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(54) Mechanical handling vehicle

(57) A material handling vehicle comprising a chassis, a pair of front and a pair of rear ground engageable wheels, a material handling implement movably mounted on the vehicle, drive means for moving the material handling implement relative to the vehicle, an engine for driving said rear wheels and supplying power to said drive means and a station for an operator, a subframe provided mounting means for the rear wheels and for the engine and the subframe being carried on a part of said chassis by vibration isolation attachment means.

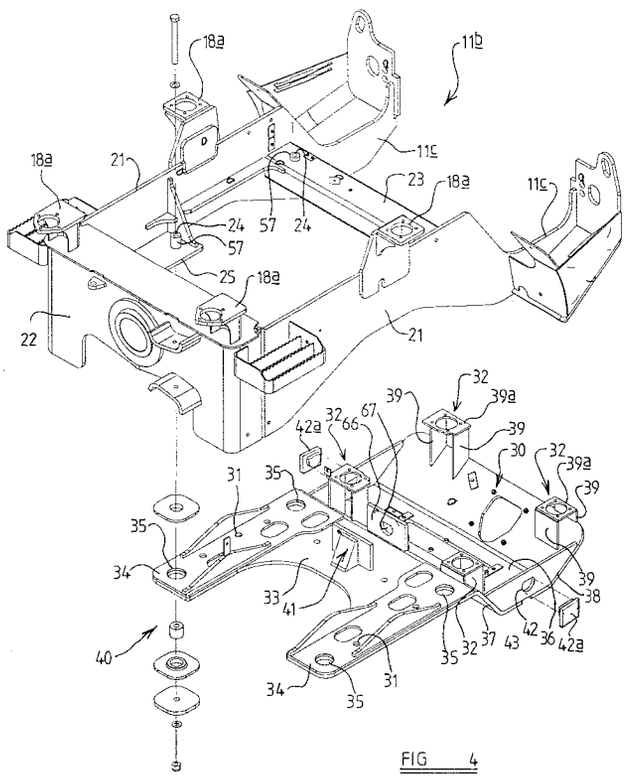


FIG 4

EP 0 833 012 A1

Description

Description of Invention

This invention relates to a material handling vehicle, hereafter referred to "the kind specified" comprising a chassis, a pair of front and a pair of rear ground engageable wheels, a material handling implement movably mounted on the vehicle, drive means for moving the material handling implement relative to the vehicle, an engine for driving said rear wheels and supplying power to said drive means and a station for a operator.

An object of the invention is to provide a new and improved material handling vehicle of the kind specified.

According to the present invention we provide a material handling vehicle of the kind specified comprising a subframe provided with mounting means for the rear wheels and for the engine and the subframe being carried on a part of said chassis by vibration isolation attachment means.

The vehicle may be an articulated vehicle wherein said chassis part comprises a rear chassis part and the vehicle also comprising a front chassis part which is articulated to the rear chassis part for steering movement relative thereto.

The rear chassis part may carry said station for an operator.

The front chassis part may have said material handling implement and said drive means mounted thereon.

The material handling implement may be mounted for up and down movement.

The material handling implement may be mounted on a mast of fork lift truck type.

Alternatively the material handling implement may be mounted on a boom assembly mounted for pivotable movement about a horizontal axis.

Said vibration isolation attachment means may comprise at least one resiliently deformable member.

Said vibration isolation attachment means may comprise a section of said chassis part which overlies a section of the subframe, a resiliently deformable member dispose therebetween, and a rigid member to restrain separation of, and extending generally perpendicular to, said section of the chassis part and said section of the subframe.

Said vibration isolation attachment means may attach the subframe to the chassis part such that the subframe is carried by the chassis part, said rigid member comprising a bolt passing through corresponding apertures provided on the chassis part and the subframe, the bolt further passing through a pair of resiliently deformable members disposed above and below the subframe and in contact with said subframe, the resiliently deformable member disposed between the subframe and the chassis also being in contact with the chassis part, a base plate being disposed below the lower resiliently deformable member and in contact therewith.

The vibration isolation attachment means may further comprise a spacer disposed within the aperture in the subframe and having a central bore through which the bolt is passed.

A boss may be provided on the subframe of the chassis part through which the bolt also passes.

Compressive force may be applied to the vibration isolation attachment means by means of a nut attached to the bolt.

Said resiliently deformable members may comprise a generally flat body having a hole through which the bolt, or where appropriate the spacer, may be received, and having a section projecting from the surface of the body adapted to receive in the aperture of the subframe.

Said resiliently deformable members may comprise rubber, such as nitrile rubber.

A plurality and preferably four of said vibration isolation attachment means may be provided.

Said subframe may be provided with buffer means to limit the range of movement of said subframe. Said buffer means may comprise a buffer comprising a further resiliently deformable member disposed such that each buffer faces a part of the chassis.

Said buffer means may be provided for limiting side to side motion and/or fore and aft motion of the subframe.

Buffer means for limiting fore and aft motion may comprise a pair of supports projecting generally vertically from said subframe section and having said buffers facing one another, said buffers being disposed so that a member of the chassis is disposed between said buffers.

Said buffer means for limiting fore and aft motion may comprise a mounting block having a relatively massive body having two, preferably generally vertical, projections which provide spaced parallel abutment surfaces, the block being attached beneath the subframe such that the projections pass through apertures in the subframe.

The chassis part may comprise a pair of generally parallel longitudinal members having a forward end and a rearward end, a first transverse member connected between said longitudinal members disposed towards the forward end of the longitudinal members, and a second transverse member disposed rearwardly of the first transverse member.

When buffer means for limiting fore and aft movement is provided wherein a member of the chassis is disposed between buffers, said second transverse member may comprise said member.

Said second transverse member may be a box section member.

Apertures may be provided in the chassis part with which attachment means may engage to attach said subframe to said chassis part.

Said apertures may be provided in projecting members extending inwardly from each longitudinal member.

Such apertures may also be provided in said second transverse member.

The subframe may comprise a generally flat forward section from which a pair of arms may project forwardly, a generally flat intermediate section disposed at a level below the forward section, an inclined section connecting the forward and intermediate sections and a further inclined section projecting upwardly and rearwardly of said intermediate section.

The subframe may be disposed such that the forward section projects generally forwardly of the second transverse member, and the rearward section projects generally rearwardly of said second transverse member.

Said attachment means may be provided in the forward section.

The wheel mounting means may be provided on the forward section and the engine mounting means may be provided on a rearward section.

The engine mounting means may comprise a plurality and preferably four towers, extending upwardly from the subframe. Each tower may comprise a pair of generally vertical members connected at their upper ends by a generally horizontal member.

The invention will now be described by way of example only with respect to the following diagrammatic drawings wherein

FIGURE 1 is a side view of a material handling vehicle of the kind specified,
FIGURE 2 is a front view of the machine of Figure 1,
FIGURE 3 is a rear view of the vehicle of Figure 1,
FIGURE 4 is an exploded view of a chassis section and subframe embodied in the vehicle of Figure 1.
FIGURE 5 is a cross-section through a vibration isolation attachment means embodied in the vehicle of Figures 1-4, and
FIGURE 6 is a cross-section through a buffer means of the vehicle shown in Figures 1-5.

Figures 1-3 show a machine of the kind specified at 10 having a front part 10a and a rear part 10b which are articulated together in conventional manner by an articulated joint shown at 10c and suitable hydraulic ram means 10d are provided between the rear part 10b and the front part 10a for steering movement about the articulation joint. For example, + or - about 45° of movement about a generally vertical axis may be provided for steering. In addition the articulation joint may provide a limited amount of movement in a generally vertical plane, for example of the order of + or - 10°.

The front part 10a has a front chassis part 11a which is connected to a rear chassis part 11b by the articulated joint 10c. The front chassis part 11a has a pair of front wheels 12 and a pair of vertical pillars 14 each of which carries an arm 15 of a boom assembly carrying at their forward ends a bucket 16 or other material handling implement. A drive means comprising a hydraulic ram 17 is connected between each pillar 14 and each arm 15 for raising and lowering the implement 16 about the pivotable connection to the pillars 14. A suitable crowd ram 17a is provided to tilt the material handling implement by a suitable linkage.

The rear chassis part 11b carries a pair of rear wheels 13, an operators station 18 in the form of an operators cab and an engine compartment 19 disposed at the rear of the cab 18.

Referring now to Figure 4, the rear chassis section part 11b comprises a pair of generally parallel plate like longitudinal members 21 connected at their forward ends by a box section transverse member 22 and rearwardly thereof by a second box section transverse member 23. Four apertures 24 are provided in the main rear chassis part 11b with which attachment means 40 are engaged. Said apertures 24 are located in the second transverse member 23 and in generally horizontal inward projections 25 attached to each of the longitudinal members 21.

A subframe 30 comprises apertures 31 for mounting means for a conventional rear axle 13b for the wheels 13, not shown in Figure 4 and a mounting means 32 for an engine E. The subframe comprises a generally flat forward section 33 from which a pair of arms 34 project forwardly. Apertures 35 corresponding to the apertures 24 in the main rear chassis section are provided in the forward section 33 and arms 34. The subframe 30 comprises a generally flat section 36 attached to the forward section 33 by an inclined part 37, and a further inclined section 38 projecting forwardly and upwardly of the part 36. Said engine mount 32 comprises towers having a pair of parallel generally vertical members 39 joined at the upper ends by a generally horizontal section 39a wherein resilient mounting means are provided to enable the engine to the attached to the mounts 32.

An attachment means 40 is shown in transverse section in Figure 5, comprising a bolt 51 which passes through a boss 57 welded to the upper surface of chassis part 11b, apertures 24 and 35 on the chassis part 11b and the subframe 30 respectively and has at its lower end a nut 52. Resiliently deformable vibration isolation members 53, 54 are disposed above and below the subframe 30. The vibration isolation members comprise nitrile rubber members having a shore hardness of 60-70 shore but may comprise other rubber members and may have a shore hardness lying in the range 50-80 and preferably 60-70 shore, or members which provide vibration isolation in any other desired way. A base plate 55 is disposed below vibration isolation member 54 and a spacer 56 is disposed within the aperture 35. The base plate 55, vibration isolation member 54 and 53, spacer 56, subframe 30, and chassis part 11b are held in contact by pressure applied by the bolt 51 and nut 52.

Buffer means are provided to limit the horizontal fore-and-after and side-to-side movement of the subframe.

The side-to-side buffer means comprise resiliently deformable buffer pads 42a disposed in D shaped apertures 42 formed in sides 43 of the rearward section 36

of the subframe, the buffer pads 42a facing outwards, and which abut adjacent parts 11c of the chassis part 11b.

Referring also to Figure 6, the fore-and-aft buffer means 41 is disposed on the forward section 33 on the longitudinal axis of the subframe 30 with buffer surfaces 41a facing one another. When the subframe 30 is attached to the rear chassis part 11b, the second transverse member 23 is disposed between the buffer surfaces 41a.

The fore-and-aft buffer means 41 shown in transverse section in Figure 6 comprises a relatively massive body 60 welded to the subframe 30 comprising vertical projections 61, 62 which passes through the subframe 30 and provide generally vertical surfaces 63, 64. Attached to these surfaces 63, 64 are two plates 65, 66 each having a non-circular recess 67, 68 adapted to hold a resiliently deformable pad 69, 70 having the buffer surfaces 41a. With the subframe 30 attached to the chassis part 11b, the pads 69, 70 engage the second transverse member 23 to restrict fore-and-aft movement to the subframe.

It will be appreciated that vibration isolation attachment means and buffer means may be disposed wherever is desirable.

The cab 18 is mounted in conventional manner by vibration isolation means to brackets 18a of the chassis part 11b.

If desired the invention may be embodied in any other kind of material handling vehicle. For example, a front end loader having a unitary chassis so that said front and rear chassis parts are an integral part of the unitary chassis.

The chassis may be of any desired configuration and the term is used herein to encompass a monocoque type construction where the or at least part of the body also provides a chassis.

The loader arm assembly may have a single arm, if desired. The implement may be carried on a back-hoe if desired or be slidable up and down a fork lift type mast.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, or a class or group of substances or compositions as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A material handling vehicle (10) comprising a chassis (11a, 11b), a pair of front and a pair of rear ground engageable wheels (12,13), a material handling implement (16) movably mounted on the vehicle (10), drive means (17) for moving the material handling implement (16) relative to the vehicle (10), an engine (E) for driving said rear wheels (13) and supplying power to said drive means (17) and a station (18) for an operator, a subframe (30) provided with mounting means for the rear wheels (13) and for the engine (E) and the subframe (30) being carried on a part of said chassis by vibration isolation attachment means (40).

2. A material handling vehicle according to claim 1 wherein the vehicle (10) is an articulated vehicle wherein said chassis part comprises a rear chassis part (11b) and the vehicle (10) also comprises a front chassis part (11a) which is articulated to the rear chassis part (11b) for steering movement relative thereto.

3. A material handling vehicle according to claim 2 wherein the rear chassis part (11b) carries said station (18) for an operator and wherein the front chassis part (11a) has said material handling implement (16) and said drive means (17) mounted thereon.

4. A material handling vehicle according to any one of the preceding claims wherein the material handling implement (16) is mounted for up and down movement.

5. A material handling vehicle according to any one of the preceding claims wherein the material handling implement (16) is mounted on a boom assembly (15) mounted for pivotable movement about a horizontal axis.

6. A material handling vehicle according to any one of the preceding claims wherein said vibration isolation attachment (40) means comprises a resiliently deformable member (33).

7. A material handling vehicle according to claim 6 wherein said vibration isolation attachment means (40) comprises a section of said chassis part (11b) which overlies a section of the subframe (30), a resiliently deformable member (53) disposed therebetween, and a rigid member (51) to restrain separation of, and extending generally perpendicular to, said section of the chassis part (11b) and said section of the subframe (30).

8. A material handling vehicle according to claim 7 wherein apertures (24,35) are provided in the chassis part (11b) and the subframe (30) and wherein said rigid member (51) comprises a bolt passing through said apertures (24,35).

9. A material handling vehicle according to claim 8 wherein the bolt passes through said resiliently deformable member (53) disposed between the sub-

frame (30) and the chassis part (11b), and through a further resiliently deformable member (54) disposed between the subframe (30), each resiliently deformable member (53,54) being in contact with the subframe (36), the resiliently deformable member (53) disposed between the subframe (30) and the chassis part (11b) also being in contact with the chassis part (11b), a base plate (55) being disposed below the lower resiliently deformable member (54) and in contact therewith.

10. A material handling vehicle according to claim 8 or claim 9 wherein the vibration isolation attachment (40) means further comprises a spacer (56) disposed within the aperture (35) in the subframe (30) and having a central bore through which the bolt (51) is passed.

11. A material handling vehicle according to any one of claims 8 to 10 wherein compressive force is applied to the vibration isolation attachment means (40) by means of a nut (52) attached to the bolt (51).

12. A material handling vehicle according to any one of claims 8 to 11 wherein said resiliently deformable member (53,54) comprises a generally flat body having a hole in which the bolt (51), or where appropriate the spacer (56), is received, a section projecting from the surface of the body being adapted to be received in an aperture of the subframe.

13. A material handling vehicle according to claim 12 wherein said resiliently deformable members (53,54) comprise rubber.

14. A material handling vehicle according to any one of the preceding claims wherein said subframe (30) is provided with buffer means (42a) for limiting side to side motion of the subframe (30).

15. A material handling vehicle according to any of the preceding wherein said subframe (30) is provided with buffer means (41) for limiting fore and aft motion of the subframe (30).

16. A material handling vehicle according to claim 15 wherein said buffer means (41) for limiting fore and aft motion comprises a pair of supports (61,62) projecting from said subframe section (30) and having resiliently deformable buffers (69,70) facing one another, said buffers (69,70) being disposed so that a member (23) of the chassis is disposed therebetween.

17. A material handling vehicle according to any of the preceding claims wherein the chassis part (11b) comprises a pair of generally parallel longitudinal members (21) having a forward end and a rearward end, a first transverse member (22) connected between said longitudinal members disposed towards the forward end of the longitudinal members, and a second transverse member (23) disposed rearward of the first transverse member (22), said second transverse member (23) being a box section member.

18. A material handling vehicle according to claim 17 wherein apertures (24) are provided in the chassis part (11b) with which said vibration isolation attachment means (40) may engage to attach said subframe (30) to said chassis part (11b), and wherein said apertures (24) are provided in projecting members (25) extending inwardly from each longitudinal member (21).

19. A material handling vehicle according to any one of the preceding claims wherein the subframe (30) comprises a generally flat forward section (33) from which a pair of arms (34) project forward, a generally flat intermediate section (36) disposed at a level below the forward section, an inclined section (37) connecting the forward (33) and intermediate (36) sections and a further inclined section (38) projecting upwardly and rearward of said intermediate section (36).

20. A material handling vehicle according to claim 19 where dependent on claim 17 or claim 18 wherein, the subframe (30) is disposed such that the forward section (33) projects generally forward of the second transverse member (23), and a rearward section (36) projects generally rearward of said second transverse member (23), said vibration isolation attachment means (40) and said mounting means for the rear wheels (13) being provided on the forward section (33) and said mounting means (32) for the engine being provided on the rearward section (36).

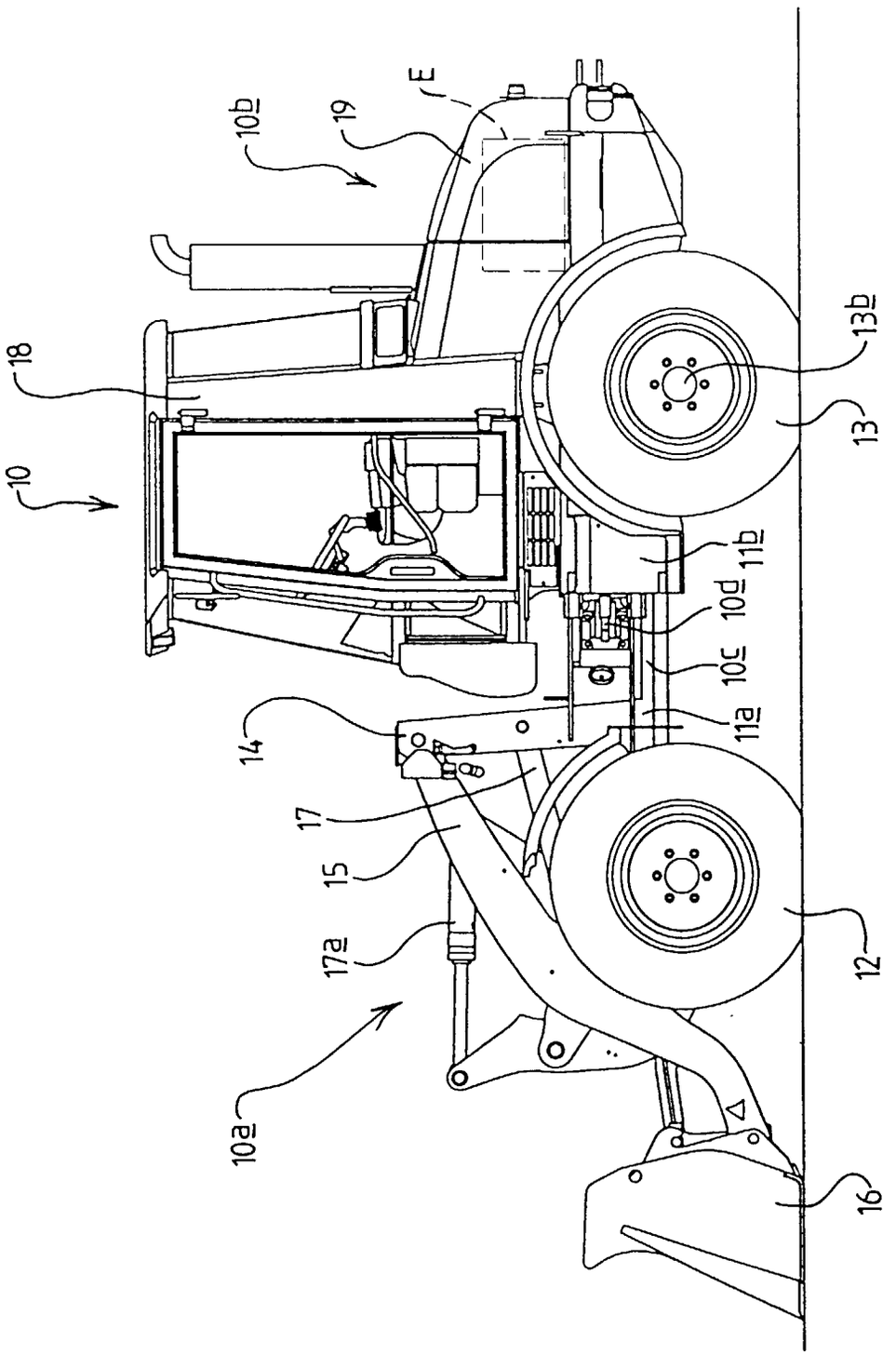
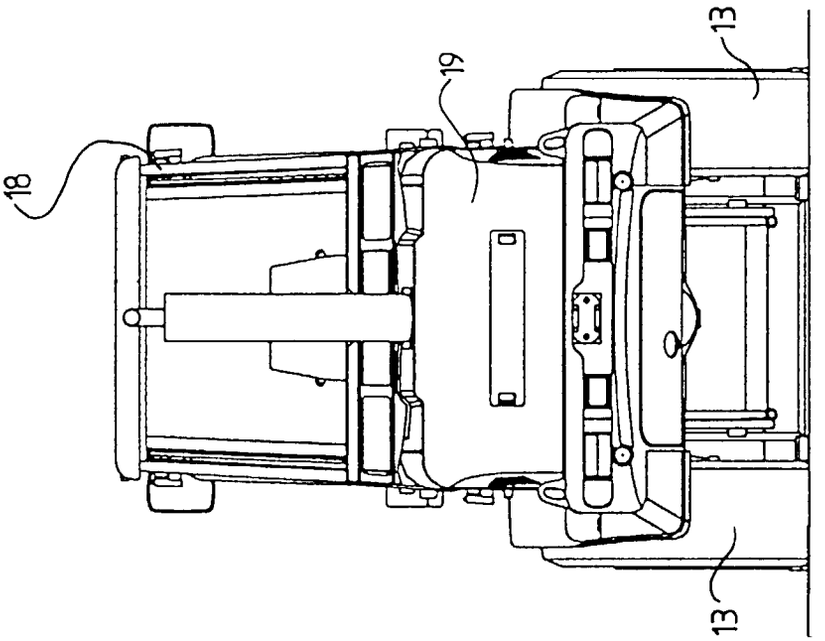


FIG 1



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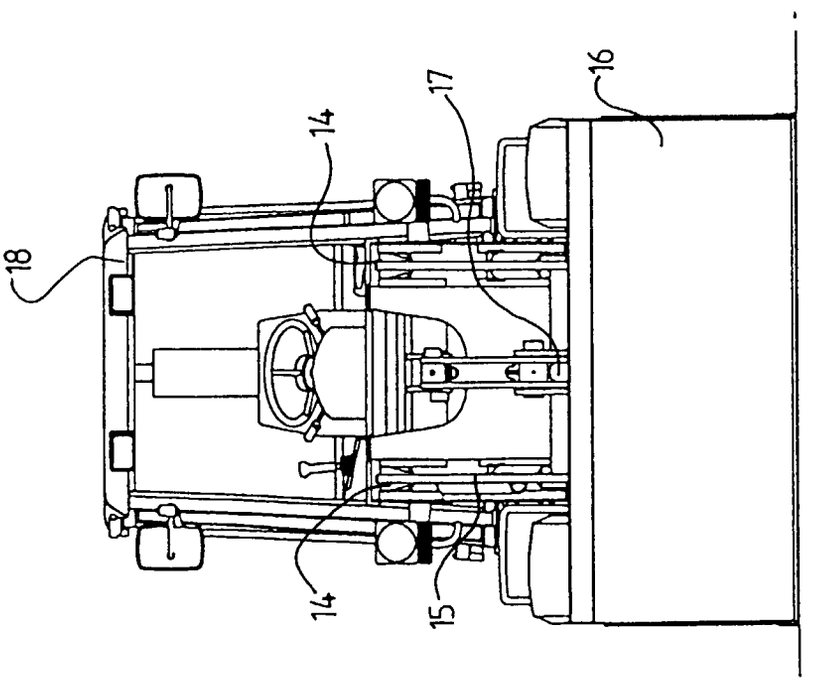

FIG 2

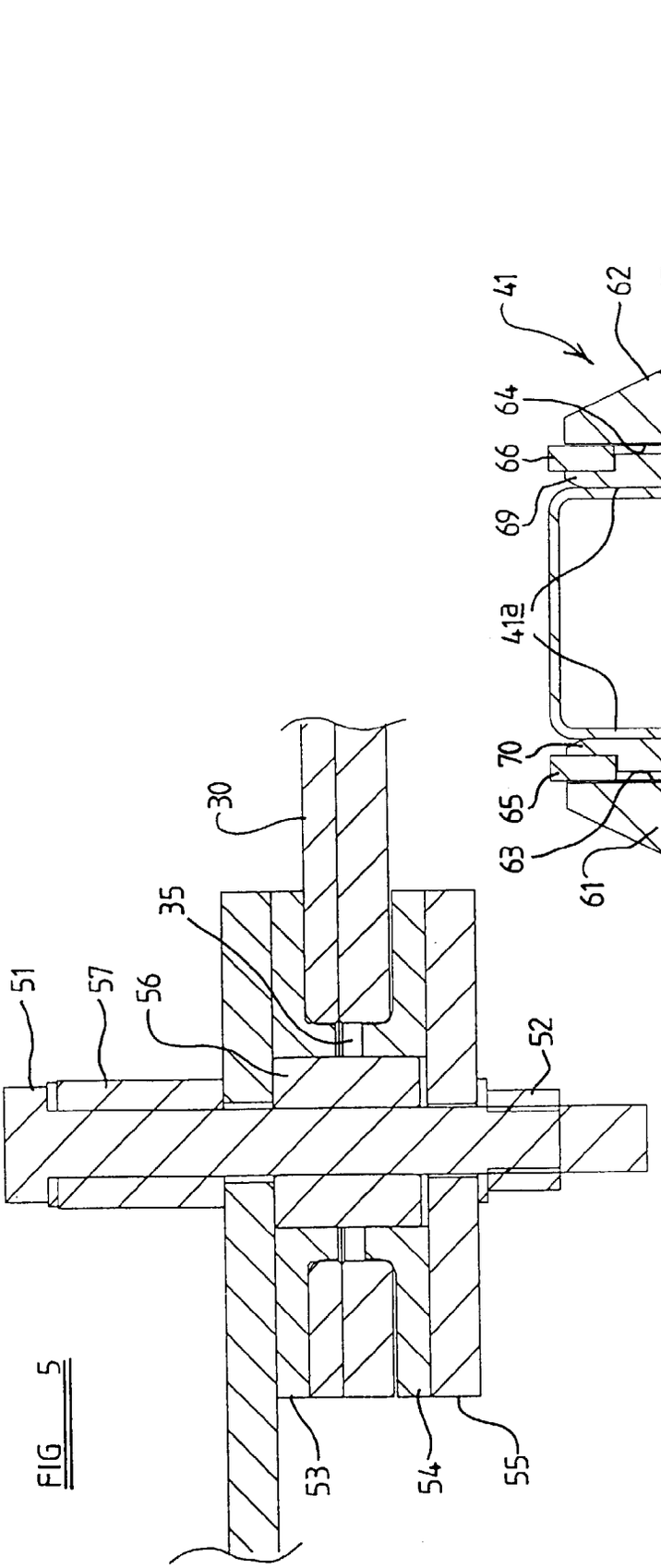

FIG 5

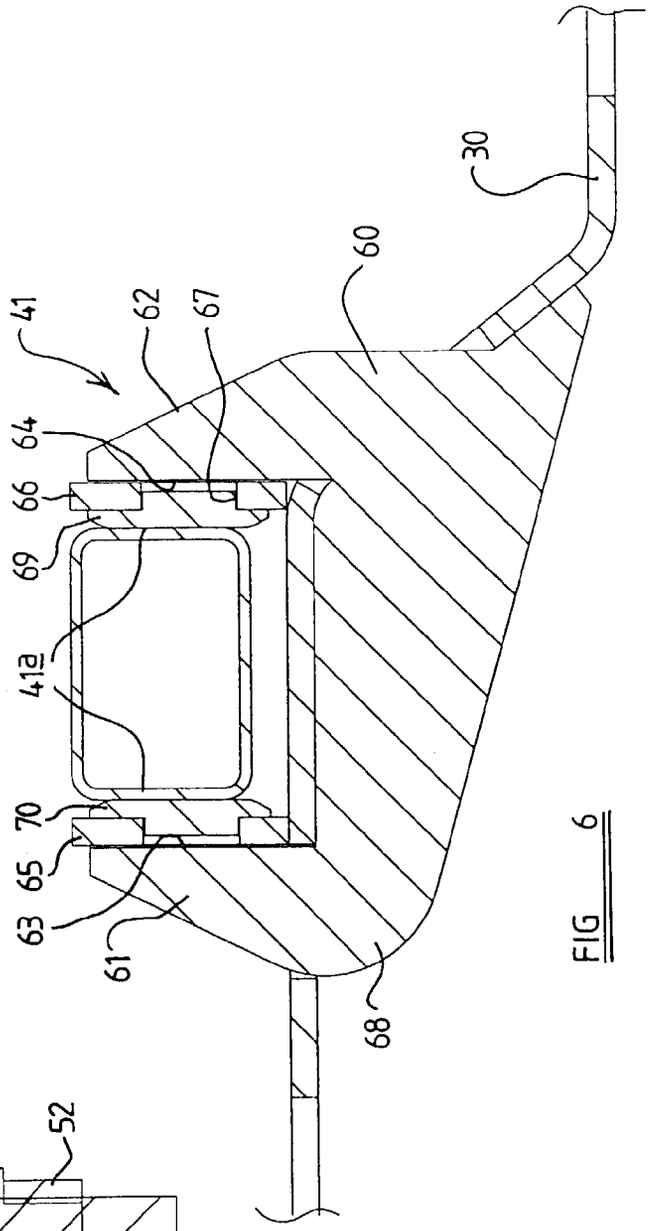

FIG 6

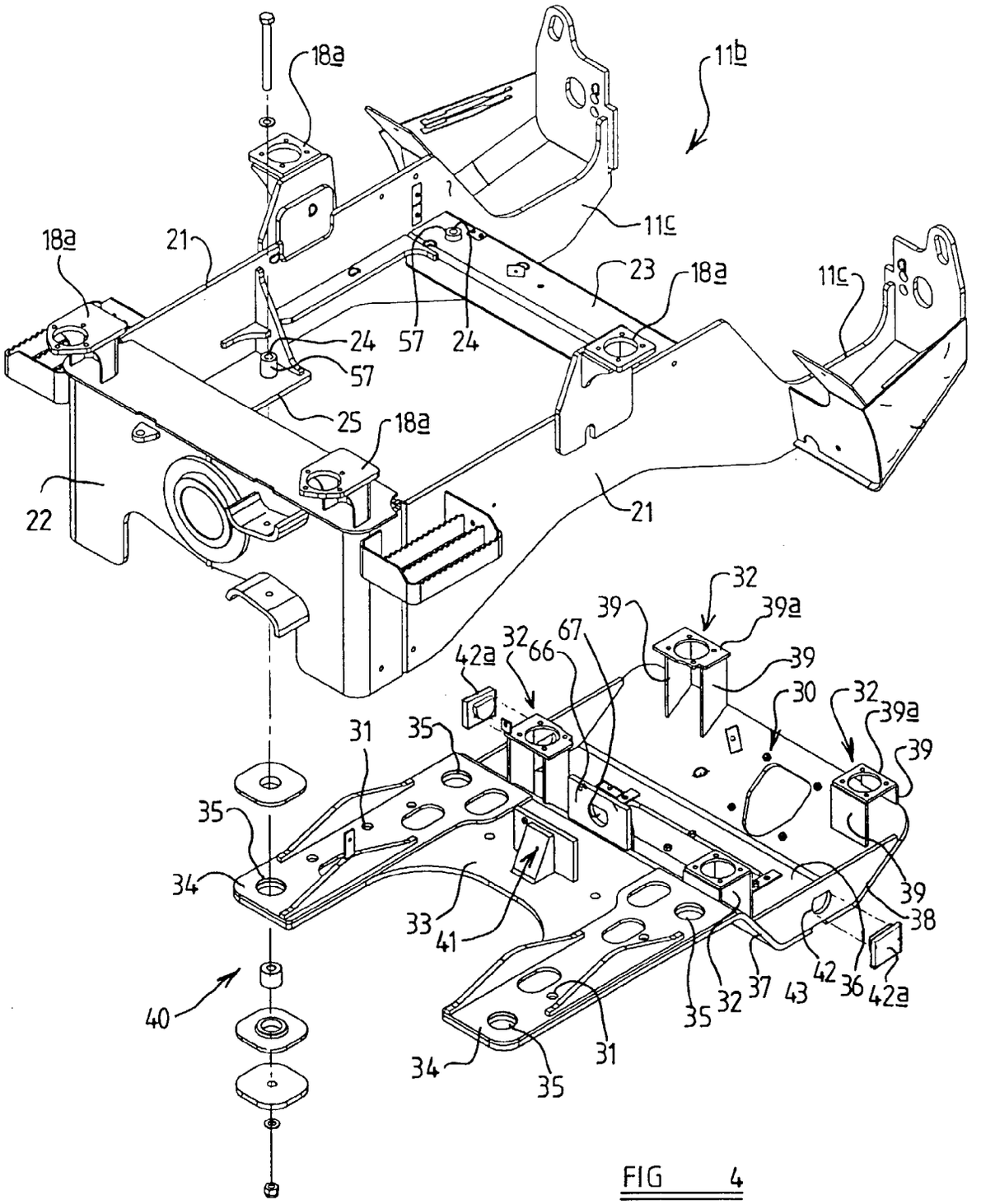
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FIG 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 7589

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.6)
A	EP 0 501 878 A (MITSUBISHI HEAVY IND LTD) * column 3, line 31 - line 43 * * figures 1,2,7,8 *	1,4,6	E02F9/08
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 047 (M-456), 25 February 1986 -& JP 60 197472 A (DAIHATSU KOGYO KK), 5 October 1985, * abstract * * figures 1-3,5 *	1,6-13	
A	DE 26 14 060 A (DRESSER IND) * page 6, paragraph 4 * * Zusammenfassung * * figures 2-5 *	1,2,6	
A	US 3 866 781 A (STEDMAN ROBERT N ET AL) * figure 3 * * column 3, line 5 - line 45 *	1	
A	FR 2 421 749 A (SCHOPF MASCH) * figure 3 * * page 8, line 34 - page 9, line 21 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E02F B62D B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 December 1997	Guthmuller, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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