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Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 404 273
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 90201693.0

(51) Int. Cl.⁵: B63B 27/22, B65G 67/60

(22) Date of filing: 26.06.90

(30) Priority: 03.07.89 NL 8901691

(43) Date of publication of application:
27.12.90 Bulletin 90/52(84) Designated Contracting States:
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(54) Vessel with unloading device.

(57) A vessel can be unloaded rapidly and automatically with a long grab (15) which is displaced systematically in lengthwise direction in a position di-

rected transversely of the hold, and which length (k) is greater than half the breadth (b) of the hold.

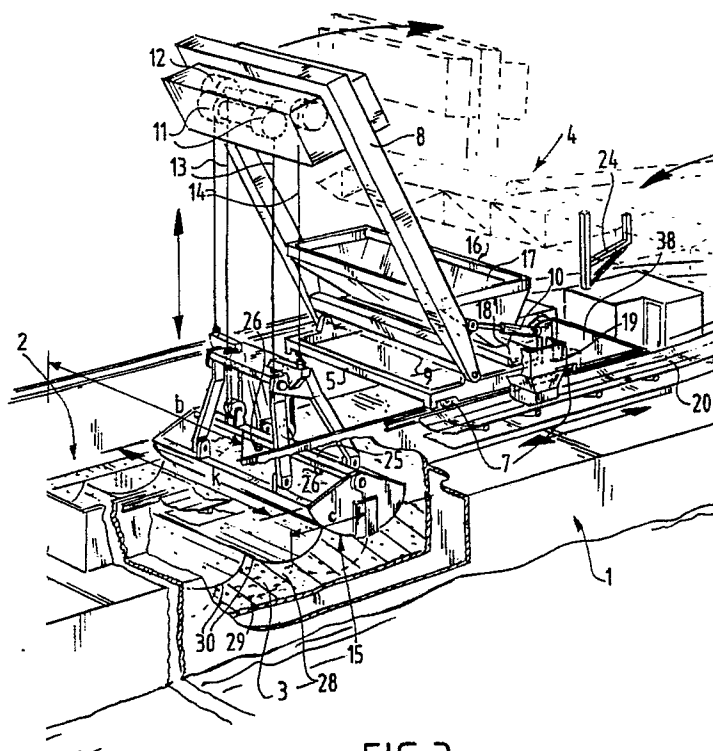


FIG.3

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The invention relates to a vessel comprising a hold for bulk material and an unloading device.

With vessels it is important that they are unloaded as quickly as possible. To this end the invention provides a vessel of the type mentioned in the preamble which has the feature that the unloading device comprises a chassis movable in lengthwise direction of the hold and guided by means of rails, which chassis bears via hoisting means a grab which has a length which is greater than half the breadth of the hold.

The cargo can be removed per layer in parallel bites. The following layer then presents itself as uniform, parallel transverse waves which allow of easy taking up by the grab. This manner of unloading furthermore lends itself well to an automatic process because of the regular presentation of material.

The invention also relates to and provides a method as formulated in claim 8.

Mentioned and other features of the invention will be elucidated in the description following hereinafter with reference to a drawing, in which:

fig. 1 shows a perspective view of a preferred embodiment of a vessel according to the invention;

fig. 2 shows on a larger scale portion II from fig. 1;

fig. 3 shows on a larger scale portion III from fig. 2; and

fig. 4 shows on a larger scale portion IV from fig. 2.

The vessel 1 comprises a hold 2 for receiving bulk material 3, in particular gravel, although sand, coal, grain and other bulk materials are also conceivable. The vessel 1 has an unloading device 4 comprising a chassis 5 which is guided along rails 6 in lengthwise direction of the hold 2. The wheels 7 are driven by electromotors or hydromotors (not drawn). A hoisting frame 8 is connected pivotally to the chassis 5 about a horizontal axis 9 and is swivelled with hydraulic cylinders 10 between a grabbing position drawn in fig. 3 with full lines and a release position drawn in fig. 3 with dashed lines.

In the grabbing position the winches 11 and 12 of respectively the closing cables 13 and the hoisting cables 14 suspended at the upper end of the hoisting frame are located at the side of the chassis 5 so that the grab 15 suspended thereon can be lowered into the hold 2. The grab 15 has a length k which is greater than half the breadth $1/2 b$ of the hold 2. Example: $b = 7\text{m}$ and $k = 6\text{m}$. In any case k is greater than $1/2 b$, preferably greater than $3/4 b$ and for example at least $6/7 b$.

In the release position the grab 15 is located above receiving means 16 arranged on the chassis 5 consisting of an elongate trough 17 positioned transversely to the hold 2 which debouches onto a

cross conveyor 18 which discharges the material via a discharge chute 19 onto a lengthwise conveyor 20 disposed alongside the hold. This pours the material via a discharge chute 22 onto an outboard transporting discharge conveyor 21 for carrying the material ashore. During passage this discharge conveyor 21 is swivelled on board about a shaft 23 into the position drawn in fig. 1 with dashed lines and then rests on a support 24.

An upper beam 25 of the grab 15 bears a number of ultrasonic pick-ups 26 which signal when the distance of the opened grab 15 to the material 3 has reached a certain minimum distance.

Because the grab 15 is suspended on four cables 14 arranged at a considerable mutual distance the grab 15 remains properly positioned in transverse direction of the hold 2.

The material 3 is picked up from the hold 2 in layers wherein an elongate bite 28 extending in a transverse direction is picked up each time, which bite has a part cylinder-shaped bottom surface 29 and two part cylinder-shaped upper surfaces 30. The grab 15 has a well-presented bite to handle with each following layer because the chassis 5, and therewith the biting grab 15, is disposed each time staggered a half bite 28 relative to the previous layer. The unloading method, controlled by a computer, is carried out automatically.

The chassis 5 is hereby displaced each time a bite breadth c after each bite 28 and in each case only one bite 28 is taken up and unloaded above the receiving means 16. After taking the bite 28, during the raising thereof and during the swivelling of the hoisting frame 8, the chassis 8 is already being moved a step in the length of the bite breadth c so that the opened grab 15 immediately comes to lie at the correct position for the following bite 28.

The reciprocal swivelling of the hoisting frame 8 also takes place automatically. Paying out of the closing and hoisting cables is stopped at the correct moment by the ultrasonic pick-ups 26. The end of the layer is signalled by limit switches (not drawn) on the chassis when the head end walls 38 of the hold 2 are approached.

At the end of a layer the chassis 5 is displaced a half bite breadth c back at the first bite 28 from a following layer.

Claims

1. Vessel (1), comprising a hold (2) for bulk material (3) and an unloading device (4), characterized in that the unloading device (4) comprises a chassis (5) displaceable in lengthwise direction of the hold (2) and guided by means of rails

(6), which chassis via hoisting means (11, 12, 13, 14) bears a grab (15) which has a length ($\underline{k}$) which is greater than half the breadth ($\underline{b}$) of the hold (2).

2. Vessel (1) as claimed in claim 1, **characterized in that** the grab (15) is suspended on a hoisting frame (8) which is connected to the chassis (5) for pivoting about a horizontal axis (9) and can be swivelled between a grabbing position wherein the grab (15) can be lowered at the side of the chassis (5) into the hold (2) and a release position wherein the grab (15) is located above receiving means (16) arranged on the chassis (5).

3. Vessel (1) as claimed in claim 1 or 2, **characterized in that** the grab (15) is suspended on a hoisting frame (8) by means of at least two hoisting cables (14) disposed at a considerable mutual distance in lengthwise direction of the grab (15) and at least two closing cables (13).

4. Vessel (1) as claimed in any of the foregoing claims, **characterized in that** the grab frame (25) is provided with at least one ultrasonic material pick-up (26) for determining the distance of the grab (15) to the material (3) present in the hold (2).

5. Vessel (1) as claimed in any of the foregoing claims, **characterized in that** the collecting means (16) comprise a cross conveyor (18) which transports material (3) onto a lengthwise conveyor (20) arranged at the side of the vessel (1) and that the lengthwise conveyor (20) discharges the material (3) onto a discharge conveyor (21) to be carried outboard.

6. Vessel (1) as claimed in any of the foregoing claims, **characterized by** a computer which controls the unloading process, in particular the stepwise movement of the chassis (5), the swivelling movement of the hoisting frame (8), the descending and lifting movement of the grab (15) and the opening and closing movement of the grab (15).

7. Vessel (1) as claimed in any of the foregoing claims, **characterized in that** the winches (11, 12) of the hoisting and closing cables (13, 14) and/or the wheels of the chassis (5) are driven by electro- or hydromotors.

8. Method for unloading the hold (2), **characterized in that** the material (3) is removed in layers in parallel transverse bites (28) of a length ($\underline{k}$) which is greater than half the breadth ($\underline{b}$) of the hold (2).

9. Method as claimed in claim 8, **characterized in that** the unloading takes place automatically controlled.

10. Method as claimed in claim 8 or 9, **characterized in that** the hold (2) is emptied with a grab (15) the length ($\underline{k}$) whereof is greater than 3/4 of the breadth ($\underline{b}$) of the hold.

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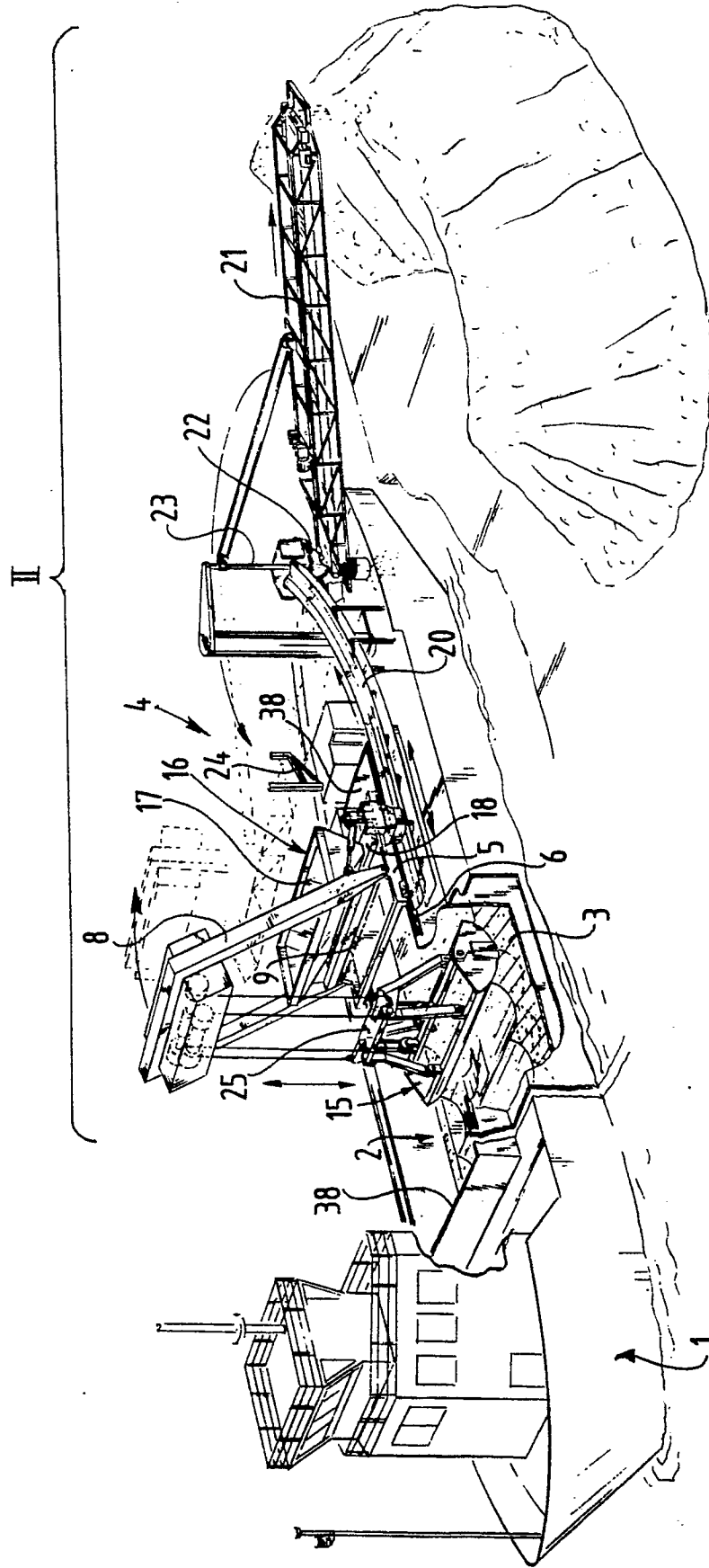
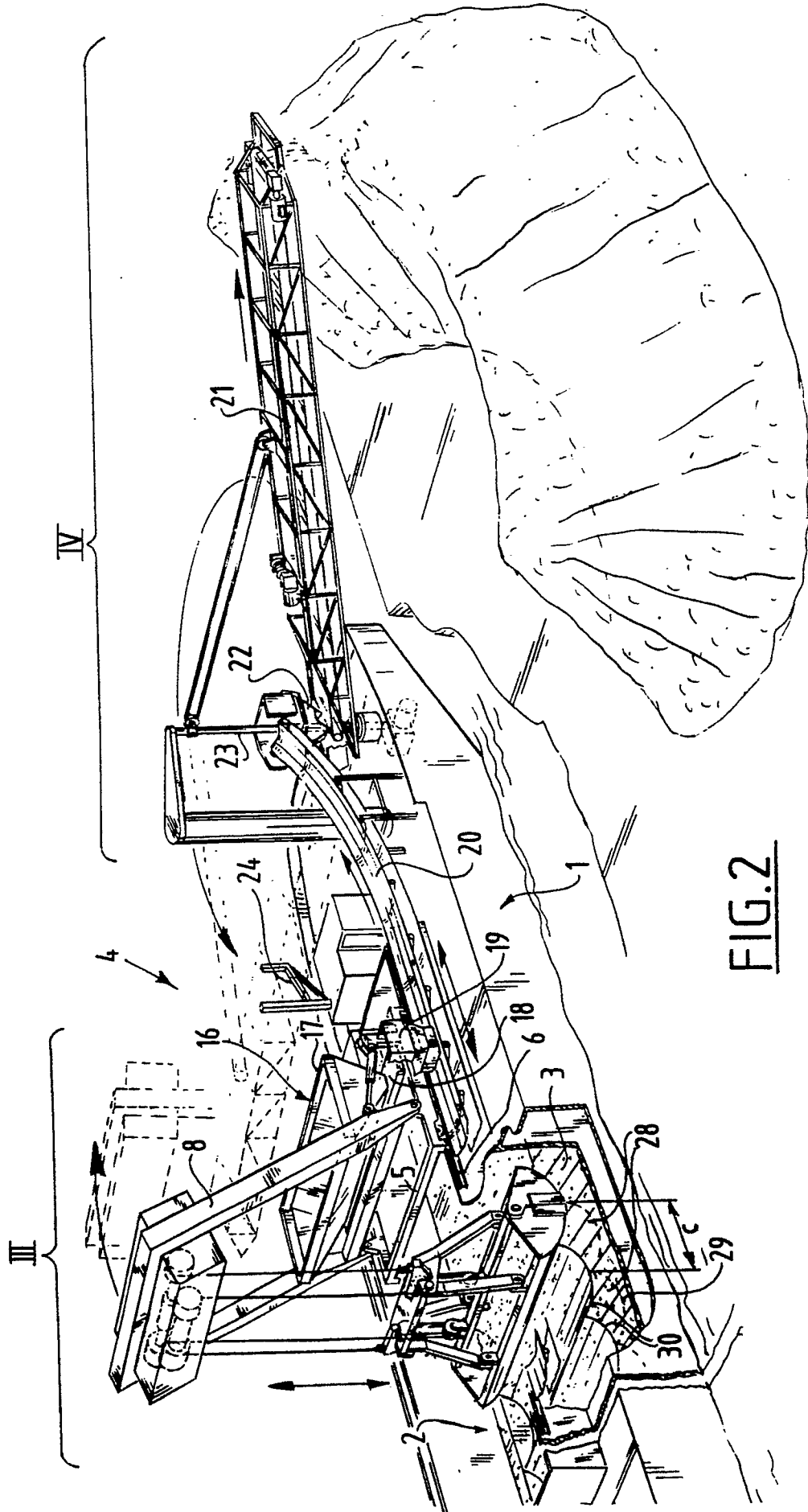


FIG.1



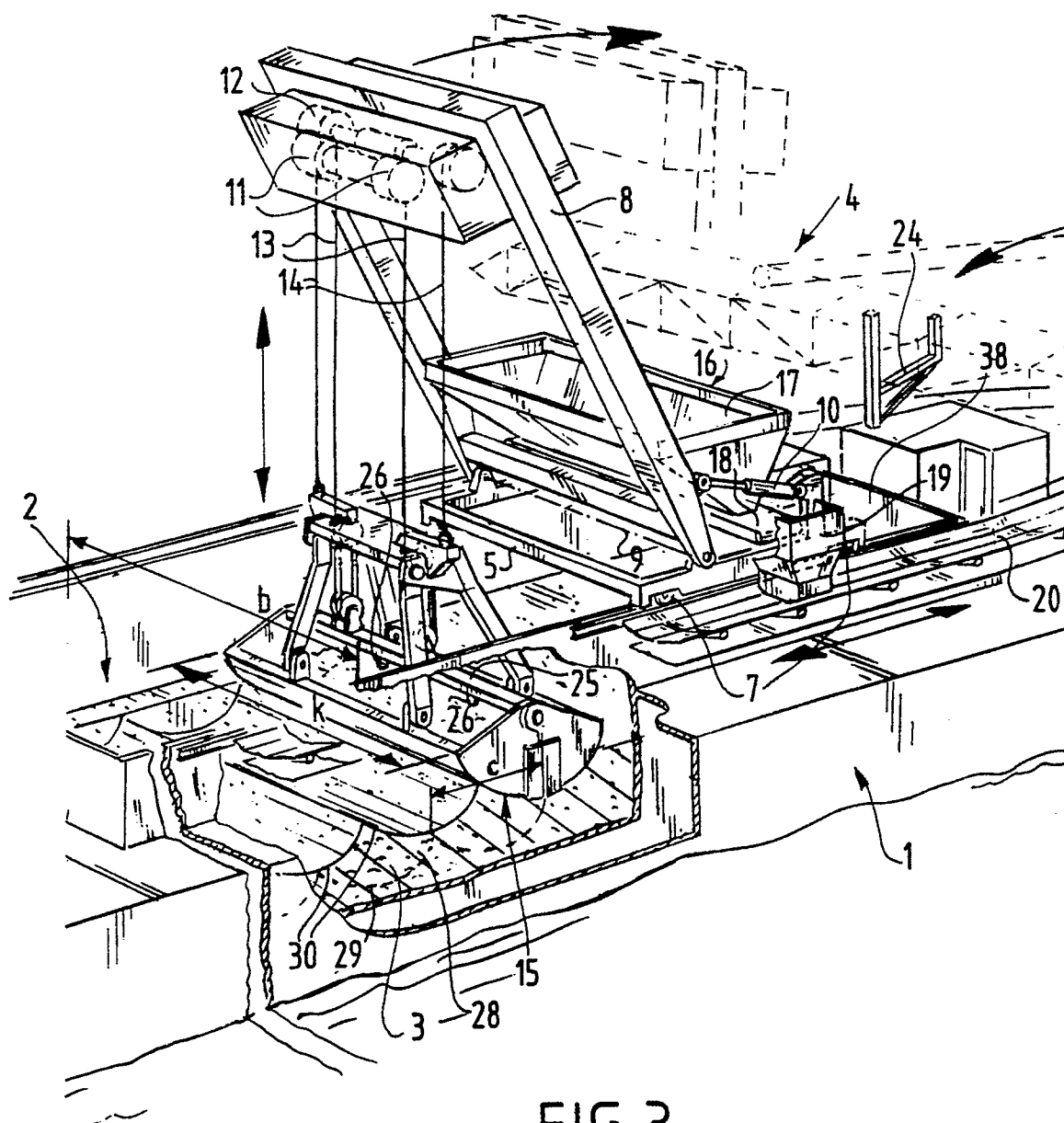
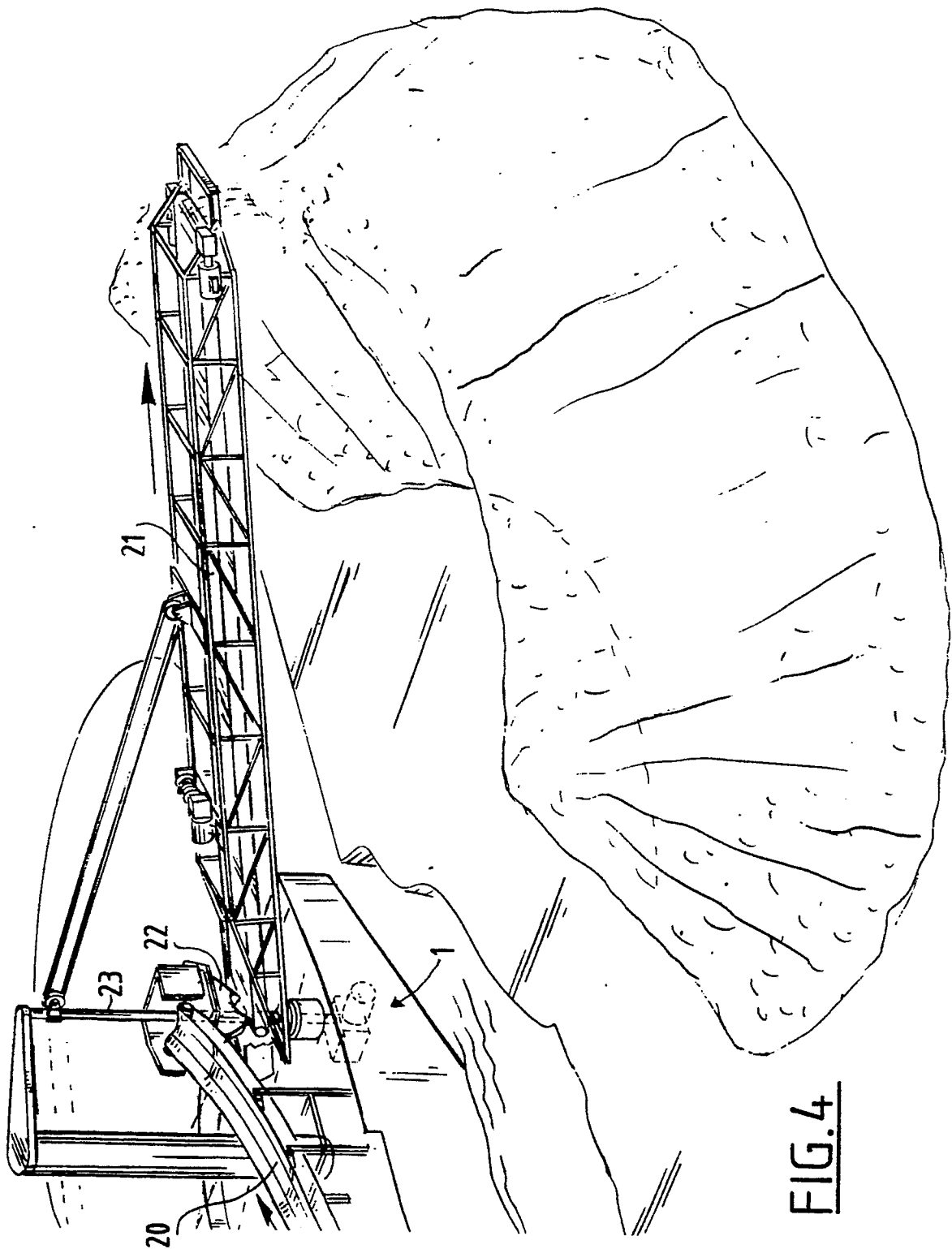


FIG.3





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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 1693

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-2 144 865 (KRUPP) * Figures 1-4 * ---	1,5	B 63 B 27/22 B 65 G 67/60
A	US-A-3 362 546 (SALE) * Figures 1,3 * ---	1,10	
A	GB-A- 19 425 (RICHARDS)(A.D. 1909) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 63 B B 65 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-09-1990	Examiner DE SCHEPPER H.P.H.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			