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I-20122 Milan(IT)(54) **A lifting and positioning structure for an aerial platform, particularly for use in elevating machines.**

(57) The invention relates to a lifting and positioning structure for an aerial platform as used in elevating machines, provided with devices (13,14) which enable a platform-supporting arm (11) to perform rotations of any extent. The structure comprises a first telescopic arm (5) that can be mounted on a vehicle (2), a second arm (7) mounted to an end of said

telescopic arm (5) through a transmission device (13) comprising at least one worm-and-wheel gearing, and a support (11) for the aerial platform(12) similarly mounted to the other end of said second arm (7) through a transmission device (14) comprising at least one worm-and-wheel gearing.

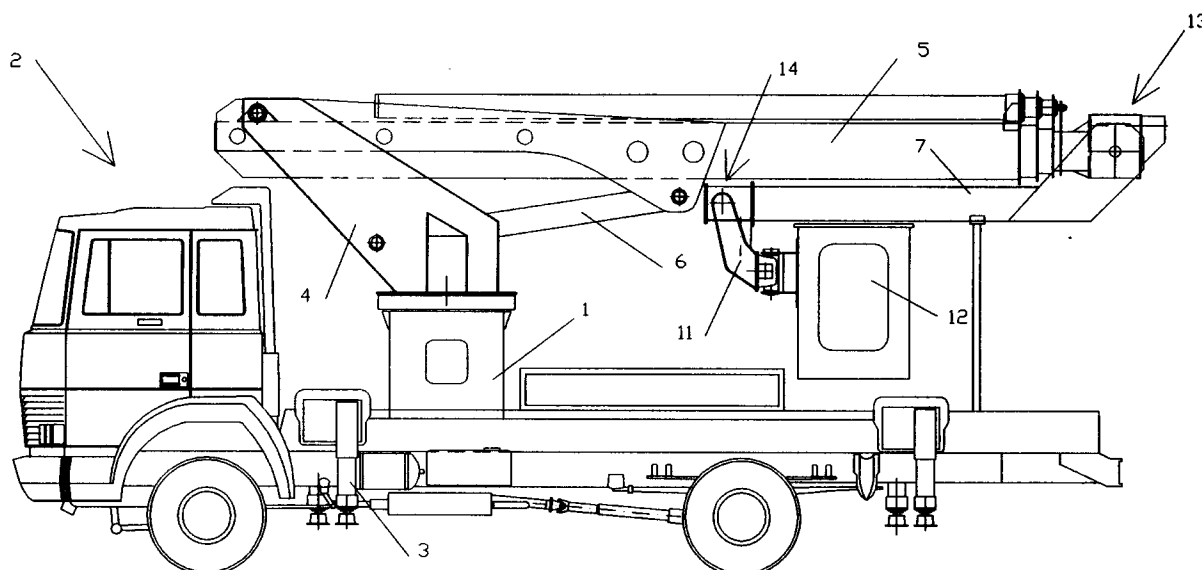


FIG. 1

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This invention relates to a lifting and positioning structure for an aerial platform, particularly a platform for an elevating machine, comprising a telescopic arm provided with means for mounting it onto a vehicle, a second arm mounted on said first-mentioned telescopic arm and a platform or gondola mounted to said second arm.

This invention is characterized in that it provides kinematic motions which permit said second arm to be rotated by an angle equal to 360 continuous degrees with respect to said main arm.

Owing to this peculiar configuration, the lifting structure according to the invention is extremely improved in practical use as compared with other prior known systems, since, due to increased moving capability of its platform support, said structure permits very much wide working areas to be covered without the necessity to move the vehicle, and the overall dimensions of the vehicle to be significantly reduced at closed structure.

Vehicles having a structure mounted thereon for raising a gondola or platform in which operatives and/or working tools can find place are known.

The field of application of such a structure is extremely wide, going from repair and maintenance operations to removal services, etc.. The structure is usually mounted on a truck equipped with suitable stabilizers, and comprises a main telescopic arm to the free end of which there is hinged a second arm to be called as an intermediate arm in the following, this second arm having a support for the platform mounted thereon.

In order to use these prior known types of apparatus, first the main arm is given a most suitable inclination that may attain an inclination approaching the vertical, then the intermediate arm, which may be, or not, a telescopic arm, is rotated so as to move the platform to a working area.

Italian Patent Application No. 67401 A/90 discloses an electromechanical unit for automatically controlling accurate setting of an aerial gondola on an elevating machine.

This electromechanical unit comprises at least one hydraulic motor connected to a worm-and-wheel gearing capable of controlling horizontality of a bearing surface of the gondola as a function of a series of pulses generated by an horizontality sensor and transmitted to the hydraulic motor.

In known lifting structures, the rotation motion of the intermediate arm with respect to the main arm is obtained by means of a piston or a like system which acts upon a lever integral with the intermediate arm.

By this solution, however, the maximum amount of rotation the secondary arm may perform is equal to or slightly greater than 180° and this limit is imposed by the mechanism by which said

secondary arm is rotated.

This limitation gives rise to different difficulties according to the type of elevating machine involved.

For example, in a machine in which, at rest, the system is folded back on the truck platform, that is a machine where the secondary arm is mounted so on the main arm as to be able to move by a 180-200° rotation between two end positions substantially aligned with said main arm, a short overall length of the closed structure, and thus of the vehicle, can be obtained, but not without sacrifice of the working area, since no possibility exists to operate beyond the vertical.

On the other hand, in case of a structure where the secondary arm is pivoted to the main arm so as to permit the secondary arm to move between two extreme positions that are substantially orthogonal to said main arm, the working area is extended beyond the vertical but the overall dimensions are substantially increased since, even at completely closed structure, the secondary arm and its associated gondola are projecting out with respect to the truck platform, which increases the overall length of the vehicle.

Thus, in one case, there are situations where the platform is uneasy to handle because of the restrained movements of the platform frequently making certain working areas hard to reach and, as a result, the structure has to be closed, the stabilizers removed, the vehicle moved to a more suitable position and the platform extended again.

In the other case, on the contrary, due to significant overall length of the vehicle, the vehicle itself is difficult to maneuver especially when it is necessary to operate within a restrained space.

In view of the above reasons, a need is felt in this field for a lifting structure which is linked so as to give greater moving flexibility to the platform and its support, and which can be brought back to its closed condition within a small space, thereby enabling a transport means to be easily maneuvered.

It is an object of this invention to provide an elevating machine wherein the intermediate arm can be angularly oriented by any desired angle, particularly an angle of at least 300°, with respect to the main arm, so as to increase the flexibility of, and the area served by the equipment.

The above object is attained in that the secondary arm is pivoted to the main arm through a transmission device comprising at least one worm-and-wheel gearing, and a support for the platform is mounted to the other end of said secondary arm through a similar transmission device.

The rotation is obtained by means of one or more hydraulic motors from which said transmission devices are driven.

A further object of this invention is to provide

an elevating machine which is mechanically simple in construction, while ensuring a great freedom of movement and occupying a restrained space both during use and when folded back on a platform of a transport vehicle.

The invention will now be described in more details by way of example only, reference being made to the accompanying drawings, in which :

Figures 1 and 2 are side views of a vehicle on which a structure according to the invention is mounted, the structure being shown as positioned at the front and the rear of the vehicle platform, respectively,

Figure 3 is a diagram showing a working area that can be covered by the structure according to the invention;

Figure 4 is a fragmentary view of the structure according to the invention for evidencing the movements a platform-supporting arm may perform in a structure according to this invention, and

Figures 5 and 6 are cross-sectional views taken along two orthogonal planes of the transmission devices which connect said intermediate arm to the main arm, and the platform structure to said intermediate arm, respectively.

Referring now to figures 1 and 2, there is shown a structure according to the invention which includes a bearing 1 fixed to a loading platform of a vehicle broadly designated by 2, the vehicle being provided with appropriate stabilizers 3.

Mounted on bearing 1 is a base support 4 to which a first telescopic arm 5, preferably of sheet steel or a light metal as, for example, an aluminum alloy sheet material, is hingedly connected. A piston 6 is provided for lifting the arm 5 to bring it from a substantially horizontal position corresponding to that in figure 1, to a lifted, operative position, for example a position approaching the vertical as shown figure 3.

The arm 5 and the device for causing extension thereof are known and do not require to be described any further.

Mounted to the upper end of arm 5 is a second or secondary arm 7.

The connection between the arm 5 and the arm 7 is obtained by means of a transmission device of the type as disclosed in the above-mentioned Patent Application No. 67401 A/90 and, thus, only a summarized description of this device will be given below with reference to figures 5 and 6.

This transmission device comprises a pair of worms 8 meshing with corresponding worm wheels 9 keyed on a shaft 10 to which the secondary arm 7 is fitted. An hydraulic motor drives the rotary worm shafts to cause the arm 7 to move in angular relationship with the arm 5.

Arm 7 is rotated about the end of main arm 5 so as to describe an arc that may cover up to 300° and over. This limit is based on the necessity to avoid any interference of the various parts of the machine with one another upon their moving to working position, but it should be apparent that if appropriate interconnections are provided for the different moving elements it will be possible for the secondary arm to perform rotations of about 360° steplessly.

Pivoted to the other end of arm 7 - again through a similar transmission device to that mentioned above - is a support 11 for a platform 12.

The driving gears that are mounted to the two ends of secondary arm 7 are broadly indicated by reference numerals 13 and 14 in figure 1.

The platform or gondola 12 should be provided with suitable control and adjusting devices for automatic levelling as described in the above-mentioned Patent Application.

In order to further increase flexibility and working area of the apparatus according to the invention, there may be provided a mechanism for rotating the gondola on an horizontal plane, which mechanism could be a rack and pinion drive or the like.

In use, first the piston 6 is actuated to give the arm 5 an inclination as required, this arm 5 being able to move to substantially a vertical position such as to reach, in operation, a maximum height with the overall dimensions being kept restrained.

Then, the telescopic arm 5 is extended and the telescopic intermediate arm 7 is oriented through the transmission device 13 with the platform 12 being maintained in an horizontal position by means of the kinematic motion 14.

Figure 3 evidences the wide working area the structure of the invention may cover when taking advantage of the different motions that the various parts are enabled to perform.

As mentioned in the introductive part of this disclosure, the described construction permits significant benefits in terms of practical use to be obtained from a point of view of both the maneuverability of the platform and the occupied space when the structure is closed.

The capability of the intermediate arm 7 of rotating by an angle up to, and/or in excess of 300° enables the platform to be used in working areas where there is a need for operating from opposed sides with respect to the main arm 5, without requiring the entire vehicle to be moved.

Thus, this situation can with advantage be utilized in case of servicing on electric aerial lines where it is possible for the arm 5 to be brought to a vertical position and extended so as to reach the line cables requiring repair.

At that time, complete rotation of secondary

arm 7 will allow the platform to be brought in proximity to all of the wires on either sides of the arm, without having to close the structure and move the entire vehicle.

The wide angle of rotation the arm 7 is enabled to perform will then permit this arm 7 to be folded against the arm 5 as seen figures 1 and 2, thereby to bring the platform 12 onto the vehicle platform.

This reduces longitudinal size during transport, which results in obvious advantages when moving in traffic situations, and permits the bearing 1 and associated main support 4 to be secured to the front side or - according to as optionally chosen when designing the vehicle - the rear side of the vehicle platform, as seen figures 1 and 2, respectively.

Though one particular embodiment of this invention has been described herein above and shown in the drawings, it should be apparent that many changes and modifications may be made thereto by a person skilled in the art, without departing from the spirit and scope of the invention as defined in the appended claims.

Claims

1. A lifting and positioning structure for a platform of an elevating machine of the type comprising a support rotatably mounted on a vehicle platform, a telescopic arm pivoted to said support so as to be brought from substantially an horizontal position to substantially a vertical position, a second arm pivoted to the end of said first-mentioned arm, and a platform fixed to a support pivotally connected to the end of said second arm, characterized in that the pivotal connection of said second arm to said first arm includes at least one gear wheel driven by a worm screw and keyed to a shaft on which said second arm is fastened.
2. The lifting and positioning structure for a platform of an elevating machine according to claim 1, wherein said second arm is connected to said first arm through a linkage by which said second arm is enabled to perform rotations in excess of 300°.
3. The structure according to any preceding claim, wherein connecting means are provided for said first and second arms which permit said second arm to completely close against said first arm.
4. A structure as described herein before with reference to, and as shown by the accompanying drawings.
5. An elevating machine comprising a structure according to claims 1 to 3.

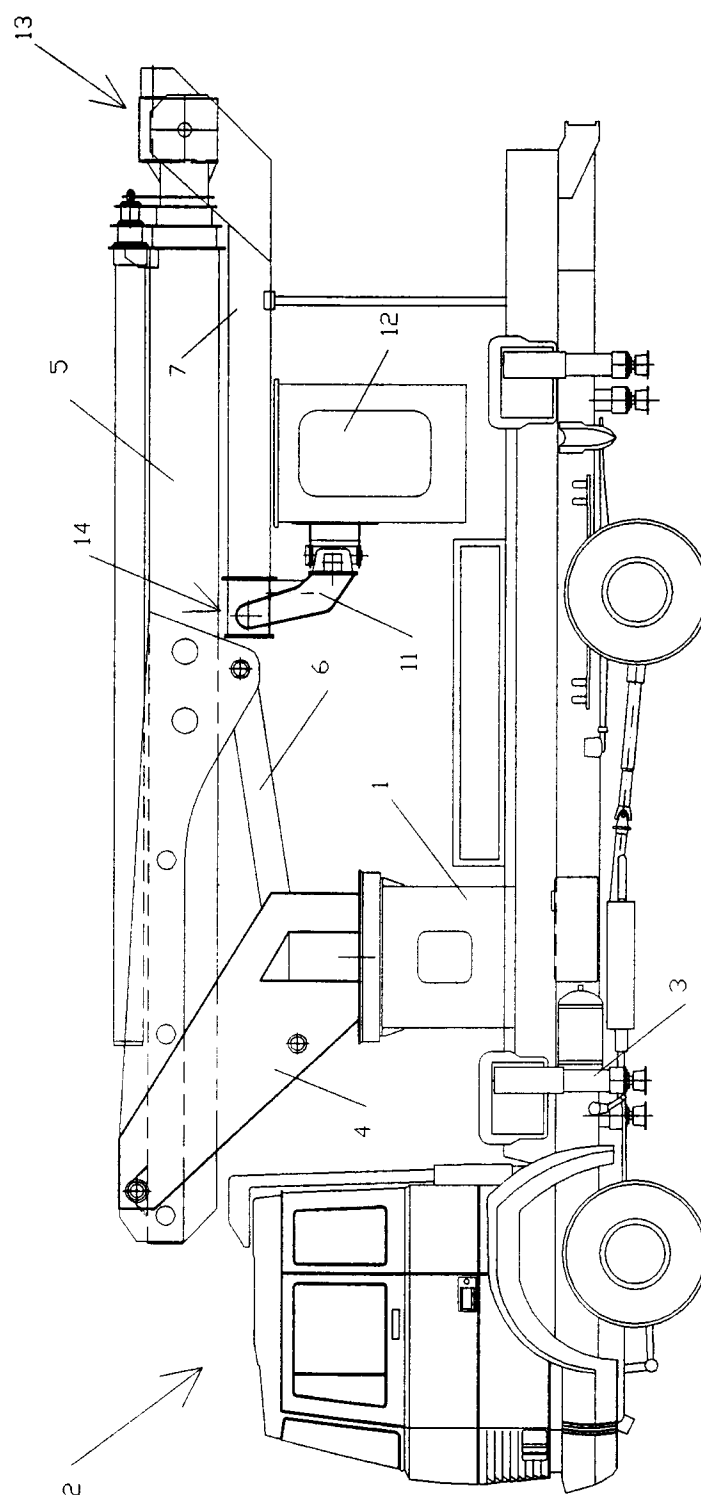


FIG. 1

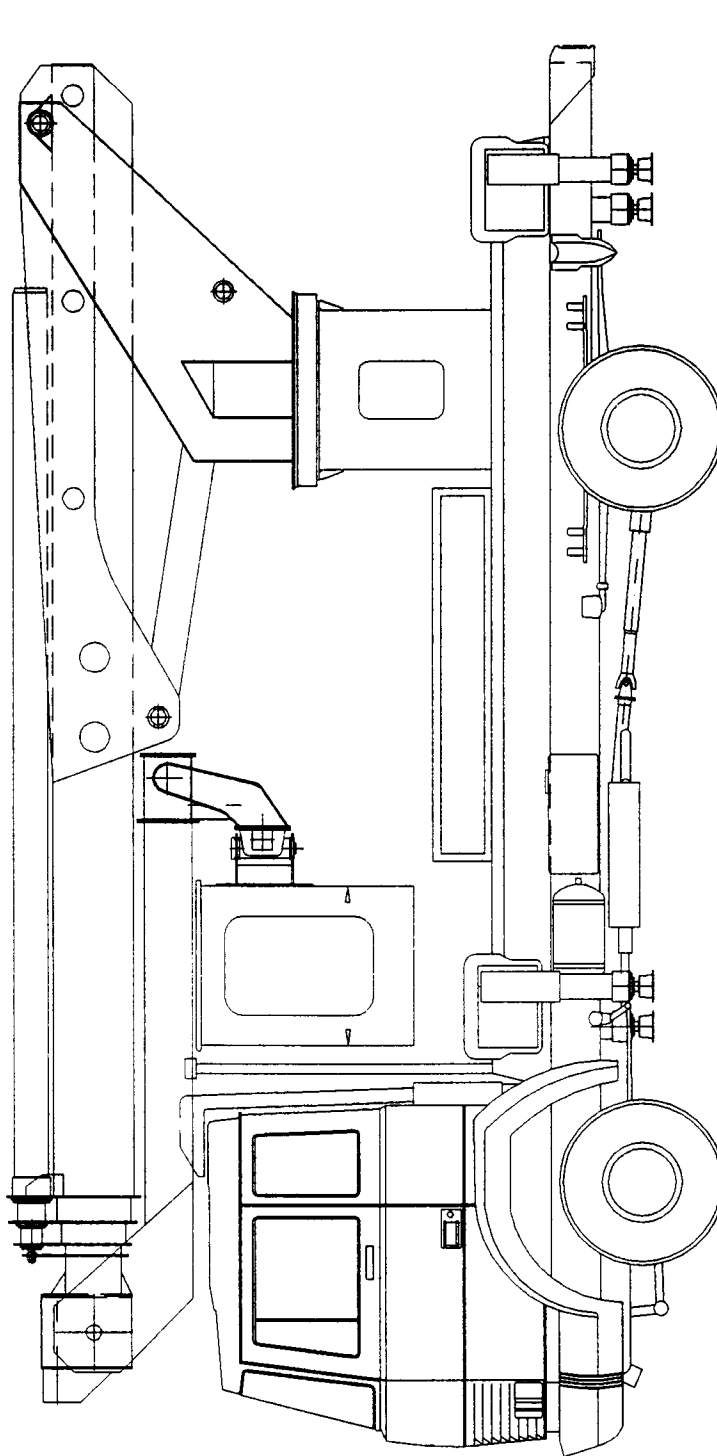


FIG. 2

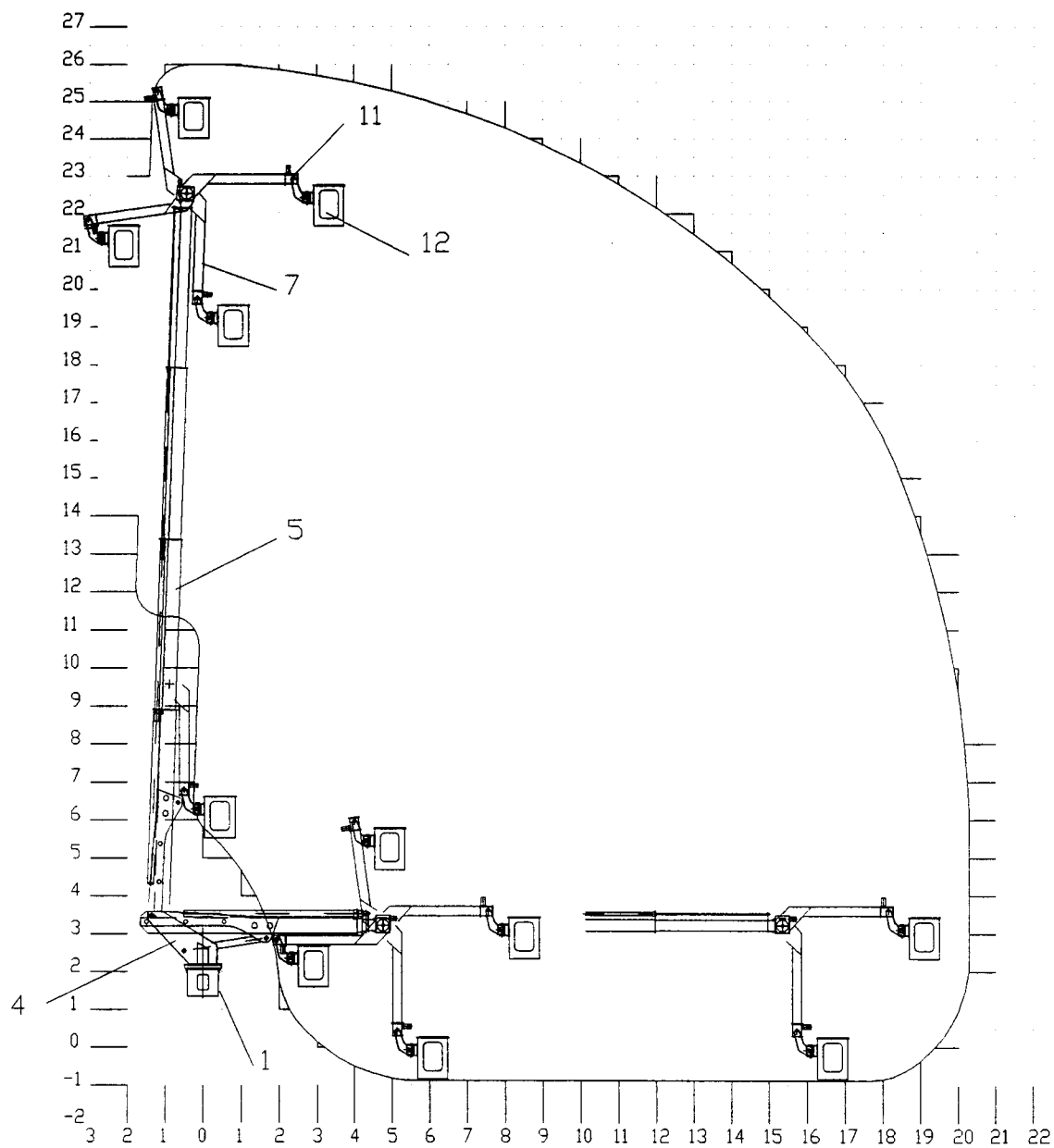


FIG. 3

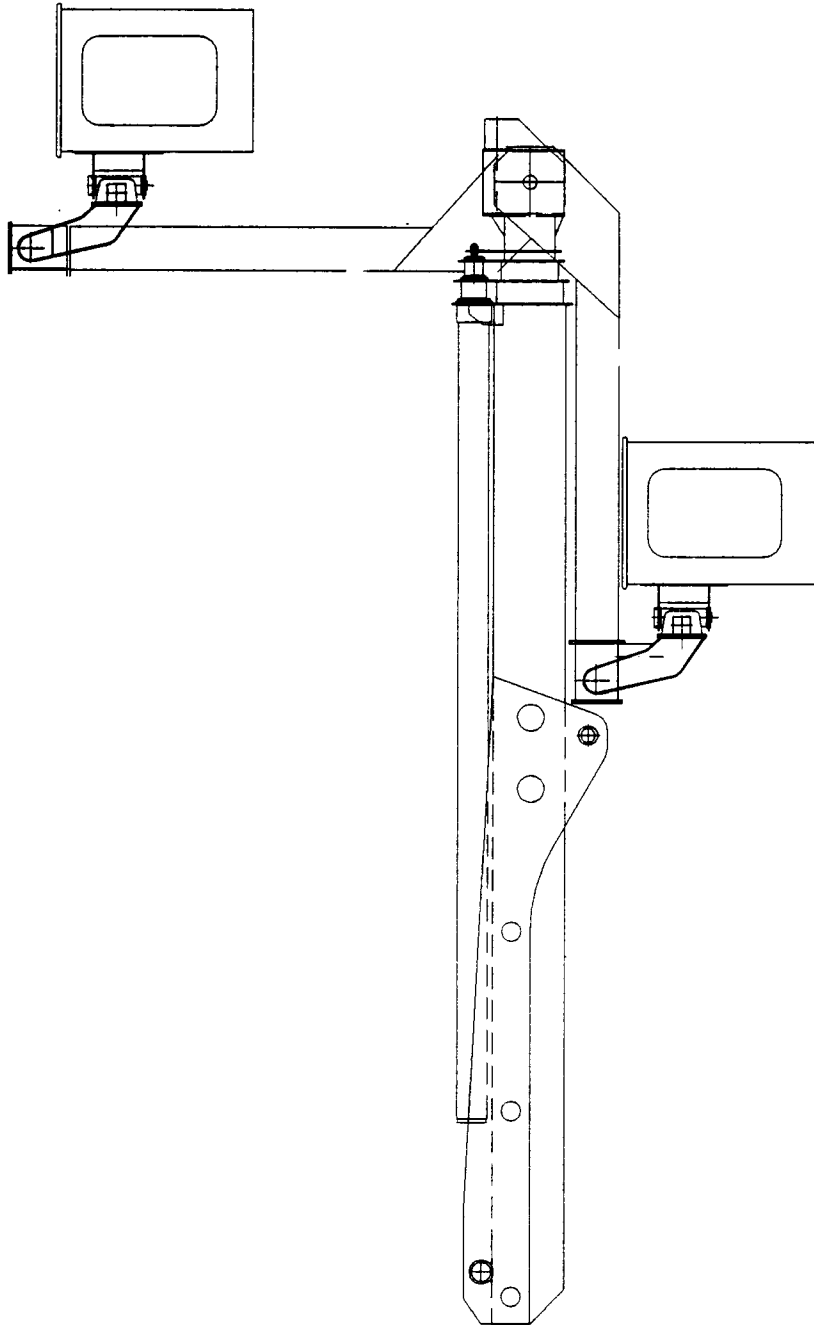
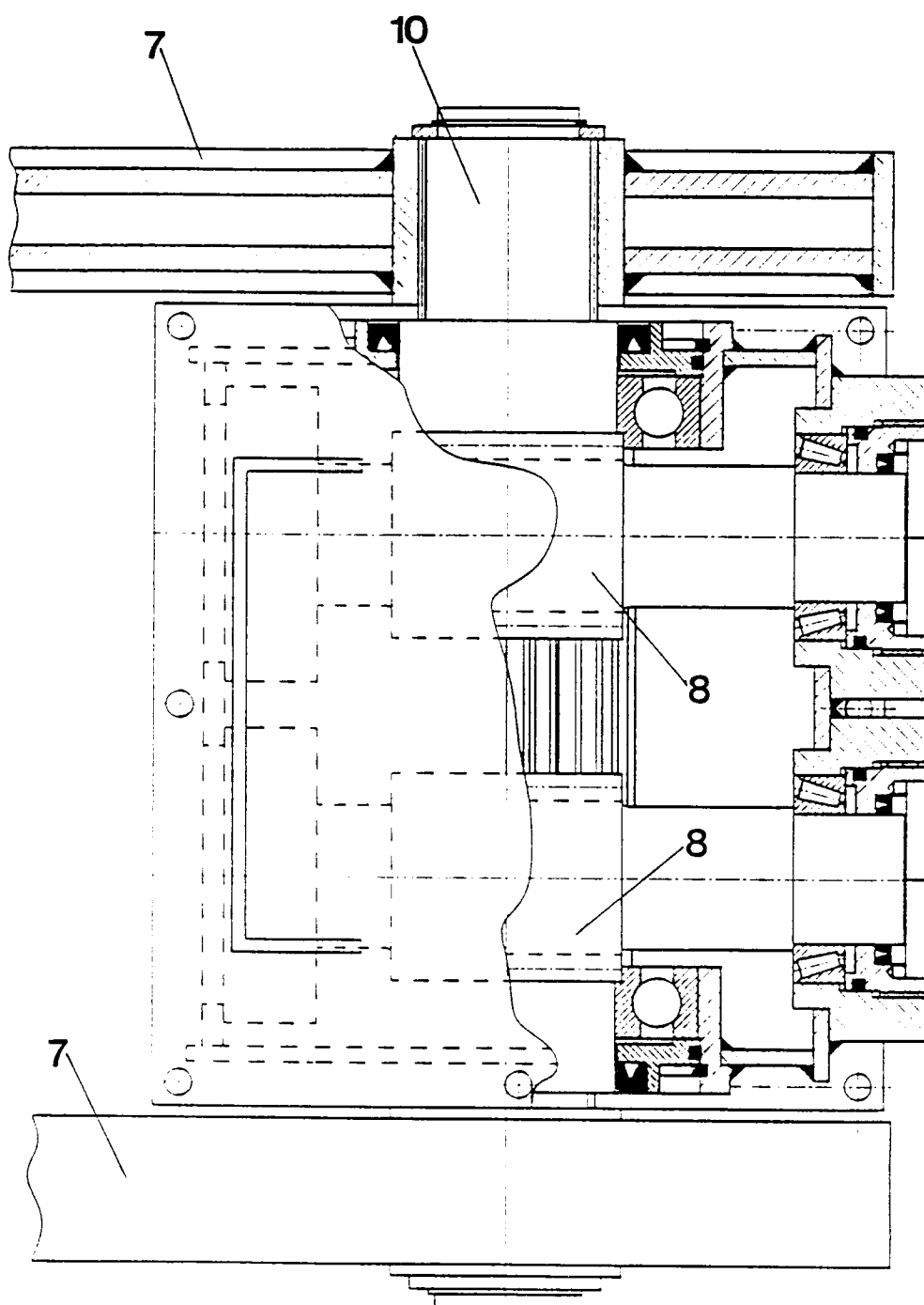
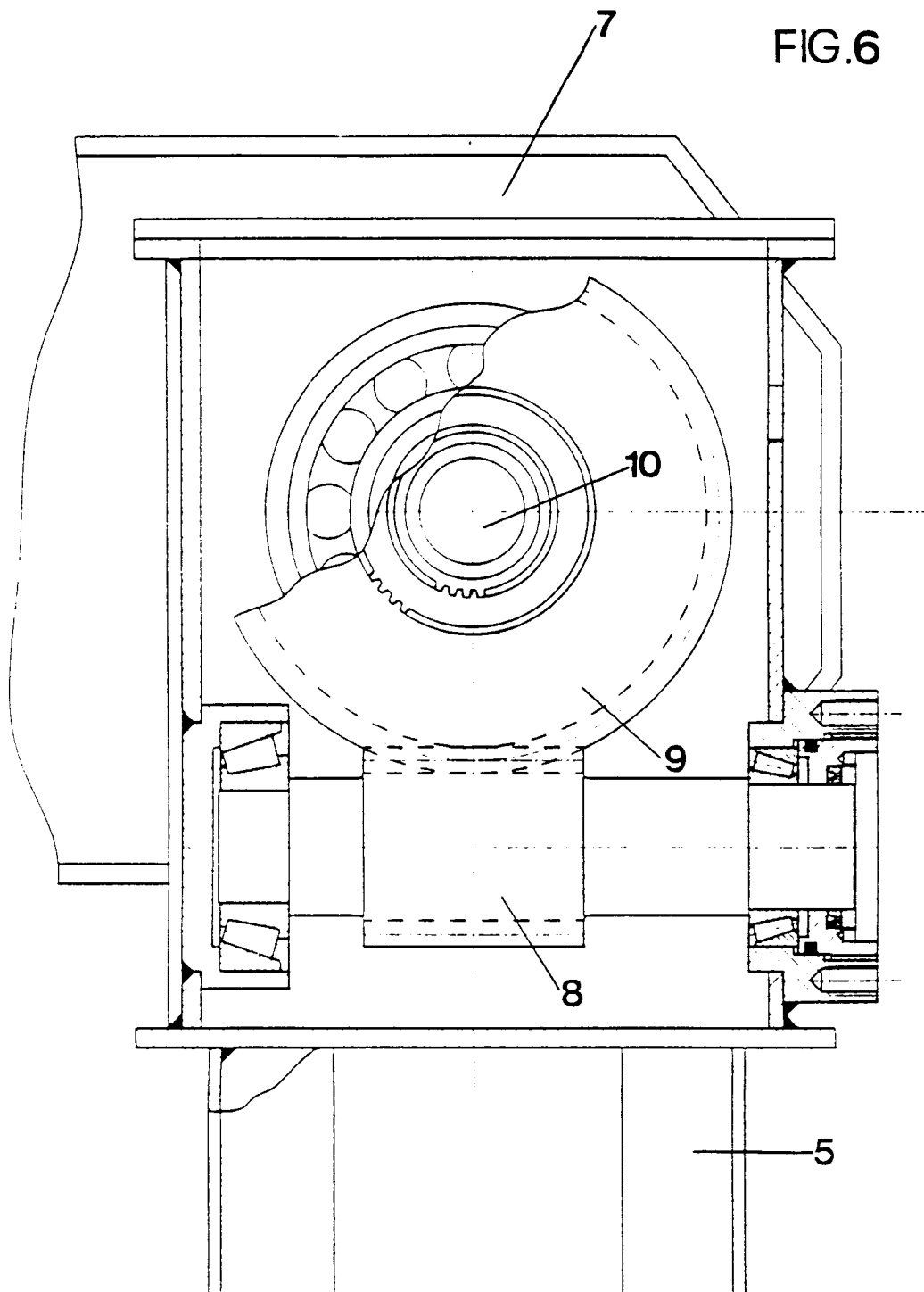


FIG. 4

FIG.5







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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)
Y A	US-A-3 690 408 (RESKE ET AL.) * figures 1,5-8 * * column 2, line 43 - line 51 * * column 2, line 58 - line 68 * * column 3, line 8 - line 24 * * column 3, line 31 - line 65 * * column 4, line 63 - column 5, line 1 * * column 5, line 7 - line 21 * * column 5, line 29 - line 37 * * column 5, line 44 - line 52 * ---	1,2 4,5	B66F11/04
Y A	US-A-3 590 948 (MILNER, JR.) * column 3, line 57 - line 63 * * column 5, line 39 - line 46 * * column 6, line 3 - line 11 * * figures 2,9 * ---	1,2 3	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 SEPTEMBER 1992	Examiner GUTHMULLER J.A.
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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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	CA-A-1 198 691 (AMADOR HYDRAULICS SERVICES LTD.) ---		
A	US-A-3 074 649 (ATKINSON) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 SEPTEMBER 1992	Examiner GUTHMULLER J.A.
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			