US 20140067194A1

(19) **United States**

(12) **Patent Application Publication**

Gralow et al.

(10) **Pub. No.: US 2014/0067194 A1**

(43) **Pub. Date: Mar. 6, 2014**

(54) **METHOD FOR DETECTING AND TRACKING THE POSITION OF A MOVABLE TRANSFERRING DEVICE/LOADING DEVICE OF A BUCKET-WHEEL EXCAVATOR OR BUCKET CHAIN EXCAVATOR**

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(21) Appl. No.: **14/073,496**

(22) Filed: **Nov. 6, 2013**

Related U.S. Application Data

(63) Continuation of application No. PCT/EP2012/058202, filed on May 4, 2012.

(30) **Foreign Application Priority Data**

May 7, 2011 (DE) 10 2011 100 890.3

Publication Classification

(51) **Int. Cl.**

E21F 13/00 (2006.01)

E02F 7/00 (2006.01)

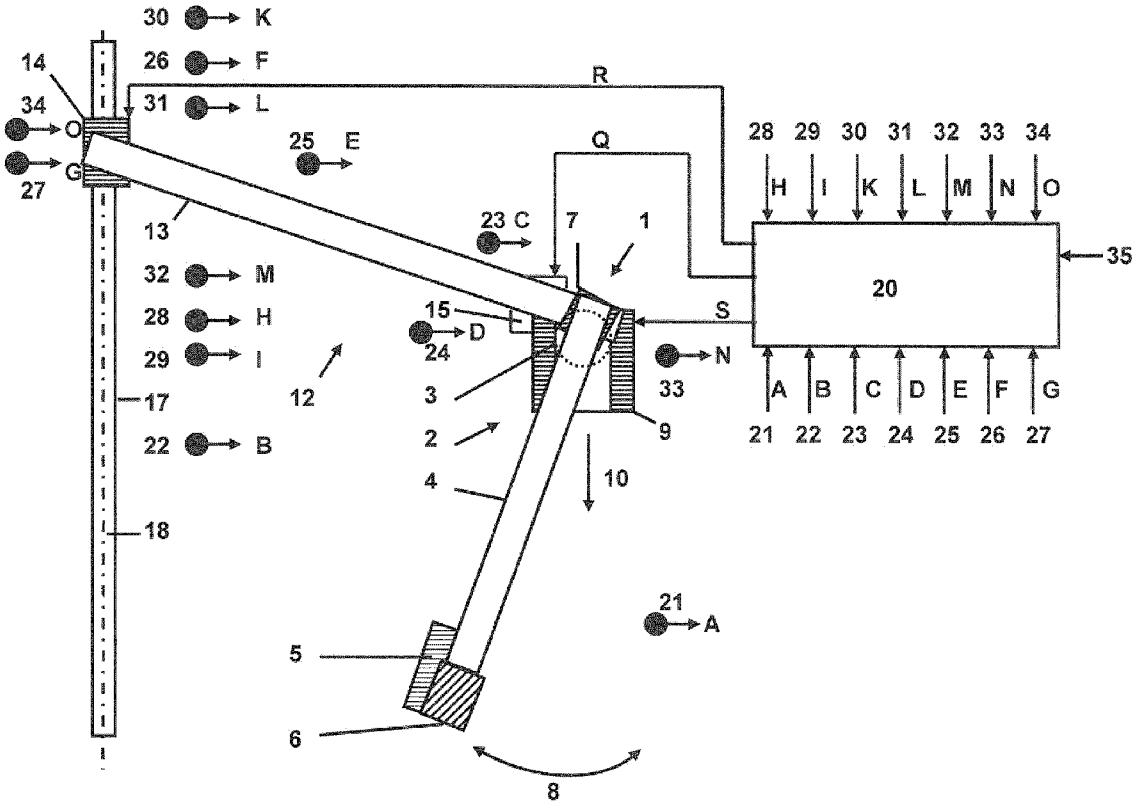
(52) **U.S. Cl.**

CPC .. ***E21F 13/00*** (2013.01); ***E02F 7/00*** (2013.01)

USPC **701/32.3**

(57) **ABSTRACT**

Exemplary embodiments are directed to a method for detecting and tracking the position of a mobile transferring device/loading device of a bucket-wheel excavator or bucket chain excavator. The bucket-wheel excavator or bucket chain excavator includes an extraction device having a pivotable superstructure, which has inclinable cantilever, a track-drivable substructure, and a transferring device having a loading cantilever and renders conveyed material through a bench conveyor. An open-loop/closed-loop control device establishes the pivot angle and the inclination of the loading cantilever of the transferring device according to the signals of a plurality of sensors.



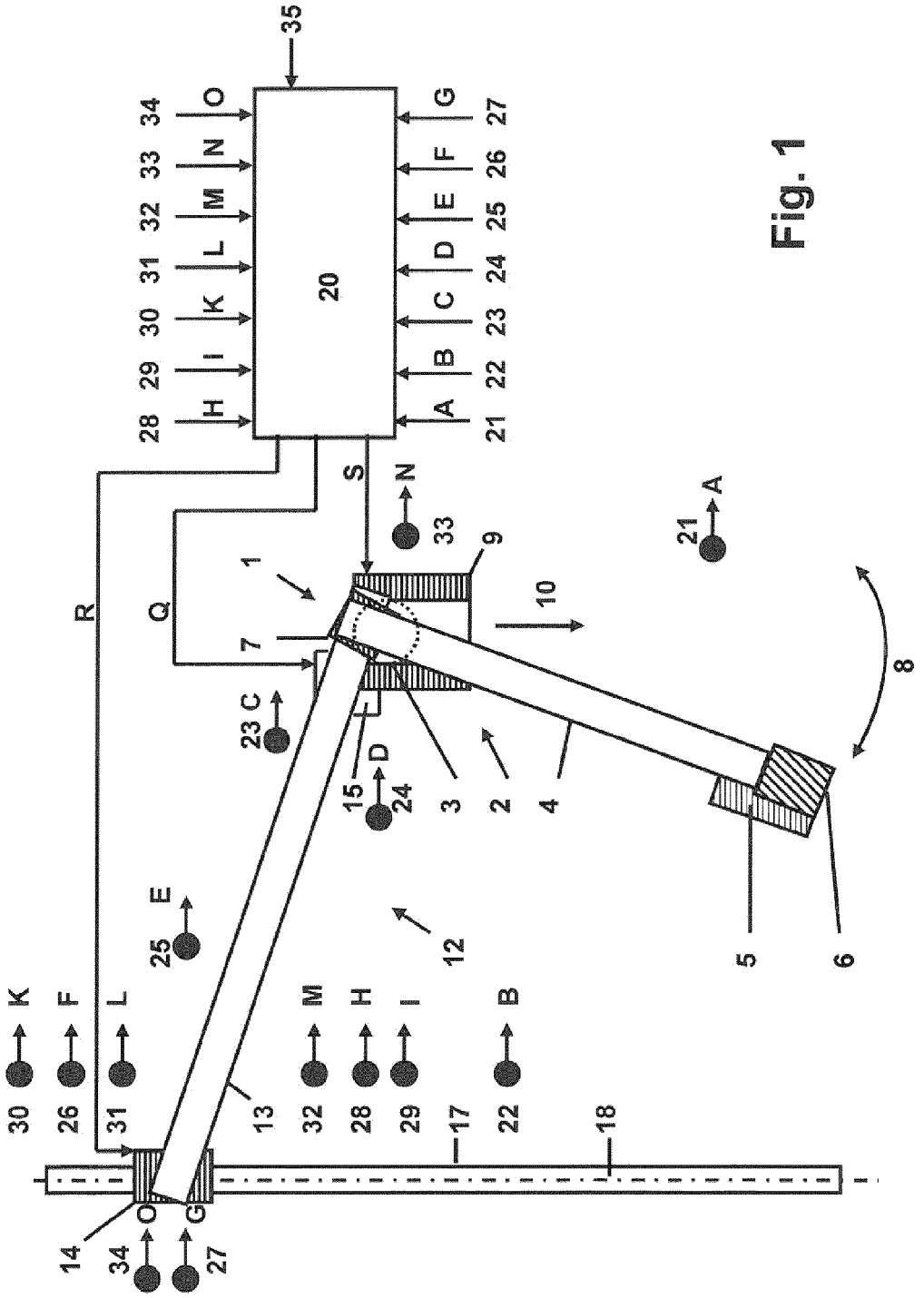

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Fig. 1

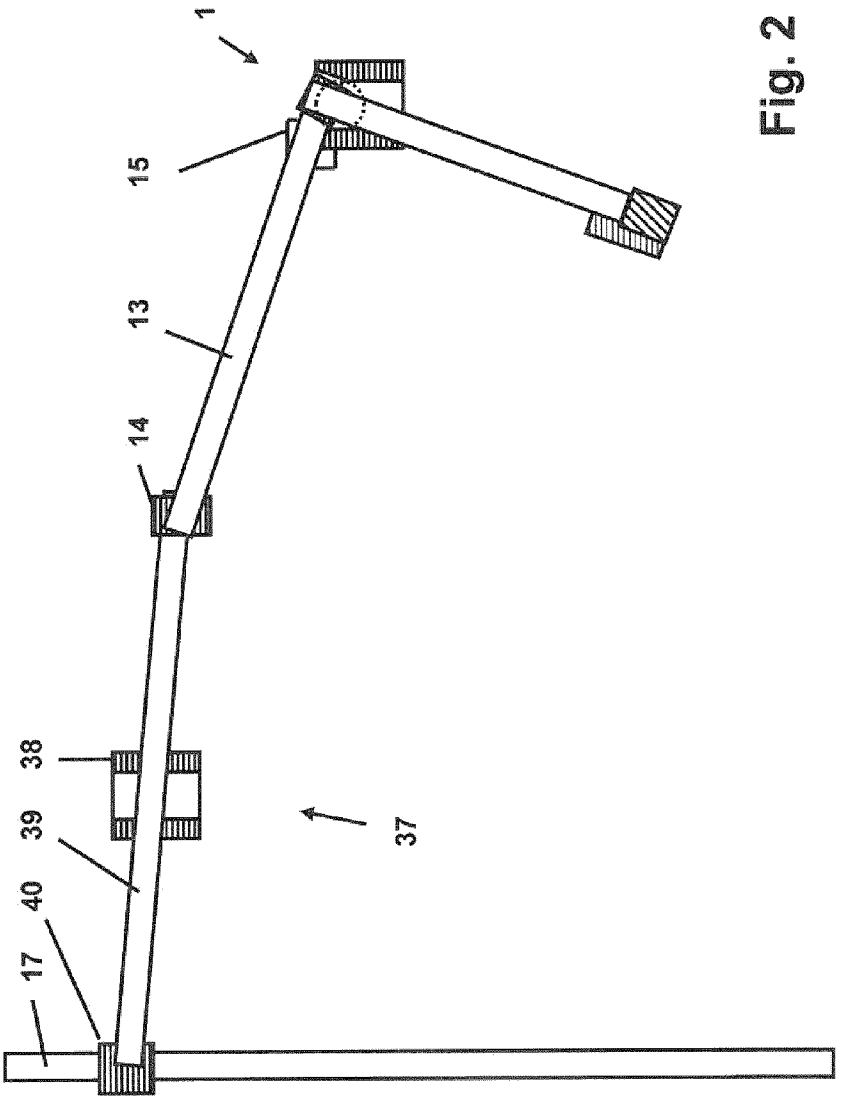

Fig. 2

METHOD FOR DETECTING AND TRACKING THE POSITION OF A MOVABLE TRANSFERRING DEVICE/LOADING DEVICE OF A BUCKET-WHEEL EXCAVATOR OR BUCKET CHAIN EXCAVATOR

RELATED APPLICATION(S)

[0001] This application claims priority as a continuation application under 35 U.S.C. §120 to PCT/EP2012/058202, which was filed as an International Application on May 4, 2012 designating the U.S., and which claims priority to European Application 102011100890.3 filed in Europe on May 7, 2011. The content of each prior application is hereby incorporated by reference in its entirety.

FIELD

[0002] The disclosure relates to a method for detecting and tracking the position of a movable transferring device/loading device of a bucket-wheel excavator or bucket chain excavator.

BACKGROUND INFORMATION

[0003] A known bucket-wheel excavator comprises (e.g., includes) in standard designs a pivotable superstructure having an inclinable boom with a bucket wheel fastened thereto, a track-mobile substructure, and a transferring device or loading device with loading boom inclusive of loading belt. During operation, the superstructure pivots back and forth on the track-mobile substructure within its working range. The bucket-wheel excavator transfers the masses which it has extracted in block operation (bench block or side block operation, or the conveyed material) for example coal or spoils, to a shiftable bench conveyor.

[0004] Track-mounted bucket chain excavators are equipped with a pivot mechanism for the superstructure. They can operate in upward cutting or downward cutting mode. The excavator superstructure receives perpendicular to the direction of travel the bucket ladder, the lower, movable part of which is suspended articulately from the superstructure and from a boom by means of one or more bucket ladder winches. On the bucket ladder runs an endless bucket chain. The bucket chain excavator is equipped with a transferring device.

[0005] The design of the transferring device takes into account that the angle between the loading belt of the transferring device and the bench conveyor belt axis in ground plan is adjustable. The pivot motion of the transferring device enables the unloading of the transferring device to be adapted to the distance of the shiftable bench conveyor from the excavator axis (center axis of the tracked substructure). The shiftable bench conveyor lies parallel to the direction of travel of the track-mobile substructure of the excavator (bucket chain excavator or bucket-wheel excavator) and is shifted in dependence on the rate of advance.

[0006] An interposed mobile transfer conveyor can be used, for example, to enlarge the radius of action of the bucket-wheel excavator or bucket chain excavator during mining.

[0007] A fundamental object in respect of the loading consists in the operation of a pivot mechanism/lifting gear of the loading boom inclusive of loading belt of the transferring device, including operation of a loading chute for the correct belt loading of the bench conveyor or of a mobile transfer conveyor and control of the mass stream or of the conveyed material stream. This object is fulfilled by a loading attendant.

[0008] The loading attendant conducts the operation of the pivot mechanism/lifting gear for the loading boom and the operation of the loading chute for the correct belt loading and control of the mass stream.

SUMMARY

[0009] An exemplary method for detecting and tracking a position of a movable transferring device/loading device of a bucket-wheel excavator is disclosed, the excavator includes an extraction apparatus having a pivotable superstructure with an inclinable boom, a track-mobile substructure, and a transferring device with a loading boom, the superstructure delivers conveyed material by means of a bench conveyor without an interposed mobile transfer conveyor or transfer point, wherein an open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading boom of the transferring device, the method comprising: detecting, in a first sensor, current spatial coordinates of the bucket-wheel excavator; detecting, in a second sensor, current spatial coordinates of the bench conveyor; detecting, in a third sensor, current longitudinal inclination and transverse inclination of the loading boom; detecting, in a fourth sensor, a current pivot angle of the loading boom; detecting, in a fifth sensor, a current distance of the loading boom above the bench conveyor; detecting, in a sixth sensor, a current vertical positioning of the loading boom above the bench conveyor; and monitoring, in a seventh sensor, overfilling at the transfer point of the loading boom.

[0010] An exemplary method for detecting and tracking a position of a movable transferring device/loading device of a bucket-wheel excavator or bucket chain excavator is disclosed, the excavator includes an extraction apparatus having a pivotable superstructure with an inclinable boom, a track-mobile substructure, and a transferring device with a loading boom, the superstructure delivers conveyed material by means of a bench conveyor with an interposed mobile transfer conveyor or transfer point, wherein an open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading boom of the transferring device, the method comprising: detecting, in a first sensor, current spatial coordinates of the bucket-wheel excavator or bucket chain excavator; detecting, in a second sensor, current spatial coordinates of the bench conveyor or of the take-up belt of the mobile transfer conveyor; detecting, in a third sensor, current longitudinal inclination and transverse inclination of the loading boom; detecting, in a fourth sensor, a current pivot angle of the loading boom; detecting, in a fifth sensor, a current distance of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor; detecting, in a sixth sensor, a current vertical positioning of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor, inclusive of detection of the belt middle; and monitoring, in a seventh sensor, an overfilling at the transfer point of the loading boom.

DESCRIPTION OF THE DRAWINGS

[0011] The disclosure is explained below with reference to the illustrative exemplary embodiment represented in the drawing, in which:

[0012] FIG. **1** shows a schematic view of an underground mining operation including as the main components a bucket-wheel excavator or bucket chain excavator in accordance with an exemplary embodiment of the present disclosure.

[0013] FIG. **2** shows a mobile transfer conveyor provided between the bucket-wheel excavator or bucket chain excavator and the bench conveyor in accordance with an exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION

[0014] Exemplary embodiments of the present disclosure specify an optimized method for detecting and tracking the position of a movable transferring device/loading device of a bucket-wheel excavator or bucket chain excavator.

[0015] Exemplary methods of the present disclosure, include an open-loop/closed-loop control device can define (e.g., establish) the pivot angle and the inclination of the loading boom of the transferring device in dependence on the signals of the following sensors: a sensor for detecting the current spatial coordinates of the bucket-wheel excavator or bucket chain excavator, a sensor for detecting the current spatial coordinates of the bench conveyor or of the take-up belt of the mobile transfer conveyor, a sensor for detecting the current longitudinal inclination and transverse inclination of the loading boom, a sensor for detecting the current pivot angle of the loading boom, a sensor for detecting the current distance of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor, a sensor for detecting the current vertical positioning of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor, inclusive of detection of the belt middle, a sensor for monitoring overfilling in/at the transfer point of the loading boom.

[0016] The advantages obtainable with the exemplary embodiments disclosed herein can include, for example, making an additional loading attendant obsolete, since the operation of a pivot mechanism/lifting gear of the loading boom inclusive of the loading belt of the transferring device, including operation of a loading chute for the correct belt loading of the bench conveyor or of the take-up belt of a mobile transfer conveyor and the control of the mass stream and of the conveyed material stream, can be fulfilled by the exemplary open-loop/closed-loop control device disclosed herein. In other words, the manual positioning is replaced by an automatic positioning (e.g., manless operation) of the loading boom for the transfer of conveyed material to the discharging conveyor—bench conveyor or mobile transfer conveyor with take-up belt.

[0017] The open-loop/closed-loop control device exerts a direct influence on the belt running of the bench conveyor belt or of the take-up belt of a mobile transfer conveyor, with due regard to the dirt contamination of the conveyor. The conveyed material is loaded with due regard to the belt transfers. In case of risk of a material jam in/at the transfer point (e.g., transfer chute), a signal is delivered to the bucket-wheel excavator or bucket chain excavator to adjust the conveyance.

[0018] Further applications of the disclosure are bucket-wheel excavators having a loading boom for transfer to the bench conveyor, bucket chain excavators having a loading boom for transfer to the bench conveyor, bucket-wheel excavators having a loading boom for transfer to an interposed mobile transfer conveyor, bucket chain excavators having a loading apparatus for transfer to the bench conveyor.

[0019] FIG. **1** shows a schematic view of an underground mining operation including as the main components a bucket-wheel excavator or bucket chain excavator in accordance with an exemplary embodiment of the present disclosure. The bucket wheel conveyor or bucket chain conveyor inclusive of a movable transferring device and a bench conveyor (e.g., face conveyor) inclusive of bench conveyor belt (e.g., discharging belt) is shown, wherein the movable transferring device is constructed with a pivot mechanism/lifting gear.

[0020] The bucket-wheel excavator or bucket chain excavator **1** has as the main components an extraction apparatus **2** for the conveyed material, for example coal or spoils, and a movable transferring device **12** for the conveyed material.

[0021] The extraction apparatus **2** includes, for example in a bucket-wheel excavator: a pivotable superstructure **3**, with inclinable boom **4** fastened thereon, inclusive of take-up belt, a bucket wheel **5**, fastened to the end face of the boom **4**, for the conveyance of the conveyed material, inclusive of chute **6** (e.g., conveyed material transferring device) for transfer of the conveyed material from the bucket wheel **5** to the take-up belt, a crawler-mounted mobile substructure **9**.

[0022] In FIG. **1**, both the direction of travel **10** of the substructure **9** and the pivot direction/pivot angle **8** of the boom **4** are shown over the block width, wherein the block width or the pivot angle determines the working range, e.g., the removal of the conveyed material.

[0023] The transferring device **12** includes a loading boom **13** (e.g., discharge conveyor) inclusive of loading belt and loading chute **14** (e.g., transfer chute), a pivot mechanism/lifting gear **15** for the loading boom **13** (e.g., fastened to the extraction apparatus **2**), a take-up chute **7** (e.g., conveyed material transferring device) for transfer of the conveyed material from the take-up belt of the boom **4** to the transferring device **12**.

[0024] The loading device **12** has—as already mentioned—a loading chute **14** (e.g., rotating chute, conveyed material transferring device, transfer chute) for transfer of the conveyed material from the loading boom **13** to the bench conveyor **17**. Furthermore, the bench conveyor axis **18** is shown, which forms the belt middle of the discharging conveyor or bench conveyor **17**.

[0025] FIG. **2** shows a mobile transfer conveyor provided between the bucket-wheel excavator or bucket chain excavator and the bench conveyor in accordance with an exemplary embodiment of the present disclosure. In FIG. **2** is shown an exemplary embodiment in which a mobile transfer conveyor is additionally provided between the bucket-wheel excavator or bucket chain excavator and the bench conveyor. A bucket-wheel excavator or bucket chain excavator **1** having a loading boom **13** fastened above the pivot mechanism/lifting gear **15** can be identified, wherein the loading chute **14** transfers the conveyed material to the take-up belt **39** of the mobile transfer conveyor **37**. The mobile transfer conveyor **37** is moved by means of its crawler-mounted substructure **38** that can be parallel to the bench conveyor **17** and transfers the conveyed material via a transfer chute **40** to the bench conveyor belt of the bench conveyor **17**.

[0026] For the automatic detection and tracking of the position of the movable transferring device **12** or positioning of the loading boom **13** for the transfer of conveyed material to the bench conveyor **17** or to the take-up belt **39** of the mobile transfer conveyor **37**, exemplary embodiments of the present disclosure can include the following sensors: a sensor **21** for detecting the current spatial coordinates $x_B/y_B/z_B$ of the bucket-wheel excavator or bucket chain excavator **1**, a sensor **22** for detecting the current spatial coordinates $x_S/y_S/z_S$ of the bench conveyor axis **18** of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer con-

veyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), a sensor **23** for detecting the current longitudinal inclination and transverse inclination of the loading boom **13**, a sensor **24** for detecting the current pivot angle of the loading boom **13**, a sensor **25** for detecting the current load upon the loading belt of the loading boom **13**, and a sensor **26** for detecting the current distance of the loading boom **13** to the track level or above the bench conveyor or above the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or above the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**).

[0027] In addition the exemplary embodiments can include a sensor **27** for detecting the current vertical positioning of the loading boom **13** above the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or above the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), inclusive of detection of the belt middle, a sensor **28** for detecting the current load state of the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), a sensor **29** for detecting any current skewing of the bench conveyor belt of the bench conveyor **17** (under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), a sensor **30** for detecting the current angular position of the loading chute **14**, a sensor **31** for detecting the current inclination of the loading chute **14**, a sensor **32** for detecting objects within the range of pivot of the loading boom **13** (e.g., impact protection), a sensor **33** for detecting the current belt pass-over point between the take-up belt of the boom **4** and the loading belt of the loading boom **13** (e.g., collision protection), and a sensor **34** for detecting the current belt pass-over point between the loading belt of the loading boom **13** and the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or the take-up belt **39** of the mobile transfer conveyor **37** (collision protection, e.g., under the conditions of the exemplary embodiment according to FIG. **2**).

[0028] To an open-loop/closed-loop control device **20** are relayed: the signal A of the sensor **21**, the signal B of the sensor **22**, the signal C of the sensor **23**, the signal D of the sensor **24**, the signal E of the sensor **25**, the signal F of the sensor **26**, the signal G of the sensor **27**, the signal H of the sensor **28**, the signal I of the sensor **29**, the signal K of the sensor **30**, the signal L of the sensor **31**, the signal M of the sensor **32**, the signal N of the sensor **33**, and the signal O of the sensor **34**.

[0029] The open-loop/closed-loop control device **20** processes these supplied signals, links them together in a predefined manner and, in dependence on these signals and in dependence on target value presets/parameter presets **35** for the above-cited sensors, drives the pivot mechanism/lifting gear **15**, the loading chute **14** and, in another exemplary embodiment, the extraction apparatus **2**, see the drive signal Q for the transferring device **12**, the drive signal R for the loading chute **14**, and the drive signal S for the extraction apparatus **2**.

[0030] The open-loop/closed-loop control device **20** hereupon can define the pivot angle and the inclination of the loading boom **13** of the transferring device **12** in the form of the drive signal Q in dependence on the signals of the following sensors: the signal A of the sensor **21** for detecting the current spatial coordinates $x_B/y_B/z_B$ of the bucket-wheel excavator or bucket chain excavator **1**, the signal B of the sensor **22** for detecting the current spatial coordinates $x_S/y_S/z_S$ of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), the signal C of the sensor **23** for detecting the current longitudinal and transverse inclination of the loading boom **13**, the signal D of the sensor **24** for detecting the current pivot angle of the loading boom **13**, the signal F of the sensor **26** for detecting the current distance of the loading boom **13** above the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or above the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), the signal G of the sensor **27** for detecting the current vertical positioning of the loading boom **13** above the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or above the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), inclusive of detection of the belt middle.

[0031] Furthermore, the open-loop/closed-loop control device **20** can define the pivot angle and the inclination of the loading chute **14** in the form of the signal R in dependence on the signals of the following sensors: the signal H of the sensor **28** for detecting the current load state of the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), the signal I of the sensor **29** for detecting any current skewing of the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or of the take-up belt **39** of the mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**), the signal K of the sensor **30** for detecting the current angular position of the loading chute **14**, the signal L of the sensor **31** for detecting the current inclination of the loading chute **14**.

[0032] For further improvement of the open-loop/closed-loop control system, the open-loop/closed-loop control device **20** can be additionally fed the signal E of the sensor **25** for detecting the current load upon the loading belt of the loading boom **13**. As a result, a possible material jam in the loading chute **14**—caused, for example, by wet masses or conveyed material—is detected and an appropriate output signal S can be transmitted to the extraction apparatus **2** in order to stop the bucket-wheel excavator or bucket chain excavator and avoid overfilling of the loading chute **14**.

[0033] For the purpose of avoiding a collision between the loading boom **13** and the bench conveyor **17** (e.g., collision protection), the open-loop/closed-loop control device **20** can be additionally fed the signals O of the sensor **34** for detecting the current belt pass-over point between the loading belt of the loading boom **13** and the bench conveyor belt of the bench conveyor **17** (e.g., under the conditions of the exemplary embodiment according to FIG. **1**) or the take-up belt **39** of the

mobile transfer conveyor **37** (e.g., under the conditions of the exemplary embodiment according to FIG. **2**).

[0034] For the purpose of avoiding a collision between the loading boom **13** and an object, such as an apparatus or a person, the open-loop/closed-loop control device **20** can be additionally fed the signals M of the sensor **32** for detecting objects within the range of pivot of the loading boom **13** (e.g., collision protection).

[0035] These signals O, M are taken into account in the generation of the drive signals R and Q, where applicable also with respect to S.

[0036] The exemplary open-loop/closed-loop control system of the present disclosure produces high availability of the components to be used and, for example, high availability of the desired "manless operation" (e.g., automatic) function. As a result, of the proposed open-loop/closed-loop control system, an independence from environmental influences, such as strong solar radiation, heavy rain, snowfall, fog, frost, is obtained. Furthermore, insensitivity to steaming coal or steaming conveyed material is obtained. High accuracy with respect to the positioning and surveying of the belt edges, as well as with respect to belt running detection, is obtained. In addition, both equipment protection and personal protection are ensured under all operating conditions.

[0037] Thus, it will be appreciated by those skilled in the art that the present disclosure can be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The presently disclosed exemplary embodiments are therefore considered in all respects to be illustrative and not restricted. The scope of the disclosure is indicated by the appended claims rather than the foregoing description and all changes that come within the meaning and range and equivalence thereof are intended to be embraced therein.

REFERENCE SYMBOL LIST

[0038] **1** bucket-wheel excavator or bucket chain excavator

[0039] **2** extraction apparatus of the bucket-wheel excavator or bucket chain excavator

[0040] **3** pivotable superstructure

[0041] **4** inclinable boom inclusive of take-up belt

[0042] **5** bucket wheel

[0043] **6** chute

[0044] **7** take-up chute of the loading boom **13**

[0045] **8** pivot direction/pivot angle of the boom **4** across the block width

[0046] **9** crawler-mounted substructure

[0047] **10** direction of travel of the substructure **9**

[0048] **12** movable transferring device of the bucket-wheel excavator or bucket chain excavator

[0049] **13** loading excavator (discharge conveyor) inclusive of loading belt

[0050] **14** loading chute (rotating chute, transfer chute) of the transferring device

[0051] **15** pivot mechanism/lifting gear for loading boom

[0052] **17** bench conveyor (face conveyor) inclusive of bench conveyor

[0053] **18** bench conveyor axis=belt middle of the bench conveyor **17**

[0054] **20** open-loop/closed-loop control device

[0055] **21** sensor for detecting the current spatial coordinates $x_B/y_B/z_B$ of the bucket-wheel excavator or bucket chain excavator **1**→signal A

[0056] **22** sensor for detecting the current spatial coordinates $x_S/y_S/z_S$ of the bench conveyor axis **18** or of the take-up belt **39** of the mobile transfer conveyor **37**→signal B

[0057] **23** sensor for detecting the current longitudinal and transverse inclination of the loading boom **13**→signal C

[0058] **24** sensor for detecting the current pivot angle of the loading boom **13**→signal D

[0059] **25** sensor for detecting the current load upon the loading belt of the loading boom **13**→signal E

[0060] **26** sensor for detecting the current distance of the loading boom **13** to the track level or above the bench conveyor belt of the bench conveyor **17** or above the take-up belt **39** of the mobile transfer conveyor **37**→signal F

[0061] **27** sensor for detecting the current vertical positioning of the loading boom **13** above the bench conveyor belt of the bench conveyor **17** or above the take-up belt **39** of the mobile transfer conveyor **37** inclusive of detection of the belt middle→signal G

[0062] **28** sensor for detecting the current load state of the bench conveyor belt of the bench conveyor **17** or of the take-up belt **39** of the mobile transfer conveyor **37**,→signal H

[0063] **29** sensor for detecting any current skewing of the bench conveyor belt of the bench conveyor **17** or of the take-up belt **39** of the mobile transfer conveyor **37**→signal I

[0064] **30** sensor for detecting the current angular position of the loading chute **14**→signal K

[0065] **31** sensor for detecting the current inclination of the loading chute **14**→signal L

[0066] **32** sensor for detecting objects within the range of pivot of the loading boom **13** (collision protection)→signal M

[0067] **33** sensor for detecting the current belt pass-over point between the take-up belt of the boom **4** and the loading belt of the loading boom **13** (collision protection) →signal N

[0068] **34** sensor for detecting the current belt pass-over point between the loading belt of the loading boom **13** and the bench conveyor belt of the bench conveyor **17** or the take-up belt **39** of the mobile transfer conveyor **37** (collision protection)→signal O

[0069] **35** target value presets/parameter presets

[0070] **37** mobile transfer conveyor

[0071] **38** crawler-mounted substructure

[0072] **39** take-up belt

[0073] **40** transfer chute

What is claimed is:

1. A method for detecting and tracking a position of a movable transferring device/loading device of a bucket-wheel excavator, which excavator includes an extraction apparatus having a pivotable superstructure with an inclinable boom, a track-mobile substructure, and a transferring device with a loading boom, the superstructure delivers conveyed material by means of a bench conveyor without an interposed mobile transfer conveyor or transfer point, wherein an open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading boom of the transferring device, the method comprising:

detecting, in a first sensor, current spatial coordinates of the bucket-wheel excavator;

detecting, in a second sensor, current spatial coordinates of the bench conveyor;

detecting, in a third sensor, current longitudinal inclination and transverse inclination of the loading boom;
detecting, in a fourth sensor, a current pivot angle of the loading boom;
detecting, in a fifth sensor, a current distance of the loading boom above the bench conveyor;
detecting, in a sixth sensor, a current vertical positioning of the loading boom above the bench conveyor; and
monitoring, in a seventh sensor, overfilling at the transfer point of the loading boom.

2. The method as claimed in claim **1**, comprising:
supplying the loading boom of the bench conveyor with conveyed material via a loading chute, wherein the open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading chute the method comprising:
detecting, in an eighth sensor, a current load state of a bench conveyor belt of the bench conveyor;
detecting, in a ninth sensor, any current skewing of the bench conveyor belt of the bench conveyor;
detecting, in a tenth sensor, a current angular position of the loading chute; and
detecting, in an eleventh sensor, a current inclination of the loading chute.

3. The method as claimed in claim **1**, wherein the open-loop or closed-loop control device is fed signals of at least one of the first through seventh sensors for detecting a current load upon a loading belt of the loading boom.

4. The method as claimed in claim **1**, wherein the open-loop or closed-loop control device is fed signals of a twelfth sensor for detecting a current belt pass-over point between a take-up belt of the boom and a loading belt of the loading boom.

5. The method as claimed in claim **1**, wherein the open-loop or closed-loop control device is additionally fed signals of a thirteenth sensor for detecting a current belt pass-over point between a loading belt of the loading boom and the bench conveyor belt of the bench conveyor.

6. The method as claimed in claim **1**, wherein the open-loop or closed-loop control device is fed signals of a fourteenth sensor for detecting objects within range of pivot of the loading boom.

7. A method for detecting and tracking a position of a movable transferring device/loading device of a bucket-wheel excavator or bucket chain excavator, which excavator includes an extraction apparatus having a pivotable superstructure with an inclinable boom, a track-mobile substructure, and a transferring device with a loading boom, the superstructure delivers conveyed material by means of a bench conveyor with an interposed mobile transfer conveyor or transfer point, wherein an open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading boom of the transferring device, the method comprising:
detecting, in a first sensor, current spatial coordinates of the bucket-wheel excavator or bucket chain excavator;
detecting, in a second sensor, current spatial coordinates of the bench conveyor or of the take-up belt of the mobile transfer conveyor;
detecting, in a third sensor, current longitudinal inclination and transverse inclination of the loading boom;
detecting, in a fourth sensor, a current pivot angle of the loading boom;
detecting, in a fifth sensor, a current distance of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor;
detecting, in a sixth sensor, a current vertical positioning of the loading boom above the bench conveyor or above the take-up belt of the mobile transfer conveyor, inclusive of detection of the belt middle; and
monitoring, in a seventh sensor, an overfilling at the transfer point of the loading boom.

8. The method as claimed in claim **7**, comprising:
supplying the loading boom of the bench conveyor or the take-up belt of the mobile transfer conveyor with conveyed material via a loading chute, wherein the open-loop or closed-loop control device establishes the pivot angle and the inclination of the loading chute, the method comprising:
detecting, in an eighth sensor, the current load state of the bench conveyor belt of the bench conveyor or of the take-up belt of the mobile transfer conveyor;
detecting, in a ninth sensor, any current skewing of the bench conveyor belt of the bench conveyor or of the take-up belt of the mobile transfer conveyor;
detecting, in a tenth sensor, a current angular position of the loading chute; and
detecting, in an eleventh sensor, a current inclination of the loading chute.

9. The method as claimed in claim **7**, wherein the open-loop or closed-loop control device is fed signals of a twelfth sensor for detecting a current load upon the loading belt of the loading boom.

10. The method as claimed in claim **7**, wherein the open-loop or closed-loop control device is fed signals of a thirteenth sensor for detecting a current belt pass-over point between the take-up belt of the boom and the loading belt of the loading boom.

11. The method as claimed in claim **7**, wherein the open-loop or closed-loop control device is additionally fed signals of a fourteenth sensor for detecting a current belt pass-over point between the loading belt of the loading boom and the bench conveyor belt of the bench conveyor or the take-up belt of the mobile transfer conveyor.

12. The method as claimed in claim **7**, wherein the open-loop or closed-loop control device is fed signals of a fourteenth sensor for detecting objects within range of pivot of the loading boom.

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