CONVENTION APPLICATION FOR A STANDARD PATENT

WE, FRIED. KRUPP GESELLSCHAFT MIT BESCHRANKTER HAFTUNG
A limited liability company of Altendorfer Strasse 103,
D-4300 Essen 1, Federal Republic of Germany

hereby apply for the grant of a Standard Patent for an
invention entitled:

STEEP BELT CONVEYOR

which is described in the accompanying complete specification.

This application is made under the provision of Part XVI of
the Patents Act 1952 and is based on an application for a
patent or similar protection made

in Federal Republic of Germany on 13 December 1986
No. (P36 42 718.7)

Our address for service is:
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Dated this 8th day of December 1987
FRID. KRUPP GESELLSCHAFT MIT BESCHRANKTER HAFTUNG

By:
Registered Patent Attorney

To: The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA
Commonwealth of Australia
The Patents Act 1952
DECLARATION IN SUPPORT

In support of the (Convention) Application made by:
FRIED. KRUPP GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, of
Altendorfer Strasse 103, D-4300 Essen 1, Federal Republic of
Germany
for a patent for an invention entitled: Steep belt conveyor

\(\text{We (We) Artur Reiffer, Assessor and Dipl. W. Dehmer, Director}\)
of and care of the applicant company do solemnly and sincerely declare as follows:

a) (We are) authorised by the applicant(s) for the patent to make this declaration on its behalf.

Delete the following if not a Convention Application.

The basic application(s) as defined by section 141(143) of the Act was (were) made

on 13 December 1986 in Federal Republic of Germany

by the present applicant company

The basic application(s) referred to in this paragraph is (are) the first application(s) made in
a Convention country in respect of the invention the subject of the application.

\(\text{We (We) are} \text{the actual inventor(s) of the invention}\)

b) Gregor Enneking, Wellinghof 28, D-2846 Neuenkirchen,

Federal republic of Germany

is (are) the actual inventor(s) of the invention and the facts upon which
the applicant company
is (are) entitled to make the application are as follows:
the applicant is a person who would if a patent were granted
upon an application made by the actual inventor, be
entitled to have the patent assigned to it.

Declared at this 4th day of November, 1987
FRIED. KRUPP GESELLSCHAFT MIT BESCHRANKTER HAFTUNG
Signed (Status) Director & Assessor
W. Dehmer
Declarant's Name Arthur Reiffer

F. B. RICE & CO PATENT ATTORNEYS
This form is suitable for any type of Patent Application. No legalisation required.
Claim

1. A steep vertical conveyor for conveying bulk materials from a lower level to an upper level, said conveyor comprising: a one-piece bridge structure having two opposed ends each arranged to be disposed at a respective one of the levels; an endless conveyor extending along said bridge structure; a first intermediate frame to which is articulated that one of said ends which is arranged to be disposed at the lower level; a second intermediate frame to which is articulated that one of said ends which is arranged to be disposed at the upper level; means connected for adjusting the position of said first intermediate frame in a vertical direction; first and second supporting devices each arranged to support a respective one of said intermediate frames while permitting each of said intermediate frames to be rotatable relative to its associated supporting device; and means supporting said first intermediate frame on said first supporting device for permitting said first intermediate frame to be displaceable relative to said first supporting device in a horizontal direction.
COMPLETE SPECIFICATION

(ORIGINAL)

Application Number : 
Lodged : 

Complete Specification Lodged :
  Accepted :
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Priority : 13 December 1986

Related Art :

Name of Applicant : FRIED. KRUPP GESELLSCHAFT MIT BESCHRANKTER HAFTUNG

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Actual Inventor(s) : Gregor Enneking

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Complete Specification for the invention entitled:

STEEP BELT CONVEYOR

The following statement is a full description of this invention including the best method of performing it known to us:-
BACKGROUND OF THE INVENTION

The present invention relates to a steep angle vertical conveyor for transporting bulk materials from ground at one level to ground at another level, which conveyor includes a bridge structure and an endless conveyor belt.

German Patent No. 740,232 discloses a conveyor for transporting bulk materials from one plane or floor to another plane or floor. The bridge of this conveyor is supported at two points of its upper end and by way of a rotary connection on a tracked vehicle and at its lower end at one point and by way of a ball joint on another tracked vehicle, with the ball joint permitting longitudinal displacement of the bridge relative to the tracked vehicle. If longitudinal displacement of the bridge with respect to the tracked vehicle is required, either the support moves out of the center plane of the tracked vehicle or the bridge support slides beyond this connection. In the former case, the tractor chains are stressed eccentrically which requires excess dimensions, while in the latter case, energy is required to displace the bridge in the direction toward the upper plane relative to the lower tracked vehicle and to raise the lower end as a whole.

Federal Republic of Germany Patent No. 942,079 discloses a steep vertical conveyor which includes a vertical tower structure and an articulatedly supported essentially horizontal bridge structure thereabove. However, the number of parts in this structure makes it more expensive.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome the above-mentioned drawbacks in a vertical conveyor of the above-mentioned type, with the conveyor also being movable in one plane.
The above and other objects are accomplished, according to the present invention, by a steep vertical conveyor for conveying bulk materials from a lower level to an upper level, the conveyor comprising: a one-piece bridge structure having two opposed ends each arranged to be disposed at a respective one of the levels; an endless conveyor extending along the bridge structure; a first intermediate frame to which is articulated that one of the ends which is arranged to be disposed at the lower level; a second intermediate frame to which is articulated that one of the ends which is arranged to be disposed at the upper level; means connected for adjusting the position of the first intermediate frame in a vertical direction; first and second supporting devices each arranged to support a respective one of the intermediate frames while permitting each of the intermediate frames to be rotatable relative to its associated supporting device; and means supporting the first intermediate frame on the first supporting device for permitting the first intermediate frame to be displaceable relative to the first supporting device in a horizontal direction.

The inclusion of a first, or lower, horizontally adjustable intermediate frame permits length compensation of the supporting structures when they move away from or toward one another during movement of the entire vertical conveyor, without the bridge structure being raised or the bridge end being stressed other than in the center of the supporting structure.

According to one advantageous feature of the invention, the bridge structure is bent in the vicinity of the end which is arranged to be disposed at the upper level. This helps to assure that the vertical conveyor can be used even if the two levels are separated by a great vertical distance if given minimum or safety distances are observed for the second, or upper,
supporting structure relative to the edge of the slope between the two levels. In further accordance with the invention, the conveyor is provided with: a double ball bearing swivel connection ball joint supporting the second intermediate frame on its associated supporting device; a scaffold-type frame supported by the double ball bearing swivel connection ball joint; and a discharge conveyor belt supported by the scaffold-type frame. The double ball allows the discharge conveyor to be pivoted independently of the orientation of the bridge structure.

One preferred embodiment of the invention is illustrated in the drawing figures and will be described in greater detail below.

**BRIEF DESCRIPTION OF THE DRAWING**

Figure 1 is a slide elevational view of a steep vertical conveyor according to the preferred embodiment in its operating position.

Figure 2 is a side view of the vertical conveyor of Figure 1 in a transporting position.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Figures 1 and 2 show the steep vertical conveyor which includes a one-piece bridge structure whose lower end is supported on a platform or, more precisely, on an intermediate frame, on the one hand, by way of a hinge having a horizontal axis perpendicular to the plane of the drawing and, on the other hand, by way of two hydraulic cylinders. The underside of intermediate frame is provided with rails via which frame is supported on wheels or rollers of a frame or stand, identified in Figure 2. Frame or stand is in turn supported by way of a ball joint (not shown in detail) in the center of a caterpillar, or tracked, drive or undercarriage disposed on a lower ground surface or a lower plane.

The upper end of bridge structure is bent relative to the lower end thereof and is supported by a horizontal
shaft 11 disposed parallel to the axis of hinge 3. Shaft 11 is carried by an intermediate frame, or intermediate support, 12 which, in turn, is supported by a ball bearing swivel connection rotary ball joint 13 mounted in the center of a gantry 14. A scaffold-type frame 16 is mounted on gantry 14 via a further ball bearing swivel connection ball joint 15, with a discharge conveyor belt 17 being articulated to frame 16. The position of conveyor belt 17 in the vertical direction is adjustable by means of a cable 18 and a drawing or pulling device 19.

In the operating position shown in Figure 1, gantry 14 rests on an upper ground surface or an upper plane 20. A steep vertical conveyor belt 21 extends along the entire length of bridge structure 2. Conveyor belt 21 can have the form described, for example, by Kunstmann et al in "New Dimensions in Capacity and Elevation with the FLEXOFAST® Conveyor System", which appeared in the periodical Bulk Solids Handling, Vol. 4, No. 1, March, 1984, pages 105-112.

Gantry 14 has such a configuration that a load transporting device 22, as disclosed for example in FRG-OS (Federal Republic of Germany Laid-Open Application) 2,416,642 and counterpart U.S. Patent No. 4,036,377, is able to move under and raise gantry 14 to carry it along for transporting the vertical conveyor. If the vertical conveyor is moved from the highest operating position shown in Figure 1 to a lower plane, or to the same plane 10 as drive 9 for transporting the vertical conveyor as shown in Figure 2 - or vice versa - hydraulic cylinders 4 are telescoped out in such a manner that intermediate frame 5 is always in a horizontal position. This can be accomplished, for example, in that pressure medium is supplied in a known manner to hydraulic cylinders 4 by way of a switching device which operates, for example, according to the principle of a bubble level and is fixed
relative to intermediate frame 5, or a pendulum connected therewith.

According to a modified version of the above-described embodiment, the upper and lower ends of bridge structure 2 may each be mounted on a track-laying vehicle or a gantry. Additionally, spindle drives (not shown) may be employed between lower intermediate frame 5 and bridge structure 2 instead of hydraulic cylinders 4.

The invention now being fully described, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein.

The present disclosure relates to the subject matter disclosed in German Application P 36 42 718.7 of December 13th, 1986, the entire specification of which is incorporated herein by reference.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A steep vertical conveyor for conveying bulk materials from a lower level to an upper level, said conveyor comprising: a one-piece bridge structure having two opposed ends each arranged to be disposed at a respective one of the levels; an endless conveyor extending along said bridge structure; a first intermediate frame to which is articulated that one of said ends which is arranged to be disposed at the lower level; a second intermediate frame to which is articulated that one of said ends which is arranged to be disposed at the upper level; means connected for adjusting the position of said first intermediate frame in a vertical direction; first and second supporting devices each arranged to support a respective one of said intermediate frames while permitting each of said intermediate frames to be rotatable relative to its associated supporting device; and means supporting said first intermediate frame on said first supporting device for permitting said first intermediate frame to be displaceable relative to said first supporting device in a horizontal direction.

2. Vertical conveyor as defined in claim 1 wherein said bridge structure is bent in the vicinity of said end which is arranged to be disposed at the upper level.

3. Vertical conveyor as defined in claim 2 further comprising: a double ball bearing swivel connection ball joint supporting said second intermediate frame on its associated supporting device; a scaffold-type frame supported by said double ball bearing swivel connection ball joint; and a discharge conveyor belt supported by said scaffold-type frame.

Dated this 8th day of December 1987

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Patent Attorneys for the Applicant
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