

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 433 892 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
06.03.1996 Bulletin 1996/10

(51) Int Cl.⁶: **E02F 3/34**, E02F 3/38,
E02F 9/14

(21) Application number: **90124091.1**

(22) Date of filing: **13.12.1990**

(54) **A linkage system for making an equipment translate parallelly to itself, such equipment being carried by an excavator or by a basic machine**

Gestängesystem zum parallelen Bewegen eines an einem Bagger oder einer Grundbaumaschine angebrachten Arbeitsgerätes

Système de tiges pour le mouvement parallèle d'un outil de travail d'une excavatrice ou engin de terrassement

(84) Designated Contracting States:
BE DE ES FR GB IT NL

(30) Priority: **19.12.1989 IT 5356189 U**

(43) Date of publication of application:
26.06.1991 Bulletin 1991/26

(73) Proprietor: **SOILMEC S.p.A.**
I-47023 Cesena (Province of Forlì) (IT)

(72) Inventor: **Trevisani, Davide**
I-47023 Cesena (FO) (IT)

(74) Representative: **Lotti, Giorgio**
c/o Ing. Barzanò & Zanardo Milano S.p.A.
Corso Vittorio Emanuele II, 61
I-10128 Torino (IT)

(56) References cited:
FR-A- 2 537 183 **US-A- 4 103 791**
US-A- 4 364 705

EP 0 433 892 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

This invention refers to a linkage system for making a drilling equipment translate parallel to itself, the drilling equipment being carried by an excavator or basic machine. More specifically, the invention refers to an articulated parallelogram linkage system connecting drilling equipment and other similar equipment to the excavator carrying it. The mast of the drilling equipment is known to be connected to the excavator by means of an articulated linkage system which makes it translate keeping the equipment consistently parallel to its own original position.

These linkages usually consist of bars, frames and pistons so arranged as to keep constant parallelism of the drilling equipment while the geometry of the linkage changes during the various movements of the equipment.

In conventional systems, two hinge axles of the linkage plus one axle of the piston hinge are provided on the excavator or basic machine.

When a mass produced hydraulic machine or excavator is being used, problems arise for there are usually only two hinge points, one for the movements of a boom and the other for the actuator/s, respectively. This is the typical example of a boom excavator.

It is therefore obvious that the mounting of a drilling machine equipped with a linkage system involves the construction of a third pivoting point on the excavator frame. This is hard work, in that the hinge support must always be welded, with a consequent alteration of the basic structure of the machine.

The mounting operation on second-hand or new commercial excavators becomes even more complicated, in that the welding of the third hinge cannot be provided on the site and quite often requires the facilities of a good workshop.

Moreover, the need for another hinge point can cause troubles, should one ever require to reconvert the excavator to its original function.

Another drawback can be the fact that such a connection can alter the properties of the frame on which it is welded, making it weaker or at least making the original structure less reliable as a whole.

The prior art (see, for example, US-A-4 103 791 and US-A-4 364 705) discloses various kinds of excavators in which the attachment means connecting the shovel to the excavator normally comprise a stroke arm that is pivotally connected to the excavator and a shovel arm or directly to the shovel. The attachment means also comprise two piston-like actuators, of which one is used to rotate the stroke arm about the excavator, while the other one is used to rotate the shovel arm or the shovel directly with respect to the stroke arm.

These arrangements do not allow the actuators to move the shovel (or the shovel arm) along a circular trajectory maintaining it parallel to a given direction. The movement is not automatically a roto-translation motion,

unless the actuators are used in combination with control means including a step microprocessor that corrects the direction continuously.

FR-A-2 537 183 discloses a linkage for an excavator comprising two stroke arms having first ends pivotally mounted to the excavator and the opposite ends pivotally mounted on a shovel arm. A piston-like actuator is mounted between the excavator and the shovel arm for rotating the latter. The two stroke arms are disposed cross-like so that the front end of the shovel arm raises well above the circular trajectory when the actuator extends.

The linkage of this device is not capable of moving the shovel along a circular trajectory maintaining it parallel to a given direction.

The purpose of this invention is to obviate the above mentioned drawbacks by proposing a linkage system allowing to keep the structure of the new or existing multi-purpose commercial excavators unchanged, as two hinging points are sufficient to carry the drilling equipment.

For these and for other purposes which will be better understood later on, this invention provides a linkage system for connecting a drilling equipment to an excavator by which said linkage system is carried, the linkage system comprising:

a quadrilateral linkage comprising a first non-extendible rigid member and a second rigid non-extendible member, both for connecting the excavator to the drilling equipment, and one piston-like member for actuating said linkage system;

said first non-extendible rigid member, said second rigid non-extendible member and said piston-like member forming the linkage system having first end portions pivotally mounted to the excavator along no more than two separate and substantially parallel hinge axles located on the excavator; characterized in that the non-extendible rigid members each have a second end portion hinged through parallel hinge axles to a non-extendible rigid frame in turn hinged to the drilling equipment, so that the articulation points of said hinge axles form an articulated parallelogram with the excavator.

The subject of the invention will now be described referring to a few configurations which are, however, of equivalent validity, as being based on the same innovating principle.

Fig. 1 is the side view of the excavator with a drilling equipment and a linkage system according to this invention in a first arrangement and showing the drilling equipment in two different operational positions.

Fig. 2 is a sectional view of the linkage of

Fig. 1 illustrating some top-view details.
 Figs. 3 and 4 are views similar to Fig. 1 of two further configurations of the linkage system according to the invention.

First of all, reference is made to the configuration illustrated in Figs. 1 and 2.

An excavator 10 carries a drilling equipment generally indicated at 11, which is connected to the excavator 10 by means of an articulated parallelogram linkage 12 that allows the drilling equipment 11 to translate parallel to itself, as shown clearly by the drawings.

Reference is made to single parts as they are sideview represented, but obviously each part that is described is intended to have an equivalent side-mounted part so as to provide stability and reliability to the whole structure. The articulated parallelogram linkage 12 consists of a rigid boom 13, a rigid bar 14 and a piston 15. Boom 13 and bar 14 are hinged respectively at 16 and 17 to a frame 18, which is in turn hinged at 19 to the mast of drilling equipment 11.

Stem 21 of piston 15 is hinged at an intermediate point of boom 13.

The other end of boom 13 is hinged at 22 to the excavator 10, while bar 14 and piston 15 are hinged along one hinge axle 23 to the same excavator 10.

A preferred but not limiting embodiment of the hinging system is shown by Fig. 2, consisting of two side-mounted bars 14 rigidly joined by a cross-member 24 with respective fork-extensions 25. These have their ends connected to flanges 26 of the excavator 10 and lugs 27 of two side-mounted pistons 15 that pivot on the same shaft through pins 23.

As to the embodiment shown in Fig. 3, the same reference numbers have been used for parts corresponding to the ones already described in Fig. 1; this will apply also to the other embodiment, illustrated in Fig. 4.

The substantial difference between the arrangement of Fig. 3 and that of Figs. 1 and 2 is that piston 15 is now hinged in 30 to a lug 31 of boom 13, instead of being pivotally connected in hinge 23 of bar 14. Stem 21 of piston 15 is hinged in 32 directly to frame 18 instead of boom 13.

The arrangement shown in Fig. 4 is different from the previous ones in that piston 15 is pivoting in 33 of a lug 34 of bar 14, while stem 21 is hinged in 20 to boom 13, as in the case of the embodiment shown in Fig. 1.

In all the above mentioned cases, the pivoting points of linkage system 12 to the excavator 10 are provided along only two horizontal axles 22 and 23, which, in the case of a commercial excavator, are the hinging points provided for the attachment of the equipment that can be mounted to the excavator. Consequently, the excavator does not require any supplementary adapting parts, such as brackets to be welded on for extra hinge axles.

Should the excavators be new, of course the solution

herein provided by this invention allows to construct them in a simple way from the beginning, that is with only two hinge axles, as is normally required for all conventional equipment designed for being mounted on this kind of machines.

Claims

1. A linkage system (12) for connecting a drilling equipment (11) to an excavator (10) by which said linkage system is carried, the linkage system (12) comprising:

a quadrilateral linkage comprising a first non-extendible rigid member (13) and a second rigid non-extendible member (14), both for connecting the excavator (10) to the drilling equipment (11), and one piston-like member (15) for actuating said linkage system (12);

said first non-extendible rigid member (13), said second rigid non-extendible member (14) and said piston-like member (15) forming the linkage system (12) having first end portions pivotally mounted to the excavator (10) along no more than two separate and substantially parallel hinge axles (22, 23) located on the excavator (10); characterized in that the non-extendible rigid members (13, 14) each have a second end portion (16, 17) hinged through parallel hinge axles to a non-extendible rigid frame (18) in turn hinged to the drilling equipment (11), so that the articulation points (16, 17) of said hinge axles form an articulated parallelogram with the excavator (10).

2. A linkage system according to claim 1 wherein the actuating member (15) is hinged on one end (20) to said first rigid non-extendible member (13) and on the other end to the hinge axle (23) connecting the second rigid non-extendible member (14) to the excavator (10).

3. A linkage system according to claim 1 wherein the actuating member (15) is hinged on one end (32) to the rigid non-extendible frame (18) and on the other end (30) along the first rigid non-extendible member (13).

4. A linkage system according to claim 1 wherein the actuating member (15) is hinged on one end (20) along said first rigid non-extendible member (13) and on the other end (33) along said second rigid non-extendible member (14).

Patentansprüche

1. Ein Gestängesystem (12) zum Verbinden einer Bohrausrüstung (11) mit einem Bagger (10), von dem das Gestängesystem getragen wird, wobei das Gestängesystem (12) folgendes umfaßt:

ein vierseitiges Gestänge, das ein erstes nicht verlängerbares starres Element (13) und ein zweites starres nicht verlängerbares Element (14) umfaßt, die beide den Bagger (10) mit der Bohrausrüstung (11) verbinden, und ein kolbenähnliches Element (15), um das Gestängesystem (12) zu betätigen;

das erste nicht verlängerbare starre Element (13), das zweite starre nicht verlängerbare Element (14) und das kolbenähnliche Element (15) bilden das Gestängesystem (12), das erste Endabschnitte aufweist, die entlang nicht mehr als zwei getrennten und im wesentlichen parallelen Gelenkachsen (22, 23), die am Bagger angeordnet sind, schwenkbar am Bagger (10) montiert sind;

dadurch gekennzeichnet,

daß die nicht verlängerbaren starren Elemente (13, 14) jeweils einen zweiten Endabschnitt (16, 17) aufweisen, der durch parallele Gelenkachsen mit einem nicht verlängerbaren starren Rahmen (18) gelenkig verbunden ist, der wiederum gelenkig mit der Bohrausrüstung (11) in der Weise verbunden ist, daß die Gelenkknotenpunkte (16, 17) der Gelenkachsen ein gelenkiges Parallelogramm mit dem Bagger (10) bilden.

2. Ein Gestängesystem nach Anspruch 1, dadurch gekennzeichnet, daß das Betätigungselement (15) an einem Ende (20) mit dem ersten starren nicht verlängerbaren Element (13) und an dem anderen Ende mit der Gelenkachse (23) gelenkig verbunden ist, die das zweite starre nicht verlängerbare Element (14) mit dem Bagger (10) verbindet.

3. Ein Gestängesystem nach Anspruch 1, dadurch gekennzeichnet, daß das Betätigungselement (15) an einem Ende (32) mit dem starren nicht verlängerbaren Rahmen (18) und an dem anderen Ende (30) entlang des ersten starren nicht verlängerbaren Elements (13) gelenkig verbunden ist.

4. Ein Gestängesystem nach Anspruch 1, dadurch gekennzeichnet, daß das Betätigungselement (15) an einem Ende (20) entlang des ersten starren nicht verlängerbaren Elements (13) und an dem anderen Ende (33) entlang des zweiten starren nicht verlängerbaren Ele-

ments (14) gelenkig verbunden ist.

Revendications

1. Système d'articulation (12) pour connecter un équipement de forage (11) à une excavatrice (10) supportant ledit système d'articulation, le système d'articulation (12) comprenant :

une articulation quadrilatérale comprenant un premier élément rigide (13) non extensible et un deuxième élément rigide (14) non extensible, servant tous deux à connecter l'excavatrice (10) à l'équipement de forage (11), et un élément (15) du type vérin pour actionner ledit système d'articulation (12) ;

ledit premier élément rigide non extensible (13), ledit deuxième élément rigide non extensible (14) et ledit élément du type vérin (15) formant ledit système d'articulation (12) ayant des premières parties d'extrémité montées pivotantes sur l'excavatrice (10), selon, au plus, deux axes d'articulation (22, 23) distincts et sensiblement parallèles, se trouvant sur l'excavatrice (10) ; caractérisé en ce que les éléments rigides non extensibles (13, 14) ont chacun une deuxième partie d'extrémité (16, 17) articulée, via des axes d'articulation parallèles, à un cadre rigide (18) non extensible, articulé à son tour à l'équipement de forage (11), de telle manière que les points d'articulation (16, 17) desdits axes d'articulation forment un parallélogramme articulé avec l'excavatrice (10).

2. Système d'articulation selon la revendication 1, dans lequel l'élément d'actionnement (15) est articulé à une extrémité (20) audit premier élément rigide non extensible (13) et, par son autre extrémité, à l'axe d'articulation (23) connectant le deuxième élément rigide non extensible (14) à l'excavatrice (10).

3. Système d'articulation selon la revendication 1, dans lequel l'élément d'actionnement (15) est articulé par une extrémité (32) au cadre rigide non extensible (18) et, par son autre extrémité (30), au premier élément rigide non extensible (13).

4. Système d'articulation selon la revendication 1, dans lequel l'élément d'actionnement (15) est articulé par une extrémité (20) audit premier élément rigide non extensible (13) et, par son autre extrémité (32), audit deuxième élément rigide non extensible (14).

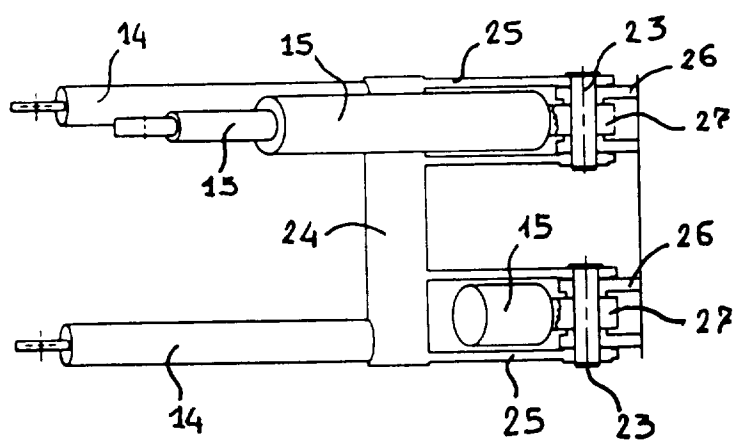
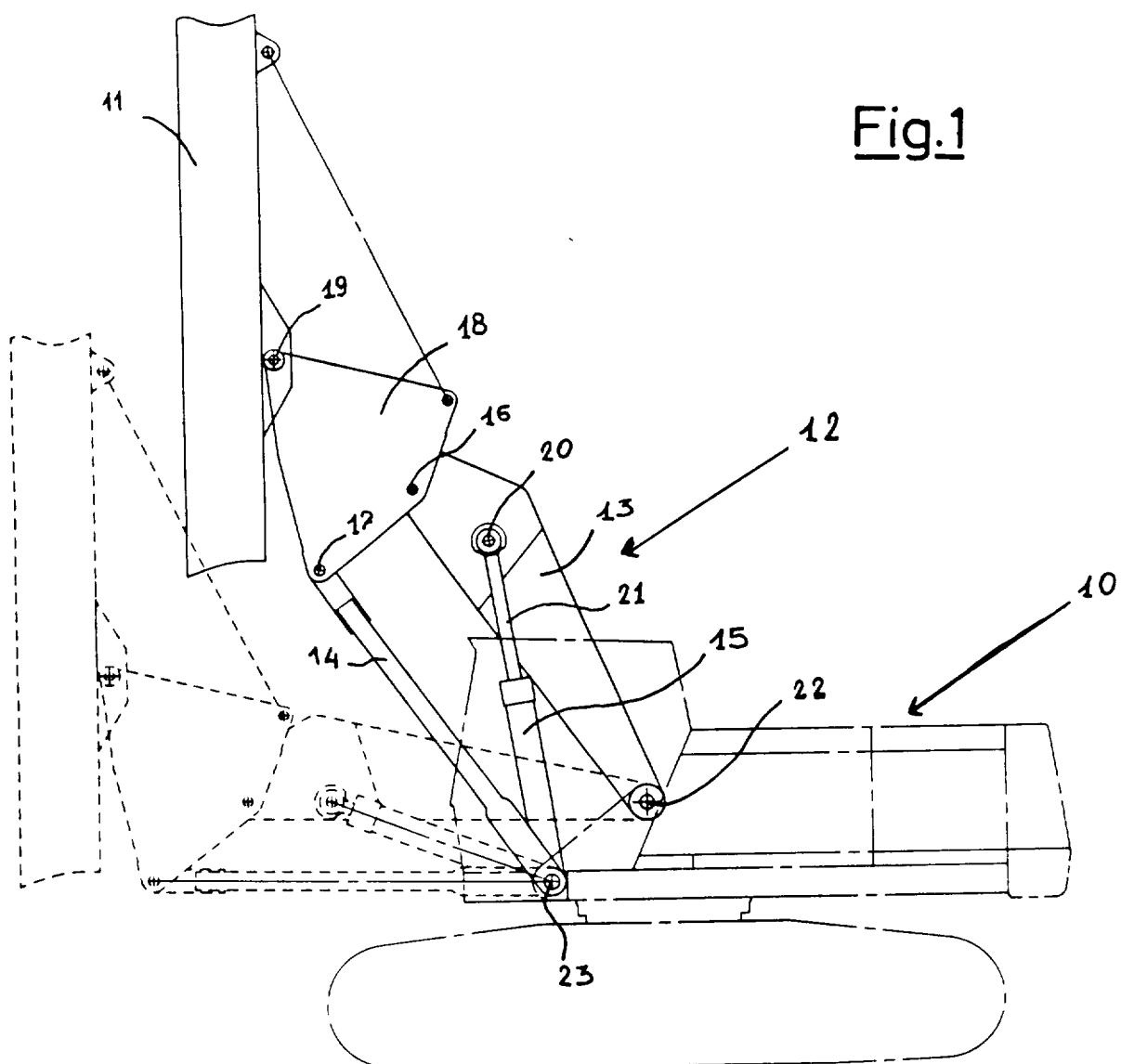


Fig. 3

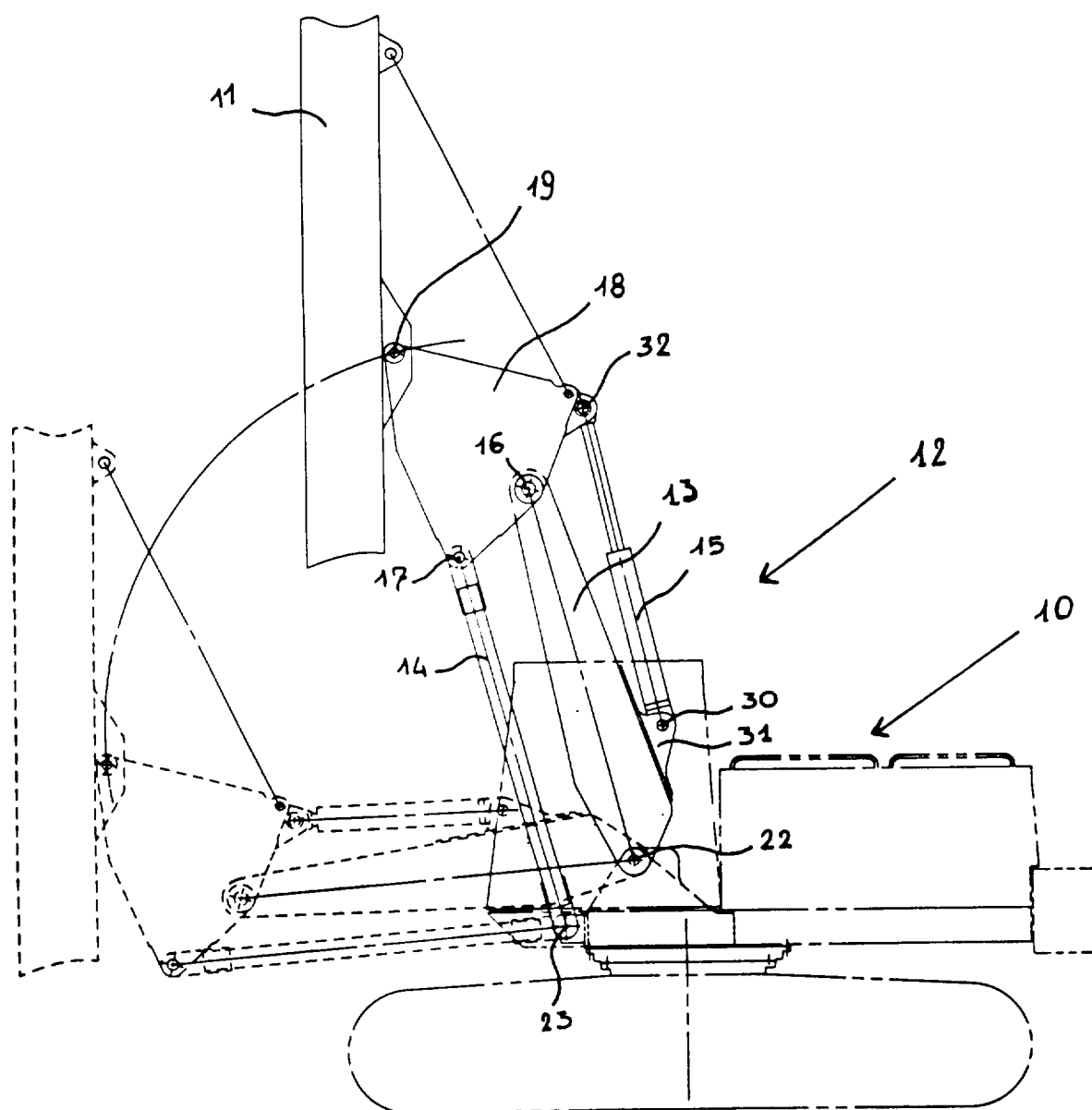


Fig.4

