

[54] **STATIONARY REFUSE PACKER**
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[63] Continuation-in-part of Ser. No. 758,889, Sept. 10, 1968, abandoned.

Foreign Application Priority Data

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[51] Int. Cl.....B30b 15/14

[58] Field of Search.....100/49, 52, 229, 245, 256, 100/289; 74/424.8; 53/124; 141/71, 73

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[57] **ABSTRACT**

A refuse packer having a ram mounted slidably in a housing for reciprocation between a packing position and a loading position, a ball nut and feed screw ram actuator is connected operatively to the ram and electrically operated power means is arranged to actuate the ball nut and feed screw ram actuator to reciprocate the ram.

7 Claims, 6 Drawing Figures

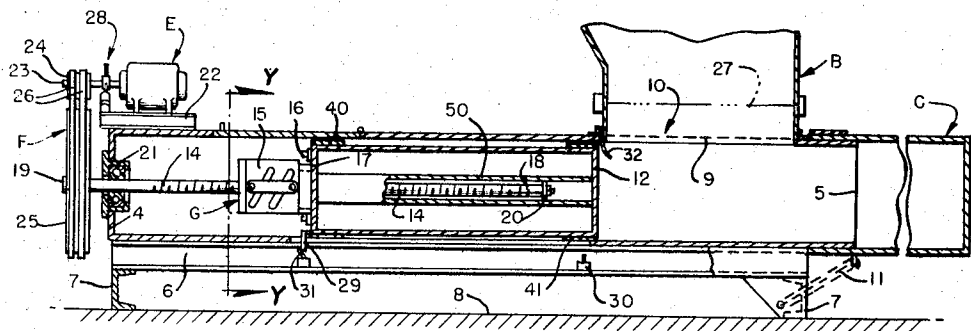


FIG. 2.

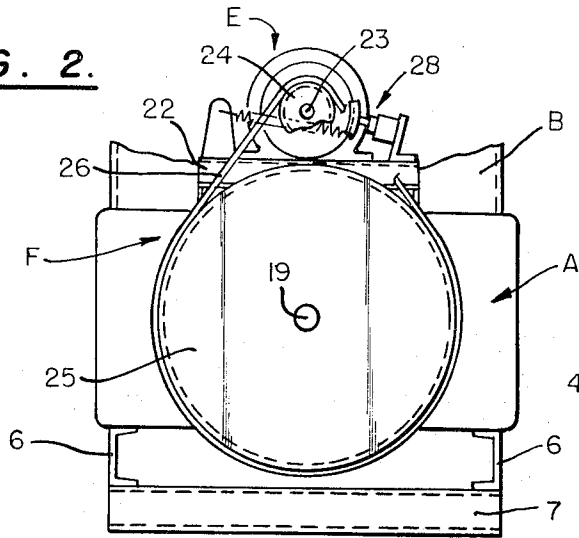


FIG. 3.

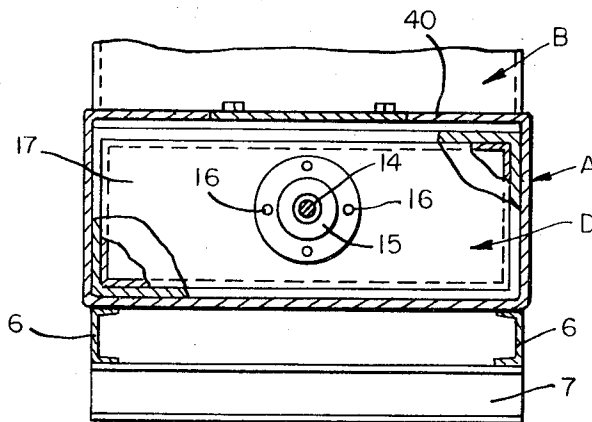


FIG. 5.

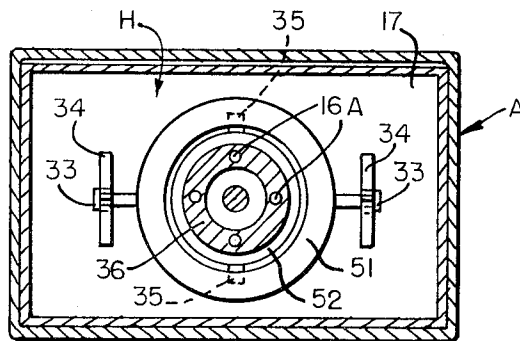
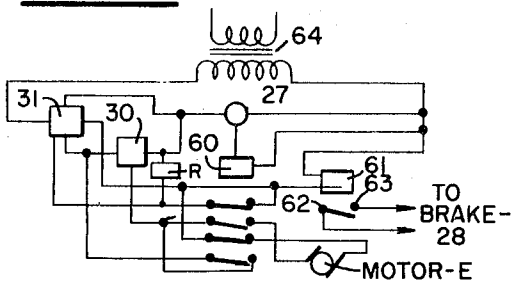


FIG. 6.



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STATIONARY REFUSE PACKER

This application is a continuation-in-part of my previously filed application Ser. No. 758,889 for a Stationary Refuse Packer application filed Sept. 10, 1968, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to refuse packers and in particular to a refuse packer having improved ram-moving means.

A major problem exists in the disposal of refuse from multilevel apartment dwellings and industrial sites. To avoid air pollution, disposal of refuse and garbage by incineration in incinerators located in the apartment dwelling or industrial complex is now banned in many areas and, it becomes necessary to find other means to dispose of refuse.

Owing to the volume of refuse in large apartment dwellings and industrial sites, it is impractical to move the refuse unless it has been compacted and it is now common to use refuse packers associated with the garbage or refuse disposal chutes in buildings so that the refuse can be reduced in size before it is removed.

2. Description of Prior Art

A popular form of refuse packer uses a reciprocating ram operated hydraulically to compress refuse in front of the ram into suitable containers for disposal.

While refuse packers of this type will operate satisfactorily to compress refuse, they suffer from a number of disadvantages. For example, the hydraulic installation necessary for powering a ram is complex and generally includes a motor of approximately 3 horsepower minimum, a drive belt or chain, a pump, a tank and filter, pressure relief valves (with resultant heat buildup), hoses and fittings, solenoid valves, hydraulic cylinders, oil, switches and valving. The cost of an hydraulic installation of this nature is usually considerable and there is always the possibility of fire should there be an electrical short in the circuitry controlling the hydraulic mechanism or an accidental fire in the refuse, that may result in ignition of the hydraulic fluid.

A further disadvantage is that an hydraulic system operating at high pressures makes considerable noise and when such system is located in an apartment building adjacent a garbage chute, the noise will be transmitted and amplified to all levels of the building.

In addition, it is estimated that hydraulic systems operate at about 30 percent efficiency, they require motors of three to 7 horsepower which in turn require 220 or 550 volts of power which may not be readily available at the location in which the packer is to operate.

A still further disadvantage to hydraulic systems, is that oil leakage may occur at some time or oil may be spilled during servicing of the system. This will result in dirty, slippery floors which can become a fire hazard. There is also the disadvantage that oil vapor from the unit breathing during operating will tend to coat the area in which the apparatus is operated.

There is also the problem that hydraulic systems require frequent and careful maintenance and lubrication if they are to operate at maximum efficiency and not be subject to excessive wear.

SUMMARY OF THE INVENTION

It has been found that the above and other disadvantages associated with hydraulically operated packer mechanisms may be reduced and, in some cases eliminated, when the refuse packer is actuated through a feed screw and ball nut (ball bearing) mechanism operated by an electric motor. With an actuating mechanism of this nature and with the moving parts constructed to operate with low frictional contact, only a 1 horsepower one hundred and ten volts electric motor is required. In addition, the problem of leaking oil from the hydraulic system with the resultant fire hazard is eliminated.

The feed screw and ball nut mechanism may be connected by a gimbal to the moving mechanism of the device with self-aligning bearings so that the ball nut and feed screw will also operate with reduced friction and wear. In such installation, it has been estimated the mechanism will operate at close to 95 percent efficiency and contribute a minimum of noise to the ordinary noise level of the refuse packer in operation. Further, an installation of this nature is less costly than hydraulically actuated mechanism of the equivalent power, it is more simple to install and maintain and generally achieves its desired purpose in a more satisfactory manner.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional side elevation illustrating a refuse packer installation and drive mechanism;

FIG. 2 is a broken away end view as seen from the left-hand side of FIG. 1;

FIG. 3 is a broken away sectional view taken at the line Y—Y of FIG. 1;

FIG. 4 is an enlarged broken away sectional side elevation illustrating a packer installation and in particular the ball nut and feed screw with the ball nut Gimbally mounted to the packer and the feed screw mounted with a self-aligning bearing at one end.

FIG. 5 is a broken away sectional end view taken at the line X—X of FIG. 4.

FIG. 6 is a schematic diagram illustrating the electrical connections between the power source, limit switches, photocell and braking circuits, with the ram D in the fully withdrawn or reverse position.

With reference now to the drawings, the refuse packer includes the housing indicated generally at A, the refuse chute indicated generally at B, the transportable container indicated generally at C and the ram indicated generally at D. The power source for moving the ram D is indicated generally at E, the drive mechanism connecting the power source E to the ram-moving means is indicated at F while the ram moving means is indicated generally at G.

The housing A is preferably of elongated rectangular form closed at its one end 4 and open at its opposite end 5. The housing A is supported on suitable longitudinal stringers 6 and lateral supports 7 which are secured firmly to the surface 8 on which the packer is supported. An inlet opening 9 is formed in the upper wall of the housing A adjacent the open end 5, and the refuse chute B is located to discharge refuse through the opening 9 into the loading area of the housing A, designated generally at 10 and, located immediately below the refuse chute B. The general shape and construction of the housing A and refuse chute B are common in this art and it is not considered that further description of this portion of the apparatus is necessary.

The transportable container C fits over the open end 5 of the housing A and is contained thereon by the holding chain 11 or other suitable mechanism. When the container C is filled with refuse, it is removed and is transported by known means for disposal of the refuse therein.

The ram D, in the embodiment illustrated, is rectangular in form to fit slidably within the housing A and is provided with end bands 40 and 41 of nylon or other material having a low coefficient of friction so that movement of the ram D in the housing A will be made with as little friction between the ram D and housing A, as possible. In the position illustrated in FIG. 1 the ram D is in the retracted position, where refuse will fall in front of the ram into the refuse area 10. When the ram D is moved forwardly to the packing position it will compress and pack refuse into the container C. It is important to note that the ram D must be provided with a substantially vertical front wall 12 to push refuse ahead of the ram and into the container C and, at the same time, include a horizontal upper wall 13 which will serve to close off the opening 9 when the ram is in the forward packing position and prevent refuse from falling behind the front wall 12 of the ram. A wiper blade 32 located

at the rearward edge of the opening 9 is adapted to wipe the upper wall 13 and thereby prevent dirt, ashes and the like from being drawn back into the screw area as the ram D is moved back to the loading position.

The ram-moving means G includes a feed screw 14 and ball nut 15. In the embodiment illustrated in FIGS. 1, 2 and 3, the ball nut 15 is secured rigidly by holding bolts 16 to a rear wall 17 of the ram. The feed screw 14 passes completely through the ball nut 15 to extend at one end 18 into the ram D and at its opposite end 19 through the wall 4 of housing A. The end 18 of the screw 14 extends into a tube 50 in the ram D and is supported in the tube 50 by a nylon washer 20 secured to the end of the feed screw 14, the nylon washer providing a sliding telescopic connection between the end 18 of the feed screw 14 and the interior of the tube 50. A thrust bearing 21 in the end wall 4 supports the feed screw 14 as it passes through the end wall 4.

The power source indicated generally at E includes a suitable electric motor mounted rigidly at 22 on the housing A and including a drive shaft 23. The drive shaft 23 is coupled to the ram-moving means G through drive pulleys 24 on the drive shaft 23, driven pulleys 25 on the projecting end 19 of the feed screw 14 and drive belts 26 coupling the drive pulleys 24 and driven pulleys 25.

In the embodiment illustrated in FIGS. 4 and 5 in the drawings, the ball nut 15 is coupled to the rear wall 17 of the ram by way of a gimbal mounting indicated generally at H. The gimbal mounting H includes concentric outer and inner rings 51 and 52, the outer ring 51 connected rotatably through pins 33—33 to spaced lugs 34—34 projecting from the rear wall 17. The concentric inner ring 52 is connected through pins 35—35 to the outer ring 51. The ball nut 15 is secured to the inner ring by means of a suitable collar 36 and holding bolts 16A.

The feed screw 14, similarly to the embodiment of FIG. 1, extends through the ball nut 15 and the end wall 17 to project at its one end 18 into the ram D. The feed screw, in this embodiment is not supported at its end 18. Support at the opposite end 19 of the feed screw 14' is provided at the wall 4 by a self-aligning bearing 21A which includes an outer collar 37 secured to the wall 4 with an inner ball race 38 through which the end 19 of the shaft projects, the inner ball race being capable of movement within the outer ring 37 to align itself automatically and compensate for movement of the feed screw 14' about its longitudinal axis.

Control circuits (shown in FIG. 6) for controlling movement of the ram D within the housing A and controlling operation of the power source E may include an electric eye beam 27 installed in the throat of the refuse chute B to be actuated by the passage of refuse through the beam or by an accumulation of refuse sufficient to interrupt the beam. Preferably, this would energize suitable relays to close switches and energize the power source E. In the embodiment illustrated, a solenoid actuated disc brake mechanism indicated generally at 28, normally brakes operation of the drive shaft 23. At the same time that the power source E is energized, a brake 28 would be activated to permit movement of the drive shaft 23 and so that power would be transmitted through the V belts 26 to the feed screw 14 or 14'. Rotation of the feed screw 14 or 14', will move the ram D to compress refuse into the container C and the ram D will move forwardly until a detent 29 projecting down from the ram, trips a limit switch 30. This will halt movement of the ram and reverse the direction of rotation of the power source E so that the ram D will be moved in the opposite direction. At its rearward limit of travel as illustrated in FIG. 1, the detent 29 will trip a limit switch 31 to again shut off the power source E and allow the disc brake mechanism 28 to grip the drive shaft 23 and stop operation.

In FIG. 6, limit switches 30 and 31 each have two pair of contacts. With the ram in the withdrawn position, with the proper contacts open, relay 60 is actuated and two of the four pairs of contacts of relay 60 shown in FIG. 6 are open while the other two are closed. Current flows through the closed

contacts of each of the limit switches, through the relay and to the motor E to actuate the motor and cause it to move ram D forwardly.

As the ram moves forwardly, the closed contacts in limit switch 30 open and the open contacts are closed so as to maintain operation of motor E.

When the ram D reaches its maximum forward position, the contacts in limit switch 31 are actuated, those which were closed are opened and those which were open are closed, thereby changing the current path through relay 60 and causing the motor to rotate E in the reverse direction.

At the end of each transit of the ram, time delay relay 61 is actuated to close contacts 62, 63 for actuation of brake 28. The time delay interval for the application of braking is only sufficient to arrest movement of the ram D.

If at this point the photocell 27 is still actuated by the presence of refuse in chute B, the relay 60 will again be closed and the cycle will be repeated to move the ram forwardly, as described.

In the event of a blockage by refuse that is not immediately crushed or disintegrated and which stops full travel of the ram, there would be provided an automatic overload relay R connected in parallel with limit switch 30 and which would take over control of the ram. The action of this overload relay would be to reverse the forward travel of the ram whenever complete forward motion of the ram is impeded by a blockage. The overload relay would control the initiation of the reverse cycle that is to say movement of the ram in the opposite direction until the obstruction was cleared and the limit switch 30 would then resume normal control operations. Should the obstruction be of an unmovable nature, the overload relay, after a given period of time, would automatically shut the packer down so that blockage could be cleared manually.

I claim:

1. In a refuse packer wherein a ram is slidably mounted in a housing for controlled reciprocation between a packing position and a loading position, the combination with said packer of a ram actuator including

- A. a power source mounted on said housing;
- B. a feed screw mounted for rotation substantially centrally longitudinally in the ram and having a sliding telescopic supporting connection at one end with the ram and adapted at its opposite end to be rotated by the power source;
- C. a ball nut having a driven connection with the feed screw for movement along the screw as the screw is rotated; and
- D. means connecting the ball nut to the ram.

2. A refuse packer as claimed in claim 1, wherein the power source is actuated automatically when a predetermined quantity of refuse is located in the housing and wherein there is included controlling and limiting means to limit reciprocation of the ram within the housing.

3. The refuse packer as claimed in claim 1, wherein the ram includes means to restrict passage of refuse to the housing when the ram is moving and whereby the reciprocation of refuse into the housing is always forward of the ram.

4. The refuse packer as claimed in claim 1, wherein the power source includes an electric motor which is connected operatively to the ball nut and feed screw mechanism through V belts and pulleys.

5. The refuse packer as claimed in claim 1 wherein the ram is provided with material having a low coefficient of friction, such material being located between the ram and the housing.

6. In a refuse packer wherein a ram is slidably mounted in a housing for controlled reciprocation between a packing position and the loading position, the combination with said packer of a ram actuator including

- A. a power source mounted on said housing;
- B. a feed screw mounted for rotation substantially centrally longitudinally in the ram to project at one end outside the ram and being supported at its projecting end in a self-aligning bearing as well as being adapted at such end for rotation by the power source;

C. a ball nut having a driven connection with the feed screw for movement along the feed screw as the screw is rotated; and means including a gimbal mounting for connecting the ball nut to the ram.

7. The refuse packer as claimed in claim 6 wherein the ram is provided with material having a low coefficient of friction, such material being located between the ram and the housing.

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