Jan. 15, 1963 J. E. FLANAGAN 3,073,462

MATERIAL HANDLING AND TRANSFER DEVICE

Filed May 13, 1959

FIG 2

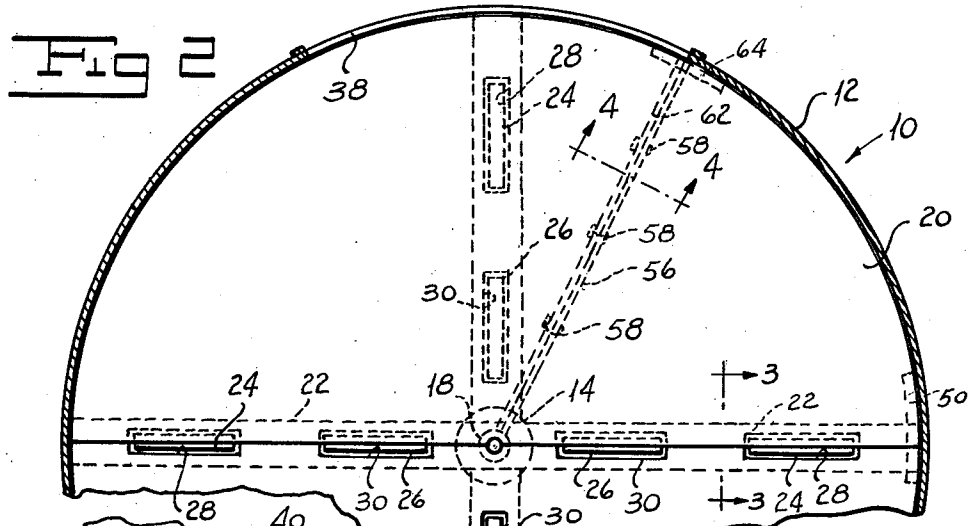
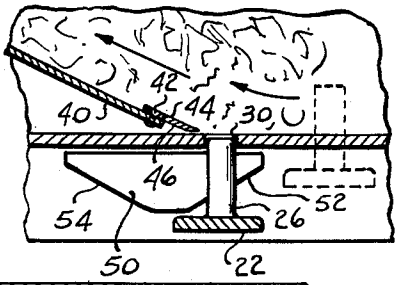


FIG 4

FIG 3



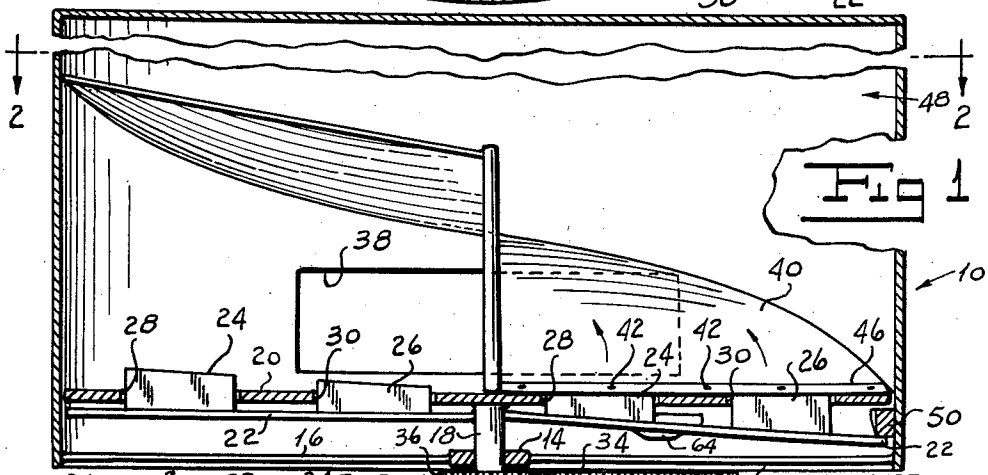


FIG 1

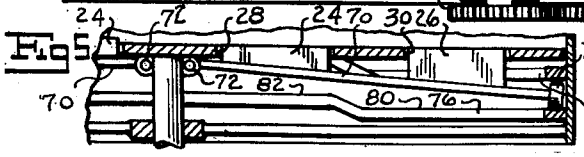


FIG 5

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3,073,462
Patented Jan. 15, 1963

3,073,462

MATERIAL HANDLING AND TRANSFER DEVICE

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Filed May 13, 1959, Ser. No. 812,999
7 Claims. (Cl. 214—17)

My invention relates to a material handling and transfer device and more particularly to an improved material handling and transfer device which is especially adapted to handle refuse.

Many various material handling devices are known in the prior art. Some of these devices are designed for use on mobile carriers for the collection of trash and other refuse.

Material handling devices of the prior art for handling refuse are complicated, cumbersome, and expensive. In most types of these devices, refuse is fed directly to moving parts of the machine which convey the material horizontally toward a storage space in which the material is compressed. Owing to the fact that refuse is fed directly to exposed moving parts, these devices are not as safe as is desirable. Refuse collecting devices of the prior art are not sufficiently rugged to permit their use over a long period of time without extensive maintenance. After a relatively short period of time in use, the entire unit must be replaced. Owing to the design of units of the prior art, a relatively large amount of power is necessary to compact the material to the degree desired.

I have invented an improved material handling and transfer device which is especially adapted for use in handling trash and other refuse. My device is relatively inexpensive to construct as compared with units of the prior art. My device is simple in construction and is lightweight to permit the use of a larger unit on a given carrier than is possible in the prior art. Owing to the simplicity of my device, unskilled labor may be employed to operate the device without danger of damage. All moving parts of my material handling mechanism are enclosed with the result that the device is safer than those of the prior art. My device requires less maintenance and has a longer life than do devices of the prior art intended for the same purpose. My unit is such that it requires less power to accomplish the same degree of compaction of the material as is achieved by a device of the prior art. I provide my device with means for rapidly and expeditiously unloading the unit.

One object of my invention is to provide a material storage and handling device which is simple in construction and in operation.

Another object of my invention is to provide a material handling and storage device which is inexpensive to construct and to operate.

A further object of my invention is to provide a material handling and transfer device which is safer than devices of the prior art intended for the same purpose.

A still further object of my invention is to provide a material handling and transfer device which requires less power to compact material to a given degree than is required by a device of the prior art designed to compact and to store material.

Yet another object of my invention is to provide a material handling and transfer unit which may rapidly and expeditiously be unloaded.

Other and further objects of my invention will appear from the following description:

In general my invention contemplates the provision of a material handling and transfer device in which a storage housing has a charging door through which material to be handled is deposited on a continuously driven conveyor. Retractable pushers assist the conveyor in moving the material toward an upwardly inclined ramp leading into a storage space. The pushers are retracted as they approach the leading edge of the ramp. Under the action of the conveyor and pushers material on the conveyor approaching the ramp causes the material on the ramp to be pushed upwardly into the storage space. As the operation continues, the material is compacted in the storage space. I provide my device with means by which it may be rapidly and expeditiously unloaded merely by reversing the direction of movement of the conveyor.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a sectional view of my material handling and transfer device.

FIGURE 2 is a sectional view of my material handling and transfer device taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a fragmentary sectional view of my material handling and transfer unit taken along the line 3—3 of FIGURE 2 and drawn on an enlarged scale.

FIGURE 4 is a fragmentary sectional view of my material handling and transfer unit taken along the line 4—4 of FIGURE 2 and drawn on an enlarged scale.

FIGURE 5 is a fragmentary sectional view showing a modified form of my material handling and transfer unit.

Referring now more particularly to FIGURES 1 to 4 of the drawings, my device indicated generally by the reference character 10 includes a generally cylindrical vertical housing 12 formed from a suitable material such as sheet steel or the like. A bearing 14 carried by any suitable means such as by struts 16 welded or otherwise secured to the housing 12 rotatably supports a shaft 18. I secure a circular conveyor plate 20 to shaft 18 for rotation therewith by any appropriate means such for example as welding. I weld or otherwise secure a plurality of spaced resilient arms 22 formed from a material such as spring steel to the shaft 18 for rotation therewith. In the particular form of my device shown, I provide four arms, 22, adjacent ones of which are substantially perpendicular to each other.

Each arm 22 carries a pair of pusher blocks 24 and 26 at spaced locations along its length. Under the action of the spring arm, the blocks 24 and 26 normally extend through respective openings 28 and 30 formed in the conveyor plate 20 over the blocks.

I provide my device with a motor 31 adapted to be energized to drive a shaft 32 carrying a gear 34 for rotation with the shaft. Gear 34 meshes with a gear 36 secured to the shaft 18 by any suitable means such as by a key or the like. From the structure thus far described, it will be apparent that, with the motor 31 energized, gear 34 drives gear 36 to rotate conveyor plate 20 together with the arms 22 about the axis of shaft 18.

I provide the housing 12 with a charging door 38 through which the material such as refuse to be handled may be deposited on the plate 20. When the plate 20 rotates in the manner described hereinabove, this refuse is carried along with the plate. Pushers 24 and 26 assist in this operation. My device includes a vertically inclined ramp 40 formed of a material such as sheet steel or the like for receiving material from the conveyor plate 20. Any suitable means such as bolts 42 passing through slots 44 in a bar 46 secure the bar to the leading edge of the ramp 40. The bolts 42 cooperating with the slots 44 provide a means by which the position of bar 46 on the ramp 40 may be adjusted to adjust the clearance between the bar and the surface of the plate 20. I secure the ramp 40 to the wall of housing 12 by means of welding or the like. I direct the ramp 40 spirally upwardly over the charging door 38 to keep the area below the door clear of the material being handled to permit loading. Ramp 40 leads

upwardly into a storage space indicated generally by the reference character 48 over the ramp. It will be appreciated that the storage space 48 may be of any desired size.

When the shaft 18 is driven in a counterclockwise direction as viewed in FIGURE 2, the plate 20 and the pushers 24 and 26, which move with the plate, advance material deposited on the plate through the door 38 toward the ramp 40. When a certain quantity of material has been loaded into the device, the conveyor and pushers load the material onto the ramp 40 and, upon continued operation, advance the material along the ramp while at the same time compressing the material under the action of its own weight.

I weld or otherwise secure a cam 50 to the wall of housing 12 below the bar 46 at the leading edge of the ramp 40. As an arm 22 approaches the bar 46, its end engages a surface 52 of cam 50 to move the arm downwardly as viewed in FIGURES 1 and 3 to retract the pushers 24 and 26 to positions below the surface of plate 20. After an arm 22 passes under the leading edge of the ramp 40, its end rides upwardly along a surface 54 on the cam 50 to return the blocks 24 and 26 to their normal positions above the surface of plate 20.

I secure an unloading deflector plate 56 to the wall of housing 12 by any suitable means such as welding or the like. I dispose the deflector 56 below the ramp 40 adjacent one side of the door 38. Respective bolts or the like 58 passing through slots 60 in the deflector 56 adjustably secure a bar 62 to the lower edge of the deflector 56. Bolts 58 permit the position of bar 62 on the deflector 56 to be adjusted to provide the desired clearance between the edge of bar 62 and the upper surface of plate 20. I mount a cam 64 on the wall of housing 12 below deflector 56. When an arm 22 which is rotating in a counterclockwise direction as viewed in FIGURE 2 approaches the deflector 56, its end engages a surface 66 on cam 64 and the arm is moved downwardly against the action of its inherent resilience to retract blocks 24 and 26 to permit the arm to pass under the deflector 56. After the arm has passed under the deflector, its end rides upwardly along surface 68 to permit blocks 24 and 26 to return to their normal positions at which they may pick up trash or the like, deposited in the housing 12 through the door 38.

Referring now to FIGURE 5, I have shown an alternate form of my invention in which I replace the resilient arms 22 by arms 70 pivotally supported at their inner ends on pivot pins 72. I pivotally mount respective cam follower rollers 74 on the ends of arms 70. Followers 74 ride on a cam track 76 secured to the wall of housing 12 by any suitable means such as welding or the like. A guide rail 78 welded to the wall of housing 12 retains followers 74 on track 76. I form the track 76 with a lower level 80 which holds the arms 70 in a position at which blocks 24 and 26 are retracted below the level of the surface of plate 20 in the course of movement of an arm carrying the blocks from a position in advance of bar 46 to a position immediately following the deflector 56 in a counterclockwise direction of movement of an arm. I form track 76 with an upper level 82 which raises blocks 84 to their normal position above the surface of plate 20 at which they may pick up material deposited in the housing.

In operation of the form of my material handling and transfer device shown in FIGURES 1 to 4, when it is desired to load refuse or the like into the housing 12, motor 31 is energized to drive plate 20 and the arms 22 in a counterclockwise direction as viewed in FIGURE 2. Material deposited in the housing 12 through the charging door 38 is carried by the plate 20 and by the pushers 24 and 26 toward the ramp 40. As an arm 22 approaches the leading edge of bar 46, its end engages the surface 52 which moves the arm to retract blocks 24 and 26 to permit refuse or the like to be pushed upwardly along the ramp. As more and more material is loaded into the machine, the material behind that adjacent bar 46 causes the material to be fed upwardly along the ramp until it spills over the terminal edge of the ramp and falls downwardly on freshly deposited material. It is to be noted that the ramp 40 shields the charging door 38 with the result that this door is clear to permit material to be deposited. As the housing 12 fills, the material in the housing is compacted under the action of its own weight and under the action of plate 20 as augmented by pushers 24 and 26 or the arms 22.

If it is desired to unload the stored material, the direction of rotation of motor 31 is reversed to cause plate 20 and arms 22 to rotate in a clockwise direction as viewed in FIGURE 2. In this direction of rotation, plate 20 and the pushers 24 and 26 carry material sliding off the ramp 40 toward door 38. As an arm 22 approaches deflector 56 in this direction of movement, its end engages surface 68 of cam 64 and the arm is moved to retract the pushers to permit them to pass under the bar 62. As material is moved toward the charging door, deflector 56 causes the material to spill out through the charging door to unload the housing 12.

The operation of the form of my invention shown in FIGURE 5 is substantially the same as that of the form of my invention shown in FIGURES 1 to 4. In this form of the invention the pivoted arms 70 having the followers 74 which ride on track 76 perform the same function as is performed by the resilient arms 22 which cooperate with cams 50 and 64.

It is to be understood that while I have described my invention as being particularly adapted to handle material such as trash and other refuse, it could as well handle any other type of material which is to be stored in a container such as the housing 12.

It will be seen that I have accomplished the objects of my invention. I have provided a material handling and transfer device which is simple in construction and operation. My device is inexpensive to construct and to operate. It has no exposed moving parts with the result that it is safer than devices of the prior art for handling and transferring material. My material handling device achieves a high degree of compaction of material for the amount of power required to operate the device. The storage housing of my device may rapidly and expeditiously be unloaded.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a generally helical ramp having a leading edge, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a plate for receiving material deposited in said housing, means mounting said plate within said housing for movement to carry deposited material from said opening to the leading edge of said ramp, a pusher, means mounting said pusher for movement from an operative position at which it assists said plate in transferring material onto said ramp to a retracted position, a common drive means for said plate and said pusher and means for moving said pusher to its retracted position as it approaches the leading edge of said ramp.

2. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a generally helical ramp, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a conveyor for receiving material de-

posited within said housing, means mounting said conveyor within said housing for movement to carry deposited material from said opening to the leading edge of said ramp, a pusher, means mounting said pusher for movement from an operative position at which it assists said conveyor in transferring material onto said ramp to a retracted position, a common drive means for said conveyor and said pusher, means for moving said pusher to its retracted position as if approaches said ramp, an unloading deflector, means mounting said deflector with said housing adjacent said opening and means for moving said pusher to its retracted position as it approaches said unloading deflector.

3. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a generally helical ramp having a leading edge, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a generally circular plate for receiving material deposited in said housing, means mounting said plate within said housing for movement to carry the deposited material from said opening to the leading edge of said ramp, a plurality of pushers, means mounting said pushers in spaced relationship for movement with said plate and for movement from operative positions at which they assist said plate in transferring material onto said ramp to retracted positions, a common drive means for said plate and said pushers and means for moving a pusher to its retracted position as it approaches the leading edge of said ramp.

4. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a generally helical ramp having a leading edge, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a plate for receiving material deposited in said housing, means mounting said plate within said housing for movement to carry deposited material from said opening to the leading edge of said ramp, a pusher, a resilient arm, means mounting said arm below said plate, means mounting said pusher on said arm, said plate being formed with an opening through which said pusher is adapted to extend under the action of said arm, a common drive means for said plate and said arm and means responsive to action of said drive means in moving said arm for retracting said pusher as it approaches the leading edge of said ramp.

5. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a generally helical ramp having a leading edge, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a plate for

receiving material deposited in said housing, means mounting said plate within said housing for movement to carry deposited material from said opening to the leading edge of said ramp, a pusher, an arm, means mounting said arm for pivotal movement below said plate, means mounting said pusher on said arm, said plate being formed with an opening through which said pusher is adapted to extend and means for guiding said arm from a normally operative position at which said pusher extends through said opening to a retracted position as the pusher approaches the leading edge of said ramp.

6. A material handling and transfer device including in combination a housing provided with an opening through which material may be deposited within the housing, a stationary inclined ramp, means mounting said ramp in said housing in a position at which the ramp extends over said opening, a conveyor for receiving material deposited in said housing, means mounting said conveyor within said housing for movement to carry deposited material from said opening to the leading edge of said ramp, a pusher, means mounting said pusher for movement from an operative position at which it assists said plate in transferring material onto said ramp to a retracted position, a common drive means for said plate and said pusher, means for moving said pusher to its retracted position as it approaches said ramp, an unloading deflector, means mounting said deflector within said houisng adjacent said opening and means for reversing said drive means to unload material from said housing.

7. A material handling and transfer device including in combination a generally vertical cylindrical housing having a bottom and an opening adjacent said bottom, a stationary generally helical ramp within said housing extending from the bottom thereof toward the top, a circular conveyor in the bottom of said housing for carrying material deposited in the housing toward said ramp and for pushing said material on to said ramp, each of said conveyor and said ramp having a width substantially equal to the radius of said cylindrical housing and retractable pushers for assisting said conveyor in pushing said material onto said ramp.

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