United States Patent

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[73] Assignee **Whirlpool Corporation**

[54] **REFUSE COMPACTOR**
17 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **100/52,** 100/53, 100/229
[51] **Int. Cl.** **B30b 15/14**
[50] **Field of Search** ..... 53/124; 141/71, 73; 100/50, 48, 52, 53, 229, 229 A, 256, 290

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ABSTRACT: A refuse compactor having a ram movably carried on a support for selective movement into a refuse-holding drawer to compact refuse deposited therein. The ram is driven by an electric motor which is controlled to effect preselected forcible compaction of the refuse and return to a "start" position for subsequent compaction of additional refuse subsequently deposited in the drawer. The drawer is movable between an inner, compacting position and an outer, refuse-receiving position. The motor is controlled to permit operation of the ram only when the drawer is substantially in the compacting position.

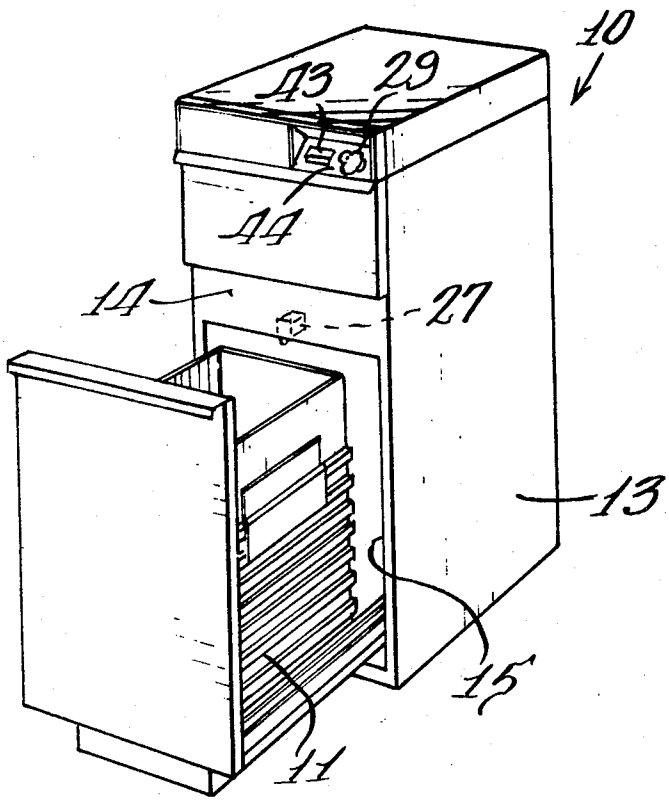


Fig. 1.

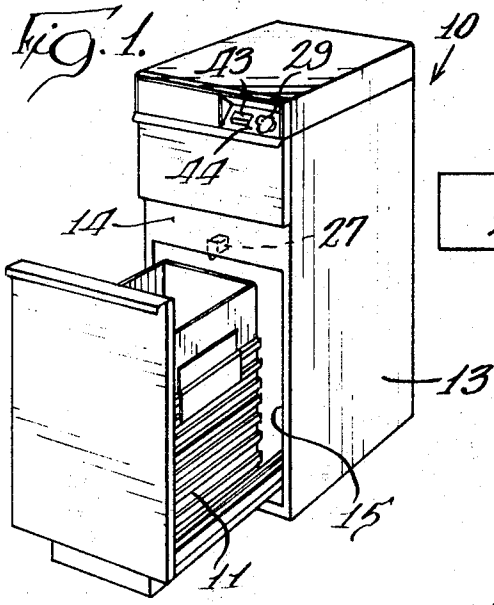


Fig. 2.

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Fig. 3.

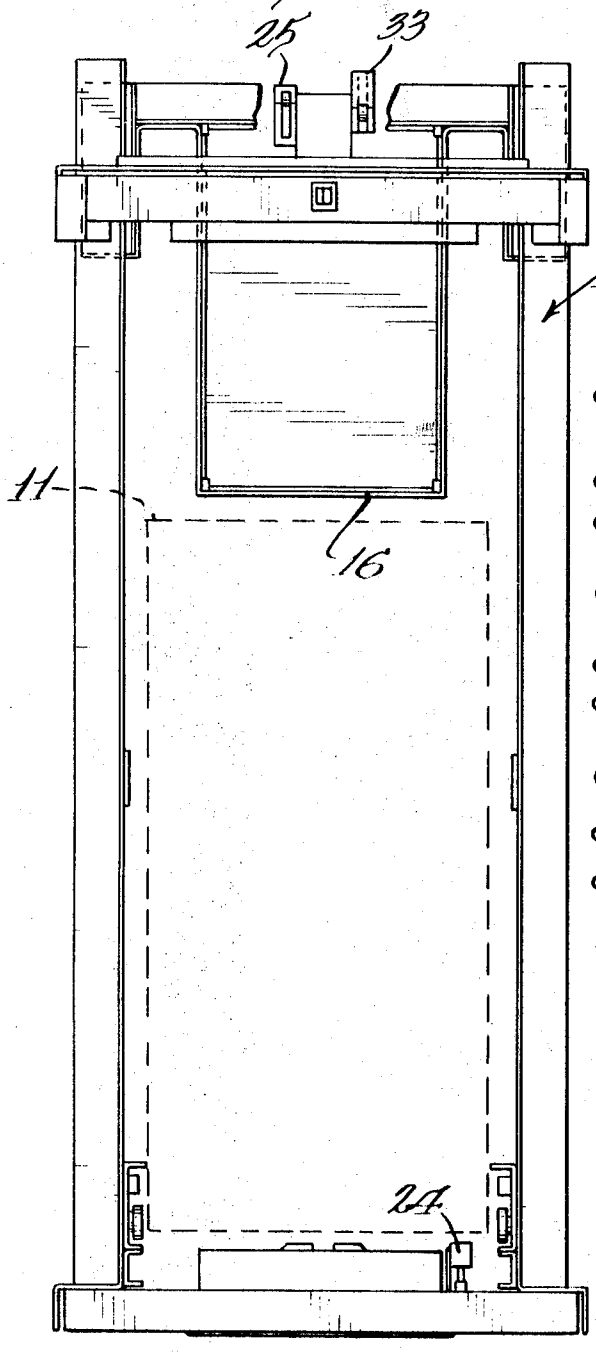
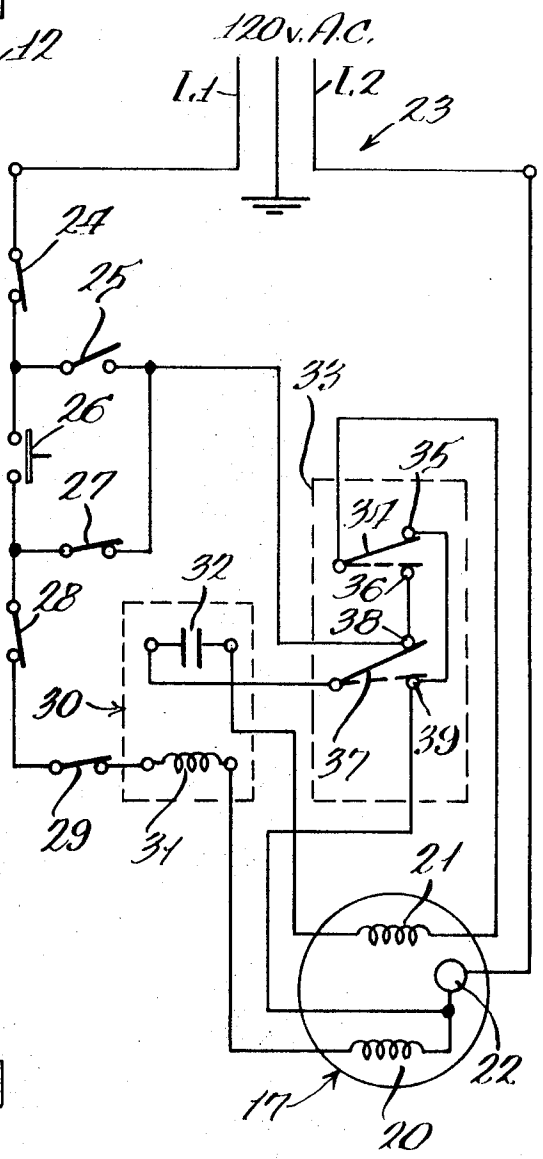

25
33
12
11
16
24

Fig. 4.


120v. A.C.
L1
L2
23
24
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26
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28
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31
32
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39
21
22
17
20

REFUSE COMPACTOR

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to refuse compactors and in particular to refuse compactors having a ram selectively movable to compact refuse received in a refuse-holding means.

SUMMARY OF THE INVENTION

The invention comprehends an improved refuse compactor arranged to provide a preselected forcible compaction of refuse received in a holding means thereof and to cycle the compactor for sequential compacting operations in a novel and simple manner.

The refuse compactor includes a new and improved control means for forcibly driving a compacting ram to effect the preselected compaction of refuse in the holding means and cause a subsequent withdrawal of the ram to a retracted position for sequential compacting operations. The control is arranged to permit operation of the ram for compacting the refuse only when the refuse-holding means is substantially in a preselected compaction position within the apparatus. The control includes means for terminating the compaction operation in the event that the ram jams refuse material in such a manner as to displace the refuse-holding means from the compaction position. The control further includes means for eliminating the jammed condition by withdrawing the ram from the refuse-holding means.

The control includes new and improved circuitry for directionalizing the control of the start winding of the motor and effecting a starting operation at the opposite ends of travel of the ram. The control includes means for initiating the compaction travel of the ram as by manual operation of a starting switch and means for effecting withdrawal travel of the ram as by automatic functioning of the control when the compaction force reaches a preselected maximum.

The control is economical of construction while yet providing each of the highly desirable features discussed above.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a front perspective view of a refuse compactor embodying the invention;

FIG. 2 is a fragmentary vertical longitudinal section thereof;

FIG. 3 is a fragmentary vertical transverse section thereof; and

FIG. 4 is a schematic diagram of the electrical circuitry thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a refuse compactor generally designated **10** is shown to comprise a refuse-holding means, or drawer, **11** movably carried on a support **12** for selective positioning in an exposed refuse-receiving position as shown in FIG. 1 and an inner compaction position as shown in dotted lines in FIGS. 2 and 3. The support **12** is disposed within an outer cabinet **13**. The front wall **14** of the cabinet **13** is provided with an opening **15** through which the drawer **11** is movable between the refuse-receiving and compaction positions.

Refuse placed in drawer **11** is compacted therein by means of a ram **16** guided by support **12** for vertical movement from an uppermost retracted position downwardly into the drawer **11** when the drawer is in the compaction position. Ram **16** is forcibly driven by means of an electric motor **17** through a suitable connecting drive including upright threaded shafts **18** and threaded connectors **19**.

The present invention comprehends improved means for controlling the operation of motor **17** to provide improved

compaction of the refuse in drawer **11**. Thus, as shown in FIG. 4, motor **17** includes a main winding **20** and a start winding **21**. The motor may comprise a conventional split phase motor having a conventional overload protection device **22** integral therewith. Operation of motor **17** is selectively reversible by suitable energization of the start winding **21**. The selective energization of the motor to effect such reversible operation is effected by a control circuit generally designated **23** arranged to be connected to a pair of conventional power supply leads L_1 and L_2. As shown, the control includes a single-pole, single-throw drawer safety switch **24**, a normally closed single-pole, single-throw top limit switch **25** which is held open in the retracted position of the ram, a normally open, momentary close start pushbutton switch **26**, a single-pole, single-throw door switch **27**, a single-pole, single-throw stop switch **28**, and a single-pole, single-throw safety lock switch **29**. The control further includes a motor relay generally designated **30** including a current coil **31** and a normally open contact switch **32**. Control **23** further includes a double-pole, double-throw directionalizing switch **33**, having a first moving contact **34** selectively engageable with a first fixed contact **35** and a second fixed contact **36**, and a second moving contact **37** selectively engageable with a first fixed contact **38** and a second fixed contact **39**.

As shown in FIG. 4, drawer safety switch **24** is connected in series with power supply lead L_1 and through a series connection of start pushbutton switch **26**, stop switch **28**, safety lock switch **29**, coil **31**, main motor winding **20** and motor overload **22** to power supply lead L_2. Thus, when start pushbutton switch **26** is depressed with the drawer **11** in the refuse compaction position and the ram **16** in the uppermost retracted position, a circuit is established through motor main winding **20** from power supply lead L_1 to power supply lead L_2. At this time, the top limit switch **25**, which is carried on an upper portion of the support **12**, is opened by the engagement therewith by a portion **40** of the ram.

The initial high-current flowing through the main motor winding **20** by the momentary closing of switch **26** causes the coil **31** to close normally open contact **32** and thereby connect start winding **21** across the power supply leads L_1 and L_2. More specifically, a circuit is established at this time from start pushbutton switch **26** through closed door switch **27**, the lines connecting switch **27** to fixed contact **38**, directionalizing moving switch contact **37**, the line connecting contact **37** to the contacts **32**, the now closed contacts **32**, the line connecting contacts **32** to start winding **21**, start winding **21**, directionalizing switch moving contact **34** now engaging fixed contact **35**, and overload **22**. With start winding **21** thusly connected, operation of motor **17** is initiated in a suitable direction to move the ram **16** downwardly into the drawer **11** as seen in FIG. 2.

Immediately after initiation of movement of the motor **17**, the current through coil **31** drops sufficiently to permit the contacts **32** to open. Shortly after the ram commences the downward movement, top limit switch **25** is permitted to close thereby providing a holding circuit with closed door switch **27** around the start pushbutton switch **26**.

Shortly after the top limit switch **25** closes, directionalizing switch **33** is released so as to throw the moving contacts **34** and **37** to the biased position of the switch whereby these contacts engage fixed contacts **36** and **39**, respectively.

The downward movement of the ram is continued by the operation of motor **17** in this first direction until the ram movement is resisted sufficiently to increase the current through main winding **20** and relay coil **31** to the point where the relay contacts **32** are again closed. Such resistance to movement of the ram is normally effected by the engagement of the ram with the refuse when the compaction of the refuse reaches a preselected compaction. Where insufficient refuse is deposited in the drawer **11** to provide this resistance to the downward movement of the ram, the ram engages a pair of resilient bumper pads **41** carried on a suitable crossmember **42** of support **12** and thereby provide the necessary resistance

to the downward motion to cause the current through the relay coil **31** to reach the preselected value for reclosing switch **32**.

As indicated, above, directionalizing switch **33** is repositioned immediately after initiation of the downward movement of the ram. Thus, when relay contacts **32** are now reclosed, a reverse circuit is established relative to the start winding **21** thereby initiating an upward withdrawal movement of the ram **16** to return the ram to the upper retracted position. More specifically, a circuit is now established from contacts **32** through directionalizing switch moving contact **34** now engaging fixed contact **36**, start winding **21**, moving contact **37** now engaging fixed contact **39** and overload device **22**. The upward movement of the ram continues until the directionalizing switch **33** becomes actuated then immediately the top limit switch **25** is opened by the ram portion **40** whereupon the holding circuit around pushbutton switch **26** is broken, thereby deenergizing the motor **17** and establishing the compactor for a subsequent compacting operation as by a subsequent depression of start pushbutton switch **26**. Thus, directionalizing switch **33** is automatically potentiated for the reversal operation of motor **17** as a function of the movement of the ram **16** downwardly from the retracted position permitting the reversal to be effected at any position of the ram upon the current through the motor main winding **20** reaching a preselected high value indicating a high resistance to the downward travel of the ram **16**.

As shown in FIG. **2**, the drawer safety switch **24** is carried on the support **12** rearwardly of the drawer **11** to be closed only when the drawer **11** is in the fully closed position of FIG. **2**. Thus, the operation of pushbutton switch **26** is effected to initiate a compaction operation only when the drawer is fully inserted into cabinet **13**.

At times the drawer **11** may move slightly as from a jamming of the refuse in the drawer by the ram. Illustratively, where a relatively hard object, such as a soft drink bottle or the like, becomes jammed between the ram and the front wall of the drawer, the drawer **11** may move forwardly slightly, such as approximately one-fourth of an inch. When this occurs, it is desirable to effect withdrawal of the ram so as to permit continued operation of the compactor. To this end, the door safety switch **27** is connected in the holding circuit around pushbutton **26** and is adapted to be engaged by the drawer so as to stop operation of the compactor motor **17** upon such a small movement of the drawer. The drawer safety switch **24** is set to open upon a greater displacement of the drawer from the compacting position and illustratively, may be set to open when the drawer is set in excess of approximately one-half of an inch therefrom. Thus, switch **24** would remain closed under such jamming conditions permitting reverse withdrawal movement of the ram by the depression of pushbutton **26**. The circuit to the start winding **21** is at this time in the arrangement wherein the start winding may be reversely energized as the directionalizing switch **33** is in the thrown position with moving contacts **34** and **37** engaging fixed contacts **36** and **39** respectively, whereby reenergization of motor **17** effects the desired withdrawal movement of the ram.

To preclude unauthorized use of the compactor as by children, the switch **29** comprises a key-operated switch permitting operation of the ram only when the key switch is turned to an "On" position. As shown in FIG. **1**, the switch **29** and a Start-Stop rocker switch **43** are disposed in a forward control panel portion **44** of the cabinet **13** for facilitated use.

The operation of compactor **10** is extremely simple. The user merely moves the drawer **11** out from the front cabinet **13** to deposit refuse therein. When the amount of refuse so deposited reaches a preselected maximum level, a compaction of the deposited refuse may be effected by depressing the start pushbutton switch **26** by suitable manipulation of Start-Stop rocker switch **43**. As discussed above, the motor **17** is thusly energized in a direction to move the ram **16** downwardly into the drawer **11** and engage the deposited refuse therein for suitable compaction. The operation of the ram **16** is automatically reversed either by the compaction force generated against the deposited refuse reaching a preselected maximum, or by the engagement of the ram with the bumper pads **41** to produce a similar reaction force where the collected refuse is insufficient to provide the preselected reaction force. The ram automatically moves back to the upper retracted position thereby permitting free movement of the drawer outwardly from the compactor for subsequent further deposit of refuse therein. The control **23** provides a fail-safe functioning in that the directionalizing switch **33** is potentiated at all times after the ram moves slightly downwardly from the retracted position to effect a reversal of the ram movement in the event of any one of a number of different conditions arising. The various control switches may be adjustably mounted for accurate control of the operation of the compactor and the coil **31** may be suitably preselected for effecting the reversal of the ram operation at a desired preselected maximum force. In the illustrated embodiment, the compactor is arranged to reverse the ram upon exertion of a force of approximately 2,200 to 2,500 pounds. Illustratively, the coil **31** may be arranged to have a pickup current rating of approximately 10.7 amperes and a dropout current rating of approximately 8.8 amperes. It will be understood that these ratings are dependent upon the mounting location of the relay coil and are subject to change.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a refuse compactor having a support, movable means for holding refuse to be compacted in a preselected compacting position, and a ram movably carried on said support for movement into said refuse-holding means to compact refuse received therein, apparatus for operating said ram comprising: drive means operatively connected to said ram for forcibly urging said ram selectively into and from said refuse-holding means; and control means for controlling the operation of said drive means for causing said drive means to apply a compaction force to refuse in said refuse-holding means up to a preselected maximum compaction force and upon reaching said preselected maximum force, effect a reversal of the drive means to withdraw said ram from said refuse-holding means, said control means including means to prevent initiation of operation of the drive means to apply a compacting force in the event the refuse-holding means is displaced from said compacting position at least a first preselected amount and to prevent further operation of the drive means to apply a compacting force after initiation of operation thereof in the event that the refuse-holding means becomes displaced from said compacting position at least a second preselected amount different from said first preselected amount.

2. The refuse compactor apparatus of claim **1** wherein said control means includes manually operable means for initiating operation of said drive means and means for causing reversal operation of the drive means by operation of said manually operable means in the event said refuse-holding means becomes displaced said second amount during a compaction operation.

3. The refuse compactor of claim **1** wherein said second preselected amount of movement of said refuse-holding means is substantially less than said first amount.

4. In a refuse compactor having a support, means for holding refuse to be compacted, and a ram movably carried on said support for movement into said refuse-holding means to compact refuse received therein, apparatus for operating said ram comprising: drive means operatively connected to said ram for forcibly urging said ram selectively into and from said refuse-holding means; and control means for controlling the operation of said drive means for causing said drive means to apply a compaction force to refuse in said refuse-holding means up to a preselected maximum compaction force and upon reaching said preselected maximum force, effect a reversal of

the drive means to withdraw said ram from said refuse-holding means, said control means including manually operable means for initiating operation of said drive means, said control means further including means for precluding unauthorized operation of said manually operable means.

5. In a refuse compactor having a support, means for holding refuse to be compacted, and a ram movably carried on said support for movement into said refuse-holding means to compact refuse received therein, apparatus for operating said ram comprising: drive means operatively connected to said ram for forcibly urging said ram selectively into and from said refuse holding means; control means for controlling the operation of said drive means for causing said drive means to apply a compaction force to refuse in said refuse-holding means up to a preselected maximum compaction force and upon reaching said preselected maximum force, effect a reversal of the drive means to withdraw said ram from said refuse-holding means; and means for manually controlling the control means to withdraw the ram in the event that the refuse-holding means becomes spaced from a preselected compaction position more than a preselected amount during a compaction operation.

6. In a refuse compactor having a support, means for holding refuse to be compacted, and a ram movable guided by said support for movement into said refuse-holding means to compact refuse received therein, apparatus for operating said ram comprising: an electric motor operatively connected to said ram for moving said ram into and from said refuse-holding means, said motor having a main winding and a start winding; and control means for controlling operation of said motor including a relay having an operating coil connected in series with said motor main winding and a start switch controlled by said coil, a directionalizing switch connected in electrical series with said start switch and selectively connecting said start switch in a first circuit arrangement for energizing said motor start winding in a first direction to initiate operation of the motor to move said ram for compacting refuse in said refuse-holding means, and in a second direction to initiate operation of the motor to move said ram for withdrawal from said refuse-holding means upon completion of a compaction of refuse in said refuse-holding means, and safety means for effecting withdrawal movement of the ram in the event of malfunctioning of the compactor during a compacting operation.

7. The refuse compactor apparatus of claim 6 further including a pair of safety switch means in series with said motor windings to prevent operation of said motor when said refuse-holding means is spaced from a preselected compaction position a first amount prior to movement of the ram from its completely withdrawn position, or a second amount when the refuse-holding means is moved from said preselected compacted position during a compaction operation.

8. The refuse compactor apparatus of claim 6 further including a limit switch in series with said start switch and in series with said main winding for deenergizing the motor when the ram moves to the end of its withdrawal travel, a safety switch in series with said motor windings to permit operation of said motor only when said refuse-holding means is substantially in a preselected compaction position, and means for independently adjusting said limit switch and said safety switch.

9. The refuse compactor apparatus of claim 6 wherein said directionalizing switch is biased to an arrangement wherein said start winding is connected thereto for energization in said second direction and said relay operates to permit said directionalizing switch to energize said start winding only at the opposite ends of travel of said ram.

10. The refuse compactor apparatus of claim 6 wherein said relay coil positions said start switch to permit energizing said start winding through said directionalizing switch only when the current flowing through said main winding increases to a predetermined value including when operation of the motor is initiated and when resistance by the refuse to movement of the ram reaches a preselected high value.

11. The refuse compactor apparatus of claim 6 further including means carried by the support for resisting operation of said drive means in said first direction to cause a reversal of said motor to operate said drive means in said second direction.

12. The refuse compactor apparatus of claim 11 wherein said resisting means comprises resilient pad means carried by the support for engagement by said ram.

13. The refuse compactor apparatus of claim 6 further including a key-operated switch permitting operation of the compactor apparatus only when said key-operated switch is turned to an "On" position.

14. The refuse compactor apparatus of claim 6 wherein said safety means includes means for stopping the motor in the event the refuse-holding means becomes displaced during a compacting operation.

15. The refuse compactor apparatus of claim 14 wherein said safety means includes selectively operable means for effecting a withdrawal of the ram subsequent to said stopping of the motor.

16. In a refuse compactor having a support, means for holding refuse to be compacted, and a ram movably carried on said support for movement into said refuse-holding means to compact refuse received therein, apparatus for operating said ram comprising: drive means operatively connected to said ram for forcibly urging said ram selectively into and from said refuse-holding means; and control means for controlling the operation of said drive means for causing said drive means to apply a compaction force to refuse in said refuse-holding means up to a preselected maximum compaction force and upon reaching said preselected maximum force, effect a reversal of the drive means to withdraw said ram from said refuse-holding means, and safety means for preventing further compaction of the refuse in the holding means in the event the holding means is moved a preselected amount as a result of a lateral redirecting of the compacting force such as caused by nonuniform resistance to compaction by the refuse.

17. The refuse compactor apparatus of claim 16 further including selectively operable means for causing withdrawal of the ram from the holding means subsequent to the preventing of further compaction operation by said safety means.