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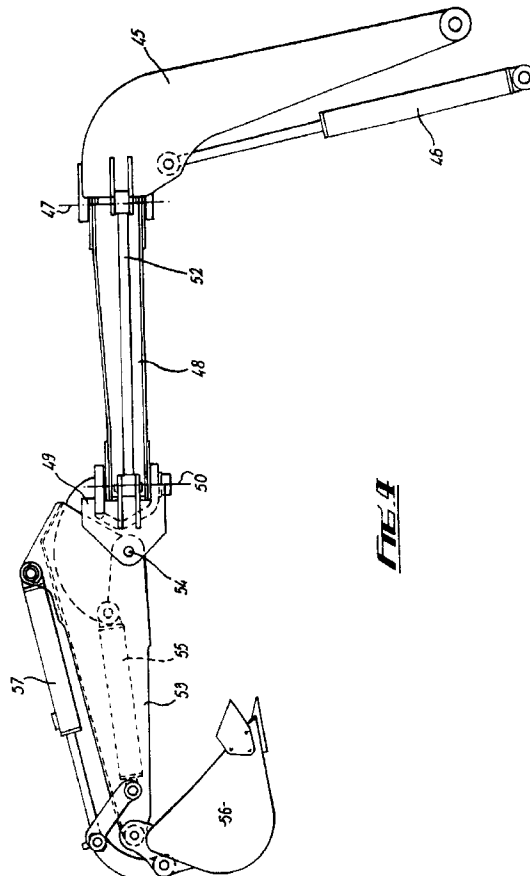
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(54) **Excavator with laterally displaceable arm**

(57) An excavator (40) has a digging member (44) comprising, in conventional manner, a second boom (48) connected to a first boom (45) which in turn is connected to the platform (41) of the excavator (40). A further body (49) is connected to both the free end of the

second boom (48) and a shovel arm (53). A piston and cylinder arrangement (55) extends between this body (49) and the shovel arm (53) so as to achieve vertical movement of the shovel arm (53). The piston and cylinder arrangement is wholly provided forwardly of the second pivot.



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Description

The present invention relates to an excavator and to a digging member for an excavator. The invention has particular, but not exclusive reference to vehicles commonly referred to as mini-excavators and to digging members therefor.

One known type of mini-excavator and its digging member is illustrated in Figs. 1 and 2. The mini-excavator 10 comprises a platform 11 mounted on a pair of tracks 12, 13. The platform 11 is rotatable through 360°. A driver's cabin is located on the platform 11. A digging member 14 is provided at the front of the platform 11. The digging member 14 comprises a first boom 15, the base of which is connected to the platform 11 via a horizontal pivot. A hydraulic piston and cylinder arrangement 16 is pivotally connected at its ends to the upper part of the first boom 15 and the platform 11 respectively. The free end of the upper part of the first boom 15 is connected via a vertical pivot 17 to a second boom 18. The second end of the second boom 18 is connected to a third boom 19 by a vertical pivot 20. This second end of the second boom 18 and the first boom 15 are connected by pivot joints to a hydraulic piston and cylinder arrangement 21. A further link 22 is pivotally connected at its ends to the first 15 and third booms 19 respectively in order to restrict sideways movement of the third boom 19 as a safety precaution. It is noted that the third boom 19 extends rearwardly of the pivotal connection 20 with the second boom 18.

An arm 23 extends forwardly of the third boom 19. The arm 23 is connected to the front of the third boom 19 by a horizontal pivot 24 such that the arm 23 may swing downwardly. The arm 23 is also pivotally connected to the rear of the third boom 19 by a hydraulic piston and cylinder arrangement 25. This piston and cylinder arrangement 25 is stored in a recess in the third boom 19. A shovel 26 is pivotally connected to the free end of the arm 23. The shovel 26 is also connected to the arm 23 by a hydraulic piston and cylinder arrangement 27.

In use lateral movement of the arm is achieved by displacing the third boom relative to the first boom. This inevitably leads to the rear of the third boom extending to the side of the first boom as is illustrated in Fig. 1. In this position the third boom and arm cylinder are exposed and are often damaged by objects in the working environment located around the machine. As a consequence the working space within which the machine may operate is limited if damage of the third boom and arm cylinder is to be avoided.

The present invention has been made from a consideration of this problem.

According to a first aspect of the present invention there is provided an excavator having a digging member, the digging member comprising:-

a first boom and a second boom, the second boom being connected by a first pivot to the first boom;

a further body, the further body being connected by a second pivot to the second boom;

an arm connected to the body by a third pivot so as to achieve substantially vertical motion of the arm, means being provided for moving the arm about the third pivot, said means being provided between the body and the arm, the said means not extending rearwardly of the second pivot.

According to a second aspect of the present invention there is provided an excavator digging member comprising:-

a first boom and a second boom, the second boom being connected by a first pivot to the first boom;

a further body, the further body being connected by a second pivot to the second boom;

an arm pivotally connected to the body by a third pivot so as to achieve substantially vertical motion of the arm, means being provided for moving the arm about the third pivot, said means being provided between the body and the arm, the said means not extending rearwardly of the second pivot.

The structure eliminates the need for an extension of the third boom to the rear of the pivotal connection between the second boom and body so as to accommodate a piston cylinder arrangement. Thus the excavator can work satisfactorily in more confined spaces. It is obviously the case that a small portion of the third body will be located to the rear of the second pivot in order for the pivot joint to securely mate with the third body. However the length of this portion will generally be less than a tenth of the length of the second boom.

Ideally the means for moving the arm comprises a pressure fluid operable piston and cylinder arrangement. Such arrangements are generally hydraulic or pneumatic. Preferably the ends of the piston and cylinder arrangement are connected to the arm and the third body. In a preferred embodiment of the invention the point of connection of the piston and cylinder arrangement with the third body is provided to the front of the second pivot. Ideally the piston and cylinder arrangement is stored in a recess in the arm.

The invention will now be described further, by way of example, with reference to the accompanying drawings wherein:-

Fig. 1 is a plan view of a prior art mini-excavator;

Fig. 2 is a side elevation of the digging arm of the excavator of Fig. 1;

Fig. 3 is a plan view of a mini-excavator in accordance with the present invention; and

Fig.4 is a side elevation of the digging area of the excavator of Fig.3.

The prior art of Figs. 1 and 2 has been discussed in detail in the introductory passages hereof, and will not be discussed further here.

Referring to Figs. 3 and 4 a mini-excavator 40 comprises a platform 41 mounted on a pair of tracks 42,43. The platform 41 is rotatable through 360°. A driver's cabin is located on the platform 41. A digging member 40 is provided at the front of the platform 41. The digging member 44 comprises a first boom 45 which is connected at its base to the platform 41 via a horizontal pivot. A hydraulic piston and cylinder arrangement 46 is pivotally connected at its ends to the upper part of the first boom 45 and the platform 41 respectively. The free end of the upper part of the first boom 45 is connected via a vertical pivot 47 to a second boom 48. The second end of the second boom 48 is connected to a third body 49 by a vertical pivot 50. This second end of the second boom 48 and the first boom 45 are connected by pivot joints to a hydraulic piston and cylinder arrangement 51. A further link 52 is optionally provided between the first boom 45 and third body 49 respectively in order to restrict lateral movement of the third body 49.

An arm 53 extends forwardly of the third body 49. The arm 53 is connected to the front of the third body 49 by a horizontal pivot 54 such that the arm 53 may swing downwardly. A hydraulic piston and cylinder arrangement 55 is pivotally connected at its ends to the arm 53 and the front of the third body 49. This piston and cylinder arrangement 55 is stored in a recess in the arm 53. It is noted that both points of attachment of this piston and cylinder arrangement are located in front of the pivotal attachment 50 between the second boom and third body. It is also noted that the third body does not extend to a substantial extent to the rear of the pivot 50 between the second boom 48 and body 49. A shovel 56 is pivotally connected to the free end of the arm 53. The shovel 56 is also connected to the arm 53 by a hydraulic piston and cylinder arrangement 57.

In use lateral movement of the arm 53 is achieved by displacing the arm 53 relative to the first boom 45. In this case the rear of the third body 49 does not extend rearwardly of the pivotal connection between the second boom 48 and the third body 49. As a consequence the machine may operate in smaller working spaces than known excavators.

It is to be understood that the above described embodiment of the invention is by way of illustration only. Many modifications and variations are possible.

Claims

1. An excavator having a digging member, the digging member comprising:-

a first boom and a second boom, the second boom being connected by a first pivot to the first boom;

a further body, the further body being connected by a second pivot to the second boom;

an arm connected to the body by a third pivot so as to achieve substantially vertical motion of the arm, means being provided for moving the arm about the third pivot, said means being provided between the body and the arm, the said means not extending rearwardly of the second pivot.

2. An excavator as claimed in claim 1, wherein the means for moving the arm about the third pivot comprises a pressure fluid operable piston and cylinder arrangement.

3. An excavator as claimed in claim 2, wherein the ends of the piston and cylinder arrangement are connected to the arm and the third body.

4. An excavator as claimed in claim 3, wherein the point of connection of the piston and cylinder arrangement with the third body is provided to the front of the second pivot.

5. An excavator as claimed in any of claims 2 to 4, wherein the piston and cylinder arrangement is stored in a recess in the arm.

6. An excavator as claimed in any preceding claim, wherein a portion of the third body is provided to the rear of the second pivot, the length of said portion being less than a tenth of the length of the second boom.

7. An excavator digging member comprising:

a first boom and a second boom, the second boom being connected by a first pivot to the first boom;

a further body, the further body being connected by a second pivot to the second boom;

an arm pivotally connected to the body by a third pivot so as to achieve substantially vertical motion of the arm, means being provided for moving the arm about the third pivot, said means being provided between the body and the arm, the said means not extending rearwardly of the second pivot.

8. An excavator digging member as claimed in claim 7, wherein the means for moving the arm about the third pivot comprises a pressure fluid operable piston and cylinder arrangement.

9. An excavator digging member as claimed in claim

8, wherein the ends of the piston and cylinder arrangement are connected to the arm of the third body.

10. An excavator as claimed in claim 9, wherein the point of connection of the piston and cylinder arrangement with the third body is provided to the front of the second pivot. 5
11. An excavator digging member as claimed in any of claims 8 to 10, wherein the piston and cylinder arrangement is stored in a recess in the arm. 10
12. An excavator as claimed in any of claims 8 to 11, wherein a portion of the third body is provided to the rear of the second pivot, the length of said portion being less than a tenth of the length of the second boom. 15

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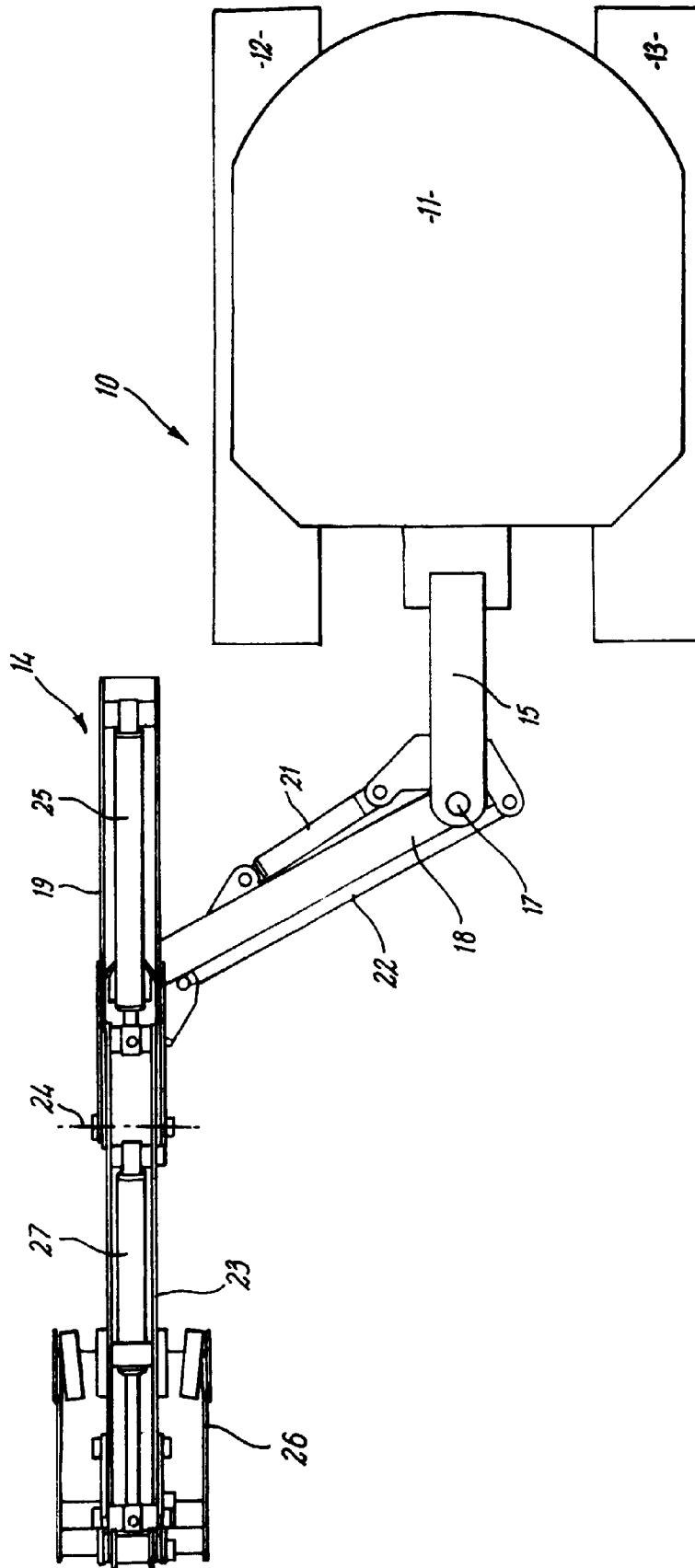
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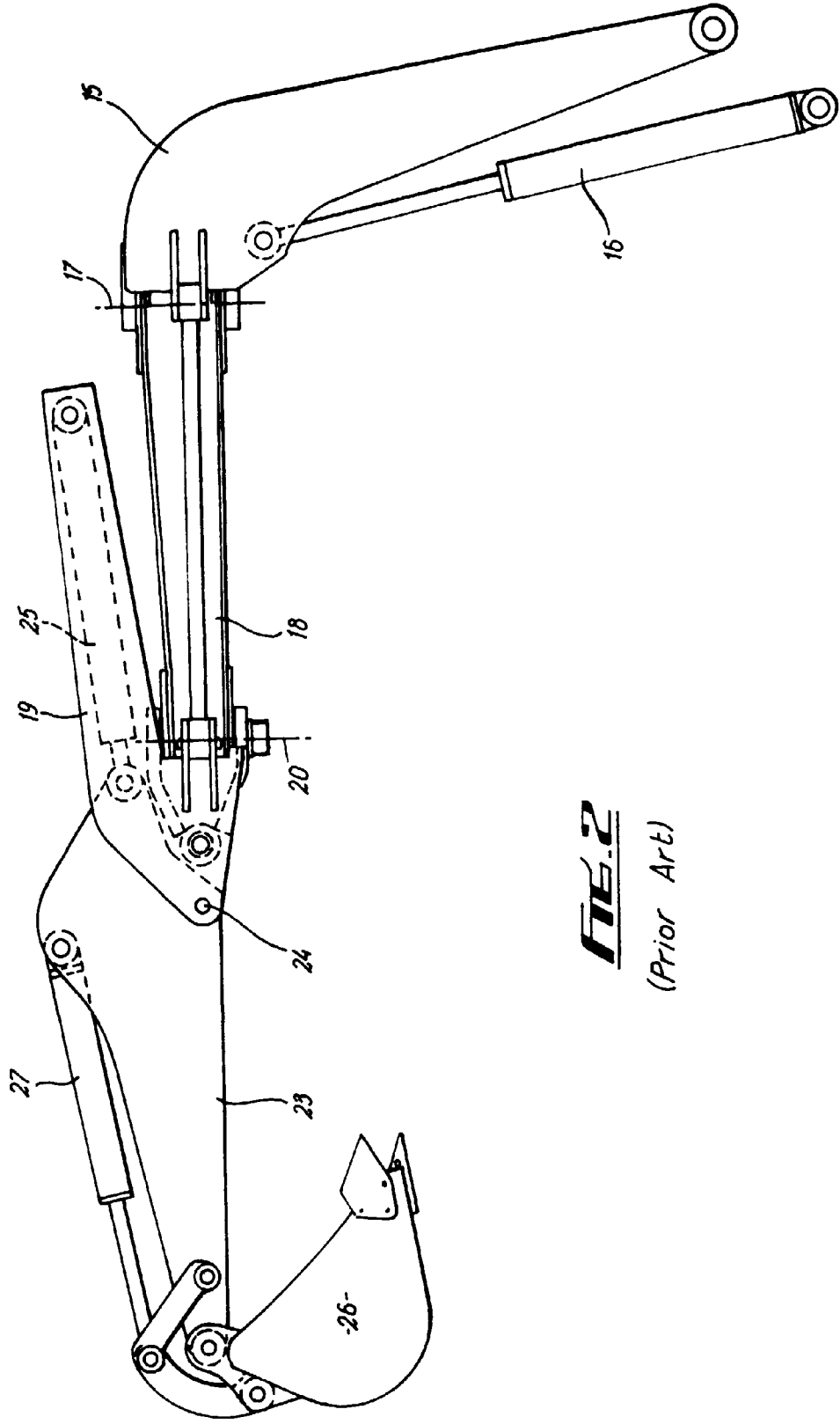
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FIE.1
(Prior Art)



FE.2
(Prior Art)

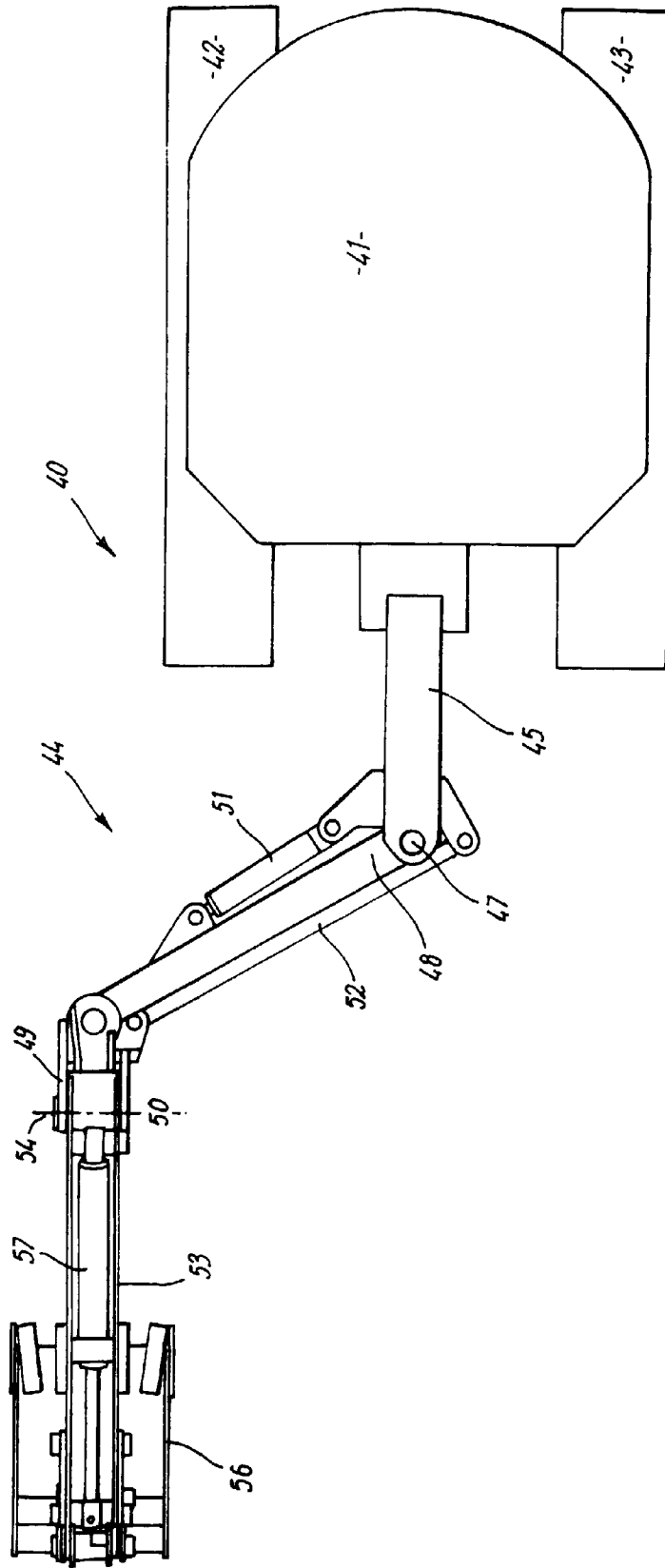


FIG. 3

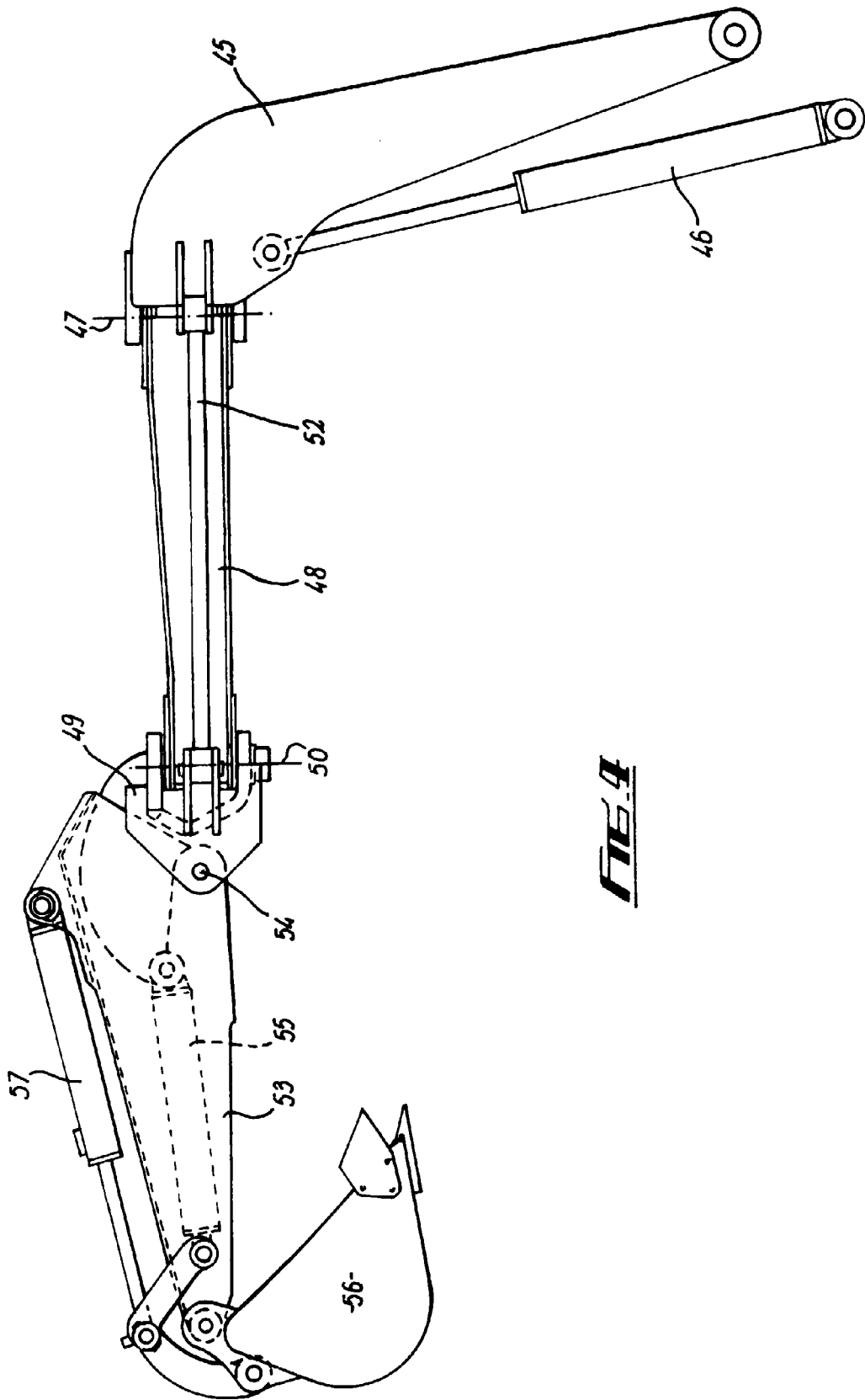


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 1964

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)
Y	DE-A-41 10 991 (KUBOTA KK) 17 October 1991 * the whole document * ---	1-12	E02F3/30
Y	WO-A-93 19252 (COMET ITR S P A) 30 September 1993 * the whole document * -----	1-12	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E02F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		19 June 1996	Estrela y Calpe, J
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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