Sept. 21, 1965 L. L. CHAPPUIS 3,207,382

APPARATUS FOR DISCHARGING MATERIAL FROM A VESSEL OR OTHER CONTAINERS

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FIG. 1

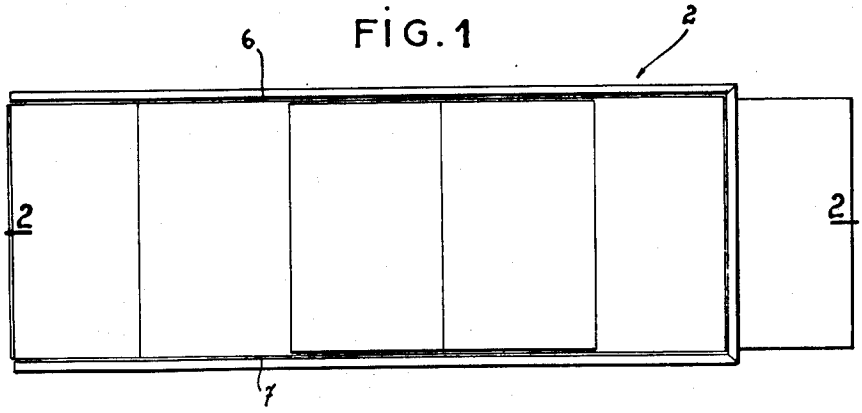


FIG. 2

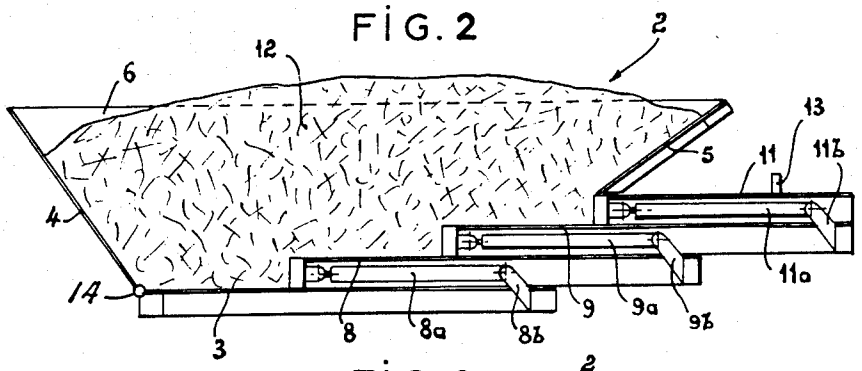
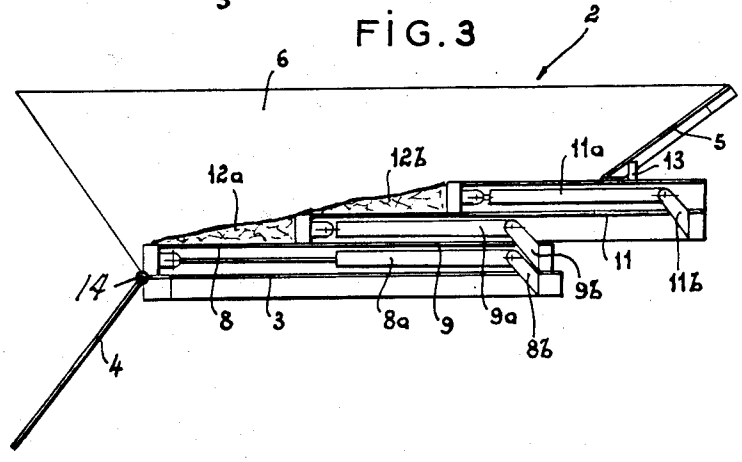


FIG. 3



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FIG.4

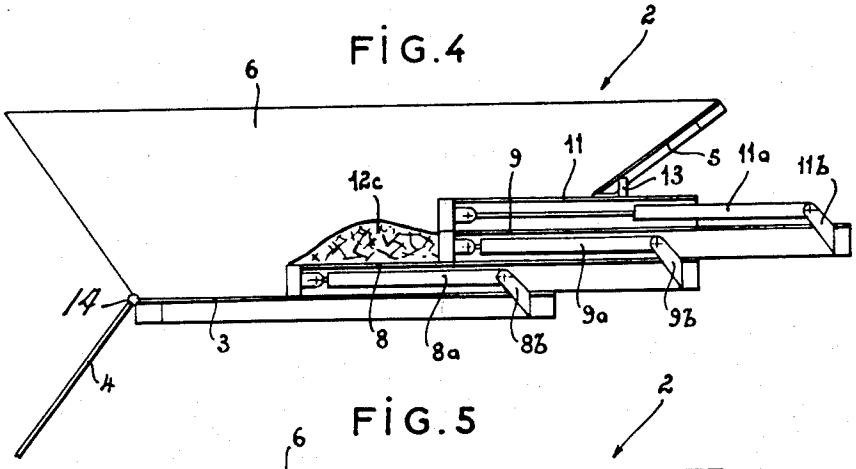


FIG.5

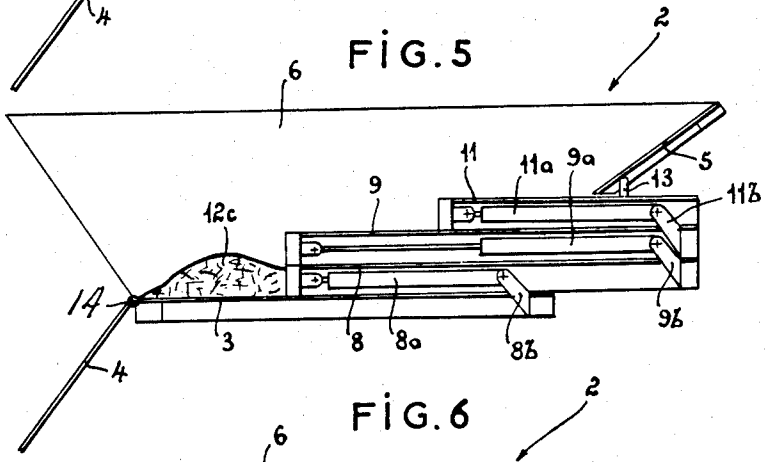
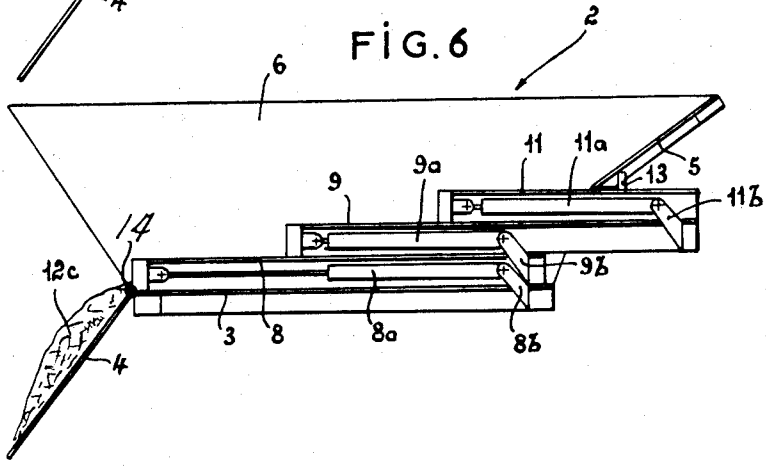


FIG.6



United States Patent Office 3,207,382 Patented Sept. 21, 1965

3,207,382

APPARATUS FOR DISCHARGING MATERIAL FROM A VESSEL OR OTHER CONTAINERS

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Filed Mar. 23, 1964, Ser. No. 353,980
Claims priority, application France, Apr. 12, 1963, 43,546, Patent 1,361,540
4 Claims. (Cl. 222—254)

This invention relates to apparatus for the discharging of material from a vessel and more particularly to a discharge device in said vessel.

When a tub or vessel has to travel in galleries of low height, for example, in underground tunnels or shafts discharging of the vessel by tilting is not possible. It becomes necessary therefore to use some other mode of discharge.

To overcome this difficulty, end vessels have been prepared having a movable wall rigid with the rod of of a jack. The opposite wall being retractable. In this way it is possible by actuating the jack to discharge the entire contents of the vessel. To achieve this discharge it is necessary for the stroke of the jack plunger to be equal to the length of the vessel. The length of the complete discharge device is therefore double that of the vessel. Furthermore, as the weight of the contents may be considerable it is necessary to provide a very powerful jack or a plurality of jacks of moderate power.

The purpose of the invention is to mitigate these inconveniences by providing a discharge device for the vessel of smaller bulk which does not require the production of excessive force.

To this end the apparatus according to the invention comprises a stepped discharge device projecting into the vessel at the base of one wall, occupying the entire width thereof, said device being rigid with the rod of one or more external jacks and enabling by a series of advancing and retracting movements the substantial emptying of the vessel.

The stroke of the jack or jacks is reduced as compared to the known device because it corresponds to the difference in length between the lowest step and the vessel. Moreover, since discharge is effected by a plurality of operations, force developed by the jack or jacks for each operation is reduced in proportion.

Nevertheless such a device does not enable the vessel to be completely emptied because there will always remain a certain quantity of material on the different steps of the discharge device. For this reason the invention provides a more highly developed apparatus in which the discharge device is formed by a plurality of telescopic steps or stages. Each stage is actuated by the stage immediately therebelow while the alternate displacement of each stage is effected by one or more jacks, which are respectively secured to the stage immediately below, while the jack of the lowest stage is secured to the bottom of the vessel.

Discharge of the vessel is effected by first applying to the complete discharge device a reciprocating movement by operating only the jack or jacks of the lowest stage.

This operation is followed by a cleaning operation, the purpose of which is to discharge the material resting on the steps or stages of the discharge device. To accomplish this cleaning operation each stage is operated independently of the others commencing with the uppermost and finishing with the lowermost.

The invention will be better understood from the following description with reference to the accompanying diagrammatic drawings which illustrate by way of

example an embodiment of the discharge device applied to a vessel.

FIGURE 1 is a plan view of an embodiment of the invention,

FIGURE 2 is a section taken on the line II—II of FIGURE 1 after a filling operation,

FIGURES 3, 4, 5 and 6 are sections also taken on the line II—II of FIGURE 1 but showing four successive phases of the material removal operation.

The vessel **2** shown in the drawings comprises a flat bottom or base **3** and four walls **4**, **5**, **6**, and **7**. The side walls **6** and **7** are of trapezoidal form such that the front wall **4** and rear wall **5** are inclined from top to bottom in a direction towards the center of the vessel.

The base of the front wall **4** is attached by a hinge **14** to the front edge of the bottom **3** so that it can be swung down forward when the vessel is to be discharged.

There is an opening between the lower edge of the rear wall **5** and the bottom **3** of the vessel. This accommodates three stages **8**, **9** and **11** of a stepped discharge device. Each stage is slidably mounted on the stage immediately below which serves as a runaway while the lowest stage **8** is slidably mounted on the bottom **3**. The displacement of each stage is effected by one or more jacks **8***a*, **9***a* and **11***a* respectively. Each jack has one end connected to a vertical head of the associated stage while an opposite end of the jack is secured to the respective brackets **8***b*, **9***b* and **11***b* which are fixed to the stage immediately below. Thus each stage carries the bracket to which is secured the jack which displaces the stage for which it serves as a runway. The bracket **8***b* to which is secured the jack **8***a* of the stage **8** is carried by the bottom **3** of the vessel **2**.

When the jacks **8***a*, **9***a* and **11***a* are retracted the front head of the stage **11** is in vertical alignment with the lower edge of the rear wall **5** and the stage **8** covers about half the surface of the bottom **3** while the stage **9** occupies an intermediate position between stages **8** and **11** as shown in FIGURE 2.

During the loading of the vessel with material **12** the three stages **8**, **9** and **11** of the discharge device occupy the retracted position shown in FIGURE 2. The first phase of discharge is effected by displacing the three stages **8**, **9** and **11** of the discharge device simultaneously. For this the operator actuates only the control of the jack **8***a* after having swung the front wall **4** of the vessel downwardly. The discharge device moves between the two extreme positions shown in FIGURES 2 and 3, because the bracket **9***b* and jack **9***a* carry the stage **9** with them and the bracket **11***b* and jack **11***a* carry the stage **11** with them.

When the discharge operation has been completed there will remain a small quantity of material on the steps formed by stages **8** and **9** indicated at **12***a* and **12***b* respectively in FIGURE 3. The assembly of the three stages of the discharge device is now returned to the retracted position shown in FIGURE 2. The operator now actuates the jack **11***a* to displace the stage **11**. At the end of the stroke of the plunger of the jack **11***a* the front head of the stage **11** registers with the front head of the stage **9** as shown in FIGURE 4. The quantity of material **12***b* is thus pushed on to the stage **2** and added to the quantity **12***a* previously there thus forming a residual quantity **12***c*, FIGURE 4.

The operator now displaces the stage **9** by actuating the jack **9***a*. As the bracket **11***b* is rigid with the stage **9** the latter carries with it the jack **11***a*, the stage **11** itself being prevented from moving upon the engagement of wall **5** with an abutment **13**.

At the end of the stroke of the plunger of the jack **9***a*, the front head of the stage **9** registers with the front

head of the stage **8** and the residual quantity **12***c* is therefore pushed on to the bottom **3** of the vessel **2** while the jack **11***a* is pushed over the plunger rod as shown in FIGURE 5.

As will be easily understood actuation of the jack **8***a* to its extended position will now push the residual material **12** over the wall **4** as shown in FIGURE 6.

It will be clear that in order to save time it is possible to effect this cleaning operation by actuating the jacks **8***a*, **9***a* and **11***a* in successive steps arranged at short intervals of time rather than await completion of the strokes of the jacks.

The invention is not limited to the single embodiment described above by way of example but includes all modifications within the scope of the claims and in particular in the number of stages of the stepped discharge device.

What is claimed is:

1. Apparatus for discharging material comprising a vessel including a base, a front wall, means supporting the front wall for pivotal movement between a closed position and an open position, and a rear wall provided with a lower opening extending to said base, and a discharge device located in said opening and supported on said base for completing the discharge of material from the vessel when the front wall is open, said device comprising a plurality of stages, including a lowermost stage and a plurality of upper stages, said stages having a width equal to that of the vessel, the lowermost stage being slidably mounted on said bottom, the upper stages being slidably supported on the next lower stage, each stage including a jack which has extended and retracted positions, the jack of the lowermost stage having one end securely connected to such stage and an opposite end secured to said base, each of the jacks of the upper stages having one end secured to the respective stage and an opposite end secured to the next lower stage, the lowermost stage extending the length of the base of the vessel with the jack thereof extended to enable discharge of material on said base, through

the open front wall, the stages defining a succession of steps on said base when the jacks of the stages are retracted whereby upon selective extension and retraction of the said jacks the material on said steps can be discharged from the vessel.

2. Apparatus as claimed in claim **1** wherein each stage includes a substantially vertical front head which moves in a horizontal plane towards the front wall, said lowermost stage having a movement of approximately one-half the length of the bottom of said vessel between extension and retraction of the jack thereof, each of the upper stages being slidably displaceable upon extension of the jack thereof to a position of vertical alignment of the head thereof with the head of the next lower stage when the jack of the latter is retracted.

3. Apparatus as claimed in claim **1** comprising a stop mounted on the uppermost stage for contact with said rear wall to limit movement of the uppermost stage into the vessel.

4. Apparatus as claimed in claim **1** wherein said means supporting the front wall for pivotal movement comprises a hinge connecting the front wall to said base.

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M. HENSON WOOD, JR., *Primary Examiner.*

LOUIS J. DEMBO, *Examiner.*