

[54] **DISCHARGING MEANS FOR VESSELS FOR STORING POWDER, GRAIN AND THE LIKE**

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[58] Field of Search..... 214/17 D, 17 DA; 222/342, 222/410

[56]

References Cited

UNITED STATES PATENTS

3,713,552 1/1973 Schnyder 214/17 D

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[57]

ABSTRACT

Discharge means for vessels for storing powder, grain and the like having an inverted conical structure and an annular outlet opening at the bottom thereof, comprising a table provided below the outlet opening for receiving the material in the vessel means for scraping off the material dropped on the table, and means for conveying the dropped material from the table.

1 Claim, 3 Drawing Figures

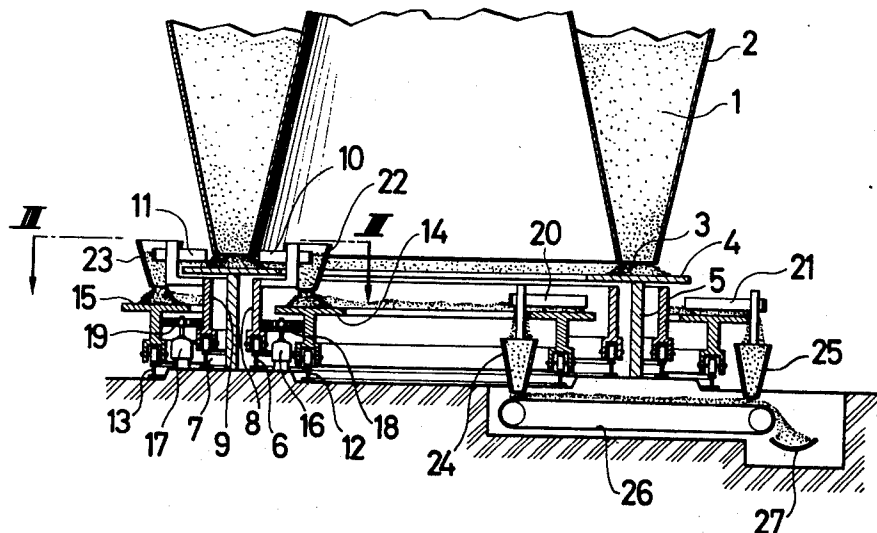


FIG. 1

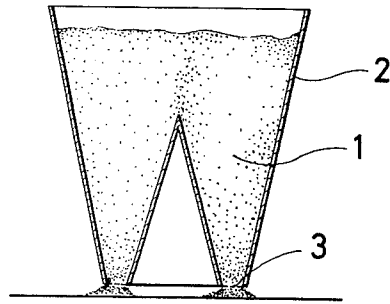


FIG. 2

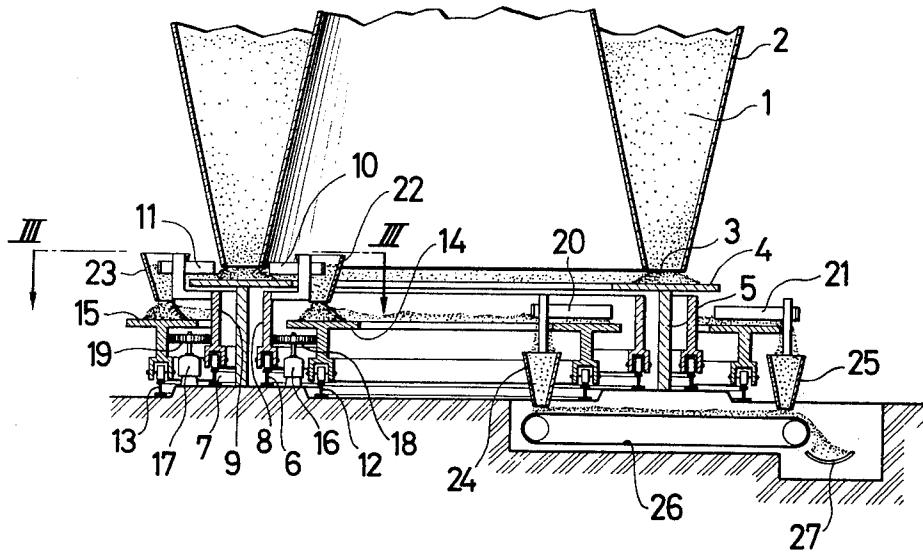
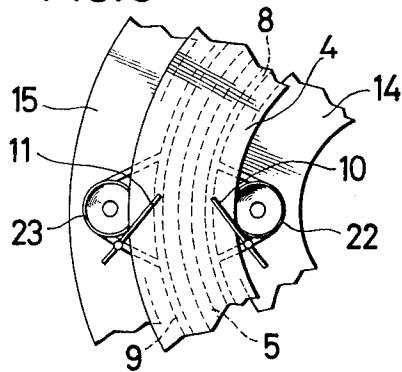


FIG. 3



DISCHARGING MEANS FOR VESSELS FOR STORING POWDER, GRAIN AND THE LIKE

This invention relates to discharging means for storage vessels for storing powder, grain or granular material and provided at the lower end with an annular outlet opening.

The typical powder storage vessel heretofore used has an inverted conical lower half and has a circular outlet opening at the bottom thereof. In order to discharge the powder from the vessel, a feeder is provided at the outlet opening. In this type of vessel, if the apex angle at the outlet of the vessel is increased, the fluidity of the powder in the vessel is reduced, and the so-called suspension bridge phenomenon will be resulted. On the other hand, if the apex angle is decreased, the height of the vessel is inevitably increased.

The object of this invention is to provide a powder storage vessel having a relatively large capacity without increasing the height and a discharging means suited to the vessel. In accordance with this invention, the discharging means comprises a stationary table and movable scrapers provided below the outlet and movable tables and stationary scrapers provided below the said stationary table and movable scrapers, whereby the powder can be scraped down through the successive steps.

This invention will be more fully set forth with reference to the accompanying drawings, in which,

FIG. 1 is a schematic view outlining a storage vessel to which the discharging means of this invention is applied,

FIG. 2 is a sectional view showing an embodiment of the discharging means according to this invention, and

FIG. 3 is a plan view of the same, partly in section taken along line III—III in FIG. 2.

Referring to the drawings, in order to increase the capacity of the vessel without increasing the height of the vessel, there is proposed a vessel consisting of an inverted conical outer shell 2 and a concentric conical inner wall, as shown in FIG. 1. With this structure of vessel, an annular outlet opening 3 is formed at the lower end. Heretofore, table feeders are used to take out powder discharged from such single annular outlet. In case the vessel is of large capacity, a table of a very large diameter must be provided, and the table feeder of the prior art type can no longer be employed. This invention overcomes the disadvantage of such type of vessel.

An embodiment of the invention will now be described with reference to FIGS. 2 and 3. Below and in the vicinity of the annular outlet 3 formed at the lower end of the storage vessel 2, there is provided a horizontal annular table 4 secured to supports 5. Below the table 4, concentric circular rails 6 and 7 are provided on the ground, on which concentric inner and outer rings 8 and 9 are supported by a number of wheels engaging with the rails. The inner and outer rings 8 and 9 are provided at one or more locations and near the

surface of the table 4 with scrapers 10 and 11. Thus when the rings are rotated, along the proximity of the surface of the table 4, powder on the table is scraped off. In order to prevent the scatter of the powder, hoppers 22 and 23 are provided to surround the scrapers 10 and 11. Below the table 4, there are also provided concentric inner and outer tables 14 and 15, which are rotatable about their center and are respectively provided with a number of wheels for running on respective circular rails 12 and 13. The inner ring 8 and inner table 14, and also outer ring 9 and outer table 15, are driven by motors 16 and 17 through gears 18 and 19. Stationary scrapers 20 and 21 are provided at one or more positions along the inner and outer tables 14 and 15 for scraping off the powder on the tables. The stems of the stationary scrapers 20 and 21 are provided with respective hoppers 24 and 25 for collecting the scraped powder and dropping it onto the belt feeder 26 provided therebelow. The powder on the belt feeder 26 is finally fed onto the transfer conveyor 27.

With the above construction, the powder discharged from the annular outlet 3 of the storage vessel 2 onto the stationary annular table 4 is scraped thereof by the movable scrapers 10 and 11 to be dropped through the hoppers 22 and 23 upon the lower inner and outer tables 14 and 15. Because the inner and outer tables 14 and 15 are rotated by the motors 16 and 17, the powder dropped on the tables 14 and 15 is scraped thereof by the stationary scrapers 20 and 21 and dropped through the hoppers 24 and 25 onto the belt feeder 26 and is finally collected on the transfer conveyor 27.

Although the direction and speed of rotation of the inner and outer rings 8 and 9 and inner and outer tables 14 and 15 can be selected at will, it is preferable to rotate the rings and tables in the same direction at different speeds.

From the foregoing, it will be understood that the discharging means according to the invention is suited to a storage vessel having an annular outlet and enables to realize a large doublewall conical vessel, which has comparatively small height and great capacity, and whose cone apex angle is small to ensure smooth flow of powder in it.

What is claimed is:

1. A discharging means for material containing vessels having an inverted conical structure and having an annular outlet opening at the bottom thereof, comprising a stationary annular table provided below and in the vicinity of the annular outlet opening to receive material therefrom, scrapers disposed on each side of said annular table and in close proximity to the surface thereof, rotatable annular inner and outer tables provided below and in the vicinity of said stationary annular table and adapted to receive material scraped from said stationary table, and stationary scrapers extending in close proximity to the surfaces of said inner and outer tables, whereby the discharged material can be successively scraped off.

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