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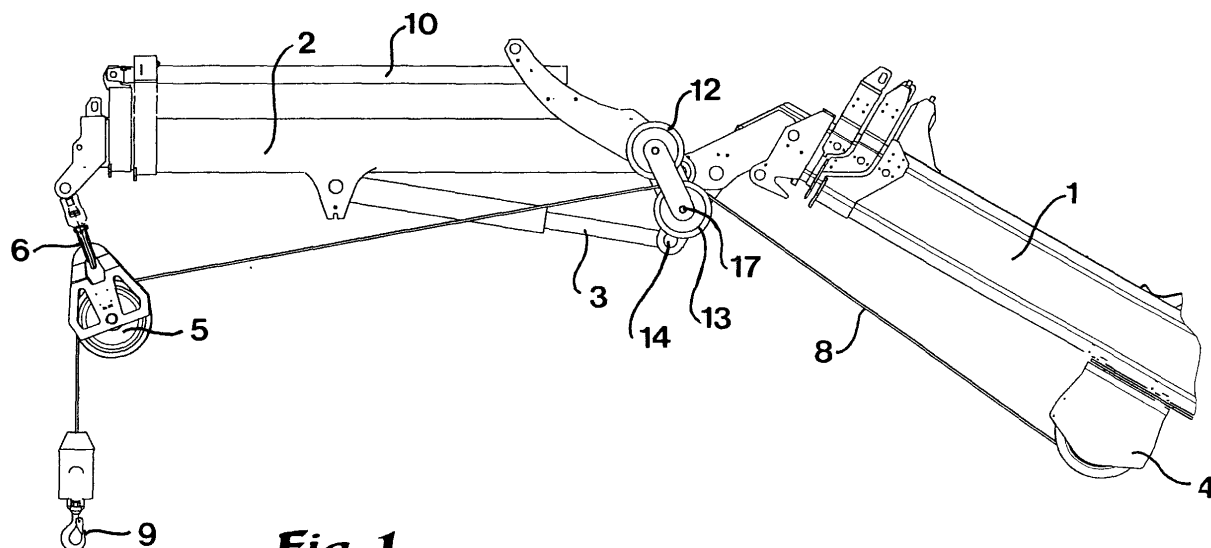
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(54) **A crane**

(57) A crane, comprising a first arm (1) and a second arm (2) that are interconnected with each other, wherein the second arm (2) is pivotally arranged in relation to the first arm (1), and wherein a longitudinal axis of the first arm (1) and a longitudinal axis of the second arm (2) extend in a common, plane which is also the pivot plane of the second arm (2), and comprising a winch device

(4) arranged on the first arm (1) and provided with a wire (8), and a pulley device (5) arranged on the second arm (2), and a wire guide (7) that is arranged between the winch device (4) and the pulley device (5), the wire (8) extending from the winch via the wire guide (7) to the pulley device (5). The wire (8) is redirected by the wire guide (7) in the region of the pivot centre between the first and second arm (2).



**Fig 1**

EP 1 477 450 A1

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a crane, comprising a first arm and a second arm that are interconnected, wherein the second arm is pivotally arranged in relation to the first arm, and wherein a longitudinal axis of the first arm and a longitudinal axis of the second arm extend in a common, plane which is also the pivot plane of the second arm, and comprising a winch device arranged on the first arm and provided with a wire, and a pulley device arranged on the second arm, and a wire guide arranged between the winch device and the pulley device, the wire extending from the winch via the wire guide to the pulley device.

**[0002]** The crane according to the invention particularly belongs to the type of cranes that are used as piece goods cranes, for example on trucks and the like, and that comprises a hydraulic cylinder/ piston unit for pivoting the second arm in relation to the first arm, one end of said unit being connected to the first arm and the second end thereof being connected to the second arm.

**[0003]** In particular the crane belongs to the type of cranes where one of the arms, here the second arm, is pivotal in two opposite angular directions outgoing from the position in which the second arm is generally in alignment with the first arm. Preferably, the second arm is pivotal more than 180° in one of the directions in order to permit it to be folded or pivoted into a position in which it extends beside the first arm, thereby reducing the total length of the first and second arms to a length corresponding to the one of the first arm.

**[0004]** "Wire guide" should be regarded in broad sense and may include any kind of guide that is suitable for the purpose of re-directing or supporting a wire running from a winch on the first arm to a pulley on the second arm.

**[0005]** Also the term "pulley" should be regarded in a broad sense, and may include any kind of guide member of re-directing member via which a wire end is connected to a crane hook or the like.

**[0006]** In the particular, the second arm is an end arm in a set of interconnected arms that form part of the crane according to the invention. The second arm, as well as the first arm, may be extendable and may comprise a plurality of sub-arms arranged in a telescopic manner.

**[0007]** In the context of this invention "winch" may also be referred to as "lifting winch".

### BACKGROUND OF THE INVENTION

**[0008]** By piece goods cranes of today an end arm, the remote arm, in a set of interconnected arms forming part of the crane is often pivotal in two opposite angular directions outgoing from the position in which the arm in question is generally in alignment with the adjacent

arm. In other words, both negative and positive angles between the end arm and the adjacent arm are possible outgoing from the position in which these arms are generally in alignment with each other.

**[0009]** Since there are crane operations by which it is desirable to lift an object by means of a wire from the crane rather than by means of a hook or the like that is directly attached to the end of the crane, it is also desirable to provide a winch solution that permits a wire to be guided from a winch on the adjacent arm to a pulley arranged at the free end of an end arm such as a jib, and that permits the end arm to be pivoted to both negative and positive angles in relation to the adjacent arm without the wire interfering with the second arm or with a cylinder-piston unit for pivoting the end arm in relation to the adjacent arm.

**[0010]** It is also desirable to have a crane that permits pivotation of the second arm in relation to the first arm without thereby having a change in the wire length required between the winch and the pulley device. In other words, it is desirable to avoid length changes of the wire during pivotation of the second arm.

### PRIOR ART

**[0011]** Prior art includes a solution by which a lifting winch is attached to a first arm and a pulley is attached to a second arm of a piece goods crane, the second arm being pivotal in relation the first arm by means of a hydraulic cylinder-piston unit. A wire guide that comprises a wire support roll is connected to the second arm. There is also provided a second roll, the task of which is to act as a guide aid for preventing the wire from losing its engagement with the first roll, which is the main guide element. The wire guide is arranged generally in the common plane of the longitudinal axes of the first and second arms at a given distance from the second arm in order not to interfere with an adjacent cylinder-piston unit for generating the pivotation movement of the second arm.

**[0012]** However, the position and arrangement of the wire guide according to prior art necessitates an adjustment of the wire length between the winch and the pulley if the second arm is pivoted and a given wire length from the pulley to the wire end is to be kept constant.

### THE OBJECT OF THE INVENTION

**[0013]** It is a primary object of the present invention to present a crane as initially defined that does not necessitate an adjustment of the wire length between the winch and the pulley if the second arm is pivoted and a given wire length from the pulley to the wire end is to be kept constant.

**[0014]** Further, it is an object of the present invention to present a crane as initially defined the wire of which does not interfere with any cylinder-piston unit or any other vital part of the crane irrespectively of the pivota-

tion direction of the second arm, outgoing from a position in which the second arm is generally in alignment with the first arm. In other words, the second arm shall be able to pivot both above a common horizontal plane in which the longitudinal axes of both the first arm and the second arm extends when in alignment with each other, the horizontal plane being generally perpendicular to the pivotation plane of the second arm.

#### BRIEF DESCRIPTION OF THE INVENTION

**[0015]** The primary object of the invention is achieved by means of the initially defined crane, characterised in that the wire is guided by the wire guide in the region of the pivot centre between the first and second arm. The pivot centre is referred to as a line or axis around which the pivotation between the first and second arms takes place. The invention is not delimited to an embodiment in which the wire passes through the region of the pivot centre in the same plane as the common plane of the longitudinal axis of the first and second arms and the pivotation plane of the second arm.

**[0016]** According to a preferred embodiment the secondary object of the invention is achieved by means of the inventive crane, further characterised in that the wire guide is laterally displaced with regard to said common plane, such that the wire extends laterally beside said second arm. The wire need not extend laterally beside the second arm all over the length thereof. It suffices that it extends so far a distance laterally that it goes free from vital operational parts such as any cylinder-piston unit arranged on the second arm. Of course, the wire must also be laterally displaced to such an extent that vital parts located along the first arm are not interfered by the wire. The winch may, but need not, be arranged generally in alignment with the first arm, i.e. not laterally displaced in relation to said common plane of the longitudinal axes of the first and second arms.

**[0017]** According to yet another preferred embodiment the wire intersects the pivot axis in the region in which it is redirected by the wire guide. By actually letting the wire go through or pass very close to the pivotation centre axis a minimum of wire length change, if any, will be needed during operation when the second arm is pivoted and the length of wire between pulley and free wire end is to be kept constant.

**[0018]** Preferably, the wire guide comprises a first guide element and a second guide element with an intermediate spacing therebetween, the wire extending through said spacing and being mainly supported either by the first guide element or by the second guide element depending on the pivot angle between the first and second arms. Thereby, full support is given by the wire guide also when pivotation angles above the horizontal plane (see definition above) are applied.

**[0019]** According to a preferred embodiment, the crane comprises a cylinder/ piston unit connected in one end to the second arm and connected in another end,

via a first pivotal link, to the first arm, and comprising a second pivotal link that is connected in one end to the second arm and in another end to the first link, the wire guide being fastened to the second link. By connecting the wire guide directly to this link, advantage is taken of a component already existing on the crane for the purpose of positioning the wire guide.

**[0020]** Preferably, the second link is connected to the second arm via a first tap extending through the link and through the second arm, and to the first link via a second tap extending through the second link and through the first link, said first and second rolls being rotatably arranged on the first tap and the second tap respectively.

**[0021]** Further features and advantages of the present invention are disclosed in the remaining dependent claims as well as in the following detailed description of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0022]** The invention will be further described by way of example with regard to the following drawings, on which:

Fig. 1 is a perspective view of a crane according to the invention,

Fig. 2 is a side view of the crane in fig. 1, from a first direction,

Fig. 3 is a side view of the crane in fig. 2, from an opposite direction and in a different pivotal position,

Fig. 4 is a view from below of the crane according to figs. 1-3, and

Fig. 5 is a side view of a crane according to prior art.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0023]** The crane according to the invention comprises a first arm 1, a second arm 2, and a hydraulic cylinder-piston unit 3 for pivoting the second arm 2 in relation to the first arm 1. It further comprises a winch 4 attached to the first arm 1, a pulley 5 attached to a hook 6 at the remote free end of the second arm 2, and a wire guide 7 between the winch 4 and the pulley 5. The longitudinal axes of the first and second arms 1, 2 extend in a common vertical plane, which is also the pivotation plane of the second arm 2 when the crane is in an upright operative position.

**[0024]** Running from the winch 4 to the pulley 5 is a wire 8, preferably made of steel. The wire 8 is wound on the winch 4 and runs through the pulley 5 to its free end, where it is attached to a hook 9.

**[0025]** The second arm 2 is extendable since it consists of two sub-arms that are slidingly and telescopically arranged in relation to each other and the telescopic

function is provided for by means of a hydraulic second cylinder-piston unit 10.

**[0026]** Preferably, there is provided a powered, e.g. electrically or hydraulically, motor 11 on the winch 4 for the purpose of winching the wire 8. Some kind of brake mechanism (not shown) should also be arranged by the winch 4 for the purpose of preventing unwanted outlet of the wire 8.

**[0027]** The winch 4 is arranged on the lower side of the first arm 1. Here, the first arm 1 comprises a beam with a generally rectangular cross-section, the winch 4 accordingly being attached to the lower wall of said beam and pointing downwards from the arm 1 when the latter extends horizontally.

**[0028]** The wire guide 7 comprises a first guide element 12 and a second guide element 13 with an intermediate spacing therebetween, the wire 8 extending through said spacing and being mainly supported either by the first guide element 12 or by the second guide element 13 depending on the pivot angle between the first and second arms 1, 2. Here, the first guide element 12 comprises a first roll and the second guide element 13 comprises a second roll, said rolls being generally parallel to each other, and said spacing being present between the outer peripheries of the rolls 12, 13. The rolls are parallel to each other in the sense that the outer peripheries thereof, against which the wire 8 is supposed to rest, extend in a common plane. This plane is parallel to the common vertical plane of the longitudinal axes of the arms 1, 2, which is the same plane as the pivotation plane of the second arm 2. When the wire is a steel wire, the diameter of each roll must be above a lower limit in order to prevent excessive bending of the wire in the bending zone in which it is re-directed by the rolls 12, 13.

**[0029]** The wire is re-directed by the wire guide in the region of pivot centre axis of the second arm 2 in relation to the first arm 1. The pivot centre axis coincides with the centre axis of a shaft or tap 18 that penetrates the adjacent ends of the arms 1, 2 in a direction perpendicular to the pivotation plane of the second arm, thereby interconnecting said arms 1, 2. Preferably, the wire 8 is in contact with, resting against the wire guide 7 at the point where it crosses the pivot centre axis region.

**[0030]** The cylinder/piston unit 3 is connected in one end to the second arm 2 and connected in another end, via a first pivotal link 14, to the first arm 1. There is also a second pivotal link 15 that is connected in one end to the second arm 2 and in another end to the first link 14, the wire guide 7 being connected to and fastened to the second link 15. The second link 15 comprises two shanks, one on each lateral side of the second arm 2. Said shanks are connected to each other by means of a first tap 16 extending through the first shank, laterally penetrating a hole in the second arm, and through the second shank of the second link 15. The shanks of second link 15 are also connected to each other by a second tap 17 extending laterally through the first shank, the first link 14 and the second shank.

**[0031]** The first and second rolls 12, 13 are penetrated by and are arranged on the first tap 16 and the second tap 17 respectively, laterally outside said the adjacent shank of the second link 15. The pivotation centre axis coincides and is defined by a tap or shaft 18 extending through an end portion 19 of the first arm 1 and an end portion 20 of the second arm 2. End portion 20 of the first arm 1 comprises two shanks that are in overlapping engagement with corresponding shanks of end portion 20 of the second arm 2. The pivotation centre axis intersects the second link 15 approximately in the middle between the first tap 16 and the second tap 17 thereof. Thus, the pivotation centre axis crosses a region in which the spacing between the first and second guide elements 12, 13 is at a minimum, given that the width or diameter of the guide elements 12, 13 is equal and that the holes for the taps 16, 17 in the second link 15 are at equal distance from the point where the link is intersected by the pivotation centre axis and on opposite sides of that point along a straight line. Of course, other solutions, resulting in a re-direction of the wire through the pivotation centre of the arm 1, 2 are also within the scope of the invention.

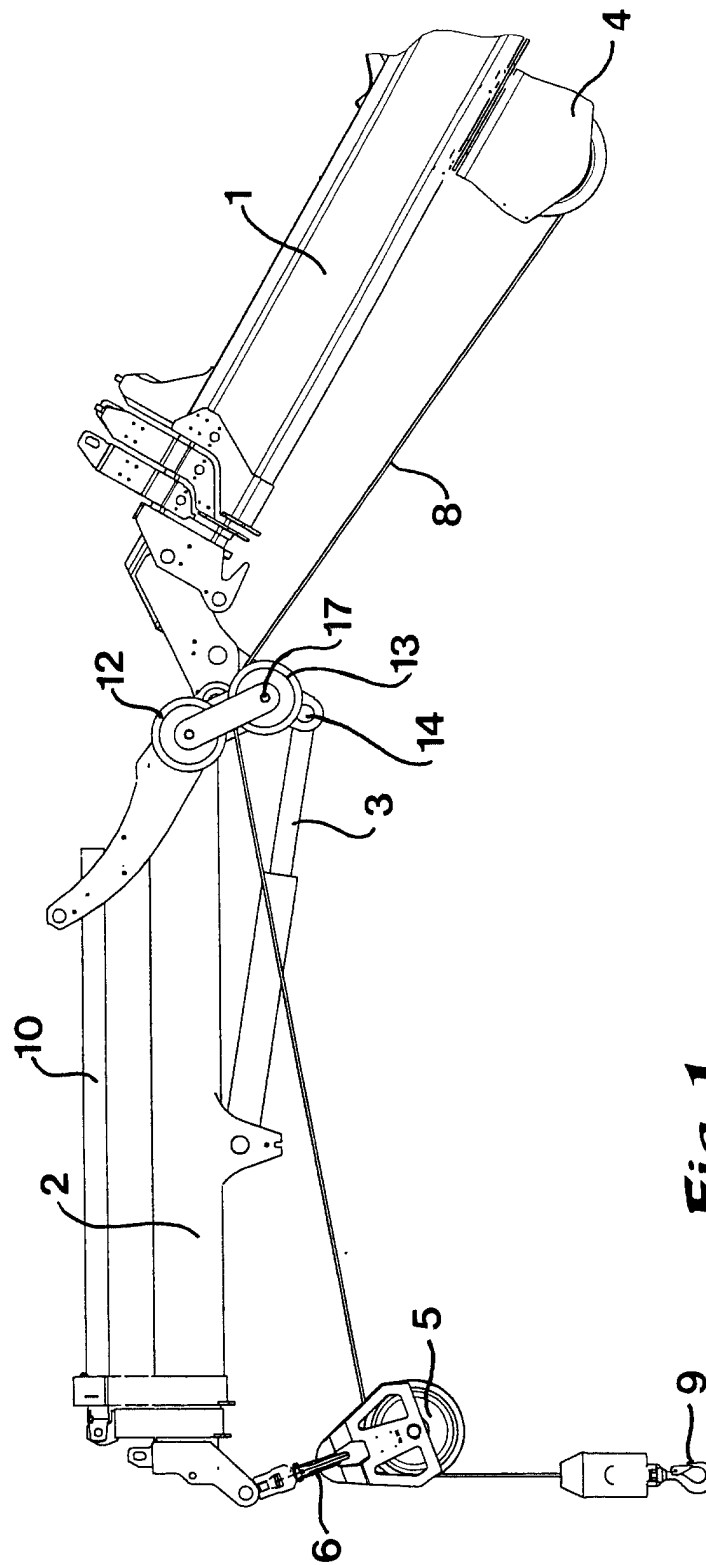
**[0032]** It should be realised that the above presentation of the invention has been made by way of example, and that alternative embodiments will be obvious for a man skilled in the art. However, the scope of protection claimed is defined in the patent claims supported by the description and the annexed drawings.

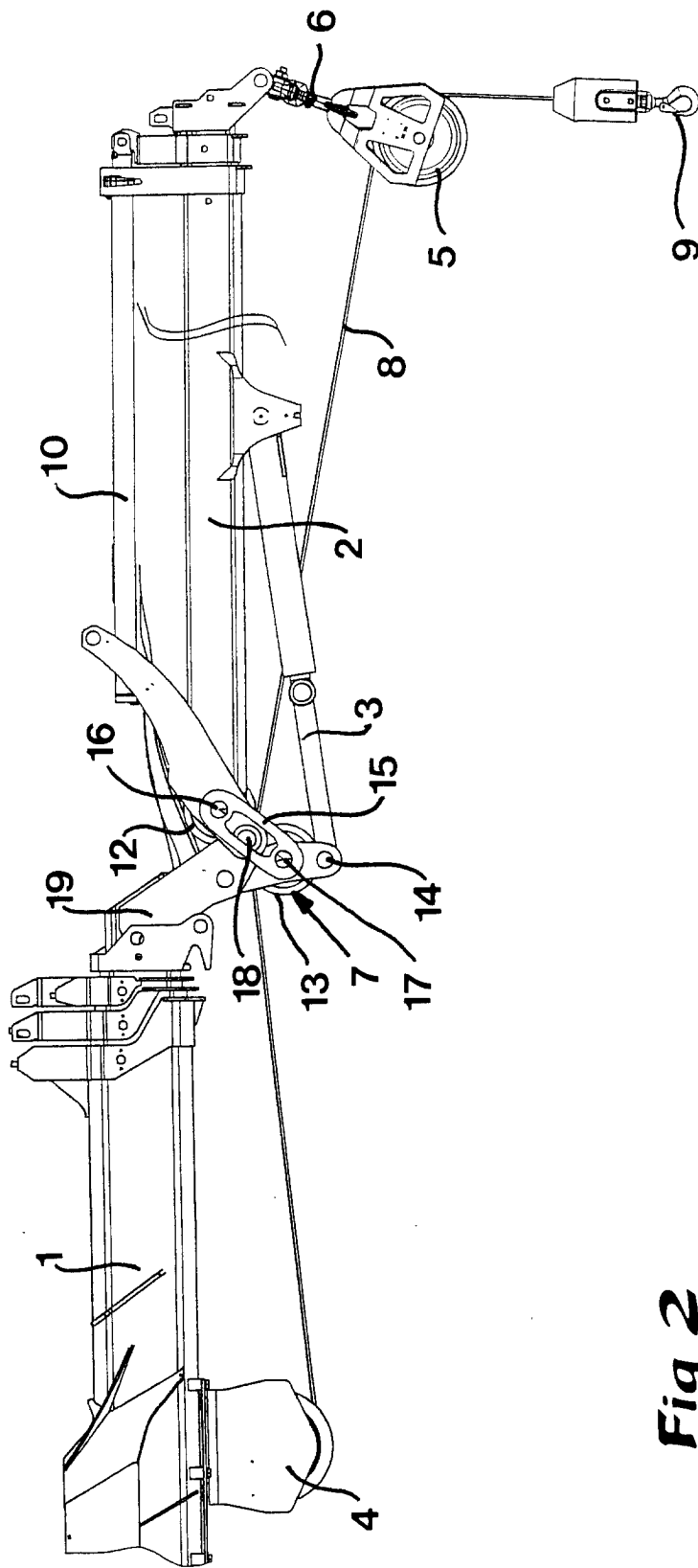
**[0033]** For example, the guide elements 12, 13 need not be attached to a link as described above. In many cases, the arms are not even connected to each other by means of links. Then, any other separate suspension or fixation arrangement for the wire guide may be provided.

## Claims

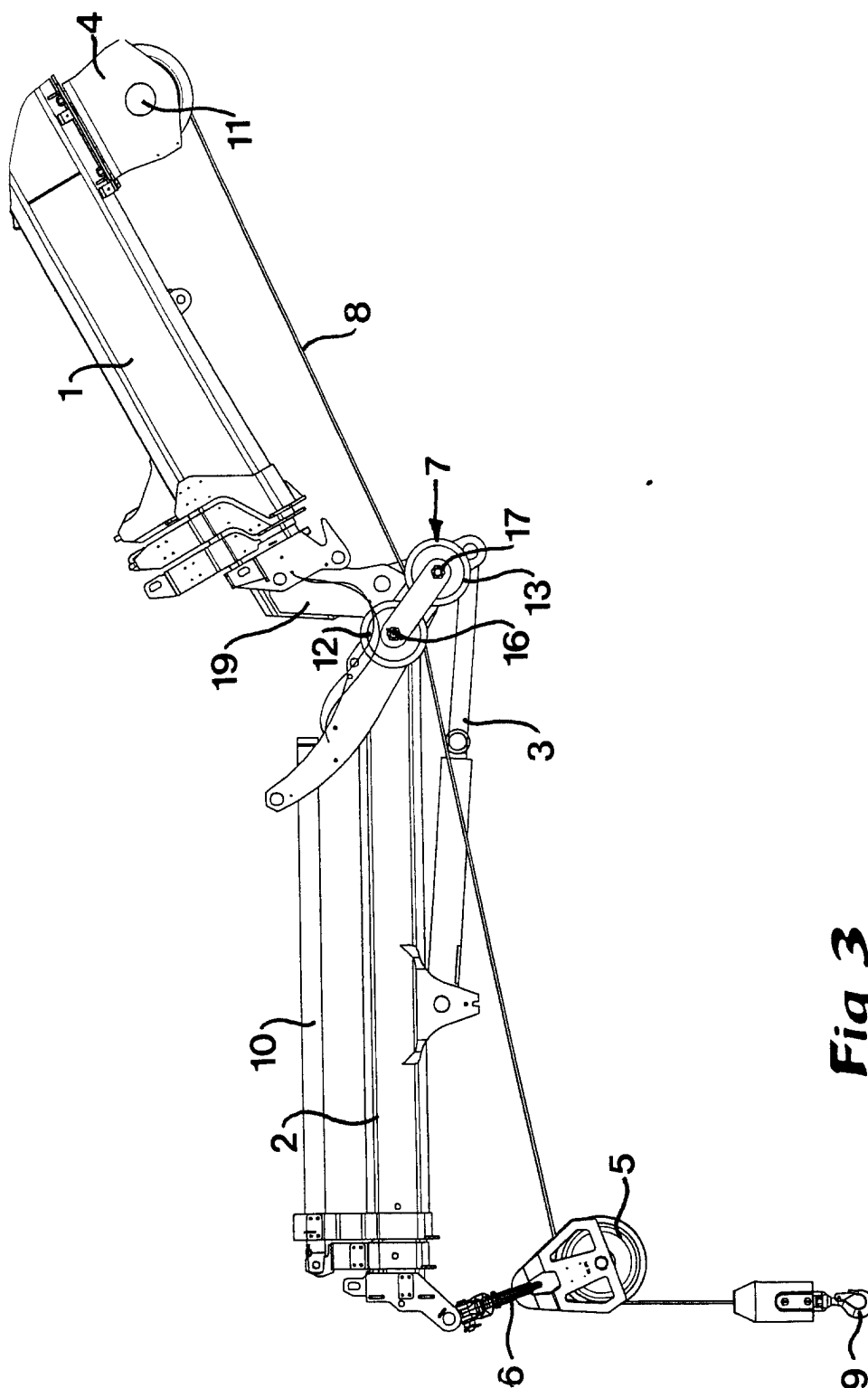
1. A crane, comprising a first arm (1) and a second arm (2) that are interconnected, wherein the second arm (2) is pivotally arranged in relation to the first arm (1), and wherein a longitudinal axis of the first arm (1) and a longitudinal axis of the second arm (2) extend in a common, plane which is also the pivot plane of the second arm (2), and comprising a winch device (4) arranged on the first arm (1) and provided with a wire (8), a pulley device (5) arranged on the second arm (2), and a wire guide (7) arranged between the winch device (4) and the pulley device (5), the wire (8) extending from the winch device (4) via the wire guide (7) to the pulley device (5), **characterised in that** the wire (8) is guided by the wire guide (7) in the region of the pivot centre between the first and second arm (2).

2. A crane according to claim 1, **characterised in that** the wire guide (7) is laterally displaced with regard to said common plane, such that the wire (8) extends laterally beside said second arm (2). 5
3. A crane according to claim 2, **characterised in that** the wire (8) intersects the pivot centre axis in the region in which it is redirected by the wire guide (7).
4. A crane according to any one of claims 1-3, **characterised in that** the wire guide (7) comprises a first guide element (12) and a second guide element (13) with an intermediate spacing therebetween, the wire (8) extending through said spacing and being mainly supported either by the first guide element (12) or by the second guide element (13) depending on the pivot angle between the first and second arms (1,2). 10 15
5. A crane according to any one of claims 1-4, **characterised in that** at least one of the first and second guide element (12, 13) comprises a rotational roll, around the periphery of which the wire (8) is redirected. 20 25
6. A crane according to claim 4 or 5, **characterised in that** the first guide element (12) comprises a first roll and that the second guide element (13) comprises a second roll, said rolls being generally parallel to each other, and said spacing being present between the outer peripheries of the rolls (12, 13). 30
7. A crane according to claim 5 or 6, **characterised in that** the pivot centre axis crosses a region in which the spacing between the first and second guide elements (12, 13) is at a minimum. 35
8. A crane according to any one of claims 1-7, **characterised in that** it comprises a cylinder/piston unit connected in one end to the second arm (2) and connected in another end, via a first pivotable link (14), to the first arm (1), and comprising a second pivotable link (15) that is connected in one end to the second arm (2) and in another end to the first link (14), the wire guide (7) being fastened to the second link (15). 40 45
9. A crane according to claim 8, **characterised in that** the second link (15) is connected to the second arm (2) via a first tap (16) extending through the link (15) and through the second arm (2), and to the first link (14) via a second tap (17) extending through the second link (15) and through the first link (14), said first and second rolls (12, 13) being arranged on the first tap (16) and the second tap (17) respectively. 50 55



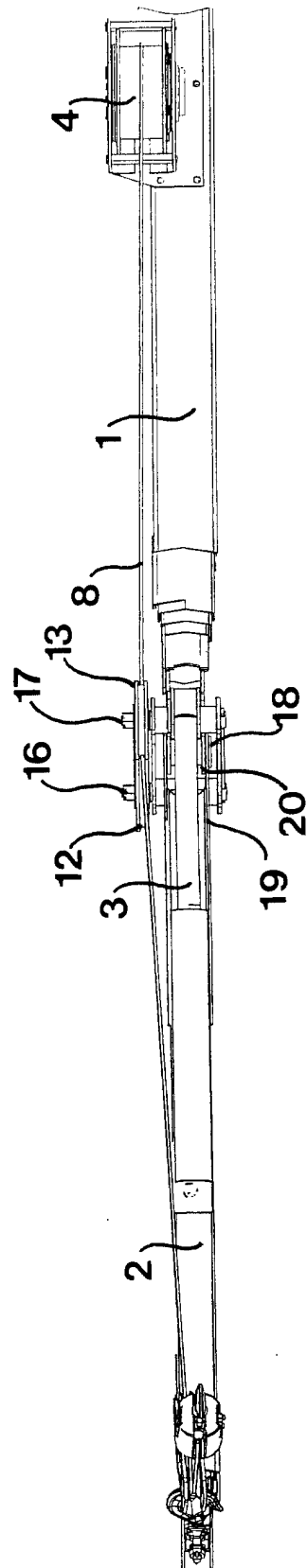


**Fig 2**

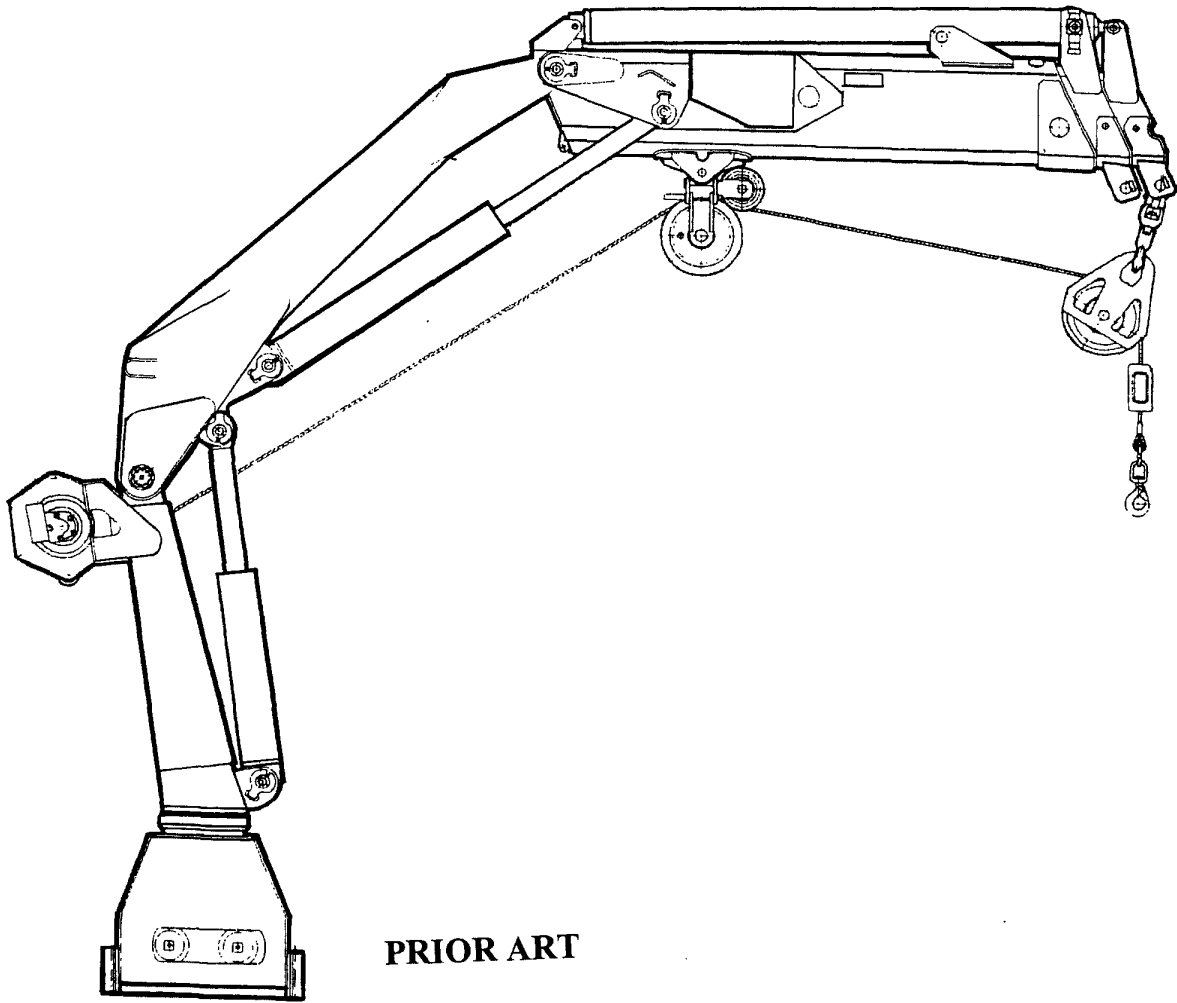


**Fig 3**





**Fig 4**



**Fig 5**



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# EUROPEAN SEARCH REPORT

Application Number  
EP 03 44 5052

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	EP 1 291 312 A (DE LILLE ALLEBROER LEO ALIX) 12 March 2003 (2003-03-12) * the whole document *	1,5	B66C23/68
X	EP 0 970 914 A (MANNESMANN AG) 12 January 2000 (2000-01-12)	1,5	
A	* abstract * * paragraph '0014! - paragraph '0016! * * figures 2,4-7 *	2	
X	US 4 241 837 A (SUVERKROP DON) 30 December 1980 (1980-12-30) * abstract * * column 3, line 44 - column 5, line 35 * * figures 1,3 *	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.CI.7)
			B66C
Place of search		Date of completion of the search	Examiner
THE HAGUE		26 September 2003	Sheppard, B
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 44 5052

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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26-09-2003

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