028] Furthermore, the pipes 10 that connect to one another the actuators and the heat-exchanging means 200 are almost completely contained inside the column 4 in a position protected from any possible outside blow.

Claims

1. Lifting apparatus (1), comprising:

- articulated-frame means (100) comprising arm means (7) hinged on further arm means (6),
- fluid-dynamic actuating means associated with said articulated-frame means (100) in such a way as to angularly move said arm means (7) in relation to said further arm means (6);
- heat-exchanging means (200) connected to said fluid-dynamic actuating means, **characterised in that** said heat-exchanging means (200) is fitted to said articulated-frame means (100).

2. Lifting apparatus (1) according to claim 1, wherein said articulated-frame means (100) is fitted in such a way that its longitudinal axis is fixed angularly and has a surface zone available for the assembling of said heat-exchanging means (200) thereupon.

3. Lifting apparatus (1) according to claim 2, wherein said surface zone is chosen in such a way as not to be substantially affected by shifts of said further arm means (6) and of said arm means (7).

4. Lifting apparatus (1) according to claim 3, wherein said surface zone is outside an operating plane on which the corresponding shifts of said further arm means (7) and said arm means (6) occur.

5. Lifting apparatus (1) according to claim 3, wherein said surface zone substantially belongs to an operating plane on which the corresponding shifts of said further arm means (6) and said arm means (7) occur.

6. Lifting apparatus (1) according to any one of claims 1 to 5 wherein said articulated-frame means (100) comprises a column (4) that has two sides (104, 204) parallel to each other and at least a transverse joining wall (304) of said two sides (104, 204) and a fifth wheel (3) from which said column (4) rises.

7. Lifting apparatus (1) according to any one of claims 1 to 6 wherein said surface zone belongs to a face of said transverse wall (304).

8. Lifting apparatus according to any one of claims 1 to 7 wherein said column (4) has passage openings of pipe means (10) for connecting said heat-exchanging means with said fluid-dynamic actuators and vice versa.

9. Lifting apparatus (1) according to claim 6 wherein said column (4) is fixed to said base fifth wheel (3).

10. Lifting apparatus (1) according to claim 9 wherein said fifth wheel (3) is fitted to a vehicle chassis (2).

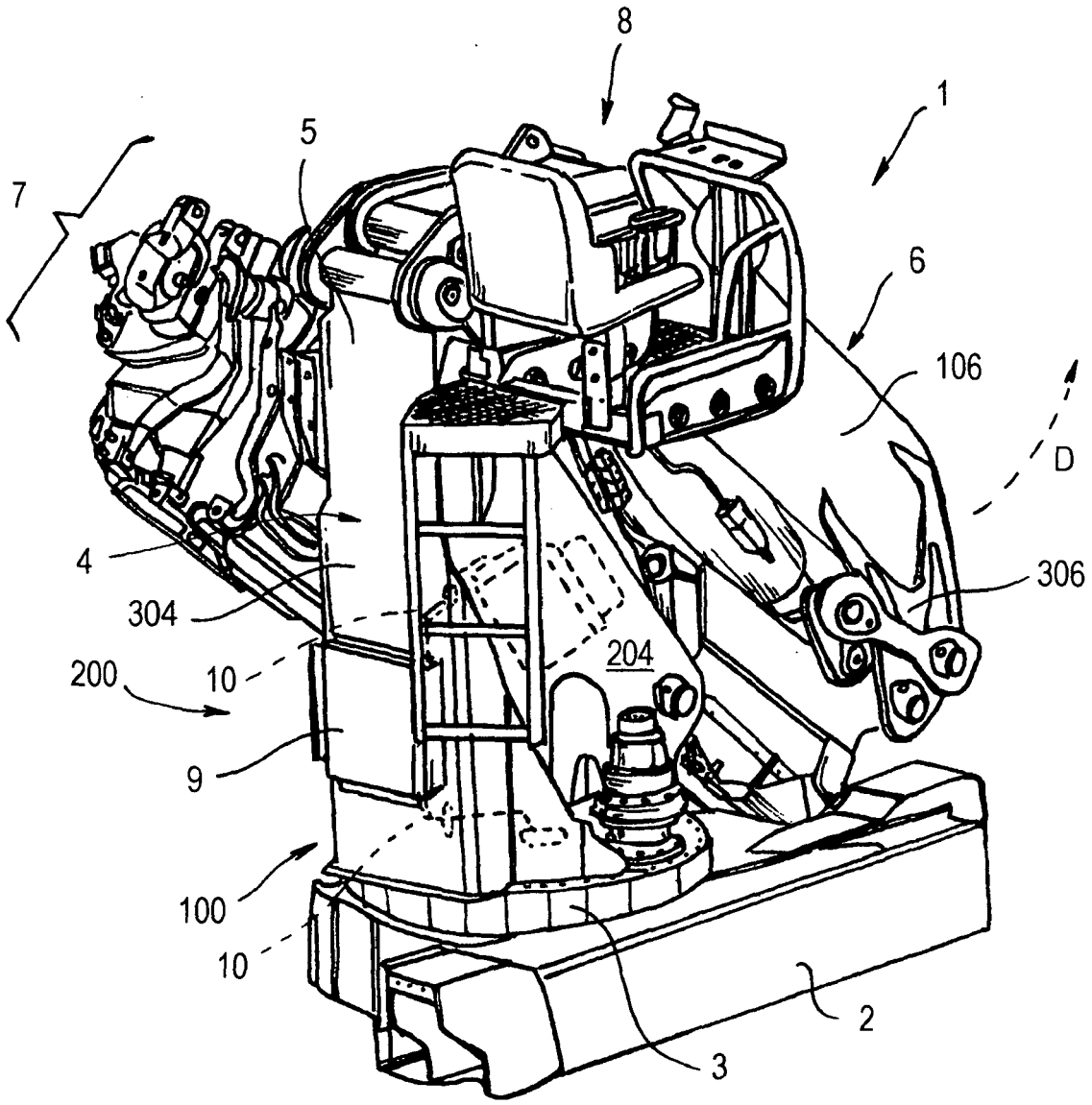

Fig. 1

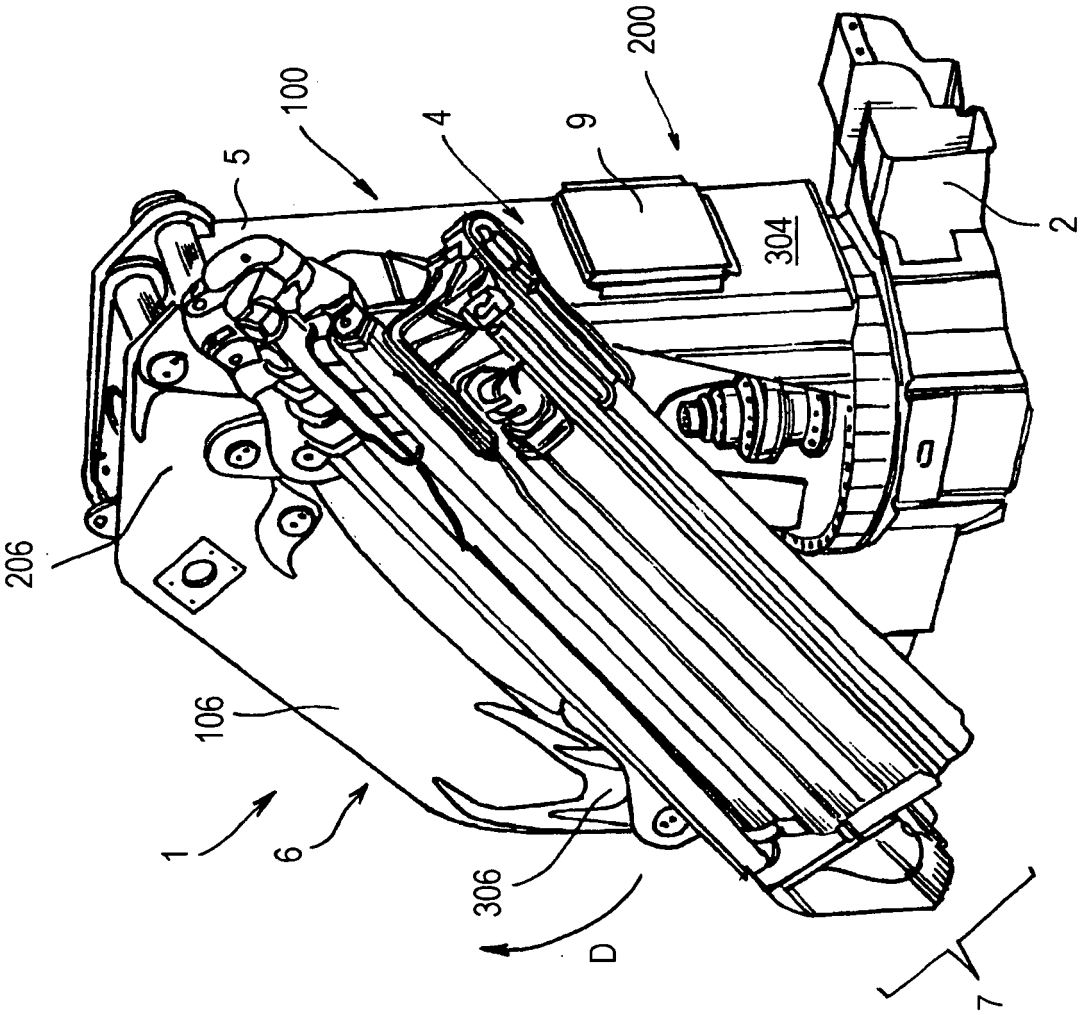

Fig. 3

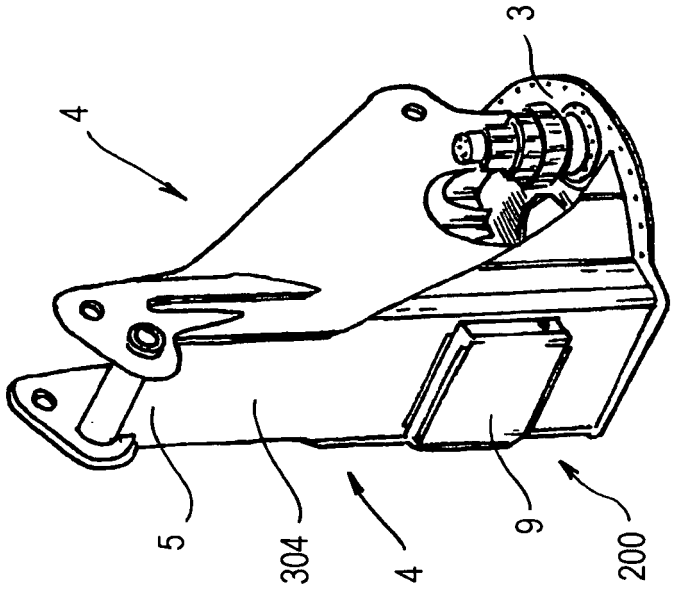

Fig. 2