Prior Art References

Patent Citations

0004

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Summary of the Invention

Problems the Invention Seeks to Resolve

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However, when a large volume of a granular material such as coal is stored in the cargo hold of such a cargo vessel, the weight of the granular material acts on the outfeed machine. This causes a large resistance to act on the rotating blades of the outfeed machine, posing the problem that the outfeed machine cannot be smoothly moved, so the work of discharging the granular material cannot be smoothly accomplished.

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Embodiments of t~~T~~he present invention ~~was undertaken in light of the above, and has the object of~~ affordi~~ng~~ a smooth discharge of granular material even when a large volume of coal or other granular material is stored in the cargo space of a cargo vessel or the like.

Means for Resolving the Problem

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According to an aspect, there is provided a conveying system mounted on a ship for conveying small clumps of coal or ore collected at a collection position outside the ship to a predetermined position outside the ship, comprising: a discharge apparatus having a storage section, an outfeed apparatus for outfeeding small clumps such as coal or ore held in the storage section, a discharge apparatus conveyor for conveying small clumps fed out from the outfeed apparatus, and a moving means for moving on the ship; a depositing

apparatus capable of moving on the ship, for depositing the small clumps from the collection position to the storage section; and a carrier apparatus for receiving small clumps discharged from the discharge apparatus conveyor and carrying said small clumps to a predetermined position outside the ship; wherein, in the discharge apparatus, the storage section has a pair of side walls of which at least the lower portions are inclined so as to be in close proximity, a space for storing granular material is formed between the pair of side walls; the bottom edge of one of the pair of side walls extends below the bottom edge of the other side wall; and an aperture extending in the longitudinal direction of the storage section is formed between the bottom edges of the two side walls; wherein the storage section has a receiving section which is disposed below the bottom of the aperture, the small clumps flowing out from the aperture is received on its top surface; wherein the outfeed apparatus comprises: a rotary blade portion including a shaft disposed on the receiving section and extending along the longitudinal direction of the aperture and outfeed blades extending radially outward around the shaft, and a drive apparatus for rotationally driving the shaft; and wherein the shaft is positioned directly below the bottom end of the other side wall.

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Disclosed herein is a~~The~~ discharge apparatus ~~of the present invention~~ comprise~~s~~sing a storage section formed in an elongated shape as viewed in plan view, an outfeed apparatus for outfeeding granular material stored in the storage section, and a conveyor for conveying granular material outfed by the outfeed apparatus; whereby the storage section has a pair of side walls of which at least the lower portions are inclined so as to approach one another, and a space for storing

granular material is formed between the pair of side walls; the bottom edge of one of the pair of side walls extends below the bottom edge of the other side wall; an aperture extending in the longitudinal direction of the storage section is formed between the bottom edges of the two side walls; the storage section is disposed to extend along the aperture beneath the aperture, and furthermore the discharge apparatus has a receiving portion for receiving the granular material flowing out from the aperture on the top surface, and the outfeed apparatus is disposed on the receiving portion.

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In an embodiment~~the present invention thus constituted~~, because one side wall extends below the other, the aperture opens to the side or diagonally downward, and even when there is a large volume stored in the storage section , the granular material load acting on the outfeed apparatus can be reduced and the outfeed apparatus smoothly driven.

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In an embodiment of the present invention, the outfeed apparatus preferably comprises: a rotary blade portion having a shaft extending along the longitudinal direction of the aperture and outfeed blades extending in the radial direction around the shaft; and a drive apparatus for rotationally driving the shaft.

In an embodiment of the present invention~~ thus constituted~~, granular material is fed out by rotary blades rotating around a shaft, therefore a fixed amount of granular material can be continuously discharged.

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In an embodiment of the present invention, the rotating blade portion is preferably divided into multiple sections in the axial direction of the shaft, and the attachment angle of the rotating blade portion in at least one section relative to the shaft differs from the attachment angle of the rotating blade portion in one of other sections

relative to the shaft.

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In an embodiment of the present invention ~~thus constituted~~, the load applied to the drive apparatus can be averaged irrespective of the angle of the rotating blade portion.

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In an embodiment of the present invention the attachment angles of the rotating blade portions in the multiple sections are preferably respectively set at one of multiple angles determined so as to form equal angle spacings.

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In an embodiment of the present invention ~~thus constituted~~, since the offsets of the attachment angles of each of rotating blade portions are uniform, the load applied to the drive apparatus can be even further averaged.

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In an embodiment of the present invention the outfeed apparatus preferably comprises a scraping member capable of moving at essentially a fixed speed on the receiving portion.

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In an embodiment of the present invention ~~thus constituted~~, an approximately fixed amount of granular material per hour falls from the receiving portion onto the conveyor at all times, therefore a stable amount of granular material can be unloaded at all times.

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In an embodiment of the present invention, the receiving portion preferably continues from the

bottom edge of one of the pair of side walls and extends more than the aperture to a position on the other side wall side.

In an embodiment of the present invention ~~thus constituted~~, the receiving portion extending from one side wall is positioned directly below the bottom of the opening, and granular material piles up on the receiving portion.

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An embodiment of t~~T~~he present invention preferably has a closing plate capable of changing the width of the opening in the aperture.

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In an embodiment of the present invention ~~thus constituted~~, by adjusting the width of the aperture with a closing plate, an essentially fixed amount of granular material can be caused to drop onto the receiving portion, even if the sizes or weights of the granular materials differs, and even if the amount of granular material stored varies.

Effect of the Invention

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According to embodiments of the present invention, granular material can be smoothly discharged even when a large amount of coal or other granular material is stored in a cargo storage.

Brief Explanation of Figures

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Fig. 1: A side view showing the constitution of a barge having a discharge apparatus according to a first embodiment of the present invention.

Fig. 2: A plan view of the barge shown in Fig. 1.

Fig. 3: A section through III-III in Fig. 1.

Fig. 4: A general perspective view showing the constitution of a discharge