Prior Art References

Patent Citations

0004

Patent Citation 1: Japanese Patent Application Publication No.2000-43784

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 affordingafford~~ 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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~~The discharge apparatus of the present invention comprises 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.~~According to an aspect, there is provided a storage equipment for holding granular material, including a storage section for holding the granular material, formed in an elongated rectangular shape in plan view, wherein at least the lower portion reduces in width toward the bottom, with an aperture formed at the bottom end thereof to extend longitudinally and open toward the side; wherein the storage section has a receiving section disposed to extend at the bottom of the aperture along the aperture, on which granular material flowing out from the aperture piles up, such that outflow of the granular material from the aperture is stopped by the granular material piled up on this receiving section; furthermore, the storage equipment includes: a scrape-out means for causing granular material piled up on the receiving section to fall from the receiving section; a conveyor disposed at a position on which granular material falls from the receiving section; and a closing plate for adjusting the width of the aperture; wherein the storage section has a pair of side walls inclined so as to be in close proximity at least at the lower portion, such that a space for holding the granular material is formed between the pair of side walls, and the aperture is formed between the bottom edges of the side walls; the receiving section continues from the bottom edges of one of the pair of side walls and extends more than the aperture toward a position on the other side wall side; and the receiving section includes a vertical plumb portion extending essentially vertically downward from the bottom edge of one side wall, and a horizontal portion extending more than the aperture, essentially horizontally from the bottom edge of the plumb portion toward the other side wall side; and wherein the scrape-out means has a scrape-out member formed of a triangular column member and capable of essentially fixed speed movement on the receiving section with the bottom surface in contact with the horizontal portion and one side surface in contact with the plumb portion.

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In an embodiment of 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

Document Title: Claims

Claim 1

A discharge apparatus comprising 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; 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 is disposed to extend along the aperture beneath the aperture, and furthermore 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.

Claim 2

The discharge apparatus according to claim 1, wherein the outfeed apparatus 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.

Claim 3

The discharge apparatus according to claim 2, wherein the rotating blade portion is 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 other sections relative to the shaft.

Claim 4

The discharge apparatus according to claim 3, wherein the attachment angles of the rotating blade portions in the multiple sections are respectively set at one of multiple angles determined so as to form equal angle spacings.

Claim 5

The discharge apparatus according to claim 1, wherein the outfeed apparatus has a scrape-out member capable of sliding at an approximately fixed speed on the receiving section.

Claim 6

The discharge apparatus according to claims 1 through 5, wherein the receiving section continues from one of the bottom ends of the pair of side walls and extends up to a position on the other side wall further than the aperture.

Claim 7

The discharge apparatus of any of Claims 1 through 6, comprising a closing plate capable of changing the opening width of the aperture.

CLAIMS

1. Storage equipment for holding granular material,

including a storage section for holding the granular material, formed in an elongated rectangular shape in plan view, wherein at least the lower portion reduces in width toward the bottom, with an aperture formed at the bottom end thereof to extend longitudinally and open toward the side;

wherein the storage section has a receiving section disposed to extend at the bottom of the aperture along the aperture, on which granular material flowing out from the aperture piles up, such that outflow of the granular material from the aperture is stopped by the granular material piled up on this receiving section;

furthermore, the storage equipment includes:

a scrape-out means for causing granular material piled up on the receiving section to fall from the receiving section;

a conveyor disposed at a position on which granular material falls from the receiving section;

and a closing plate for adjusting the width of the aperture;

wherein the storage section has a pair of side walls inclined so as to be in close proximity at least at the lower portion, such that a space for holding the granular material is formed between the pair of side walls, and the aperture is formed between the bottom edges of the side walls;

the receiving section continues from the bottom edges of one of the pair of side walls and extends more than the aperture toward a position on the other side wall side;

and the receiving section includes a vertical plumb portion extending essentially vertically downward from the bottom edge of one side wall, and a horizontal portion extending more than the aperture, essentially horizontally from the bottom edge of the plumb portion toward the other side wall side; and

wherein the scrape-out means has a scrape-out member formed of a

triangular column member and capable of essentially fixed speed movement on the receiving section with the bottom surface in contact with the horizontal portion and one side surface in contact with the plumb portion.

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