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Scholler

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[54] **LIFTING ARRANGEMENT FOR CANTILEVER ARMS OF CONVEYORS**

[75] Inventor: **Gerhart Scholler,** Bad Schwartau, Germany

[73] Assignee: **Orenstein & Koppel AG,** Lubeck, Germany

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[51] **Int. Cl.** **B65g 65/16**

[58] **Field of Search** 198/9, 36, 113, 114, 115, 198/121, 122; 37/190, 192; 214/83.36, 522, 91; 74/522.5, 524

[56] **References Cited**

UNITED STATES PATENTS

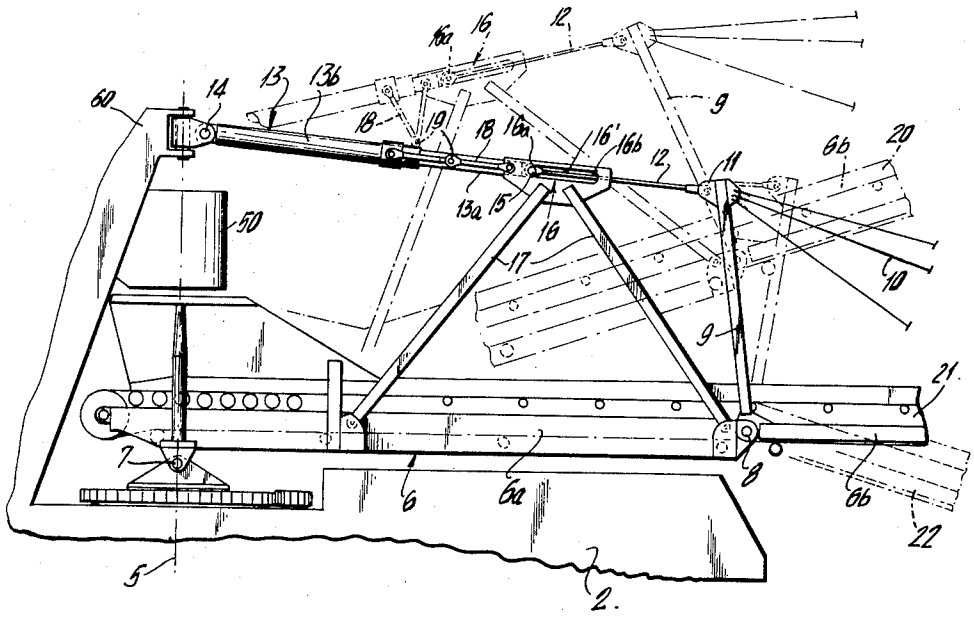
3,052,050	9/1962	Wilms et al.	198/9
3,680,233	8/1972	MacDonald	198/9
3,744,615	7/1973	Plaquet	198/36

Primary Examiner—Richard A. Schacher
Assistant Examiner—Richard K. Thomson
Attorney, Agent, or Firm—McGlew and Tuttle

[57] **ABSTRACT**

A lifting arrangement particularly for cantilever support arms of conveyors of such devices as excavators, comprises a first rear arm part which is supported for pivotal movement adjacent one end about a horizontal axis. A second front cantilever arm part is pivotally mounted about a second horizontal axis which is carried on the first cantilever arm. Lifting means in the form of a fluid pressure cylinder is pivotally connected to a mast which extends above the rear pivot of the first cantilever arm part and it is connected through a tow connection which is braced to the first cantilever part. The tow connection, for example, includes two diagonal braces pivoted at spaced locations to the first cantilever part and connected at their upper ends to a holding plate which is moved by a piston movable in the fluid cylinder of the lifting device. The tow connection also includes a connection to the second front conveyor part. The connection is such that the first part may be pivoted downwardly in respect to the first conveyor part only up to a predetermined amount and it may be lifted upwardly to a position level with the first part and then the first and second cantilever arm parts of the conveyor are lifted together upwardly. The apparatus is advantageously carried on a excavator vehicle having a carriage for moving it over the ground and carrying a bucket-wheel cantilever arm support structure at its end opposite to the conveyor cantilever arm structure.

8 Claims, 2 Drawing Figures



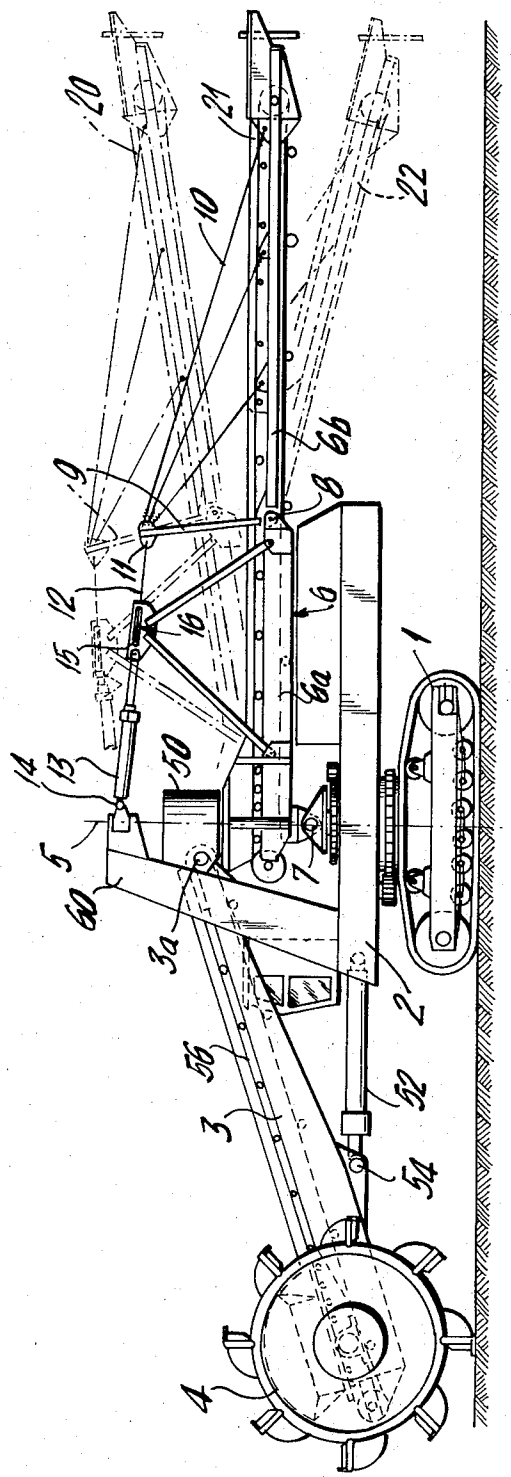


FIG.1

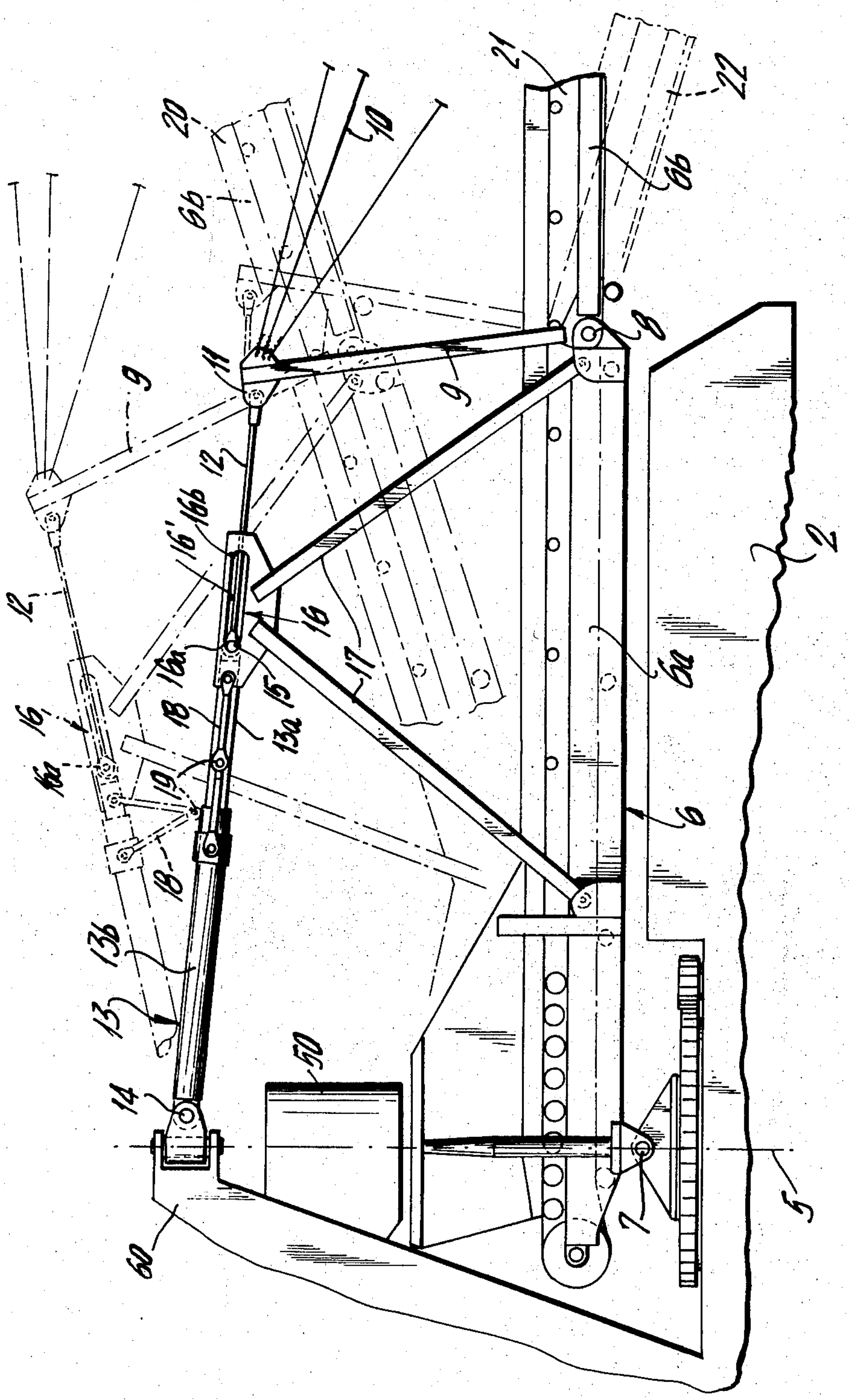

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FIG.2

LIFTING ARRANGEMENT FOR CANTILEVER ARMS OF CONVEYORS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the construction of a lifting structure or arrangement for cantilever support arms of conveyors and, in particular, to a new and useful lifting arrangement particularly for cantilever support arms of conveyors of excavators wherein the cantilever support arm structure includes a first and second cantilever arm part with the first rear arm part being pivotally mounted about a first horizontal axis and the second forward one being pivotally mounted about a second horizontal axis carried on the first part and which includes lifting means connected to the first and second cantilever support arm structures through a tow connection which permits lowering of the outermost forward cantilever arm part below the first and the combined lifting of the two parts about the first pivotal axis after the upward movement of the outermost first cantilever part by predetermined amount.

2. Description of the Prior Art

The present invention is particularly applicable to the construction and arrangement of supporting structures for conveyors particularly conveyors used in association with so-called bucket-wheel excavators. Excavators of this type are known which are provided with pivotal cantilever arms which carry the bucket-wheel and which also form a support for a conveyor which provides a means for discharging the material which is dumped onto it by the bucket-wheel in a direction away from advance of the wheel. The discharge conveyor belt is located so that it pivots around a vertical axle at the transfer point. In addition, the belt is also located and constructed so that it may be raised or lowered in a vertical direction by pivoting its support about a horizontal axis. For raising and lowering the device a hydraulic drive is provided. The cantilever belt is divided into two parts connected together by a horizontal axle so that the rear part in respect to the conveying direction can be pivoted for itself in a vertical plane. At this end a separate cable line is employed which engages the end of the rear part of the discharge belt and is guided over a support that is fixed at the end of the front part of the discharge belt. The cable line is fixed to a hoist that is located at the rear end of the frame structure of the front part of the discharge belt. It is disadvantageous that for raising and lowering the divided cantilever arm, two lifting devices, namely a hydraulic device and a cable winch or hoist, are necessary.

SUMMARY OF THE INVENTION

The present invention is based on the problem of achieving a lifting arrangement for cantilever arms of conveyors that is easier to construct and easier to operate then the known lifting devices. The invention provides a lifting device which engages the front part of a cantilever rear arm part to a tow connection which also connects to the front arm part which is pivotable about a horizontal axis carried by the forward end of the rear cantilever arm part. The tow connection and the lifting means are such that the forward arm part may be lowered below the level of the rear arm part and also raised to a predetermined position in respect thereto and both parts lifted together. The invention has the advantage that with one lifting device both cantilever arm parts may be operated and that the operating personnel need not give attention to which of the two lifting arrangements is to be actuated. The device is simple in construction and easy to service and to operate.

In accordance with a feature of the invention, the front cantilever arm part may be provided at its rear end with a support that is firmly guyed with the front cantilever arm part and which is connected at its upper end with the means for lifting the two arm parts.

A simple arrangement is one in which the stop for the movement of the one arm part in respect to the other comprises a transverse pin connecting a pull rod with a piston rod of the lifting device. The stop guidance construction can be designed in many ways and a simple embodiment is one in which the stop guidance is a slot. The pivoting restriction may be effected in a simple manner by the use of a link rod pair. This may be arranged between the front end of the hydraulic cylinder and the rear end of the towing connection.

Accordingly, it is an object of the invention to provide an improved lifting arrangement particularly for cantilever support arms of conveyors of excavators which comprises front and rear cantilever parts which are pivotally mounted about respective horizontal axes and which are lifted by a lifting arrangement which engages a front cantilever arm part and is connected through a tow connection with the rear cantilever arm part but engages this rear cantilever arm part only when both cantilever arm parts are in a defined position in respect to each other, and wherein the connection prevents the lowering of the front cantilever arm part beyond a predetermined position in respect to the first cantilever arm part.

A further object of the invention, is to provide a lifting arrangement for cantilever support arms of conveyors which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principles of the invention, reference is made to a description of a typical embodiment thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

FIG. **1** is a side elevational view of a bucket-wheel excavator having conveyors constructed in accordance with the invention; and

FIG. **2** is a view similar to FIG. **1** of an enlarged portion of the apparatus shown therein.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a bucket-wheel excavator which includes a superstructure or platform **2** which is mounted over a carriage **1** for movement along the ground. The device includes a bucket-wheel cantilever support arm **3** which is pivoted at **3***a* about a fixed structure **50** raising above the superstructure **2** and which carries a bucket-wheel **4** at its outer end. The arm **3** may be pivoted about the pivot **3***a* by movement of a hydraulic motor **52** which is connected through a piston rod at a pivot connection **54.** The whole chassis **2** is also pivotable about a vertical axis **5.**

In accordance with the invention, there is provided a cantilever support structure for a delivery conveyor which cooperates with the pickup conveyor **56** which

is defined on the arm **3**. The delivery conveyor includes a rear cantilever support arm part **6a** which is pivoted about a horizontal axis **7** of the support structure **2** and which includes a forward or second cantilever arm part **6*b*** which pivots about an axis **8** which is carried on the front part of the first cantilever arm part **6*a***. A support **9** is carried at the rear end of the front cantilever arm part **6*b*** and it carries a traction stay **10** on a support plate portion **11** at its upper end. The opposite side of the support plate portion **11** is connected to a pull rod **12** which is pivotally connected to a piston rod **13*a*** of a hydraulic cylinder **13*b*** of a lifting device or lifting means which is pivoted at **14** to an upstanding mast portion **60** which is carried on the superstructure **2**. The rod **12** is connected to the rod **13a** through a transverse pin **15** which is formed as a stop and is guided on both sides of a stop guidance member **16**. The stop guidance member is in the form of a gusset plate which is securely connected through diagonal struts or braces **17** which are articulated at spaced locations to the rear conveyor supporting arm portion **6*a***.

The rear end of the stop guidance **16** is connected to the front end of the hydraulic cylinder **13*b*** through a pair of link rods **18** which are connected with each other over a link point **19**.

The conveyor **6*a*** and **6*b*** may be lifted upwardly together by pivoting about the horizontal axis **7** and brought into the position **20** represented in dash lines. The position **20** corresponds to the high raised position. In this position, the piston rod **13*a*** is withdrawn into the cylinder **13*b*** so that the transverse pin **15** abuts the against the stop surface **16*a*** of the stop guidance member **16**. The front cantilever part **6*b*** is lifted through the support **9**.

When the piston rod **13*a*** is moved outwardly from its associated hydraulic cylinder **13*b***, both cantilever arm parts **6*a*** and **6*b*** with their relative positions unchanged, move into the solid line position shown at **21**. In this solid line position **21**, both cantilever arm parts **6*a*** and **6*b*** align one with the other in enter end relationship and they are pivoted together in this position around the horizontal axle **7**.

When piston rod **13*a*** is moved further outwardly, the rear cantilever arm part **6*a*** is prevented from further lowering by the link rod pair **18** which becomes oriented in an outwardly extended position as shown in solid lines. Since the rear cantilever part **6*a*** cannot pivot downwardly any further, further extension of the piston rod **13*a*** permits the lowering of the front cantilever arm part **6*b*** into the position **22** shown in dotted lines. The transverse pin **15** moves in the stop guidance member **16** toward the front thereof. A lowering of the front cantilever arm part **6*b*** is then prevented when the transverse pin **15** hits the front end of the stop surface **16*b*** of the stop guidance plate **16**. The length of the slot **16'** of the stop guidance plate member **16** determines the amount of movement of the cross pin **15** and hence the amount of relative movement which can take place between the cantilever front part **6*b*** and the rear part **6*a***.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A lifting arrangement particularly for cantilever support arms of conveyors of excavators, comprising a first rear cantilever conveyor support arm, first support means pivotally mounting said first rear cantilever conveyor support arm for pivotal movement about a first horizontal axis, a second front cantilever conveyor support arm pivotally mounted about a second horizontal support axis carried on said first rear cantilever conveyor support arm, lifting means for lifting said first and second cantilever conveyor support arms including a member anchored at its one end above said first and second cantilever conveyor support arms, a tow connection braced to said first cantilever support arm at a spaced location from said first support means and connected to said lifting means and including a lost motion connection connected to said second rear cantilever conveyor support arm, said lost motion connection permitting independent movement of said second cantilever conveyor support arm from said first cantilever conveyor support arm, said lifting means being connected to said tow connection to exert a direct lift on said first rear cantilever conveyor support arm and through said lost motion connection to said second forward cantilever conveyor support arm, said forward cantilever conveyor support arm being pivotal below the axis of said first rear cantilever conveyor support arm in a lowermost position and being raisable to a position in which the axis thereof is substantially aligned with the axis of said first rear cantilever conveyor support arm before said connection to said lifting means causes lifting of both first and second cantilever support arms.

2. A lifting arrangement, according to claim **1**, including a support extending upwardly from said second forward cantilever conveyor support arm at a location adjacent said second horizontal axis and being connected on one side to said lost motion connection and on the opposite side to the opposite end of said second cantilever conveyor support arm.

3. A lifting arrangement, according to claim **1**, wherein said lifting means comprises a hydraulic cylinder having a piston rod movable therein connected to said tow connection, said lost motion part including an elongated slot with a cross bolt member therein connected to said second forward conveyor support arm.

4. A lifting arrangement, according to claim **3**, wherein said piston rod is pivotally connected to said tow connection, said second forward centilever conveyor support arm having an upstanding rigid member, said lost motion part having a cross member slidable in an elongated slot, said cross member being connected to said upstanding connection on one side thereof the opposite being connected to a traction member to the outer end of said second forward conveyor support arm.

5. A lifting arrangement, according to claim **1**, wherein said lifting means includes a fluid pressure operated cylinder having a piston slidable therein with a connecting rod connected directly to said tow connection, a linkage between the end of said cylinder and said tow connection comprising two links pivoted together and to said cylinder and said tow connection respectively, said links when extending limiting the downward movement of said first rear cantilever support arm and being pivotal together upon retraction of the

piston in said cylinder to permit lifting of said first rear cantilver conveyor support arm.

6. A lifting arrangement, according to claim **1,** wherein said first support means comprises a superstructure having a pivotal mounting portion for said first rear cantilever conveyor support arm, and carriage means supporting said superstructure for movement over the ground.

7. A lifting arrangement, according to claim **6,** including an upstanding mast portion carried on said superstructure and carrying said lifting means.

8. A lifting arrangement, according to claim **7,** including a bucket-wheel cantilever support arm pivotally mounted on said superstructure and extending outwardly therefrom in a direction opposite to said first and second cantilever conveyor support arms and a bucket-wheel rotatably mounted adjacent the outer end of said bucket-wheel support arm and means on said superstructure for raising and lowering said bucket-wheel support arm.

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