(54) Title: RECOVERY VEHICLE AND RECOVERY SYSTEM FOR HEAVY LOADS SUCH AS AN AEROPLANE

(57) Abstract: The invention relates to a recovery vehicle suitable for heavy loads such as an aircraft, comprising a mobile chassis upon which a lifting element is provided and the lifting element comprises an air cushion. The lifting element comprises an adjustable lifting platform and the air cushion is provided on this lifting platform. The height of the lifting platform in relation to the chassis, is adjustable.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Recovery vehicle and recovery system for heavy loads such as an aeroplane

The invention relates to a recovery vehicle suitable for heavy loads such as an aircraft, comprising a mobile chassis upon which a lifting element is provided.

Such a recovery vehicle is known in practice and is used for the recovery of an aircraft that has gone off the runway.

The known recovery vehicle used for this purpose is a crane. It is also possible to use a recovery system involving several cranes.

A drawback of the known recovery vehicle and recovery system is that moving the aircraft, and in particular lifting it, is liable to cause extra damage to the aircraft, which may give rise to an increase in costs and occasionally, may result in the loss of the aircraft.

It is the object of the invention to provide a recovery vehicle with which this drawback is prevented.

To this end the recovery vehicle according to the invention is characterised in that the lifting element comprises an air cushion.

It should be noted that the recovery vehicle proposed in accordance with the invention can also be used for the recovery of other types of heavy loads that are easily damaged and where damage must be avoided as much as possible.

The recovery vehicle proposed in accordance with the invention has the advantage that during lifting, the air cushion is able to adapt to the shape of the part of the aircraft it supports.

In order to endow the recovery vehicle with a wide range of deployment, it is desirable for the lifting element to comprise an adjustable lifting platform and for the air cushion to be provided on this lifting platform.

The recovery vehicle is preferably embodied such that the height of the lifting platform in relation to the chassis, is adjustable.
Especially with respect to the deployability of the recovery vehicle on uneven ground or when the aircraft to be recovered slopes, it is advantageous for the recovery vehicle to be embodied such that the lifting platform can be adjusted elevationally in relation to the chassis.

The adjustability of the lifting platform is aided by the fact that the lifting platform is mounted on the chassis by interposition of six hydraulic cylinders, with these cylinders being placed such as to make the lifting platform adjustable in the x-, y- and z-direction.

In a further aspect of the invention the recovery vehicle is characterised in that the same possesses crawler tracks. This makes the recovery vehicle well deployable on unimproved terrain.

The invention is also embodied in a recovery system that is characterised by two or more co-operating recovery vehicles of the kind discussed above.

With these it is possible firstly to recover very heavy loads. In addition, they make it possible to recover loads of particularly large dimensions, so that an appropriate distribution of the recovery vehicles will realise a suitable distribution of the lifting forces exerted on the load, e.g. an aircraft.

It would be expedient for each recovery vehicle to possess a measuring device for determining the height of the lifting platform of that recovery vehicle.

Under certain conditions it may suffice for each recovery vehicle to possess a measuring device for determining the height of the lifting platform in relation to the chassis of that recovery vehicle. In that case, however, it is desirable for a reference marker to be provided on solid ground, and for the recovery vehicles to be designed to interact with the reference marker for determining the height at which the recovery vehicles are situated.

The recovery system is further preferably characterised in that it is provided with a computer system for gearing the operation of the recovery vehicles to one another.
Hereinafter the invention will be further elucidated with reference to a non-limiting exemplary embodiment of the recovery vehicle and recovery system according to the invention.

The exemplary embodiment is elucidated by way of the drawing of a single figure in which similar components carry identical reference numerals.

The figure shows two recovery vehicles indicated by reference number 1. Each recovery vehicle 1 individually as well as both recovery vehicles 1 shown, or possibly further recovery vehicles that may be part of an integrated recovery system, are subject to protection as defined in the appended claims.

To elucidate, the construction of an individual recovery vehicle 1 will be explained first. The recovery vehicle 1 is mobile and for this purpose preferably provided with crawler tracks 2, to enable the recovery vehicle 1 to be deployed in numerous kinds of terrain, even if the ground is soft.

The recovery vehicle 1 possesses a lifting element 3 comprising an air cushion 4. This air cushion 4 is positioned on a lifting platform 5, which in relation to the chassis 6 of the recovery vehicle 1, is adjustable in height.

It is also desirable for the lifting platform 5 with the air cushion placed thereon to be adjustable in an elevated position, so as to enable the recovery vehicle or the recovery system to be deployable on hilly terrain.

The recovery vehicle is suitably realised such that the lifting platform 5 is mounted on the chassis 6 with the interposition of six hydraulic cylinders 7, with said cylinders 7 being placed such as to render the lifting platform 5 adjustable in the x-, y- and z-direction.

When two or more recovery vehicles 1 are working together as part of one recovery system, it is desirable for them to be in contact with one another by means of sender/receiver combinations 8. The control of the two or more recovery vehicles 1 may preferably be realised such that a computer system is provided for gearing the operation of
said recovery vehicles 1 to one another. Such a computer system may be installed on one of the recovery vehicles or may be operated via a separate sender/receiver installation from solid ground.

In a manner quite obvious to the person skilled in the art and therefore not shown in the drawing, each recovery vehicle 1 may be equipped with a measuring device for the determination of the height of the lifting platform 5 of that recovery vehicle 1. This height of the lifting platform 5 may also be related to, for example, the respective height of the chassis 6 of the recovery vehicle. In that case, it is desirable for a reference marker to be provided on solid ground, for example, an indicator post 9, and for the recovery vehicles 1 to be equipped to work together with this reference marker 9 for the determination of the height on which the respective recovery vehicles 1 are located.

Within the frame of the invention as specified in the appended claims, many variations are conceivable without departing from the spirit of the invention as may be derived from the claims, if necessary in connection with the grant file, the specification and the drawing. For example, instead of the hydraulic cylinders that serve to adjust the lifting platform 5 it is possible to provide other types of adjusting members able to fulfill the objectives of the invention.
CLAIMS

1. A recovery vehicle suitable for heavy loads such as an aircraft, comprising a mobile chassis upon which a lifting element is provided, characterised in that the lifting element comprises an air cushion.

2. A recovery vehicle according to claim 1, characterised in that the lifting element comprises an adjustable lifting platform and the air cushion is provided on this lifting platform.

3. A recovery vehicle according to claim 2, characterised in that the height of the lifting platform in relation to the chassis, is adjustable.

4. A recovery vehicle according to claim 2 or 3, characterised in that the lifting platform can be adjusted elevationally in relation to the chassis.

5. A recovery vehicle according to one of the claims 2-4, characterised in that the lifting platform is mounted on the chassis by interpositioning six hydraulic cylinders, with these cylinders being placed such as to make the lifting platform adjustable in the x-, y- and z-direction.

6. A recovery vehicle according to one of the preceding claims, characterised in that the same possesses crawler tracks.

7. A recovery system for heavy loads, such as an aircraft, characterised by two or more co-operating recovery vehicles according to one of the claims 1-6.

8. A recovery system according to claim 7, characterised in that each recovery vehicle possesses a measuring device for determining the height of the lifting platform of that recovery vehicle.

9. A recovery system according to claim 7 or 8, characterised in that each recovery vehicle possesses a measuring device for determining the height of the lifting platform in relation to the chassis of that recovery vehicle.
10. A recovery system according to one of the claims 7-9, characterised in that a reference marker is provided on solid ground, and that the recovery vehicles are designed to interact with the reference marker for determining the height at which the recovery vehicles are situated.

11. A recovery system according to one of the claims 7-10, characterised in that it is provided with a computer system for gearing the operation of the recovery vehicles to one another.
INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL2004/000210

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60P3/11  B64F5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60P  B64F  B61D  B62D  B65G  B66F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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