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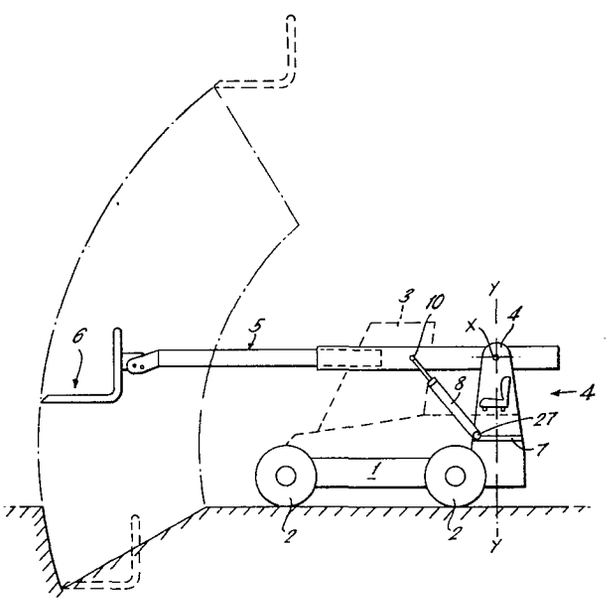
(54) Improved load handling vehicle.

(57) The application provides a load handling vehicle with a chassis (1) and a telescopic load handling member which may be increased or decreased in length as required. The load handling member is movable about both a horizontal axis (x) and a vertical axis (y–y) so that the load handling member may extend either to the front or to the rear of the vehicle. The load handling member comprises a boom (5) of two or more telescopic sections pivotally mounted at one end to the chassis (1) and having a load handling attachment (6) at the other end, the load handling attachment (6) being detachable and selected from a fork carriage, a shovel loader bucket and a digger bucket.



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IMPROVED LOAD HANDLING VEHICLE

This invention relates to improved load handling vehicles which may be operative to the front and rear whilst the chassis of the vehicle remains stationary.

An object of the present invention is to provide an improved load handling vehicle in which the load handling member is more versatile.

According to the present invention a load handling vehicle comprises a chassis, and an elongate telescopic load handling member so that the length of the load handling member may be increased or reduced wherein the load handling member is movable about both a substantially horizontal and a substantially vertical axis, the movement about the substantially vertical axis being at least 180^{o} and arranged so that the load handling member may extend either to the front or to the rear of the vehicle as desired and wherein the telescopic load handling member comprises a telescopic boom of two or more telescopic sections pivotally mounted at one end to a rotatable support on the chassis, and a load handling attachment at the other end of the boom, the load handling attachment being detachable and interchangeable and selected from a fork carriage, a shovel loader bucket and a digger bucket.

The load handling vehicle may include a strain gauge mechanism connected between the chassis and each of the axles of the vehicle to detect changes in the turning moment applied to a respective axle by the weight of the superstructure and the load and an audible and or visual

alarm operable by a respective strain gauge mechanism to give warning when the turning moment about an axle is such as to render the vehicle unstable.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side elevation of a preferred form of load handling vehicle simplified by the inclusion only of the main parts of the vehicle;

Figures 2a, 2b and 2c are side elevations of part of the load handling boom shown in the load handling vehicle of figure 1 partly in section and with various alternative load handling attachments;

Figure 3 is a rear view in the direction of arrow 4 in figure 1;

Figure 4 is a side elevation of the load handling vehicle of figure 1 showing the load handling member in an alternative position;

Figure 5 shows an arc of movement of the load handling member about a horizontal axis with the load handling vehicle standing still; and

Figure 6 shows the preferred arc of movement of the load handling member about a vertical axis with the load handling vehicle standing still.

In the drawings and referring particularly to figure 1 a load handling vehicle consists of a chassis 1 supported upon ground-engaging sheels 2. The chassis 1 supports engine and transmission components (not shown), a control cab 3

and a cradle 4 positioned at the rear of the vehicle. The cradle 4 provides a mounting for a load handling member which comprises a load handling boom 5 pivotally mounted between the cradle 4 for movement about the horizontal axis X-X (see also figure 3), and a load handling attachment 6 at the end of the boom. The cradle 4 is mounted on a slewing bearing 7 (figure 3) so that the load handling member may be rotated about a vertical axis Y-Y.

The load handling boom 5 is shown as two telescopic sections but the boom may comprise three or more sections if desired. The boom 5 is elevated or depressed respectively above or below the horizontal by means of hydraulic piston and cylinder assemblies 8 pivoted to the boom at 10 and pivoted to the cradle 4 at 27 power being supplied in a conventional manner by means of the main engine or a secondary engine provided for the operation of the load handling member.

As seen from figures 2a, 2b and 2c the boom 5 is extended or retracted by means of a hydraulic ram 11 or similar device contained within the boom. The boom 5 may have various alternative load handling attachments 6 three of which are shown in figures 2a, 2b and 2c to illustrate different modes of operation.

Figure 2a illustrates a boom 5 having a fork carriage load handling attachment 6. The fork carriage 6 pivots about the point 9 on the boom 5 and is able to change its attitude to the boom by means of a hydraulic piston and

cylinder assembly 12 acting between a fixed point 13 on the boom 5 and a pivot 14 on the fork carriage 6. As shown the hydraulic assemblies 11 and 12 may act through the same fixed point 13 attached to the final boom section. If desired there may be provided an arrangement whereby the fork carriage 6 will automatically level itself as the boom elevation angle changes, a manual override being provided if the operator particularly wishes to angle the fork carriage 6 during movement.

In figure 2b the construction of the load handling member is substantially the same as in figure 2a except that the load handling attachment is a shovel loader bucket 15 rather than a fork carriage 6. However in figure 2c the construction is slightly different from the construction in figures 2a and 2b. In figure 2c the load handling attachment is a digger bucket 16 which is pivotally mounted to the boom 5 at 9. The digger bucket 16 is actuated by the hydraulic assembly 12 which acts between the fixed point 13 on the boom 5 and a linkage assembly 18 comprising links 19 and 20. The link 19 is pivoted to the boom 5 at pivot 17 and the link 20 secured to the digger bucket 16. Preferably the various load handling attachments are readily interchangeable by means of quick release devices at all of the boom head pivots.

In figure 4 the cradle 4 and load handling member carried thereby have been rotated through 180° so that the boom 5 is in a rearwardly extending position with a digger attachmenet 16 fitted. Either before or after rotating the boom 5 to the

rear of the vehicle the pivots 10 of the hydraulic assemblies 8 are moved from the positions 10 to positions 21 on the boom 5 thus allowing an arc of movement of the boom about the horizontal displaced downwardly from that in the forward facing mode shown in figure 1. The pivot positions may be displaced from 10 to 21 either manually with the boom 5 held in the horizontal condition or the ends of the hydraulic assemblies 8 may be placed in slider blocks which may be moved between positions 10 and 21 by manual or powered means. In the position shown in figure 4 the digging operation may be controlled from a seat 24 attached to the rotatable cradle 4 as well as from the cabin 3 so that the operator has a clear view of the digging operation.

Figures 5 and 6 show the arcs of movement of the load handling member about horizontal and vertical axes respectively. In figure 5 the load handling boom 5 is shown in front and rear modes but has an additional extension member known as a dipper arm 25 attached between the boom 5 and the load handling attachment, in this case a digger bucket 26. The dipper arm 25 is attached to the end of the boom 5 by quick release devices and is actuated by the hydraulic assembly 12 (see figures 2a, 2b and 2c). The digger bucket 26 is identical with the digger bucket 16 except that it is actuated by a further hydraulic device (not shown) mounted separately in the outer end of the dipper arm and powered from the vehicle itself via hoses up the boom 5. In figure 6 the arc movement about the vertical axis Y-Y is shown indicating that the load handling vehicle may operate not

only front and rear as shown in figure 5 but also to the sides of the vehicle.

Although figure 6 illustrates an angle of rotation of 270° the angle of rotation could be in excess of 360°

in the case of a load handling vehicle having no cabin 3. Also although the specification has referred to movement about horizontal and vertical axes this is understood to include movement about axes lying substantially horizontal or vertical.

The load handling vehicle of the present invention is preferably a four wheel drive vehicle having four wheel steering for rough terrain or agricultural usage. Also, as a load handling vehicle of the present invention may be subject to overloading or unbalancing it is preferred to include a strain gauge mechanism connected between the chassis and each of the axles of the vehicle to detect changes in the turning moment applied to a respective axle by the weight of the superstructure and the load and to give warning when the turning moment about the rear axle with respect to the position of the load handling member is such as to render the vehicle unstable.

A suitable strain gauge arrangement is disclosed in our cognate copending application Nos. 44295/74 and 23270/75 now British Patent No. 1 528 741 to which reference is directed for further details.

Although the present invention has been particularly described with reference to movable pivot points on the boom 5 for the hydraulic assemblies 8 alternatively the pivot points on the cradle 4 may be movable.

WHAT WE CLAIM IS:

1. A load handling vehicle comprising a chassis, and an elongate telescopic load handling member so that the length of the load handling member may be increased or reduced wherein the load handling member is movable about both a substantially horizontal and a substantially vertical axis, the movement about the substantially vertical axis being at least 180° and arranged so that the load handling member may extend either to the front or to the rear of the vehicle as desired and, wherein the telescopic load handling member comprises, a telescopic boom of two or more telescopic sections pivotally mounted at one end to a rotatable support on the chassis, and a load handling attachment at the other end of the boom, the load handling attachment being detachable and selected from a fork carriage, a shovel loader bucket and a digger bucket.

2. A load handling vehicle according to claim 1 wherein the rotatable support comprises a cradle between which the elongate boom is pivotally mounted for movement about a substantially horizontal axis, the cradle being rotatable on the chassis about a substantially vertical axis.

3. A load handling vehicle according to claim 2 wherein the telescopic sections of the boom are extendable and retractable hydraulically.

4. A load handling vehicle according to claim 3 wherein the pivotal movement of the boom is effected by a hydraulic piston and cylinder assembly acting between the cradle and the boom.

5. A load handling vehicle according to claim 4 wherein the cradle is mounted at the rear of the vehicle and there are two positions either on the cradle or on the boom at which the hydraulic piston and cylinder assembly may be pivotally mounted, a first forward position when the boom is extending towards the front of the vehicle and a second position still forward in relation to the vehicle when the cradle and boom carried thereby have been turned through 180^{o} about the vertical axis so that the boom extends outwardly from the rear of the vehicle so that in the rear position the arc of movement of the boom about the horizontal axis is increased.

6. A load handling vehicle according to any one of the preceding claims including a strain gauge mechanism connected between the chassis and each of the axles of the vehicle to detect changes in the turning moment applied to a respective axle by the weight of the superstructure and the load and an audible and or visual alarm operable by a respective strain gauge mechanism to give warning when the turning moment about an axle is such as to render the vehicle unstable.

7. A load handling vehicle according to any one of claims 1 to 6 wherein the load handling member is movable about a vertical axis through 360^{o} or more.

8. A load handling vehicle substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

FIG. 1.

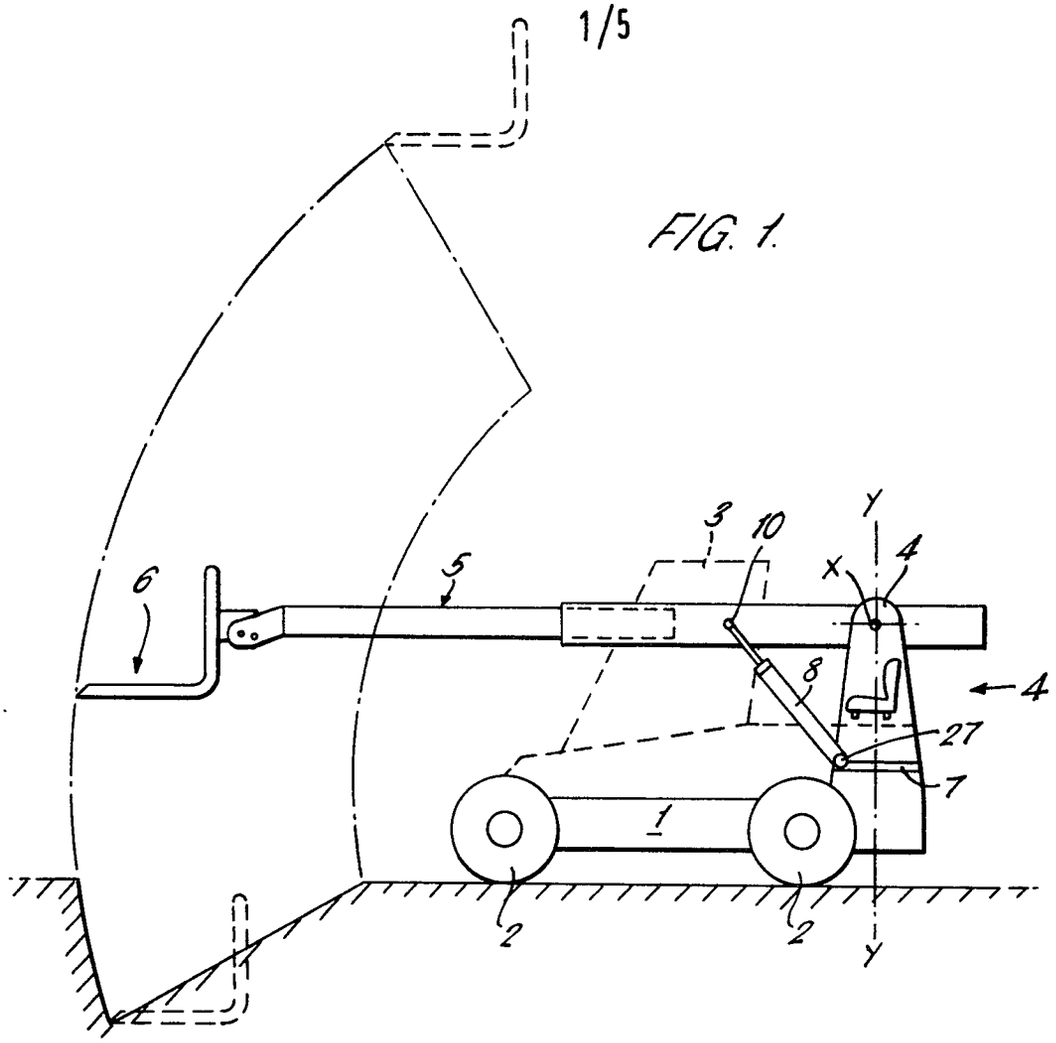


FIG. 3.

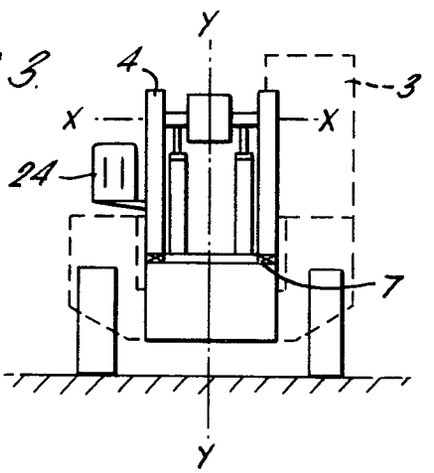


FIG. 2a.

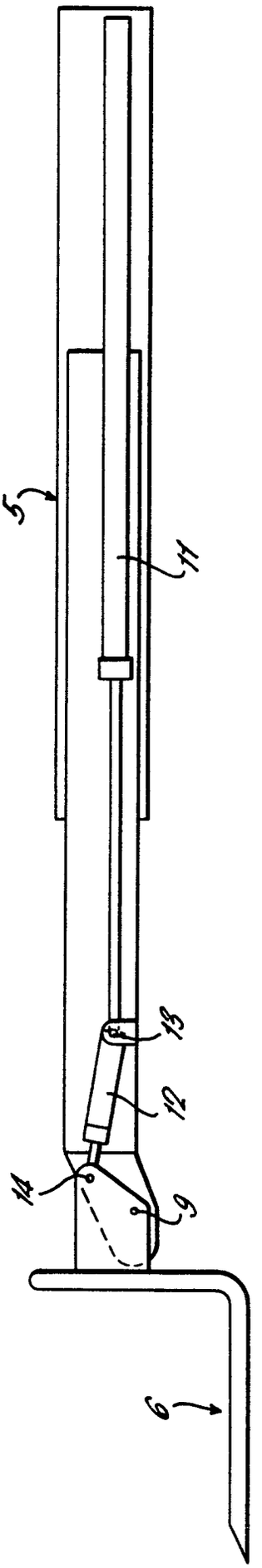


FIG. 2c.

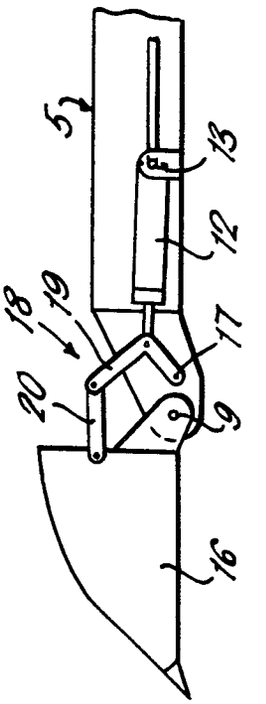
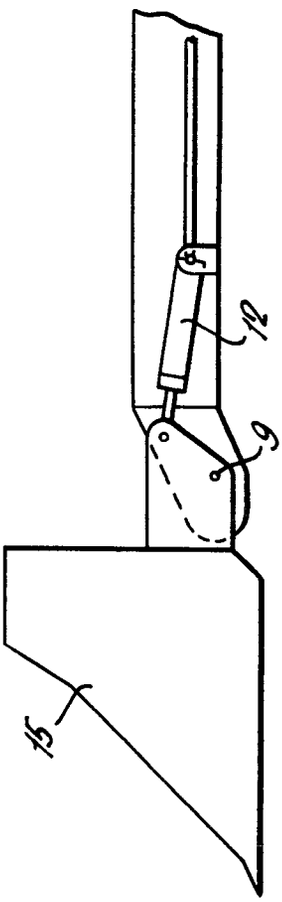


FIG. 2b.



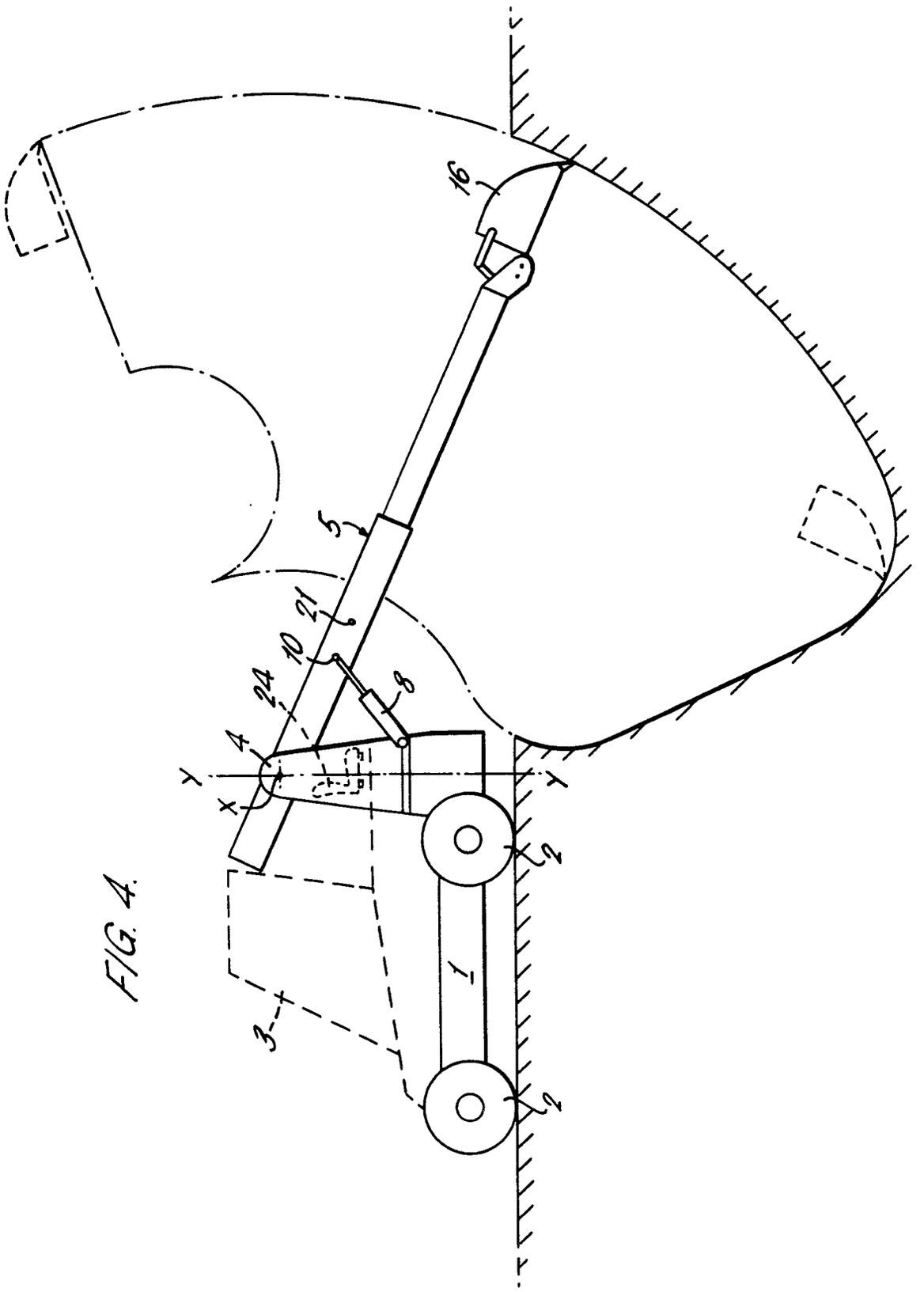


FIG. 4.

FIG. 5.

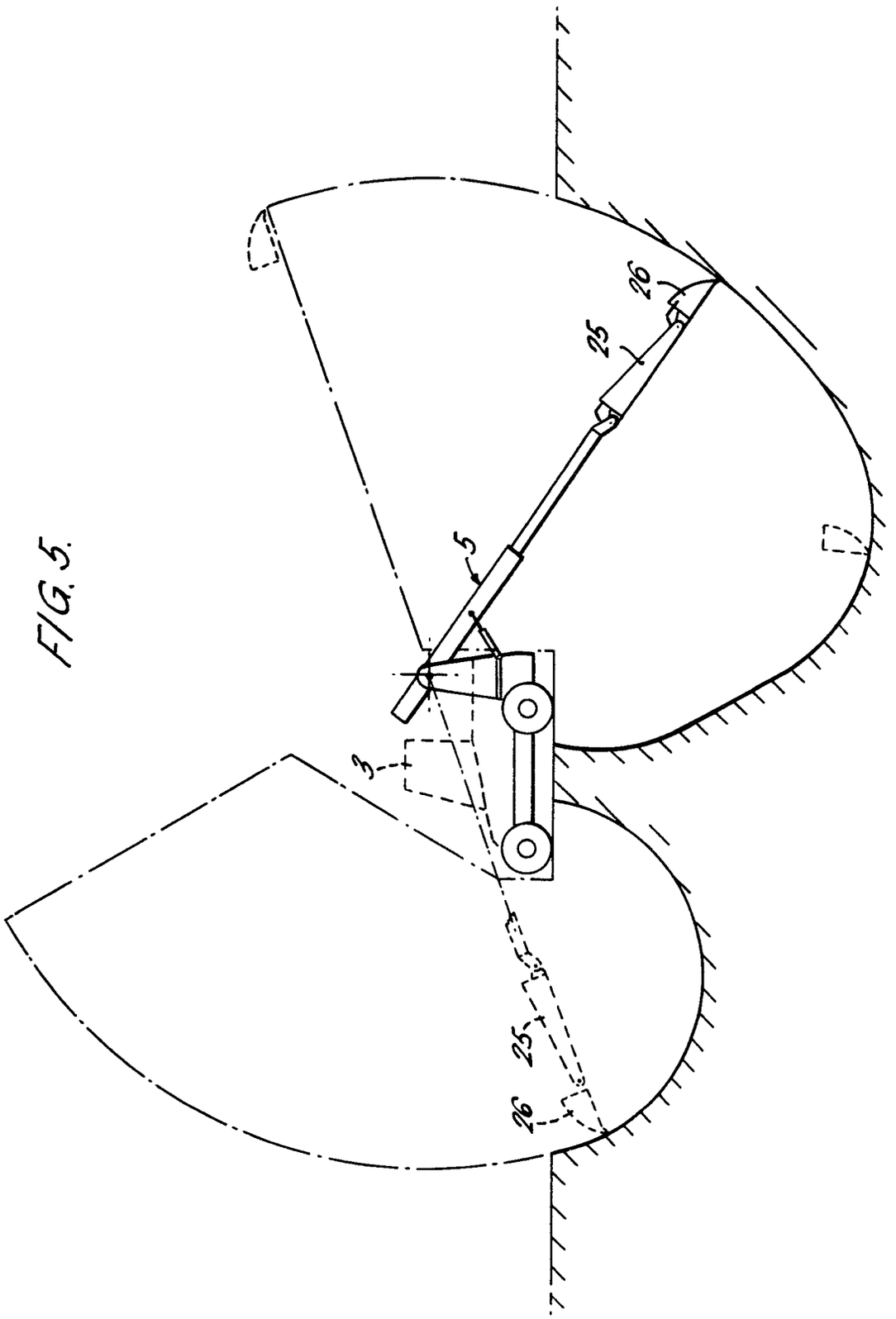
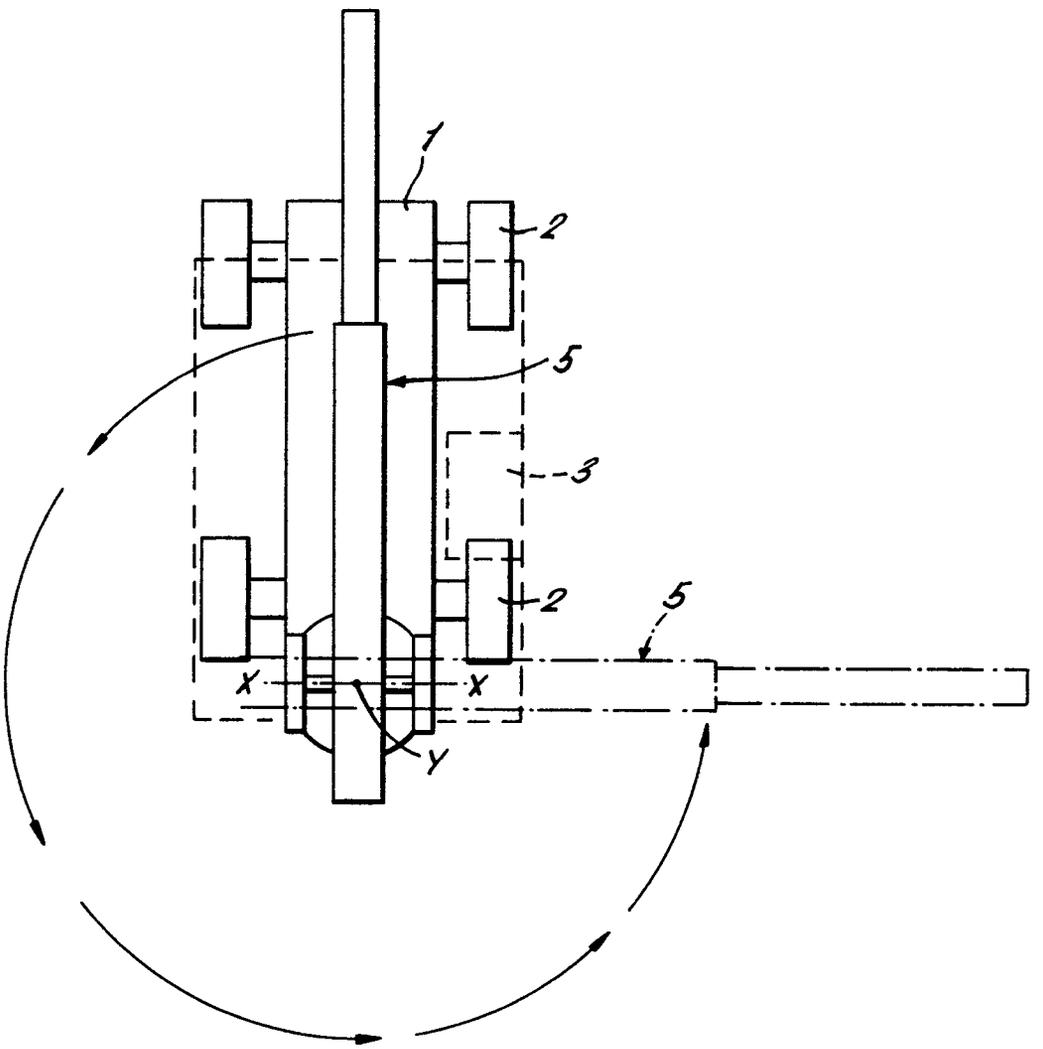


FIG. 6.



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EUROPEAN SEARCH REPORT

0036455
Application number

EP 80 30 0813.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 270 899 (E.C. BROWN et al.) * claim 1; fig. 1 to 4 *	1-4,7
	DE - A - 2 159 041 (RHEINSTAHL) * claim 1; fig. 1 to 3 *	1
	US - A - 3 807 586 (V.J. HOLOPAINEN) * claim 1; fig. 1 *	1-3
	US - A - 3 554 395 (G.G. DUNBAR) * claims 1, 5, 7; fig. 1 *	1,3,4
	US - A - 2 911 111 (J.L. GROVE) * fig. 1 *	1-4
	US - A - 2 684 159 (H.A. OLDENKAMP) * fig. 1 *	1,3
	US - A - 2 666 417 (C.A. HARSCH) * fig. 1, 2 *	1,3,4
	US - A - 2 571 858 (C.B. GARLAND) * fig. 1 *	1
	US - A - 2 501 112 (P.E. WEBSTER) * fig. 1 to 3 *	1,3
A	GB - A - 1 525 923 (LINER CONCRETE MACHINERY CO.) * fig. 1 *	1,3

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CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 66 F 9/065
B 60 P 1/54

TECHNICAL FIELDS SEARCHED (Int.Cl.³)

B 60 P 1/00
B 66 C 23/00
B 66 F 9/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons
&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	12-01-1981	KANAL

EPO Form 1503.1 06.78

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US - A - 3 836 025 (OLSON et al.) * fig. 1 *	1,3
D	GB - A - 1 528 741 (LINER CONCRETE MACHINERY CO.) * claim 1; fig. 1 *	1,3,6

CLASSIFICATION OF THE APPLICATION (Int. Cl.3)

TECHNICAL FIELDS SEARCHED (Int. Cl.3)