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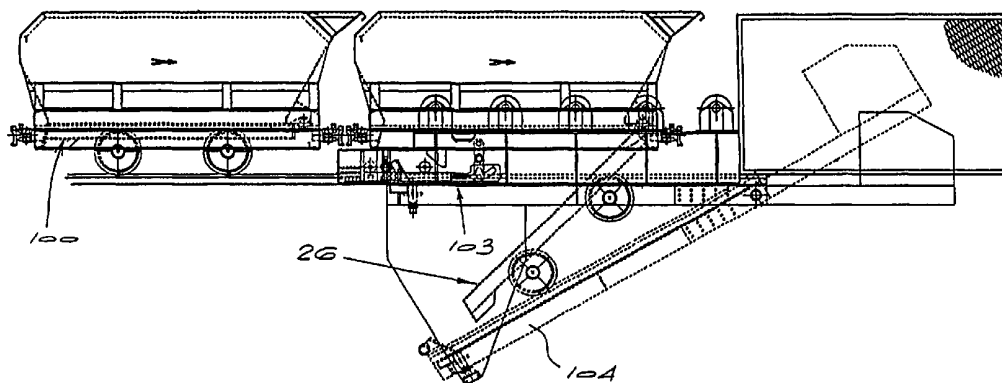
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(54) Title: HOPPER



(57) **Abstract:** The invention concerns a hopper (10) comprising a hopper body (12) having side and end walls (14 and 16) extending downwardly to a lower edge (54). In addition, there is a hopper bottom (26) having a chassis frame (28) carrying rail wheels (30) on which the hopper runs on a rail track. The hopper bottom (26) is connected pivotally to the hopper body (12) for movement relative to the hopper body between an open position in which the bottom has moved pivotally away from the hopper body to allow gravitational discharge of the hopper contents and a closed position in which the chassis frame of the bottom and the lower edge of the hopper body locate one inside the other.



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**“HOPPER”****BACKGROUND TO THE INVENTION**

THIS invention relates to a hopper.

So-called Rockflow Hoppers have been known for many years. A hopper of this type has an ore carrying body defined by side and end walls and a bottom which is pivoted to the remainder of the hopper about an axis transverse to the travel direction. The rail wheels on which the hopper runs in normal use are carried by the bottom. The bottom structure also carries a central, so-called “bull wheel” between the rail wheels.

A Rockflow Hopper is discharged under gravity at a specially designed discharge station at which there is an excavation beneath the level of the normal rails. The normal rail track terminates on either side of the excavation while a central bull wheel rail extends through and follows the contour of the excavation. In addition there is a robust supporting frame spanning the excavation and carrying a series of spaced apart support wheels elevated above the level of the normal rail track, on either side of the track. The hopper and tractive locomotive are fitted with laterally projecting flanges which can rest and ride on the support wheels.

In use, the locomotive and hopper train move continuously through the discharge station. Each vehicle in the train leaves the rail track on one side of the excavation, traverses the excavation on the support wheels and thereafter regains contact with the rail track on the opposite side of the excavation. As each hopper moves over the excavation, the bull wheel picks up and follows the bull wheel rail and the bottom of the hopper pivots downwardly into the excavation. As the bottom of the hopper swings open, the hopper contents discharge under gravity into the excavation and eventual chute or pass.

Rockflow Hoppers of the type described above operate extremely well and reliably in practice. However a major drawback of these hoppers is their relatively high cost when compared to other hoppers. The high cost is attributable to a number of factors. Firstly, known Rockflow Hoppers have a dual chassis, namely an upper one at the lower edge of the body and a lower one on the bottom. Secondly, the coupling buffers which all rail hoppers must have are mounted at the leading and trailing ends of the upper chassis. This means that they are higher than the buffers on other rolling stock such as material cars, explosive cars and hoppers of different type, and so cannot be coupled to such equipment making them incompatible with other rolling stock and therefore unattractive to mines which use different types of hoppers which need to be coupled to one another. Thirdly, the bull wheel structure provided on conventional Rockflow Hoppers adds considerably to the overall hopper cost. Fourthly, the double chassis and bull wheel requirements reduce the volumetric efficiency of the hopper.

An associated disadvantage is the high cost of the discharge stations which are designed for use with Rockflow Hoppers. This particular disadvantage is addressed in a copending patent application of the applicant entitled "Hopper Discharge Station".

The present invention seeks to address the abovementioned disadvantages of the known Rockflow Hoppers.

### **SUMMARY OF THE INVENTION**

According to the present invention there is provided a hopper comprising a hopper body having side and end walls extending downwardly to a lower edge and a bottom having a chassis frame and carrying rail wheels on which the hopper runs on a rail track in use, the hopper bottom being connected pivotally to the hopper body for movement relative to the hopper body between an open position in which the bottom has moved pivotally

away from the hopper body to allow gravitational discharge of the hopper contents and a closed position in which the chassis frame of the bottom and the lower edge of the hopper body locate one inside the other.

In the preferred embodiments, the hopper body is pivoted to the hopper body about an axis transverse to the direction of hopper movement with the chassis frame of the bottom locating inside the lower edge of the hopper body, the latter of which carries leading and trailing coupling buffers. Conveniently, the coupling buffers are located at a height at which they will be compatible with other hoppers and rolling stock.

The side walls of the hopper body may carry laterally projecting trigger formations, towards the lower edge of the hopper body, the trigger formations serving in use to initiate a hopper discharging operation. In addition, the side walls may carry laterally projecting flange formations arranged to ride on rollers at the sides of a hopper discharge station.

An advantage of the hopper of the invention is that it has no bull wheel to follow a bull wheel rail through an excavation.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

- Figure 1** shows a diagrammatic illustration of a conventional Rockflow Hopper;
- Figure 2** diagrammatically illustrates hoppers according to this invention at a discharge station;
- Figure 3** shows a diagrammatic end view of a hopper of the type seen in Figure 2;

- Figure 4** shows a side view of a preferred hopper according to this invention;
- Figure 5** shows a rear end view of the hopper of Figure 4; and
- Figure 6** illustrates the operation of hoppers of the kind illustrated in Figures 4 and 5.

#### **DETAILED DESCRIPTION OF THE DRAWINGS**

Figure 1 shows a conventional Rockflow Hopper 10 which has a hopper body 12 with side walls 14 and end walls 16 mounted on a chassis 18 which supports leading and trailing coupling buffers 20 and 22 respectively, the forward direction of movement of the hopper being indicated with the numeral 24. The hopper 10 also has a bottom 26 with its own chassis 28 supporting rail wheels 30. The bottom is pivoted to the hopper body at a pivot axis 31. Mounted on the side walls 14 of the hopper 10 are laterally projecting flange structures 32 on which the hopper body is supported when the hopper moves through a conventional Rockflow Hopper discharge station. A central bull wheel 34 is mounted to the trailing or rear end of the chassis 28.

Reference is now made to Figure 2 which illustrates several hoppers 50 according to this invention and Figure 3 which illustrates a single one of these hoppers. Components of this hopper corresponding to components of the conventional Rockflow Hopper seen in Figure 1 are indicated with the same reference numerals.

The side and end walls 14 and 16 of the hopper body 52 of the hopper 50 extend downwardly to a lower edge 54 formed by steel plates. The steel plate 54.1 which forms the lower edge at the trailing end of the hopper is outwardly inclined as shown. The bottom 26 of the hopper 50 includes a

chassis 56 and supports the rail wheels 30. The trailing end of the chassis 56 has an inclination corresponding to that of the plate 54.1 of the lower edge of the hopper body 52. The chassis 56 is pivoted to the hopper body 52 at the pivot axis 31, the actual pivot structures being indicated generally in Figure 3 by the numeral 58.

Coupling buffers 60, which may be of conventional design, are mounted to the leading and trailing ends of the lower edge of the hopper body, a frame 62 being provided at the trailing end for this purpose.

The hopper 50 is designed for use in a mine having a hopper discharge station of the type described in the aforementioned, copending patent application entitled "Hopper Discharge Station". Reference should be made to the specification filed in support of that application for the details of the station, an example of which is indicated generally with the numeral 51 in Figure 2. Because the hopper discharge stations described in the copending patent application have no bull wheel rail, the present hopper 50 does not have a bull wheel corresponding to the bull wheel 34 of the conventional Rockflow Hopper 10. It should however be noted that it is within the scope of the invention for the hopper 50 to have a central bull wheel mounted to the chassis 56, the resulting hopper then being suitable for use in mines which have traditional discharge stations designed for use with conventional Rockflow Hoppers.

The broken lines in Figure 2 illustrate the position of the bottom 26 of the hopper body when it is pivoted downwardly about the axis 31 for the purposes of discharging the hopper at the hopper discharge station 51. When the bottom 26 is pivoted upwardly again after a discharge operation, the chassis 56 locates within the lower edge of the hopper body, as seen in full lines in Figure 2. When so located, the chassis 56 provides the lower edge of the hopper body with additional strength to assist in carrying the coupling buffers which can transmit considerable forces to the hopper.

The cooperating inclinations at the trailing ends of the lower edge 54 and chassis 56 enable them to fit together snugly as the chassis pivots into the lower edge 54.

The fact that the chassis 56 fits inside and adds to the strength of the lower edge 54 of the hopper body enables the coupling buffers 62 to be at a lower level than is possible with the conventional hopper. With this feature, the height of the coupling buffers may be matched to that of other hopper types and other rolling stock, enabling the hopper 50 to be coupled to such other hoppers.

In cases where the bull wheel is omitted there will be a further reduction in the cost of the hopper 50.

In the hopper 50 the chassis 56 locates within the lower edge 54 of the hopper body. However, as mentioned previously, it is possible for the lower edge of the hopper body to locate inside the chassis. The edges of the chassis may be in the form of lips which will extend upwardly from the inside or the outside of the lower edge 54 when the bottom is in the closed position. It is believed that this configuration may be advantageous in preventing spillage in situations where the ore carried by the hopper includes water which may contain valuable minerals.

Figures 4 to 6 illustrate a second embodiment of the invention in which, once again, the bottom chassis locates inside the lower edge of the hopper body, as is particularly indicated in Figure 6 by the arrow 100. Referring to Figures 4 and 5, it will be seen that the lower edge 54 of the hopper body is outwardly inclined at the rear or trailing end, as indicated by the numeral 54.1, and also at the sides, as indicated by the numeral 54.2. The relevant surfaces of the hopper bottom 26 are complementally inclined.

Outwardly projecting trigger formations 102 are provided on both sides of the hopper body at an elevation close to the lower edge 54. In operation, as shown in Figure 6, the trigger formations impact against latching mechanisms 103 at the sides of the rail track at a hopper discharge station

or tip. As described in detail in the aforementioned, copending patent application, this unlatches a section 104 of the rail track which pivots downwardly to allow the hopper bottom to swing open for discharge of the hopper contents, as shown in broken outline. The embodiment of Figures 2 and 3 may also be provided with trigger formations to unlatch the relevant rail section.

It will once again be noted that in the embodiment of Figures 4 to 6, the coupling buffers 22 are mounted to the lower edge 54 of the hopper body, this being advantageous for the reasons stated above.

**CLAIMS**

1.

A hopper comprising a hopper body having side and end walls extending downwardly to a lower edge and a bottom having a chassis frame and carrying rail wheels on which the hopper runs on a rail track in use, the hopper bottom being connected pivotally to the hopper body for movement relative to the hopper body between an open position in which the bottom has moved pivotally away from the hopper body to allow gravitational discharge of the hopper contents and a closed position in which the chassis frame of the bottom and the lower edge of the hopper body locate one inside the other.

2.

A hopper according to claim 1 wherein the bottom is connected pivotally to the hopper body about an axis transverse to the direction of hopper movement.

3.

A hopper according to either one of the preceding claims wherein the chassis frame of the bottom locates inside the lower edge of the hopper body which carries leading and trailing coupling buffers.

4.

A hopper according to claim 3 wherein the coupling buffers are located at a height at which they will be compatible with other hoppers and rolling stock.

5.

A hopper according to either one of claims 3 or 4 wherein the side walls of the hopper body carry trigger formations, towards the lower edge of the hopper body, the trigger formations serving in use to initiate a hopper discharging operation.

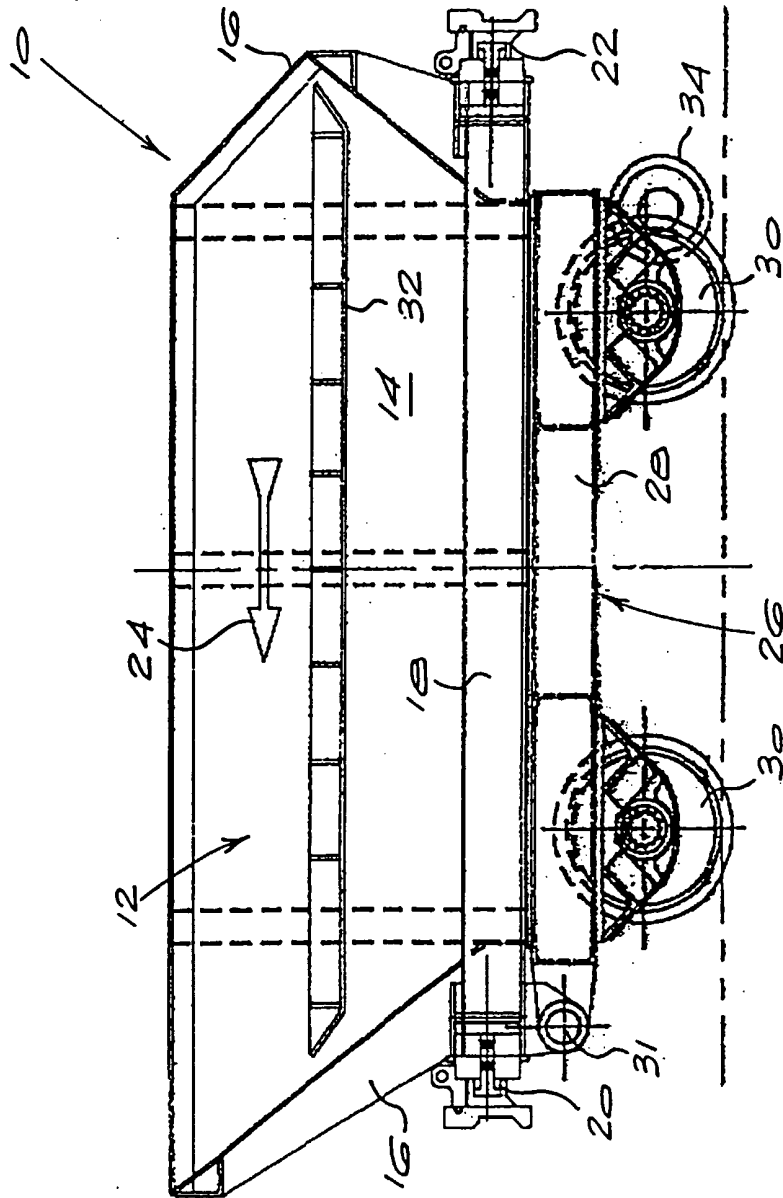
6.

A hopper according to any one of the preceding claims and wherein the side walls of the hopper body carry laterally projecting flange formations arranged to ride on rollers at the sides of a hopper discharge station.

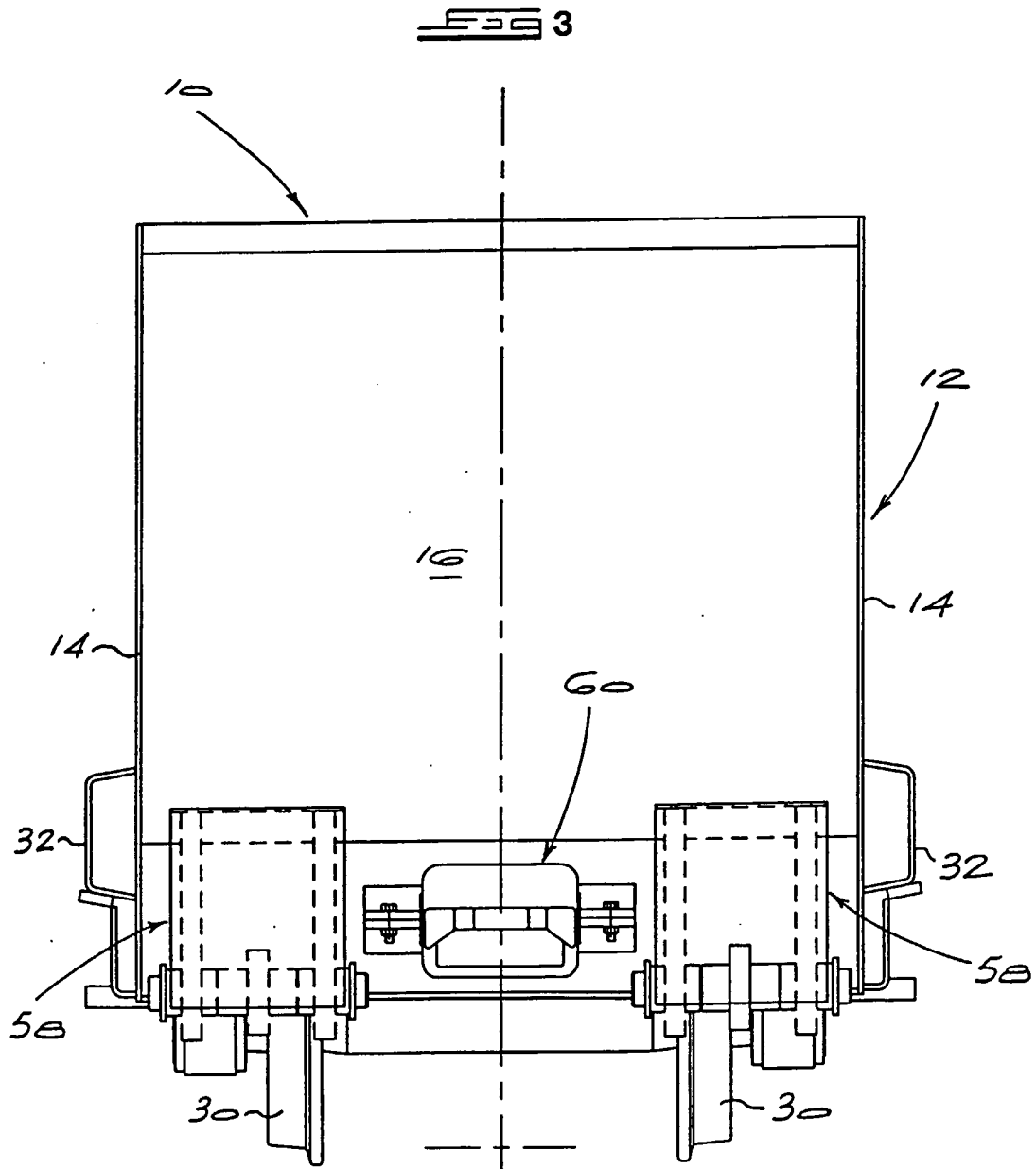
7.

A hopper according to any one of the preceding claims and having no bull wheel to follow a bull wheel rail through an excavation.

Fig 1







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Fig 4

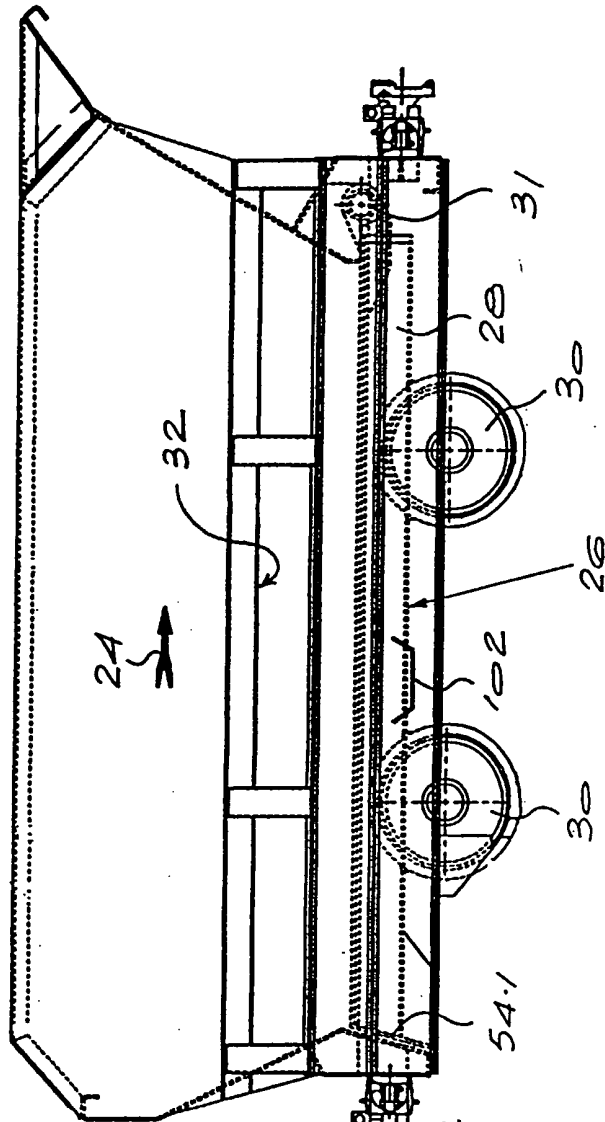


Fig 5

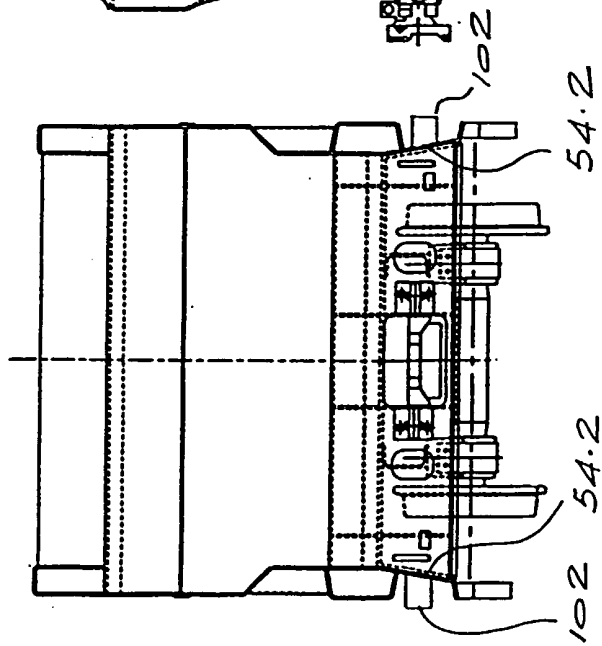
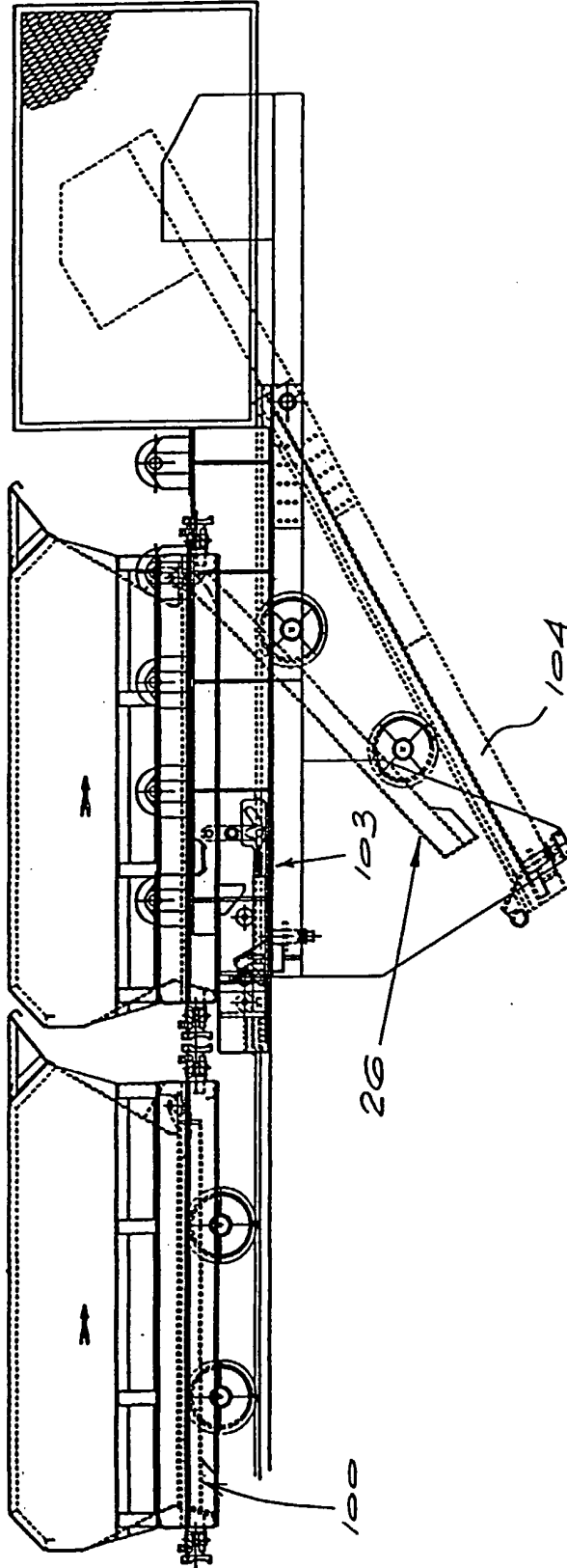


FIG 6



## INTERNATIONAL SEARCH REPORT

Int. Patent Application No

PCT/IB 00/01909

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B61D7/30

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B61D B65G B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 260 731 A (ROBERT HUDSON LTD.) 19 January 1972 (1972-01-19) page 2, line 6 - line 71; figure 1 ---	1
A	DE 24 41 530 A (GUTEHOFFNUNGSHUETTE STERKRADE) 11 March 1976 (1976-03-11) page 3, line 16 -page 4, line 4; figures 1,2 ---	1
A	DE 14 55 073 A (PROJEKTNIJ INSTITUT) 16 January 1969 (1969-01-16) page 3, line 17 -page 4, paragraph 2; figures 1-6 -----	1

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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DE 2441530 A	11-03-1976	ES 440580 A	01-03-1977
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