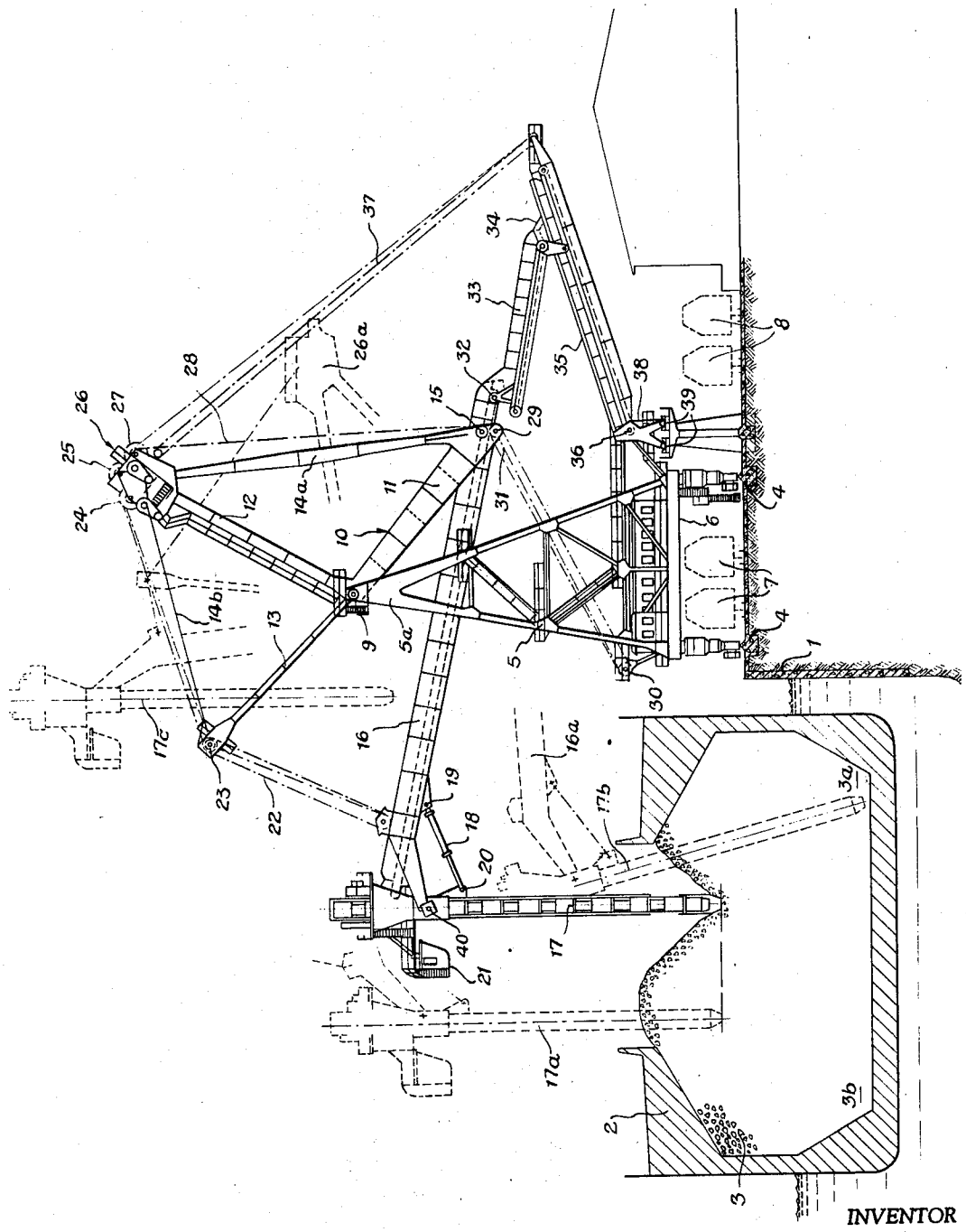
July 16, 1968 R. BASCHANT 3,392,818

SHIP UNLOADING DEVICE

Filed Nov. 25, 1966



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United States Patent Office 3,392,818 Patented July 16, 1968

3,392,818

SHIP UNLOADING DEVICE

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Filed Nov. 25, 1966, Ser. No. 597,037
8 Claims. (Cl. 198—88)

ABSTRACT OF THE DISCLOSURE

In a derrick, the hoisting cable winches are used as counterweights on a bell crank balance arm which supports the main jib or boom.

A ship unloading device is known which is mounted on a pontoon. Said unloading device consists of a mobile supporting frame to the lower platform of which a balance arm is hinged. Said balance arm is held by means of a hoisting cable engaging therewith at about half its height, said cable leading to a winch arranged on the platform of the supporting frame. Halfway up said balance arm is hinged an arc-shaped jib, held by a hosting cable which also passes over the apex of said balance arm to a winch arranged on the floor of the supporting frame. Mounted on the jib is a double-ended lever, the two ends of which are connected by hoisting cables to an adjusting device. One end of the double-ended lever is mounted in a sliding guide on the vertical conveyor which in turn is hinged to said jib. This device has the ability, when the lowerable vertical conveyor is set, for example, on the ship's bottom as is possible at low and high tide or when the position of the ship is changed, to load the structure of said ship with the weight of the vertical conveyor and, additionally, with a portion of the weight of the jib.

The object of this invention is to produce a ship unloading device which, when the vertical conveyor is set up, loads the structure of the ship not with the whole, but at the most with only a portion of the weight of the vertical conveyor and of the jib.

The problem is, therefore, to bring about the best possible equilibrium in the unloading unit and to reduce the ballast. Finally, the vertical conveyor is to be capable of being brought into all possible practical unloading positions arising by means of the simplest possible design of the jib supporting it.

This invention proceeds from a ship unloading installation having a main jib which projects over the water and carries, adjustably, a vertical conveyor, said main jib being mounted so as to pivot about a horizontal axis and on a balance arm hinged to the supporting frame of the installation and capable of adjustment in a vertical plane; said installation also having a vertically pivoted belt jib projecting from the supporting frame over the land, adjustable winches being provided for the hoisting cables leading to the jib over the water, to the balance arm, and to the belt jib over the land.

The advantage of the invention is that, when the vertical conveyor is set up, it does not load the ship's bottom with its own weight and also with a portion of the weight of the jib. Finally, there is also the advantage that the vertical conveyor with the jib can be brought practically into the space behind the wall of the dock merely by a pivoting movement.

An example of embodiment of the invention is explained hereinafter by means of the schematic side elevation illustrated in the drawing.

By the wall of dock **1** lies a ship **2**, of which only the external profile and the profile of the hold **3** are shown.

Along the wall of the dock, and running on tracks **4**, is supporting frame **5**, the lower portion of which is in the form of a gate through which vehicles can pass. Freight cars **7** can move through said gate. Additional freight cars **8** can also move externally of said gate.

Pedestal **5***a* of the supporting frame carries, in a bearing **9**, a triangular balance arm **10** consisting of three arms **11**, **12** and **13**, a connecting strut **14***a* and a hoisting cable **14***b*, thus constituting in practice a bell crank.

Mounted at the end of lower arm **11** in bearing **15** is a main belt jib **16** projecting over the water. Attached to the front end of said jib in bearing **40** is vertical conveyor **17**, the angular position of which is adjusted by a hydraulic drive **18**, one end of which is joined by a hinge **19** to jib **16**, while the other end is joined by a hinge **20** to vertical conveyor **17**. Control cabin **21** is attached to vertical conveyor **17** in such a manner that the driver can observe the unloading process.

Belt jib **16** is held by means of a block and tackle, the ends of which are led over cable pulleys **23** at the end of arm **13** to two winches **24** and **25** at the end of upper arm **12**. Said winches, in conjunction with still other winches, form counterweight **26** for vertical conveyor **17** and jib **16**. In this connection, balance arm **10** is so designed, and counterweight **26** is so arranged, that at the outermost (extreme) position of said vertical conveyor, shown by way of example at **17***a*, the counterweight is also in its outermost position **26***a*, in which arm **12** is almost horizontal. In this connection, it is assumed that vertical conveyor **17** moves from position **17** to position **17***a* at the same level. On the other hand, if vertical conveyor **17** is moved towards the land at approximately the same level, counterweight **26** finally approaches nearer to the perpendicular passing through pivot bearing **9**. This means that when vertical conveyor **17** is moved, at approximately the same level, from its extreme position over the land to its extreme position over the water, counterweight **26** is moved in such a manner that the overall center of gravity of the installation is not substantially displaced.

Also arranged in counterweight **26** is winch **27** for hoisting cable **28** which passes over pulley **29**, at the free end of lower arm **11**, to pulleys **30** attached to supporting frame **5**. End **31** of hoisting cable **28** is attached to the end of arm **11**.

It is assumed that cable winch **24** is used alone for raising and lowering belt jib **16**, the latter pivoting about bearing **15**. Furthermore, the position of the jib is not altered. On the other hand, if jib **16** is to be moved forwards or backwards, cable winch **27** is wound in or out.

However, if when belt jib **16** is moved forwards or backwards, vertical conveyor **17** is required to remain at the same height, winch **25** is also wound appropriately in or out. For example, if winch **27** is wound in, jib **16** will be forced to the left. If hoisting cable **22** were not altered, vertical conveyor **17** would be raised. However, in order to maintain the vertical conveyor at the same height, cable is let out from winch **25**. Cable hoists **27** and **25** may be coupled together mechanically or electrically in such a manner that the crew is required to carry out only one switching operation to move vertical conveyor **17** while maintaining it at the same level.

The retention of balance arm **10** by means of hoisting cable **28** has the advantage that, when vertical conveyor **17** is set up, it remains balanced by counterweight **26**, since hoisting cable **22** remains taut. Cable **28**, on the other hand, goes slack. For the purpose of unloading lateral area **3***a* of hold **3**, vertical conveyor **17** may be brought into position **17***b* shown in dotted lines. To this end, hydraulic drive **18** is moved appropriately, and the jib is lowered to position **16***a*. In a similar manner, the vertical conveyor may also be inclined in the other direction to unload hold area **3***b* on the other side.

The vertical conveyor is also shown in position **17c**, in which it can be pulled in almost to the plane of the dock wall. Thus supporting frame **5** can be moved from hatch to hatch even when the superstructure of the ship is very high.

Hinged to the rear end of belt jib **16** in bearings **32** is an intermediate conveyor belt **33**, the other end **34** of which is supported on a belt jib **35** projecting over the land, so that it may be placed over a freight car **8**. Said belt jib **35** is hinged at one end, at **36**, to supporting frame **5**. Its other end is held by a hoisting cable **37** whose winch may also be accommodated in counterweight **26**. Connected to the inner, lower end of belt jib **35** is a vertical chute **38** which delivers the material to belts **39**. However, said material may also be moved in another manner, and may be discharged, for example, into freight cars **7**, **8** or the like. The suspension of belt jib **35** provides an additional counterweight by its own weight and that of the intermediate conveyor belt.

Having now described the means by which the objects of the invention are obtained. I claim:

1. In a ship unloading device comprising a supporting frame, a balance arm carried by said frame and swingable in a vertical plane, a main belt jib pivotally secured to said balance arm for extending over a ship, a vertical conveyor carried by the free end of said main belt jib, a vertically pivotal belt jib joined to said frame and extending landwise, and hoisting cable means for actuating the main belt jib, the vertically pivoted belt jib and the balance arm, the improvement in which said balance arm is triangular with a lower arm attached to said main belt jib, and an upper arm joined to said hoisting cable means and forming a counterweight.

2. In a device as in claim **1**, said balance arm forming a bell crank opened to the land side of the device, and a strut extending between said lower arm and said upper arm.

3. In a device as in claim **2**, further comprising a support arm secured to said balance arm and extending shipwise over said main belt jib, and said hoisting means including a cable guided by said support arm and attached to said main belt jib.

4. A device as in claim **3**, said hoisting means further including a balance arm adjusting cable attached to said lower arm.

5. A device as in claim **4**, said hoisting means further comprising hoisting cable winch means for said main belt jib carried by said balance arm and forming part of said counterweight.

6. A device as in claim **5**, further comprising winch means for said balance arm adjusting cable and forming part of said counterweight.

7. A device as in claim **6**, further comprising an intermediate conveyor belt between said main jib belt and said vertically pivoted belt jib.

8. A device as in claim **7**, further comprising winch control means joined to said winch means for holding said vertical conveyor at substantially the same elevation as said balance arm is moved.

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