# United States Patent [19]

**Hardy**

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[54] **COMPACTOR BRAKE**


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[52] **U.S. Cl.**..... **100/53**; 74/424.8 R; 100/229 A; 100/289; 188/69

[51] **Int. Cl.**..... **B30b 1/18**

[58] **Field of Search**..... 188/69, 134; 74/428.4 R; 100/229 A, 289, 290, 53



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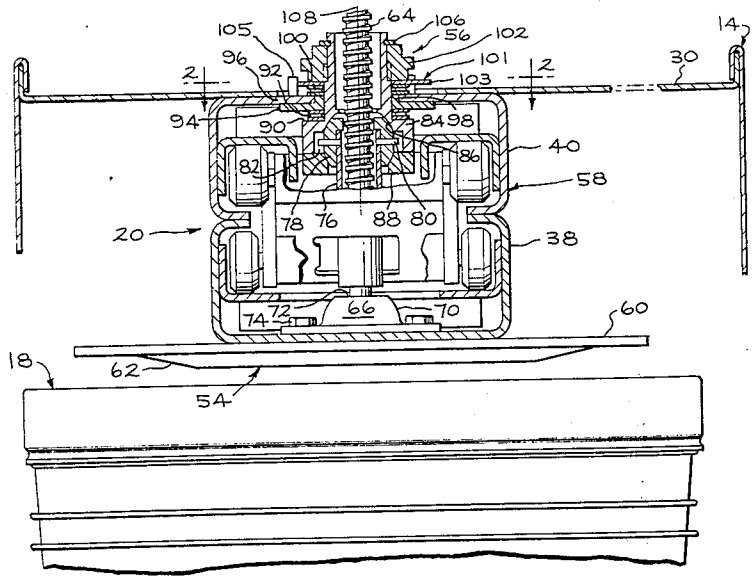
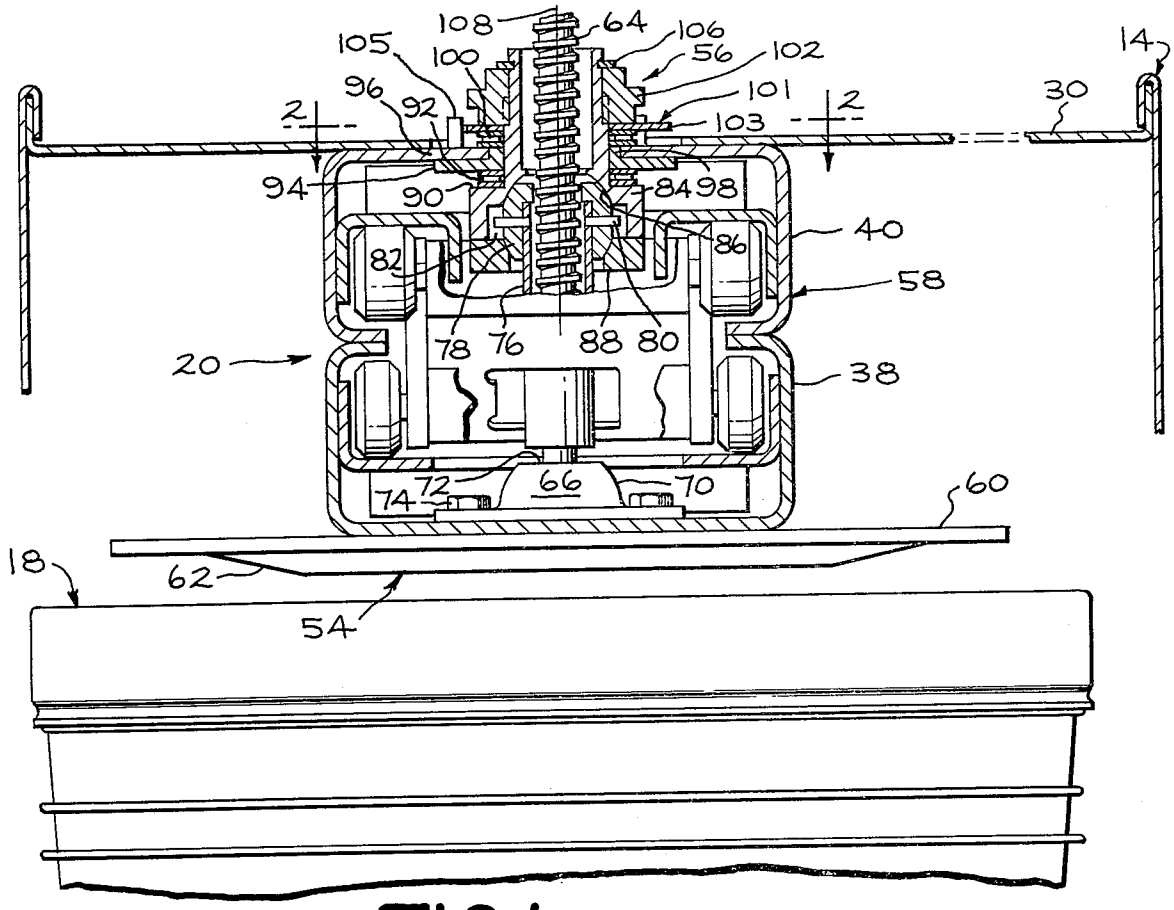
[57] **ABSTRACT**

In a domestic refuse compactor for compressing refuse into an open-topped container, having: a frame: a pressure plate for contacting the refuse; and screw-type drive means carried by the frame for reciprocating the pressure plate into and out of the open-topped container, wherein the screw-type drive means includes a screw member attached in driving relationship to the pressure plate, and a driving arrangement adjacent the frame for reciprocating the screw and pressure plate, the improvement comprising a brake located between the frame and the driving arrangement to prevent locking of the driving arrangement in abutting relationship to the frame when the pressure plate is retracted to its uppermost position.


**5 Claims, 2 Drawing Figures**




108
64
106
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100
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102
14
96
92
101
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84
98
40
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20
38
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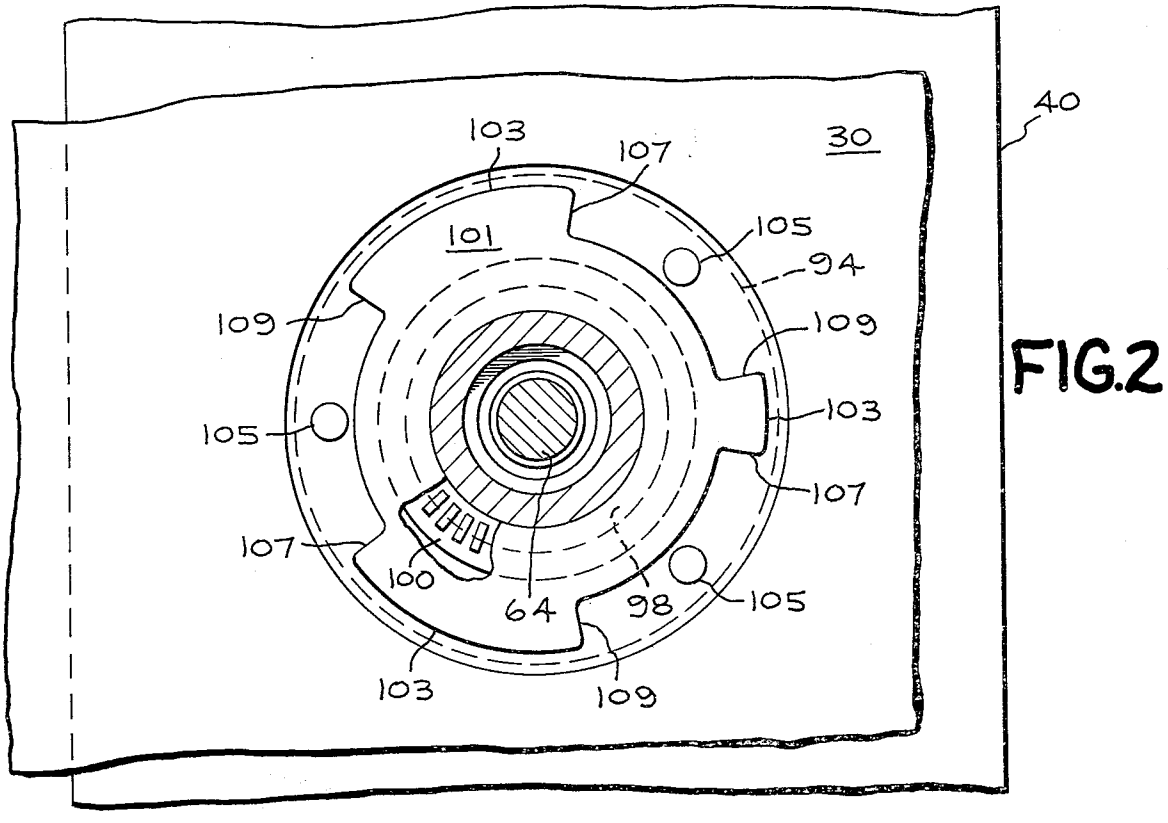
18
62
54

FIG.1


40
103
107
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94
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64
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109

FIG.2

# COMPACTOR BRAKE

## BACKGROUND OF THE INVENTION

Domestic refuse compactors are in widespread use throughout the country. Such compactors normally include a cabinet having a front opening, a door for closing the opening, an open-topped container movable into and out of the cabinet, and a press or compacting mechanism mounted in the cabinet, which is movable downwardly into the open-topped container for compressing refuse therein. Many of the compactors presently on the market incorporate a scissors-type linkage arrangement for applying force to the pressure plate. Devices of this type have an inherent disadvantage, since the mechanical advantage of the linkage arrangement varies as a function of the position of the pressure plate over the length of the compression stroke.

Other compactors have been provided in which screw-type drive means are employed to generate a compacting force which is generally constant and independent of the position of the pressure plate. Such compactors suffer from a number of defects, however. One such defect is that the screw-type drive means itself, upon reversing, may tighten and jam in its uppermost position so that the motor cannot break it loose at the beginning of a subsequent compaction cycle.

The problem of the screw-type drive means jamming arises in that, under normal operation, as the pressure plate approaches its retracted or uppermost position, a limit switch shuts off the power to the motor; however, if the operator holds the start switch in the energized position past the point of operation of the limit switch, then the screw mechanism continues to retract under power and jams in its uppermost position. Correspondingly, the motor could coast after being shut off by the limit switch to cause the screw-type drive means to jam, in certain compactors.

The use of a needle thrust bearing between the screw-type drive means and the frame means of the compactor proved to be only partially effectual in solving the jamming problem. Friction was reduced between the frame means and screw-type drive means; thus, the motor was able to break loose the jammed drive means upon initiation of a subsequent compaction cycle. However, the needle thrust bearing provided no braking effect and, as a consequence, allowed the retracting screw-type drive means to engage the frame with such force that either the drive means or the power linkage from the motor to the drive means was damaged.

The present invention provides a straightforward, inexpensive, readily constructed and easily maintained means of slowing the screw-type drive means to a stop when the pressure plate reaches its uppermost position and yet provides little or no resistance to the motor when the next subsequent cycle is initiated.

Attempts, such as those shown in U.S. Pat. Nos. 3,783,312 and 2,172,440, have been made at providing brake means for braking electric motors under no-load conditions, but such brake means are not at all suited for use in domestic refuse compactors.

## SUMMARY OF THE INVENTION

The present invention provides a compactor brake which is employed in screw-type drive compactors between the drive means and the frame means to arrest the upward motion of the pressure plate and provide



for easy reversal when the next subsequent compaction cycle is begun. More specifically, the invention includes in a household refuse compactor of the type having frame means providing a compacting chamber including an access opening thereinto; a door mounted for movement between positions opening and closing the access opening; means for supporting an open-topped container in the chamber; a pressure plate for movement into and out of the container for compressing refuse therein; screw-type drive means supported by the frame means for vertically reciprocating the pressure plate, including screw means, means mounting the plate on the screw means and rotatable driving means for driving the screw means, the improvement comprising brake means rotatably mounted in abutting engagement with the frame means and the driving means, which brake means is adapted to rotate through an arc to engage stop means mounted to said frame means to releasably arrest the rotary motion of the driving means.

The brake means of this invention has been found useful in preventing damage to the screw-type drive means of a household refuse compactor upon return of the refuse compactor pressure plate to its uppermost or rest position.

## DESCRIPTION OF THE DRAWING

FIG. 1 is a side view, partially in section, illustrating the compacting mechanism of a household compactor employing the compactor brake of this invention, the compacting mechanism being in its uppermost position; and

FIG. 2 is a top view of the compactor brake shown in FIG. 1.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the compacting mechanism **20** includes as major components a pressure plate **54**, screw-type drive means **56** for vertically reciprocating the pressure plate **54** and stabilizing means **58** located between plate **54** and top wall **30** for maintaining the plate **54** generally horizontal during downward movement toward and into a refuse receiving container **18**.

The pressure plate **54** may be of any suitable design and conveniently includes a generally circular plate **60** sized to be received in the container **18**. The plate **60** provides a pair of ribs **62** on the underside thereof to provide increased rigidity and to act as bottle breakers.

The screw-type drive means **56** for reciprocating pressure plate **54** includes a screw **64** having the lower end thereof secured in a bearing element **66** in any suitable fashion. The bearing element **66** is attached to the plate **60** by a substantially hemispherical cup **70** having an opening **72** therein for receiving the screw end. The cup **70** is attached to the pressure plate **54** in any suitable fashion, as by conventional thread fasteners **74**. It will accordingly be seen that the pressure plate **54** is mounted for tilting movement relative to the screw **64** about a plurality of horizontal axes.

The upper end of the screw **64** is received in an integrally threaded sleeve **76** which is secured to a substantially spherical bearing element **78**. A plurality of drive pins **80** project radially from the bearing element **78** into a like plurality of drive slots **82** provided by a collar **84**. The collar **84** provides an internal seat **86** mating with the exterior of the bearing element **78**. A re-

tainer **88** is releasably secured to the open bottom end of the collar **84** in any suitable manner, as by a screw connection (not shown) in order to captivate the bearing element **78.**

It will accordingly be seen that rotation of the collar **84** causes rotation of the sleeve **76** through the drive connection afforded by the pins **80** and the slots **82** to thereby reciprocate the screw **64.** It will also be seen that the screw **64** is capable of limited tilting movement relative to the collar **84** because of the sliding relationship of bearing **78** with internal seat **86** and the vertical extent of the slots **82.**

The collar **84** provides an external upwardly facing shoulder **90** captivating a needle or roller bearing **92** against a generally horizontal flange **94** which, in turn, abuts against plate **96** of upper reaction structure **40.** As will be more fully pointed out hereinafter, the plate **96** acts to transmit forces generated during compacting to top wall **30** and thence to frame **14.** Flange **94** carries a tubular bearing section **98** extending through the plate **96** and ending flush with wall **30.** Positioned on top of wall **30** and tubular bearing section **98** is a bearing means **100** upon which the brake means **101** of the present invention rests.

As can be more clearly seen from FIG. **2,** brake means **101** includes projections **103** extending radially from the outer periphery thereof. These projections **103** are sized to extend a distance sufficient so that upon rotation of the brake means they will engage posts **105** which are rigidly supported from top wall **30.** As best seen from FIG. **2,** posts **105** are attached at preselected locations on plate **96** and project through top wall **30** to engage projections **103** of the brake means and allow the brake means to rotate through an angular rotation of, for example, about 70°.

Resting upon brake means **101** is collar **102** which is powered from an external power source (not shown) and journalled to collar **84.** It will be seen that collar **102** and collar **84** are mounted for rotation about an axis **108** defined by the sleeve **76.** The collar **102** is interiorly splined to provide a driving connection with collar **84.** The collar **102** is also externally splined to provide a driving connection with a large, toothed wheel (not shown) and is captivated to the collar **84** by a suitable retainer **106.**

In operation, the brake mechanism of this invention functions to restrict the rotation of collar **102** as tightening occurs in the means **56** upon retraction of plate **54** to its uppermost position. Specifically, it can be seen that retracting the screw means to its uppermost position causes upper and lower reaction structures **40** and **38,** respectively, to abut, which in turn causes a tightening force to be transmitted to bearing element **78** and then to collar **102** as described more fully hereinafter. The cause of such tightening can be either from the operator maintaining the start button in a depressed condition as the compacting mechanism is retracting or from the motor coasting to a final rest position. Such tightening heretofore caused retainer **106** to break apart or the top of collar **84** to break off. However, the addition of brake means **101** prevents this from happening.

As noted above, the brake means **101** functions to restrict the rotation of collar **102** and thus restrain the upward motion of circular plate **60** and lower reaction structure **38.** Such restriction prevents the means **56** from jamming when the plate and reaction structure are in their uppermost position as follows: When lower reaction structure **38** abuts upper reaction structure **40,** any further rotation of sleeve **76** tends to pull the reaction structures more closely together. Screw **64** pulls on hemispherical cup **70** and, in turn, sleeve **76** pulls downwardly on spherical bearing element **78** which, in turn, pulls downwardly on retainer **88** and thus on collar **84.** Such downward force puts pressure on retainer **106.**

As explained earlier, if the lower reaction structure abuts the upper reaction structure under power, the force transmitted to retainer **106** may be sufficient to cause it to break. In the alternative, the upper portion of collar **84** supporting retainer **106** may break off. To avoid such a consequence, brake means **101** is inserted on top of bearing means **100** in abutting relationship to collar **102.** Under the circumstances described above, when a downward thrust is exerted through collar **84,** collar **102,** which is rotating, comes into forceful engagement with brake means **101,** thus exposing brake means **101** to a rotating force. As this happens, brake means **101** is more forcefully compressed between bearing means **100** and collar **102** until it begins to rotate with collar **102.** Brake means **101** rotates through an angle of, for example, about 70° until the leading edges **107** of projections **103** come into contact with posts **105,** attached to plate **96** and projecting through top wall **30,** at which time break means **101** is prevented from further rotation. The tightening between collar **102** and bearing means **100** is ever increasing; thus, the frictional forces between collar **102** and brake means **101** quickly become sufficient in magnitude to stop the rotation of collar **102.** As can be seen, the braking function of the brake means **101** is a gradually increasing type of braking effect which prevents an abrupt stopping of the moving parts of means **56.** In addition, it is easily recognizable that to begin a subsequent compaction cycle, collar **102** will be rotating in the opposite direction. Thus, brake means **101** with which collar **102** is now firmly engaged is free to rotate through an arc of, for example, 70° . Upon rotation through such a 70° arc, the tightening force between collar **102** and brake means **101** will have been diminished to such an extent that when the following edges **109** of projections **103** abut respective posts **105,** collar **102** will be easily rotatable being only in light frictional contact with brake means **101.** Thus, brake means **101** provides braking of the means **56** and easy release or "break loose" upon initiation of a subsequent compaction cycle.

It should be noted that, although brake means **101** has been shown and described as having three projections abutting corresponding posts, other similar brake means could be devised. For example, a suitable brake means having only one projection abutting only one post could be employed, under certain circumstances; whereupon, the brake means would rotate through an arc of less than about 360° in preforming the braking function. Similarly, a brake means having a plurality of projections and posts could be employed. In such an event, the rotation of the brake means may be through an arc of 30° or less in performing the braking function. Also, the brake means need not be of any specific shape as long as provision is made for it to releasably engage stop means to effect braking.

It should also be noted that if a needle bearing is selected as bearing means **100,** then it can be seen that

brake means **101**, which is in contact therewith on its underside, would be even more easily broken loose upon initiation of a subsequent compaction cycle. Such a bearing itself also minimizes the frictional forces which the motor must overcome to break loose collar **102** and begin the compaction cycle.

Another feature of the compactor described herein is illustrated in FIG. **1** wherein the bottom of the sleeve **76** is disposed well below the top wall **30** at a location where the pressure plate **54** clears the container **18** upon the termination of the upward movement of the screw **64.** Thus, the length of the stroke of the screw **64** is measured from adjacent the bottom of the sleeve **76** rather than from the top wall **30.** Since about half of the screw **64** is below the top wall **30** of the compactor in the uppermost position of the screw **64,** it is readily apparent that the overall height of the compactor has been substantially reduced. It will be apparent that the compactor may be placed under a conventional sink since the screw **64** only projects upwardly above the top of the compactor a maximum of about ½ of its overall length.

It will be noted that the screw is directly connected to the pressure plate **54** rather than being connected thereto through a linkage mechanism. Thus, the resistance to movement sensed by the screw **64** is the resistance due to compacting refuse, rather than a mechanical disadvantage appearing in a linkage arrangement. Accordingly, the full output of the motor (not shown) with the exception of any friction losses, is delivered to the pressure plate **54** at all vertical positions of the screw **64.** Thus, the compacting force delivered by the compacting means **20** is relatively constant and independent of the vertical position of the pressure plate **54.** It is, of course, fully apparent that the means **58** for maintaining the pressure plate **54** horizontal during downward movement thereof is wholly independent of the screw **64** and sleeve **76.**

Having thus described the invention, what is claimed is:

**1.** In a household refuse compactor of the type having: frame means providing a compacting chamber including an access opening thereinto; a door mounted for movement between positions opening and closing the access opening; means for supporting an open-topped container in the chamber; a pressure plate for movement into and out of the container for compressing refuse therein; screw-type drive means supported by the frame means for vertically reciprocating the pressure plate, the screw-type drive means including screw means; means mounting the plate on the screw means; and rotatable driving means for driving the screw means; the improvement comprising brake means rotatably mounted in abutting engagement with said frame means and said driving means, said brake means being adapted to rotate through an arc in response to a tightening force between said frame means and said driving means to engage stop means, thereby releasably arresting the rotary motion of said driving means.

**2.** The refuse compactor of claim **1** wherein the rotation of said brake means is limited to an angular rotation of less than 360°.

**3.** The refuse compactor of claim **1** wherein said brake means is a rotatable flat disc and said frame means includes bearing means in contact with said brake means.

**4.** The refuse compactor of claim **3** wherein said brake means includes tab portions radially extending from said flat disc to engage said stop means.

**5.** The refuse compactor of claim **4** wherein said stop means includes a plurality of posts rotatably engageable by said tab portions.

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