United States Patent [19]

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[54] REFUSE COMPACTOR

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[21] Appl. No.: **148,879**

[52] **U.S. Cl.** .....**100/229 A,** 53/124, 74/521, 100/52, 100/53, 100/287, 100/295, 141/73, 312/333

[51] **Int. Cl.** **B30b 15/06**

[58] **Field of Search** .....254/122, 126; 141/71, 73; 53/124 B; 232/43.2; 312/31, 333; 100/52, 53, 229, 229 A, 286, 287, 245, 246, 272, 240, 241, 244, 280, 281, 294, 295; 74/521

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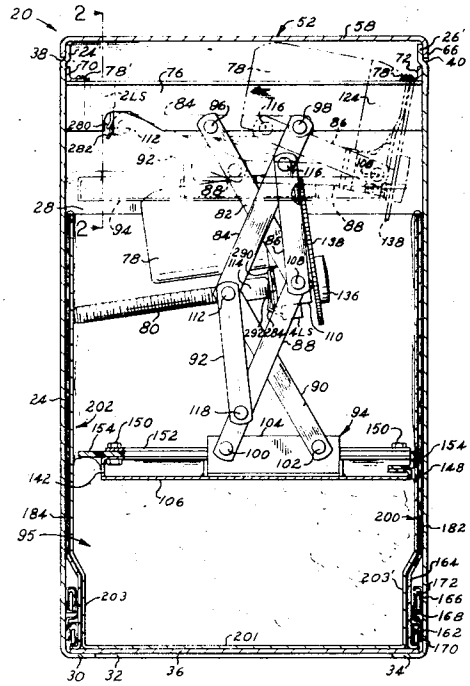
[57] **ABSTRACT**

A refuse compactor including a receptacle removably contained within a cabinet wherein refuse is compacted by a ram to a fraction of its normal volume. The refuse is compacted within a specially constructed bag supported by the receptacle and cabinet, permitting the compacted refuse to be removed as a wrapped package for convenient and tidy disposal. The ram includes a refuse-compressing platen actuated through a toggle linkage to which force is applied by a single screw driven by an electric motor coupled to the screw through a reduction drive. The screw and its motor drive train are carried as a unit by the toggle linkage and move bodily therewith to provide a very compact and high ratio force multiplication system of reliable and inexpensive construction. Additional features relating to control circuitry, a safety lock, and bag, receptacle and drawer construction are also disclosed.

26 Claims, 17 Drawing Figures



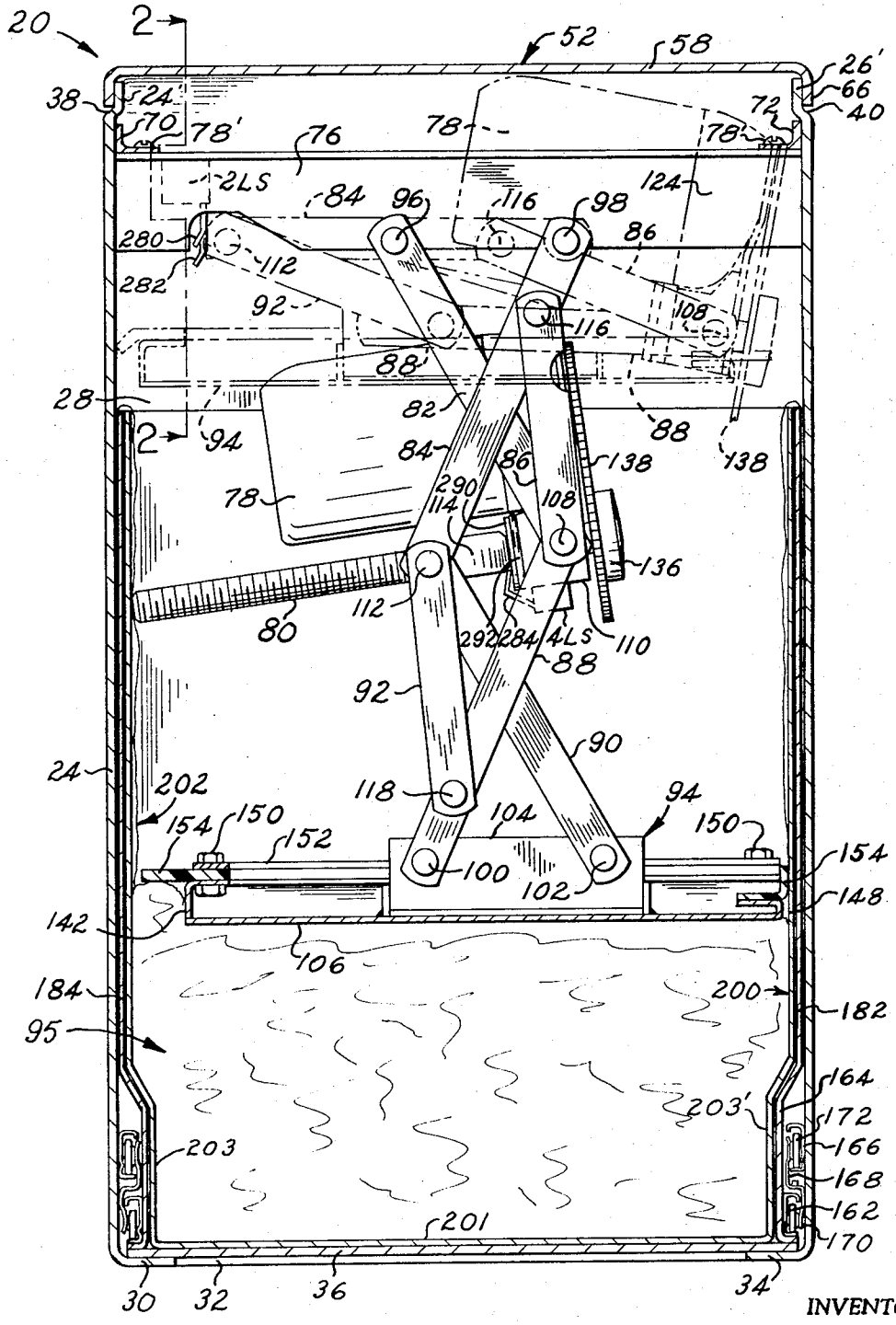


FIG. 1

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ATTORNEYS

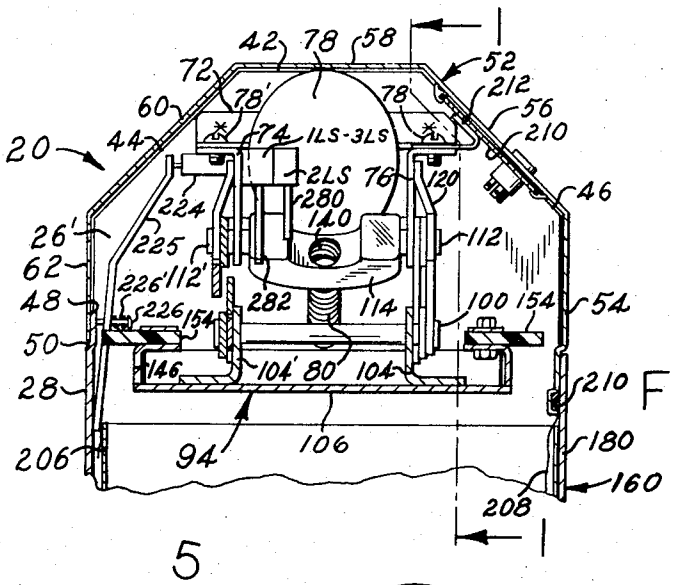


FIG. 2

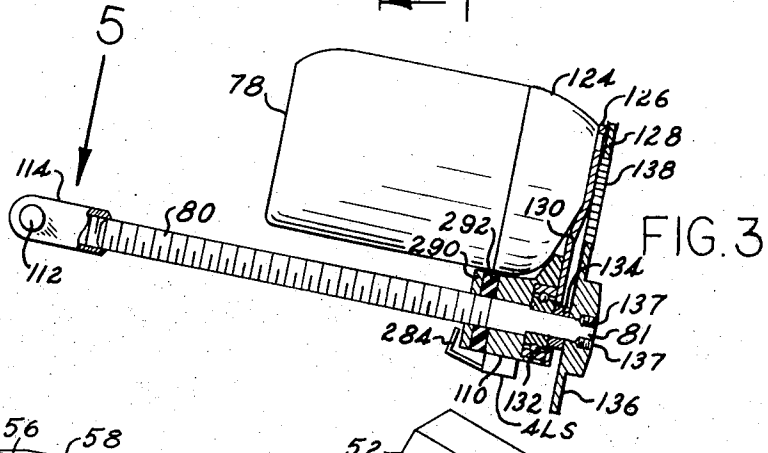


FIG. 3

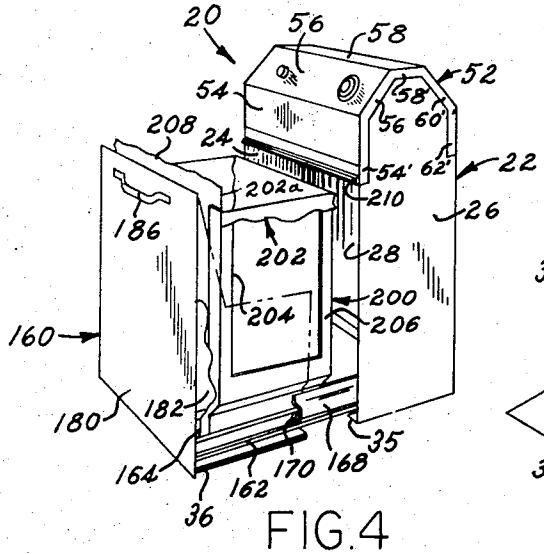


FIG. 4

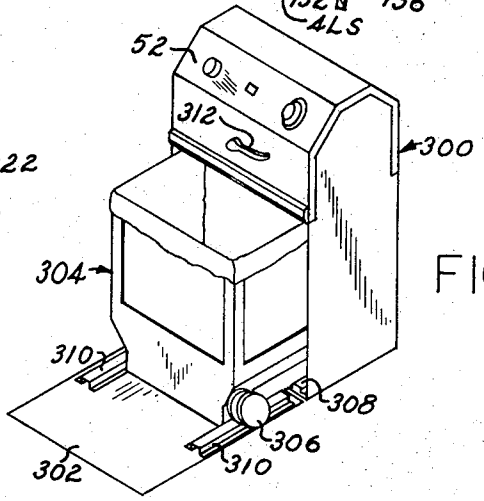


FIG. 7

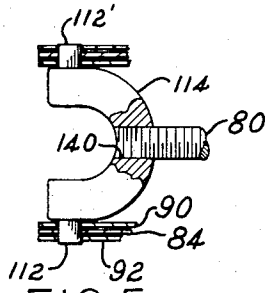


FIG. 5

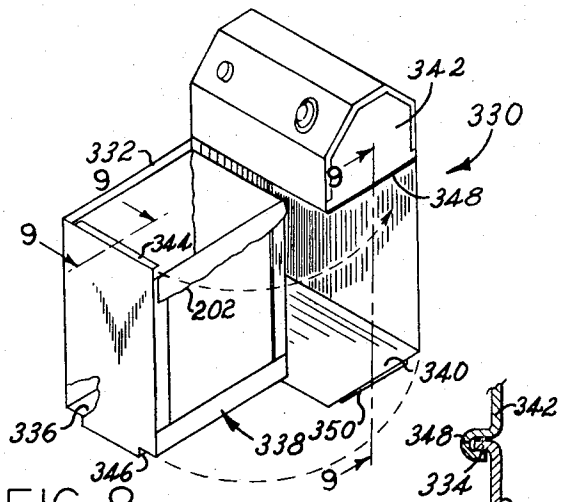


FIG. 8

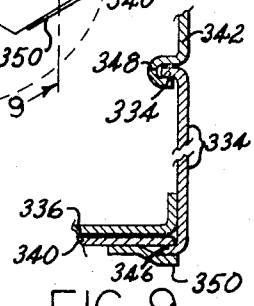


FIG. 9

FIG. 6

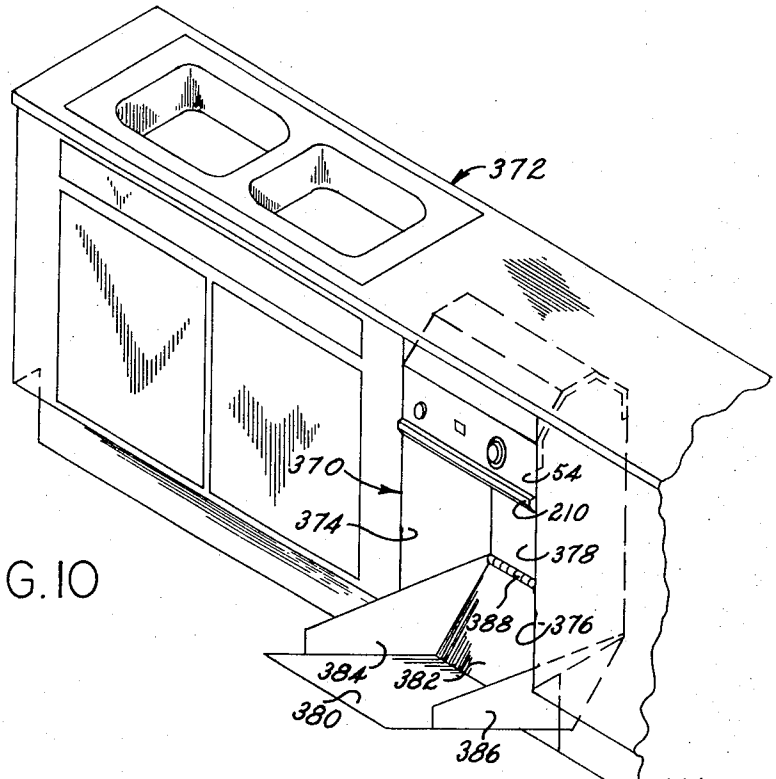


FIG. 10

FIG. 11

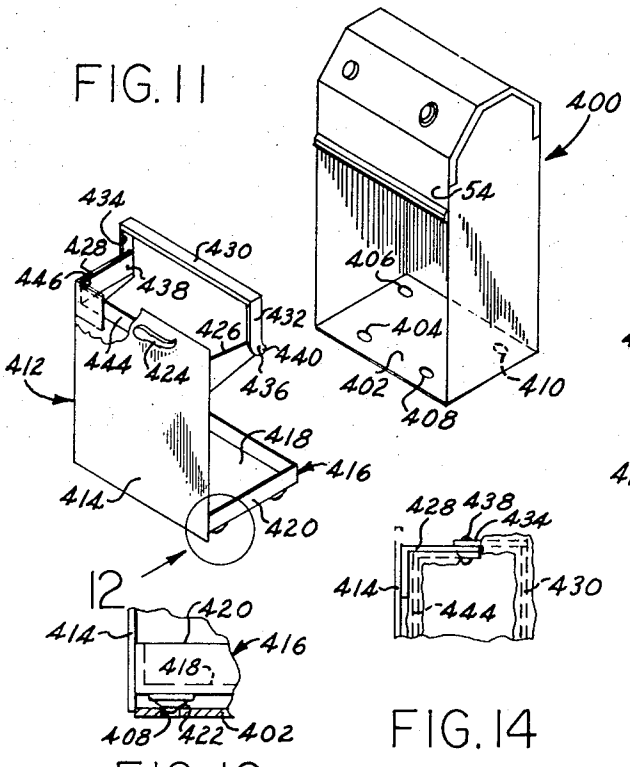


FIG. 12

FIG. 14

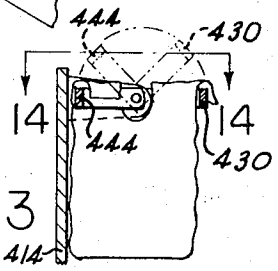


FIG. 13

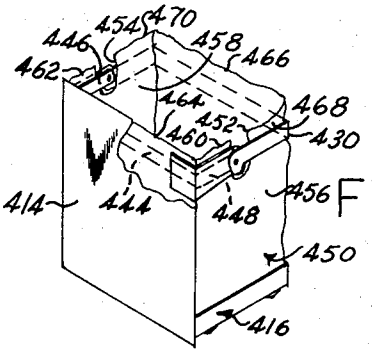


FIG. 15

FIG. 16

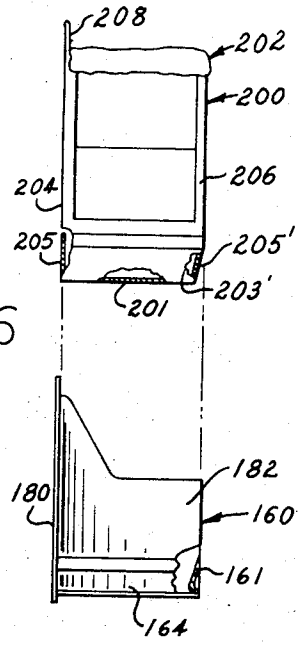


FIG. 17

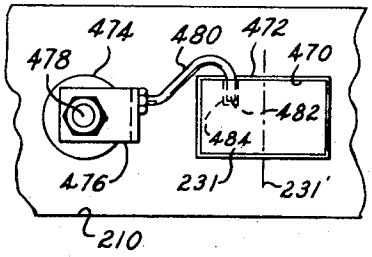


FIG. 18

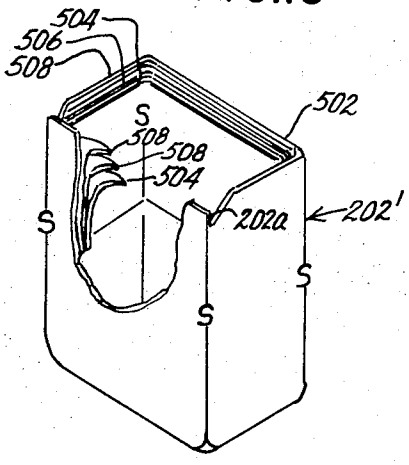
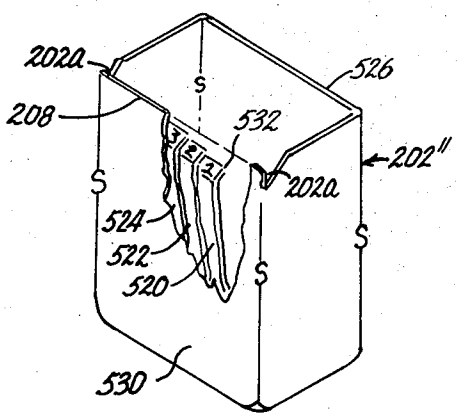


FIG. 19



REFUSE COMPACTOR

This invention relates to an apparatus for crushing, breaking, smashing and/or compacting all types of material and, more particularly, to a domestic refuse compactor which may be installed in a kitchen cabinet structure or provided as a free-standing domestic appliance.

One of the greatest problems facing the world today is solid waste pollution. Previous mechanisms proposed to deal with this problem have fallen short in the areas of cost, cleanliness, odor prevention, size, weight, compaction performance and convenience of removal of compacted material. The shortcomings of such prior art mechanisms have apparently prevented their widespread use in homes, restaurants, business, industry, recreation and other areas of modern life where such equipment is sorely needed.

Accordingly, an object of the present invention is to overcome these shortcomings by providing a solid waste compactor which is technically superior and adaptable to large size industrial and commercial use and yet sufficiently economical when constructed on a smaller scale for domestic use in the home and/or garage where the greatest need exists.

Another object of this invention is to provide a solid waste crusher and compactor having a high ratio of compaction which operates at a variable rate for maximum performance and efficiency.

A further object is to provide such a compactor which is trouble free in use yet simple and low in cost to operate and maintain, which is physically undemanding in all phases of its use and operation and adjustable in force to suit various consumer needs.

Still another object is to provide such a compactor which is fast in operation, free of odors, easy to clean, lightweight, easy to move, and sufficiently compact so that it can be placed in crowded rooms or garages but having a relatively high capacity in the amount of refuse it can receive and hold before emptying.

A further object is to provide such a compactor having a removably mounted receptacle and bag arrangement which permits easy removal and transport of compacted material without dirtying the hands or allowing spillage when removed to storage or a pickup point.

In general, this invention, as it pertains to trash and garbage compaction, comprises an attractive cabinet which also serves as a housing for a removable receptacle and as a frame for containing the compaction force loads within the unit. The cabinet has a sliding drawer or tilting bin which is located for front access to receive the trash receptacle and provides storage for trash in compacted form which is several times the volume of such material in its uncompacted state. An electrically driven, extensible quadruple five-bar linkage compacting mechanism is housed within the cabinet directly above the drawer or bin. The compacting mechanism carries a pressure platen and operates to raise and lower the platen with increasing force toward the lower end of the down stroke where most compacting force is needed. The trash is compacted within a refuse bag retained by the receptacle, resulting in a disposable package of an easy size to handle, and this is achieved in a complete machine which is no larger than presently used large wastebaskets.

Automatic controls are provided which can be selectively set to either reverse the downtravel of the ram when it reaches a preset load regardless of the height of the trash, or to lock the drive in static position at said peak load or at any desired position so as to hold pressure on the material. The ability to hold peak pressure against the material further improves the compaction ratio and also enables the pressure platen to serve as a hermetic seal for the open upper end of the bag, thereby restricting the availability of oxygen and thus slowing odor-producing decay and preventing the air circulation which otherwise might transmit odors. This "hold" feature also denies fruit flies and other pests access to the material being processed.

The refuse bag is preferably a heavy, leakproof bag which receives the uncompacted trash and in which the trash is stored both prior and subsequent to being compacted. The upper edges of the bag are folded inwardly prior to the last "load" or "charge." This forms a tight seal on the compressed block of refuse material after the unit has compressed the bag with the edges folded in. The bag will hold several days' average accumulation of household trash and wastepaper, cartons, cans, bottles and garbage, in the instance of the home use version, before it needs to be emptied. The fold-and-seal feature makes open storage of the "blocks" feasible while awaiting pickup, thus eliminating the need for trash containers.

The removable receptacle which holds the refuse bag is a combination frame and tray which can serve as a carrying basket. The top edge of this basket along the rear and both sides thereof holds the bag with a simple fold of the bag over the top edges of the basket which preferably are constructed as pivoted carrying handles. The drawer front and the cabinet when closed together clamp the upright front edge of the bag therebetween to hold the bag open at the front. Upon opening of the drawer or bin, the top rails of the basket provide handles for easily lifting out the basket with the block of compacted material therein and for carrying it to the storage area where the bag is removed and left to await pickup.

Net compaction results are greatly improved by avoiding the disruption of packed material after compressing, a common fault of existing compactors. Because of the very high compaction force developed, objects in the bag being compacted tend to nest and interlock and hold each to the other, which reduces the tendency of the objects to "spring back" to their original volume. Spring-back is further avoided by the unique feature of maintaining peak pressure on the material until ready to place the next charge of loose material into the bag in the bin. Recycling, if desired, to renew peak holding pressure further improves overall compaction ratio. The compacted material when left under compacting pressure for a period such as over night will continue to gradually and slightly further compress and will take a semipermanent set sufficient to resist spring-back.

Another unique feature is a tray or pan which forms the bottom of the basket and serves to catch any liquid leaking from the bag, thereby keeping the cabinet clean and preventing spillage when emptying. The basket can then be rinsed in the sink or yard, if necessary, prior to installing a new bag. Bag installation into the basket is

simplified because the basket is light weight and easily handled, and thus is readily placed on a table or counter, eliminating the need for the user to stoop down in order to reach down into a bin which can be loaded only at floor level. The basket with the empty bag installed is then slipped into the waiting drawer in the cabinet.

The cabinet is light enough for a woman to easily move and clean. There are no hidden recesses to collect foreign material and make cleaning difficult. Operation is simple, safe and foolproof.

Another feature of this invention is easy and low-cost maintenance and service. All electrical and mechanical parts of the power unit are mounted as a module on one bracket which is readily accessible and easily lifts out of the cabinet as a single light weight unit. This exposes all wiring and operating parts for visual inspection or repair and allows the power and control assembly to be worked on at eye level on a table or bench. The power and control assembly or module is completely functional when removed from the cabinet and thus operational checkout can be performed prior to reinstallation in the cabinet. The inconvenience and very high cost of house calls by service men can be reduced or eliminated by transporting the entire compactor appliance to a service center, if service is needed. Alternatively, only the power unit may be disassembled from the cabinet merely by removing four screws with a common screw driver for service on site or at a service center, with quick replacement by another module available as another option.

Other objects, features and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a vertical sectional view taken on the line 1—1 of FIG. 2 of a refuse compactor constructed in accordance with the present invention, the extended and retracted positions of the compacting mechanism being shown in solid and broken lines, respectively, in FIG. 1.

FIG. 2 is a fragmentary vertical sectional view taken on the line 2—2 of FIG. 1 showing the compacting mechanism in raised position.

FIG. 3 is a side elevational view of the motor and drive structure of the compacting mechanism shown by itself with portions broken away and portions shown in center section for greater clarity.

FIG. 4 is a perspective view of the refuse compactor of FIGS. 1–3 illustrating the refuse receptacle and associated slide-mounted drawer in open position.

FIG. 5 is a fragmentary plan view looking in the direction of the arrow 5 in FIG. 3 illustrating the yoke trunnion for connecting the lead screw drive to the compacting linkage mechanism.

FIG. 6 is a schematic wiring diagram of the compactor control circuit of the present invention.

FIG. 7 is a perspective view of a second embodiment of a refuse compactor also constructed in accordance with the present invention illustrating a roller-mounted receptacle cooperating with a downwardly pivoting front door of the cabinet, the unit being shown in open position with the receptacle partially inserted into the cabinet.

FIG. 8 is a perspective view of a third embodiment of the refuse compactor of the present invention wherein the receptacle is carried on an outwardly swinging portion of the cabinet made up of a front panel and side panel interconnected by a bottom panel adapted to support the receptacle for swinging movement thereon.

FIG. 9 is a fragmentary sectional view taken on lines 9—9 of FIG. 8 with the swinging door in closed position and interlocked by edge flanges with the right side and bottom of the cabinet.

FIG. 10 is a fragmentary perspective view illustrating a fourth embodiment of a refuse compactor in accordance with the present invention installed in nested relation in a kitchen cabinet structure and having a bin-type swinging front and bottom panel unit for receiving and supporting the trash receptacle.

FIG. 11 is an exploded perspective view of a fifth embodiment of the refuse compactor of the present invention illustrating a modified receptacle thereof removed from the cabinet.

FIG. 12 is a fragmentary vertical elevation of the portion circled in FIG. 11.

FIG. 13 is a semischematic fragmentary vertical sectional view illustrating the receptacle of FIG. 11 with a refuse bag suspended therein with its edges folded down over the pivoted handle and clamp members of the receptacle.

FIG. 14 is a fragmentary horizontal section taken on line 14—14 of FIG. 13.

FIG. 15 is a simplified perspective view of the receptacle of FIGS. 11–14 illustrating the refuse bag inserted therein prior to folding the edges of the bag over the handle and clamp of the receptacle.

FIG. 16 is an exploded side elevational view of the receptacle and drawer of FIG. 4 with the drawer slides omitted.

FIG. 17 is a fragmentary plan view of a key lock and mechanical interlock associated with a stop-start rocker-type control switch, as viewed from the inside of the control panel of the unit shown in FIGS. 1 and 2.

Referring in more detail to FIGS. 1 and 4, a first embodiment of a refuse compactor in accordance with the present invention is designed as a free-standing unit in which a sheet metal cabinet 22 (FIGS. 1 and 4) serves as the enclosure for the trash receptacle and compacting mechanism, as the structural framework which mounts all the working parts of the compacting mechanism housed therein and as the stress-absorbing container for resisting the compacting force exerted on refuse compacted by the unit. Cabinet 22 is made up of a pair of upright parallel side walls 24 and 26 fixed along their rear edges by full length joints to a rear wall 28, the side and rear walls preferably being welded or die formed integral with one another. The lower edges of walls 24, 26 and 28 are turned inwardly to form flanges 30, 32 and 34 respectively (FIG. 1) and a cross bar 35 is welded to the front ends of flanges 30 and 34 to brace the bottom front of the cabinet (FIG. 4). A flat bottom wall 36 of a drawer, described in more detail hereinafter, is substantially coextensive with the length and width dimensions of cabinet 22 and is adapted to rest on flanges 30, 32 and 34 in the closed position of the drawer.

Side walls 24 and 26, as well as drawer bottom wall 36, provide the primary frame members of the cabinet for taking the reaction stresses developed during trash compaction effected by power extension of the com-

pacting mechanism, and hence these members are preferably constructed of relatively heavy gauge sheet metal, such as 12-gauge steel. Side walls **24** and **26** are bent inwardly as indicated at **38** and **40** (FIG. **1**) to form a cover-receiving appliance offset along their upper three edges **42**, **44**, **46**. As best seen in FIGS. **2** and **4**, the upper ends of walls **24** and **26**, in addition to being offset, are each beveled at the corners to form a horizontal uppermost central edge **42** (FIG. **2**) extending for about a third of the width of the side wall, and two 45° downwardly sloping rear and front edges **44** and **46**. Rear wall **28** terminates at an upper edge **48** (FIG. **2**) which extends horizontally from side to side about 1 inch above the elevation of bends **38** and **40**, rear wall **28** likewise being bent inwardly at **50** at the elevation of bends **38** and **40**.

A removable cover **52** (FIGS. **1**, **2** and **4**) forms the top wall of cabinet **22** and consists of a vertical front panel **54**, a rearwardly sloping and suitably apertured control panel **56**, a horizontal top panel **58**, a forwardly sloping rear panel **60** and a vertical rear panel **62**, each of these panels having right angle flanges **54'**, **56'**, **58'**, **60'**, **62'**, respectively, at their side edges (FIG. **4**) which are dimensioned to slip closely over inwardly offset portions **24'** and **26'** of the upper edges of the side walls of the cabinet. Cover **52** may be detachably fastened to the side walls by simple sheet metal screws (not shown).

The compacting mechanism of compactor **20** is best seen in FIGS. **1–3** and **5** and is detachably mounted to the upper ends of side walls **24** and **26** so as to nest in its retracted position within the upper confines of cabinet **22**. Referring to FIGS. **1** and **2**, a pair of right angle brackets **70**, **72** are welded to the inner surface of walls **24** and **26**, respectively, near the upper edges thereof to form a strong support for a pair of parallel, horizontally extending right angle beams **74**, **76**. The horizontal upper flanges of beams **74** and **76** abut the undersides of brackets **70**, **72** and are secured by four screws **78** which extend vertically and have their slotted heads exposed above the mounting brackets. Beams **74** and **76** are spaced horizontally apart as shown in FIG. **2** to permit nesting of an electric motor **78** and associated drive train components of the compacting mechanism when the same is in its retracted position shown in broken lines in FIG. **1** and in solid lines in FIG. **2**.

The compacting mechanism comprises an extensible linkage herein illustrated by way of a preferred example as a system of two identical extensible linkages laterally spaced from one another fore and aft of the cabinet. Front beam **76** serves as the fixed anchor for one linkage set and rear beam **74** serves as the fixed anchor for the other linkage set. Each of the front and rear sets of linkages consists of two identical five-bar linkages wherein the fifth bar of each linkage consists of a variable length element which is common to both of the five-bar linkages; i.e., a threaded screw **80** shown by way of a preferred example herein, for bidirectionally applying force to the linkage to extend and retract the same. The upper five-bar linkage of the front set thus consists of beam **76**, two substantially equal length cross links **82** and **84**, a stabilizer link **86** and screw **80**. The lower five-bar linkage of the front set likewise consists of screw **80**, two substantially equal length cross links **88** and **90**, a stabilizer link **92** and a platen assembly **94** which serves as the movable ram for applying compaction force to refuse **95** contained within the receptacle of compactor **20**. Links **82** and **84** are pivotally mounted at **96** and **98** to beam **76** to provide a first set of fixed pivot points and an anchorage for the linkage. Links **88** and **90** are pivoted at their lower ends at **100** and **102** respectively to a right angle bracket **104** which in turn is welded to flat bottom plate **106** of the platen assembly **94**. Pivots **100** and **102** thus also have a fixed spacial relation relative to one another, but move up and down with platen assembly **94** in response to contraction and extension of the linkage assembly. The adjacent ends of links **82** and **88** and the lower end of stabilizer link **86** are interconnected in common pivotal relation by an axle stud **108** threadably secured to a right-hand trunnion (as viewed in FIG. **1**) in the form of a bearing block **110** in which screw **80** is journalled. The adjacent ends of links **84** and **90**, as well as the upper end of link **92**, likewise are journalled by a common pivot stud **112** secured to a left-hand trunnion **114**. The upper end of stabilizer **86** is pivoted by a stud **116** to link **84** slightly below pivot **98**, and similarly the lower end of stabilizer link **92** is pivoted by a stud **118** to link **88** slightly above pivot **100**.

The crossed links **82** and **84** and **88** and **90** thus form a toggle linkage operating from a fixed, first pivot means at **96** and **98** to raise and lower a second pivot means (platen assembly **94**) as a result of force applied through the variable length, third pivot means comprising pivots **108** and **112** carried on the screw trunnions. Links **92** and **86** together with links **84** and **88** form a parallelogram linkage for stabilizing the direction of travel of platen assembly **94** so that it moves through a vertical path of travel while being maintained generally in parallel relation with beams **76** throughout its travel from the fully extended position thereof shown in solid lines in FIG. **1** to the retracted position thereof shown in broken lines in FIG. **1** (and in solid lines in FIG. **2**). The rear linkage set is identical to the front linkage set and therefore those elements of the rear set which appear in the drawings are indicated by the same reference numerals raised by a prime and the description thereof not repeated, it being understood that upper pivot **98'** of the rear set is secured to rear beam **74** in fore and aft alignment with pivot **98**. Pivot **96** is a shaft which extends through both beams **76** and **74** to serve both sets of linkages. Likewise, the lower pivots **100** and **102** are shafts which extend through and are secured by brackets **104** and **104'** to plate **106** as best seen in FIG. **2**.

The fixed pivots **98** and **98'** are preferably short stud shafts in order to provide clearance therebetween to allow the motor assembly to retract into the space between beams **74** and **76**. Studs **98** and **98'** are additionally supported by outboard bearing brackets **120** and **120'** (shown only in FIG. **2**) which are welded at their upper ends to the associated beams **76** and **74** and bent downwardly and outwardly to provide balanced support for pivot studs **98** and **98'**.

As best seen in FIG. **3**, the drive for the compacting mechanism consists of electric motor **78** which is preferably a conventional reversible universal AC-DC fractional horsepower motor, such as that used for portable drills, having a conventional gear reduction

unit encased in a die-cast housing **124** attached to the front end of the main motor housing with an output shaft **126** protruding therefrom to which is affixed a drive sprocket **128**. Motor **78** and associated gear reduction unit **124** are cantilever mounted on a rigid bracket **130** which in turn is secured at its lower end to bearing block **110**. Block **110** has a bearing cavity in its right-hand face containing a ball bearing assembly **132** through which a reduced diameter extension **81** of shaft **80** is journalled. Bracket **130** thus serves as a retainer for bearing **132**. A thrust collar **134** is mounted between the inner face of bearing **132** and the inner face of a large diameter chain sprocket **136** which in turn is suitably fixed, as by set screws **137**, to a reduced diameter extension **81** of shaft screw **80** to rotatably drive screw **80**. This shaft journal arrangement thus provides a bearing adapted to take radial thrust as well as axial thrust forces in both directions of the axis of screw **80**. Motor **78** is drivingly connected to sprocket **136** by suitable link chain **138** trained over sprockets **128** and **136**.

The left-hand trunnion of the drive mechanism is best seen in FIGS. **2** and **5** and consists of the semicircular yoke **114** having an internally threaded bore **140** threadably receiving lead screw **80** therethrough. Pivot studs **112** and **112'** are affixed to the opposite ends of yoke **114**, and thus are spaced to the left of bore **140** as viewed in FIGS. **2** and **5**. This arrangement allows screw **80** to be shortened, thereby keeping the path of travel of the left-hand end of the screw generally within the confines of the path of travel of platen assembly **94** and clear of cabinet side **24**.

Platen assembly **94** has a left side wall **142** (as viewed in FIG. **1**), front and rear walls **144** and **146** (FIG. **2**), and a right side wall **148** (as viewed in FIG. **1**). Right wall **148** is recessed centrally thereof to provide clearance for block **110** in the retracted position of the compacting mechanism. Each of the walls **142**, **144**, **146** and **148** has an inturned horizontal flange on which is mounted by means of fasteners **150** and retaining strips **152** a rectangular wiper **154**. Wiper **154** has a large central aperture so as to be clear of the toggle mechanism in its retracted position and protrudes horizontally outwardly around the upper edge of platen assembly **94** so as to have a light wiping contact with the inner surface of refuse bag **202** suspended in the receptacle or basket **200**. Preferably wiper **154** is constructed of rubber or other suitable flexible and resilient material so that such wiping contact is maintained should the platen assembly **94** move horizontally in the plane of the drawing as viewed in FIG. **1** a short distance, for example, 1 inch during its 12 inches of vertical travel, between its retracted and extended positions. Wiper **154** also will accommodate whatever slight horizontal movement fore and aft of the unit may occur due to tolerance stack-up in the linkage as well as whatever installation misalignment may result from manufacturing tolerance variations. Wiper **154** thus serves to keep loose, small pieces of trash or refuse from moving up around the side edges of platen **106** as it descends during a compacting stroke.

Compactor **20** has a front-opening drawer assembly **160**, best seen in FIG. **4**, wherein the drawer is shown in open position out in front of cabinet **22**. Drawer **160** may be mounted for approximately horizontal sliding movement between its open position, as shown in FIG. **4**, and its closed position, as shown in FIG. **2**, by a pair of conventional drawer slides, such as disclosed in U.S. Pat. No. 3,537,390. Each of the slides thus may comprise a track **162** affixed to an indented portion **164** of the right side wall of drawer **160** (FIG. **1**), a track **166** fixed to the inner surface of wall **26**, and a roller carrier **168** having journalled thereon rollers **170** and **172** which roll in tracks **162** and **166** respectively.

Drawer **160** is made up of a front panel **180** joined at its lower edge to horizontal bottom wall **36**, the joint between front wall **180** and bottom wall **36** being reinforced by side walls **182** and **184** (FIGS. **1**, **4** and **16**). Right-hand side wall **182** is shown in solid lines in FIGS. **4** and **16** fragmentarily and the complete outline of side wall **182** is indicated by broken lines in FIG. **4**. Left-hand side wall **184** is the same as right-hand wall **182**. Drawer **160** is provided with a handle **186** for pulling the drawer open and pushing it shut, and a suitable latch may be provided if desired to lock the drawer in closed position. Preferably the tracks of the drawer slides are mounted at a slight incline (rearwardly downwardly) of approximately **2** degrees to insure that the drawer is gradually lowered as it is pushed in and when it is closed, bottom wall **36** rests on flanges **30** and **34** of the side walls so that the drawer slides do not carry the compression force exerted by the compacting mechanism.

Receptacle **200** is preferably constructed in the form of an open rectangular framework to serve as a lightweight basket for receiving the paper refuse bag **202** therein. Basket **200** has an imperforate bottom panel **201** (FIG. **16**) enclosed on all four sides by relatively short, upright left and right side walls **203**, **203'** and front and rear walls **205**, **205'**, respectively, to form a liquid-tight drip pan at the bottom of the basket. Basket **200** has four upright corner posts, two posts **204** at the front and two posts **206** at the rear. The upper ends of the front and rear posts are connected by side cross pieces and the two rear posts are connected at their upper ends across the back of the basket by another cross piece (not shown). However, there is no cross piece at the front between the upper ends of the front posts **204** in order to facilitate removal of bag **202** after the same has been filled with compacted trash and hence has a tendency to bulge slightly outwardly. The basket as illustrated herein is thus made of an open framework, preferably of metal, but also may be made of suitable plastic materials in order to make the basket lightweight and easy to handle.

Basket **200** is dimensioned to seat flat on bottom wall **36** of drawer **160** and is just slightly smaller than the interior space defined laterally between the side walls of cabinet **22**, and fore and aft by rear wall **28** of the cabinet and front wall **180** of drawer **160** when the drawer is in closed position. Thus, in accordance with one feature of the present invention, it is these side walls of the drawer and cabinet which are relied upon to restrain expansion of paper bag **202** when trash is being compacted therein, rather than the structure of the basket itself. Basket **200** is not fastened to drawer **160**, but rather merely rests loosely on bottom wall **36** thereof with the front uprights **204** of the basket adjacent the inner surface of panel **180**. To assist in a snug seating of basket **200** in drawer **160**, the rear wall **205'**

of the integral drip pan of the basket is inclined rearwardly and upwardly (FIG. 16) at a locking angle of about 5 degrees. Drawer 160 is provided with a matching short rear wall 161 likewise inclined to form a light friction locking relationship when basket 200 is fully inserted downwardly into drawer 160, the basket being readily released as soon as the basket is lifted slightly upwardly in drawer 160.

Preferably bag 202 is a suitable refuse bag made of heavy paper lined with plastic or other liquid-tight material having upper side and rear edges which protrude above the upper side and rear edges of basket 200 and which can be folded downwardly thereover as shown in FIGS. 4 and 16 to thereby removably suspend the bag in the basket. As shown in FIG. 4, bag 202 is provided with preslits or cuts 202*a* formed at the front corners of the bag so that front edge 208 of the bag may be left standing upright when the side and rear edges of the bag are folded down. Thus when drawer 160 is pushed closed, edge 208 of the bag will be clamped upright between the upper edge of panel 180 of the drawer and a sponge rubber clamping strip 209 (FIGS. 2 and 4) affixed to cabinet 22 at an elevation just high enough to clear the upper end of the basket. This insures that bag 202 is not dragged down by the friction of wiper 154 as trash is being compacted in the bag.

Compactor 20 is provided with a control circuit shown schematically in FIG. 6 for operation by control switches mounted on a control panel 210 (FIG. 2). Panel 210 is affixed by a bracket 212 to front beam 76 so that all the switches and electrical circuitry are removable as a unit or module with the compacting mechanism. Front panel 56 of cover 52 is apertured as required to accommodate the controls provided on panel 210 so that the exterior actuators or knobs of the controls protrude through panel 56 for access by the operator.

The control circuitry includes a pair of main motor energizing leads 220 and 222 connected across a suitable source of current, such as 110 volt or 220 volt AC. A safety interlock switch 224 (mounted on rear beam 74 as seen in FIG. 2) is connected in series in lead 220, as is a conventional circuit breaker 226 which may be of the automatically resetting or manual resetting type. Interlock switch 224 is operated by a lever 225 (FIG. 2) pivoted clockwise on a pin 226 against the bias of a spring 226′ when its lower arm 225′ is pressed against wall 28 by the rear upper edge of basket 200 as drawer 160 is pushed into its fully closed position. One set 228 (the "stop" set) of contacts of a commercially available rocker-type, three-position "start-stop" switch 230 is connected by the "stop" jumper of switch 230 when in neutral and "start" positions to lead 220′ and a lead 232 which in turn is connected to the parallel leads 234–234′ and 236–236′–236″. The other ("start") set of contacts 238 of switch 230 and a limit switch 1LS are connected in series in lead 234, and a second limit switch 2LS and the coil of a relay 1CR are connected in series in lead 236. A lead 240 is connected at one end to the junction of leads 234 and 236″ and at the other end to one terminal of a field winding 242 of motor 78. A set of normally closed contacts 2C2 and a lead 244 connect the other terminal of winding 242 to one terminal 246 of the armature winding 248 of motor 78. The other terminal 250 of winding 248 is connected by a set of normally closed contacts 2C3 and lead 252 to one terminal 254 of another field winding 256 of motor 78. The other terminal of winding 256 is connected to lead 222.

A reversing lead 258 is connected between terminal 243 of winding 242 and terminal 250 of winding 248 and an associated reversing lead 260 is connected between terminal 254 of winding 256 and terminal 246 of winding 248. Lead 258 has a normally open set of contacts 2C4 and a "hold-cycle" switch 262 in series therein, and lead 260 has a set of normally open contacts 2C5 connected in series therein.

A relay energization circuit is connected across leads 236″ and 222 and comprises a lead 264 connected to lead 236′ between limit switch 2LS and relay coil 1CR and in series with three sets of contacts connected in parallel with one another between lead 264 and a lead 266. These three sets of contacts consist of a normally open set of relay contacts 1C1 closed by energization of coil 1CR in response to a given value of excess current flowing through lead 236, a normally open set of contacts 2C1 closed by energization of a relay coil 2CR connected n series in lead 266, and a limit switch 4LS. Another limit switch 3LS is connected in series with coil 2CR and lead 266. Thus coil 2CR when energized closes contacts 2C1, 2C4 and 2C5 while simultaneously opening contacts 2C2 and 2C3. Commercially available arc suppressors 270, 272 and 274, such as those sold under the trademark THYRECTOR by General Electric, are connected respectively in parallel across motor windings 242, 248 and 256.

The operation of the compactor 20 will be understood from the following description of the control circuit for the compactor. First the basket 200 with the empty refuse bag 202 installed therein is placed in position in drawer 160 and then drawer 160 closed. The last increment of movement of the drawer into closed position closes interlock switch 224. Operation of the machine is then controlled by manipulating start-stop switch 230 and cycle switch 262. Start-stop switch 230 is a rocker-type switch with a maintained "stop" position, a neutral position and a momentary "start" position. As is well understood in the art, switch 230 has a wide-angle, V-shaped operating knob or rocker 231 (FIG. 17) pivotable about an axis 231′ extending parallel to panel 210. The rocker is stable in a middle, neutral position wherein contacts 228 are held closed and contacts 238 are open. When the "stop" side of rocker 231 is depressed, rocker 231 is pivoted clockwise, thereby opening contacts 228. The rocker will remain latched in the depressed stop position. If the "start" side of rocker 231 is depressed, while it is either in the "stop" or "neutral" position, rocker 231 will be pivoted counterclockwise, thereby first unlatching the rocker and allowing contacts 228 to be closed and then closing contacts 238 as the rocker reaches the other limit of its travel. However, rocker 231 must be held by finger pressure to keep it in "start" position, and it will return to the middle neutral position if such pressure is removed.

To start a compacting cycle of machine 20, the operator presses switch 262 to either the "cycle" or "hold" position. If switch 262 is pressed to the "cycle" position (closed) and then the operator depresses the "start" side of switch 230 and holds it down for about 2

seconds, contacts **238** are thereby closed so that power can flow to the motor windings via lead **220**, switch **224**, breaker **226**, contacts **228**, lead **232**, contacts **238**, switch **1LS**, leads **234** and **240**, winding **242**, contacts **2C2**, lead **244**, winding **248**, contacts **2C3**, winding **256** and lead **222**. This energizes motor **78** to rotate clockwise, causing lead screw **80** to rotate and begin drawing pivots **108** and **112** toward one another to thus begin extending the compacting mechanism on its downstroke from the completely retracted position shown in phantom in FIG. **1**. As the left-hand trunnion **114** begins to move downwardly away from the actuating arm **280** (FIG. **2**) of limit switches **2LS** and from the adjacent actuating arm **282** of a combined double throw unit containing limit switches **1LS** and **3LS**, the sequential positions and differing lengths of these arms first causes switch **2LS** to close, establishing an enabling shunt around contacts **238** and switch **1LS** relative to the motor windings. The next slight downward movement of trunnion **114** causes limit switch **3LS** to close, and the further slight downward movement then causes limit switch **1LS** to open. Motor energizing current now flows through lead **236**, switch **2LS** and coil **1CR** so that the operator can now release pressure from the "start" side of switch **230**, allowing its spring to open contacts **238** without thereby de-energizing the motor.

Continued downward movement of the compacting mechanism causes platen **106** to engage and compress the trash or refuse downwardly in bag **202**. When the mechanism in its downstroke encounters a given upper limit of resistance from the compressed trash, correlated to a given maximum value of current draw by motor **78**, this amount of current causes coil **1CR** to close its contacts **1C1**, thereby energizing relay coil **2CR** via lead **264**, contacts **1C1**, lead **266** and switch **3LS**. Energization of relay coil **2CR** closes contacts **2C1** which provides a hold-in shunt around contacts **1C1** for coil **2CR**. Energization of coil **2CR** also simultaneously closes contacts **2C4** and **2C5** while opening contacts **2C2** and **2C3**, thereby reversing the power connections to armature winding **248** and thus reversing the direction of rotation of motor **78**. The compacting mechanism will now be driven on its upstroke to return to the retracted position thereof.

As trunnion **114** approaches the end of its upstroke, it will sequentially engage the aforementioned switch arm **282** of limit switch **1LS–3LS** and arm **280** of switch **2LS** to sequentially close switch **1LS**, then open switch **3LS** and then open switch **2LS**. The closure of switch **1LS** conditions the circuit for the next cycle. The opening of switch **3LS** de-energizes relay coil **2CR** to thus close contacts **2C2** and **2C3** and open contacts **2C4** and **2C5** to return the motor connections to the clockwise or the down direction. However, by the time it takes the relay coil **2CR** to effect this action, switch **2LS** will have been opened, de-energizing motor **78** so that it stops in the full-up position of the compacting mechanism (bearing in mind that contacts **238** are still open).

Thus, upon completion of one cycle as described above, the initially loose fill of trash will have been compacted in bag **202** and platen **106** returned to its fully retracted position so that it is clear of the top of basket **200**. Drawer **160** can now be opened for receiving another load of uncompacted trash. The compacting cycle then can be repeated by the operator again pushing start switch **230** as described above.

At any time desired, typically after each loading, unless an immediate reloading is desired, or at the end of a day's use, after say two or three loads of trash have been successively compacted in bag **202**, compactor **20** can be conditioned for tighter "setting" of the trash. To do this, the operator merely pushes the rocker of hold-cycle switch **262** to the "hold" position in which it maintains the switch contacts open. The operator then pushes start button **230** to begin the downstroke portion of the compacting cycle. The first half of the sequence described above is repeated; i.e., motor **78** is energized in the clockwise direction to drive pressure platen **106** downwardly until the resistance of the trash being compacted reaches the aforementioned upper limit, thereupon causing relay contacts **1C1** to be closed by the current sensing coil **1CR**. This again energizes relay coil **2CR** to thus open the contacts **2C2** and **2C3** and close contacts **2C4** and **2C5**, thereby disabling the "downstroke" connections to winding **248** and making the "upstroke" connections thereto. However, since switch **262** is in its "hold" or open position, the reversing circuit is still disabled and hence the motor is stopped rather than being energized in the reverse direction. The compacting mechanism will thus be stopped at the maximum pressure point in its downstroke and will remain at this position because of the very high force multiplication ratio between the motor armature and compacting linkage; that is, the force exerted upwardly by the compacted trash on platen **106** is not sufficient to overcome the resistance of the lead screw **80** and associated drive train components. The mechanism thus is effectively locked down at the normal reversing point in its cycle, thereby maintaining full pressure on the compacted load until such time as the operator, say after breakfast the next morning, actuates switch **262** to the "cycle" position. The motor then will be energized in the reverse direction to retract and shut off the compacting mechanism, thereby completing the full cycle of downstroke and upstroke.

In the event that the amount of trash in bag **202** is insufficient to create a resistance force equal to said given current draw value prior to completion of a full downstroke of platen **106**, and thus insufficient to cause a pressure trip reversal of the compacting mechanism, the compacting mechanism will continue to drive platen **106** downwardly until it is fully extended. This will cause left-hand trunnion **114** to travel all the way in on screw **80** until it strikes the actuating arm **284** of limit switch **4LS** mounted on bearing block **110** (FIG. **1**) to thereby close the switch. This will energize relay coil **2CR** even though contacts **1C1** are still open due to motor current not having risen to the setting of coil **1CR**. Closure of switch **4LS** thus will effect reversal of the motor to reverse rotation of drive screw **80**. As trunnion **114** starts to move away from block **110**, switch **4LS** will reopen, but the now closed contacts **2C1** will hold relay **2CR** "in" to enable the upstroke to be completed as described above.

It is to be understood that limit switches **1LS**, **2LS** and **3LS** may be either a compound switch with internal phasing driven from a single actuator, or two or

more independent switches and external actuators phased to provide proper sequencing. Also, the circuit arrangement described by way of example in FIG. 6, while presently preferred, may be varied as to components and arrangement to accomplish the function intended.

In the event that switch 4LS should malfunction, trunnion 114 will continue to be drawn toward block 110 until it engages a metal plate 290 (FIG. 3) which is adhesively secured to a rubber bumper 292, which in turn is adhesively secured to block 110. As bumper 292 is compressed, it will increase the load on motor 78 until motor current reaches the aforementioned predetermined reversing value, thereby causing relay 1CR to close contacts 1C1 to thereby energize the reversing relay to reverse the direction of rotation of the motor. Although switch 4LS could be eliminated, and bumper 292 relied upon to effect full stroke reversal of the compacting mechanism, it is preferred to use limit switch 4LS for this purpose to reduce the wear on the bumper and to rely on the bumper only as a malfunction safety device.

FIG. 7 illustrates a second embodiment 300 of a refuse compactor also constructed in accordance with the present invention in which the construction differs from compactor 20 only with regard to the drawer and basket arrangement. Compactor 300 has a fixed bottom wall (not shown) corresponding to the drawer bottom 36 of compactor 20, which is secured in stationary relation to flanges 30 and 34 of the cabinet side walls. Front panel 302, instead of being part of a drawer, is hinged along its lower edge to the front edge of the bottom wall of the cabinet so as to pivot about a horizontal axis between a horizontal down position (as shown in FIG. 7) to an upright position in which panel 302 closes the front of the cabinet. With this arrangement, a modified basket 304 may be constructed similar to basket 200 described previously except that four rollers 306 are added, two of the rollers being rotatably mounted on each side of the drip pan portion of the basket which are adapted to roll on two parallel guide tracks 308 mounted on the side edges of the cabinet bottom wall and two parallel tracks 320 mounted on the inside surface of panel 302. Tracks 310 thus serve as extensions of tracks 308 when panel 302 is in its open horizontal position. Such roller basket and track arrangements are well known in the art, particularly in connection with household automatic dishwashing machines and hence need not be described in further detail herein. It is also to be understood that suitable depressions may be provided in tracks 308 which register with rollers 306 when basket 304 is fully inserted into the cabinet so that the bottom of the basket seats firmly on the floor of the cabinet in the closed position of the cabinet, whereupon the bottom wall of the cabinet supports the bottom wall of the basket against the forces exerted during compaction of trash in the basket. A suitable latch 312 is provided on cover 52 to lock panel 302 in its upright closed position after a basket 304 with a bag 202 therein has been loaded into the cabinet of compactor 300.

FIG. 8 illustrates a third embodiment of a compactor 330 also constructed in accordance with the present invention in which the sliding drawer 160 of compactor 20 is replaced by a swinging door arrangement. Compactor 330 thus has a front panel 332 rigidly connected to a right side panel 334 and a horizontal bottom panel 336 connected along its right and front edges in rigid relationship to panels 334 and 332, respectively. A modified basket 338 is provided which is constructed similarly to basket 200 except that it is contoured to seat on the bottom wall or panel 336, and no side indentations need be provided to accommodate the drawer slides embodied in compactor 20. Basket 338 receives bag 202 in the same fashion as basket 200. Panel 332 is suitably hinged along its left vertical edge to the front vertical edge of the left wall 24 of the cabinet of compactor 330 so that the door can be swung about a vertical axis from the open position shown in FIG. 8 to a closed position (as indicated by the broken lines in FIG. 8). In its closed position, panel 334 forms a portion of the right side wall of the cabinet and panel 332 serves as the front door of the cabinet.

In order to interconnect panel 334 with bottom wall 340 and with the fixed upper portion 342 of the right side wall of the cabinet, panel 334 is provided with inwardly bent flanges 344 and 346 (FIGS. 8 and 9) along the top and bottom edges respectively of the panel. The lower edge of side panel 342 is bent inwardly and then outwardly to form a channel portion 348 (FIG. 9) which receives flange 344 in the closed position of the swinging door. Likewise, bottom wall 340 has a downwardly offset retainer strip 350 affixed to the underside thereof adjacent its right edge to define therewith a lower slot or groove for receiving flange 346 of panel 334 in the closed position of the door. Thus approximately half of the reaction forces opposing the compaction force developed by the compacting mechanism of unit 330 are taken in tension through panels 334 and 342 as a result of the tongue-in-groove connection of the right door panel 334 with the cabinet panels. As in the previous embodiments, basket 338 is adapted to removably seat on the door bottom so that it can be readily lifted and removed when the door is in its open position.

FIG. 10 shows a fourth embodiment of a refuse compactor 370 which in most respects is similar to compactor 20 except that it is particularly adapted for built-in applications wherein the cabinet of the unit would be suspended from adjacent structure of a conventional cabinet 372 as illustrated in FIG. 10 for use in home kitchens, restaurants, lunch counters and the like. Compactor 370 has one-piece side walls 374 and 376 and a rear wall 378 similar to walls 24, 26 and 28 of compactor 20 but without the bottom flanges 30 and 34 thereof. In lieu of drawer 160, cabinet 370 has a downwardly opening, flour bin type front panel 380 fixed at its lower edge to a bottom panel 382, with reinforcing side gusset panels 384 and 386 suitably secured to the front and bottom panels 380 and 382. The rear edge of bottom panel 382 is hinged by a piano-type hinge 388 to the lower edge of bottom wall 378 so that the door pivots about a horizontal axis from its down, open position shown in FIG. 10 upwardly to a closed position wherein the upper edge of panel 380 overlies and engages the clamping strip 210 of compactor 370. Suitable latches and interlocks are provided to connect panel 380 to the front panel 54 of the cover so that the cabinet in closed position is adapted to take the compacting forces as well as lateral stresses imposed by

bulging of the refuse bag during compaction. A removable bag and basket such as bag **202** and basket **338** is used with compactor **370**.

FIGS. **11–15** inclusive illustrate a fifth embodiment of a compactor **400** also constructed in accordance with the present invention. Compactor **400** has a cabinet and compacting mechanism constructed identically to compactor **20** except for the bottom wall of the cabinet, the other principal modification being in the bag, basket and drawer structure. Referring to FIG. **11**, the bottom wall **402** of compactor **400** is provided with four pockets **404, 406, 408, 410** arranged with the rear pockets **406** and **410** spaced farther apart laterally of the cabinet than the front pockets **404** and **408**. As shown in FIG. **12**, wherein front pocket **408** is illustrated, the pockets may be in the form of drilled holes in wall **402** or they may be hemispherical indentations (not shown) or other readily formed shapes.

In accordance with a further feature of the invention, compactor **400** has a combination drawer, basket, drip pan and handle assembly **412**. Assembly **412** comprises an upright front panel **414** having a drip pan **416** made up of an imperforate bottom wall **418** and four short upright side walls **420**, the pan being fixed along its front edges to panel **414**, as best seen in FIG. **12**. A set of four suitable ball casters **422** are mounted on the underside of wall **418** so as to register with pockets **404–410** when drawer basket **412** is fully inserted into the cabinet of compactor **400**. In this position, the roller ball of each caster drops into its associated pocket and thus serves as a detent to hold the drawer securely positioned against lateral movement within the cabinet. A suitable latch operated by a handle **424** is mounted on panel **414** near the upper edge thereof to cooperate with latching structure (not shown) mounted on the front panel **54** of the cover of compactor **400**, as in the previous embodiments. Pan **416** is liquid tight around its joint between the bottom and sides thereof to serve as a drip pan to catch liquids which might leak from the refuse bag. Preferably bottom wall **402** of the cabinet is raised to provide a platform in the central portion thereof (not shown) to bear against the undersurface of the pan bottom wall **418** in the closed condition of the cabinet to provide support for the bottom wall against the compacting stresses.

Assembly **412** also serves as a basket for the refuse bag and for this purpose has a pair of brackets **426** and **428** affixed at their inner ends to the inner surface of panel **414** near the upper corners thereof so as to extend rearwardly slightly more than half the front-to-rear dimension of assembly **412**. A handle **430** of U-shaped configuration has the free ends of its arms **432** and **434** pivotally connected at **436** and **438** to the free ends of arms **426** and **428**, respectively. Handle arms **432** and **434** are curved beyond the pivot connection to form stops **440** which engage the lower edge of the associated arms **426, 428** when handle **430** is pivoted clockwise 90° from the upright carrying position thereof shown in FIG. **11** to the horizontal position thereof shown in FIG. **15**.

Another U-shaped member **444** having arms **446** and **448** also has the free ends of its arms pivotally connected at **436** and **438** to the inner ends of arms **426** and **428** and serves as a clamping fixture for the refuse bag. It is to be understood that handle **430** has its arms disposed outwardly of the bracket arms, whereas clamp **444** has its arms disposed inwardly of the bracket arms. Suitable shims may be provided at the pivot connections to provide clearance between the clamp arms and bracket arms to allow the upper edges of the bag to fit closely therebetween. Clamp **444** thus can be pivoted from a clamping position shown in solid lines in FIG. **13** upwardly to a release position shown in broken lines in FIG. **13**. Suitable stops (not shown) are also provided on clamp **444** to limit pivotal movement thereof counterclockwise beyond the clamping position shown in solid lines in FIG. **13**.

In accordance with another feature of the present invention, a specially constructed refuse bag **450** is provided as shown in FIGS. **13–15** for use with drawer basket **412**. Bag **450** may be constructed of heavy paper with a plastic lining and is a five-sided (i.e., four upright sides and a bottom side) bag open at the top. Bag **450** has a pair of notches **452** and **454** formed in the middle of the upper edges of its side walls **456** and **458** adapted to register with and provide clearance for the pivoted ends of handle **430** and clamp **434** when the bag is seated upright with its bottom resting snugly in the drip pan **416**, as best seen in FIG. **15**.

To install bag **450** in drawer-basket **412**, handle **430** is first rotated clockwise to its down, horizontal position, in which position it acts as a rear support for the upper edge of the bag. Clamp **444** is also rotated (counterclockwise) to its down clamping position. Then bag **450** may be inserted vertically downwardly bottom end first through the opening defined by handle **430** and clamp **444** until the bottom of the bag is seated in the drip pan **416**. Next clamp **444** is pivoted clockwise upwardly to a vertical position, whereupon the upper front edge portions **460** and **462** of the bag sides are folded slightly forwardly. Then clamp **444** is again pivoted counterclockwise downwardly to clamping position wherein it is disposed inwardly of the adjacent portions of the bag. Now the rear edge **466** of the bag and rear portions **468** and **470** of the sides of the bag are folded outwardly over and then down about the handle **430** to thereby suspend the rear half of the bag on handle **430**. Finally, the front half of the bag is suspended on clamp **444** by folding bag edges **460, 464, 462** inwardly over clamp **444** as best seen in FIGS. **13** and **14**. Preferably the front portion of clamp **444** has a tight fit against the inner surface of wall **14** in the horizontal position of clamp **444** so that the front wall of the bag is securely pressed in clamped relation against the front panel **414**. The drawer basket **412** is now ready to be loaded with trash and then rolled into the cabinet of compactor **400**.

After several loads have been compacted in bag **450**, and the bag is full except for the last load, the last load is placed in the bag, compacted, the drawer pulled out and then clamp **444** and handle **430** both pivoted upwardly. Preferably, prior to compacting the last load, the bag is loosened to uncurl and release the edges of the bag and then the upper edges are folded inwardly to seal the upper end of the bag. After compacting the bag in sealed condition, and pivoting the handle and clamp upright, handle **430** alone or in conjunction with clamp **444** is grasped with one hand and used to carry drawer basket **412** to the area where the compacted trash bags are stored for pick-up. Thus, there is a minimum han-

dling of the refuse bag, the drip pan insures that there will be no spillage in transit and one hand is free to open doors, etc.

Referring to FIG. **17**, rocker **231** of the "stop-start" switch **230** is shown as it appears from the interior of control panel **210** and for clarity without any of the other associated structures of switch **230**. As described previously, rocker **231** is pivotable about axis **231'** and is mounted in an opening **470** in panel **210** as to project on both sides thereof in all three positions of the rocker described previously. Hence, side surface **472** of rocker **231** will be exposed interiorly of panel **210**, both in the stop and start positions of the rocker. In accordance with another feature of the present invention, rocker **231** is combined with a safety key lock arrangement so as to mechanically prevent operation of compactor **20** except when a key (not shown) is inserted into the tumbler of a conventional drawer lock **474** mounted in panel **210** adjacent rocker **231**. The axis of rotation of the tumbler of lock **474** is arranged transversely to axis **231'** and lock **474** is angularly oriented so that when its tumbler is in locked position a block **476** secured to shaft **478** of the lock is oriented as shown in FIG. **17**. In this position a hook-shaped arm **480** secured to block **476** has its free end **482** inserted into a hole **484** drilled in side wall **472** of rocker **231** to thereby lock the rocker against pivotal movement. Only in this locked position of the tumbler can the key be withdrawn from the lock, the absence of the key in the lock thus indicating to the operator that the stop-start switch has been rendered safe so that the compactor cannot be operated by unauthorized personnel or children.

To unlock switch **230**, the operator inserts the key into lock **474** and rotates its tumbler **90** degrees counterclockwise as viewed in FIG. **17**, thereby pivoting the free end **482** of arm **480** out of hole **484** so that rocker **231** can now be pivotally manipulated as described previously. Lock **474** is of the type wherein any but the locked position of its tumbler the key cannot be removed. Hence, the key serves as a "warning flag," i.e., the operator can tell at a glance whether or not it is safe to leave the compactor unattended merely by observing the presence or absence of the key protruding from the control panel.

From the foregoing description, it now will be apparent that the present invention provides an improved refuse compacting mechanism, cabinet arrangement, control circuitry, safety interlock features, and drawer, basket and bag features which amply fulfill the objects of the present invention. In addition to the objects and features described previously herein, it now will be better understood that the compactor of the present invention is of economical construction due to the walls of the cabinet and drawer serving as the main structural framework, as well as providing lateral constraint against bulging forces generated in the refuse being compacted. Cover **52** also serves as a part of the compactor framework in that it is a rigid one-piece member and serves as a brace for the side and rear walls so as to resist twisting force exerted on the cabinet due to the slight lateral motion of platen **106** during its downstroke travel.

The construction of the drawer and basket wherein the drawer is generally open at the rear and the basket is generally open at the front greatly facilitates removal of a refuse bag after the same has been filled with compacted trash. The provision of the close-fitting drip pan at the bottom of basket **200** adapted to nest snugly in the bottom of drawer **160** with the mating rear walls inclined to provide the locking angle relationship insures that the basket is located in proper position in the drawer for movement therewith, as well as being properly angularly oriented in the drawer, and offers support to resist tipping or tilting of the basket during compaction and movement of the drawer. The provision of side and/or rear panels on the basket restrains the bag from bulging when the drawer with the basket therein is pulled out to open position. However, as soon as the basket is lifted a fraction of an inch to disengage it from the friction locking relationship with the bottom of the drawer, the basket may be tilted rearwardly slightly, increasing the fore and aft clearance so that the basket with the full bag therein may be readily lifted out of the drawer. Likewise, the generally open front of the basket will then permit ready removal of the refuse bag despite its tendency to bulge laterally when full of compacted material. The rear panel on the basket, by preventing rearward bulging of the trash bag when the basket is fully seated in the drawer, makes the drawer easy to shut after each successive reloading of the bag.

The suspension of the compacting mechanism from the two main beams **74** and **76**, which in turn are suspended by screws **78**, greatly facilitates servicing. Merely by loosening these four screws **78**, the heads of which are conveniently accessible from above, the entire compacting unit including the motor, drive, toggle mechanism, platen, control panel and all wiring can be removed as a single unit for servicing on the site or at a remote service center. It will be noted that fasteners **78** extend in the direction of thrust and hence are not loaded by the compacting forces but rather merely carry the weight of the compacting mechanism. Thus only hanger brackets **70** and **72** which are welded to the side walls take the compacting force as a shear stress and thus have high strength for this type of loading.

Motor **78** is mounted on the fore and aft center line of the compacting mechanism as well as on the fore and aft center line of the cabinet and compacting space. Hence the forces exerted by the compacting mechanism develop a minimum of twisting couples or moments, enabling only the walls of the cabinet themselves to serve as a framework for the unit.

It is also to be understood that the basket and refuse bag can be integrated into one unit by using a plastic container. Such a single basket-bag unit need not be any stronger than the refuse bag described herein, but in such event the back wall on the drawer would be extended slightly higher in order to provide reinforcement against rearward bulging of the unit when the drawer is opened which otherwise could make the drawer hard to close.

I claim:

1. A refuse compactor comprising a framework, a receptacle removably received in said framework adjacent one end of said framework and having an open end facing the end of the framework opposite said one end, a compacting mechanism mounted in said framework adjacent said opposite end thereof including a presser platen movable into and out of the open

end of said receptacle between an extended position within said receptacle and a retracted position disposed outwardly and clear of said open end of said receptacle, said mechanism comprising toggle linkage means having first pivot means fixed to said framework, second pivot means connected to said platen, and third pivot means intermediate said first and second pivot means and movable transversely of the direction of movement of said platen to extend and retract said linkage means, said toggle linkage means comprising first and second sets of crossed-bar linkages, two crossed links of said first set being connected at one of their ends to said first pivot means and at their other ends to said third pivot means, two crossed links of said second set being connected at one of their ends to said second pivot means and at the other of their ends to said third pivot means, a motor, drive means operably interconnecting said motor and said third pivot means of said toggle means for causing movement of said platen between said extended and retracted positions thereof, said drive means comprising a threaded shaft coupled to said third pivot means for bodily movement therewith in the direction of extension and retraction of said toggle linkage means, first connector means threadably engaged with said shaft and connected to said other ends of one of said crossed links of each of said first and second sets, second connector means connected to said other ends of the other one of said crossed links of each of said first and second sets and having said shaft mounted therein but restrained against axial movement relative thereto whereby rotation of said shaft and said first connector means relative to one another causes said first and second connector means to move relative to one another axially of said shaft to thereby articulate said linkage and thus cause said movement of said platen, and means mounting said motor on one of said first and second connector means for bodily movement therewith, said drive means operably coupling said motor to said shaft and said connector means to produce said relative rotation.

2. The compactor as defined in claim 1 wherein said motor mounting means comprises a rigid bracket cantilever mounted on said one connector means.

3. The compactor as defined in claim 2 wherein said motor and drive means have rotatable shaft means disposed parallel to said threaded shaft and said motor extends adjacent said threaded shaft on the side of said threaded shaft closest to said fixed pivot means.

4. The compactor as defined in claim 1 wherein said first and second crossed bar linkages comprise five-bar linkages, said first pivot means serving as a fixed immobile link in said one set and said second pivot means serving as a link in said second set movable with but maintaining fixed spacing between said one ends of said two crossed links of second set, said third pivot means serving as the variable-length force-application link common to each set of said five-bar linkages.

5. The compactor as defined in claim 4 wherein said toggle linkage means comprises third and fourth five-bar linkages corresponding to said first and second five-bar linkages, said third and fourth linkages being mounted in side-by-side relationship with said first and second linkages and being spaced therefrom in a direction perpendicular to the axis of said threaded shaft.

6. The compactor as defined in claim 5 wherein said motor is mounted on said second connector means, and said drive means includes a speed reduction torque multiplying drive train coupling an output shaft of said motor to said threaded shaft.

7. A refuse compactor as set forth in claim 6 wherein said motor is disposed in the space defined between said first and third linkages and said first and third pivot means in the extended position of said toggle linkage means.

8. The compactor as defined in claim 1 wherein said framework comprises a cabinet having at least a pair of spaced upright side walls and top and bottom walls respectively connected to the top and bottom ends of said side walls, said compacting mechanism being mounted to said side walls and said receptacle being supported on said bottom wall whereby compression force exerted by said platen on material contained in said receptacle is resisted by tensile forces taken by said side walls.

9. The compactor as defined in claim 8 wherein said cabinet includes drawer slide means mounted to the side walls of said cabinet adjacent said one end of said framework, and including a pull-out drawer having panels defining the front and bottom walls of said cabinet and adapted to receive said receptacle, said drawer being mounted on said drawer slide means for movement from a closed position wherein said cabinet bottom wall is aligned vertically beneath said platen and an open position wherein said bottom wall is disposed outwardly in front of said cabinet to permit removal of said receptacle.

10. The compactor as defined in claim 9 wherein said side walls have lateral support means at the bottom thereof, and wherein said drawer slide means comprise tracks operably connected to said side walls of said cabinet and to said drawer, said tracks being inclined downwardly and rearwardly at a slight angle from the horizontal such that said drawer bottom wall rests on said lateral support means of said side walls in the closed position of said drawer and is elevated clear of said lateral support means as said drawer is pulled outwardly toward its open position.

11. The compactor as defined in claim 1 wherein said motor and drive means are mounted adjacent said threaded shaft on the side of said threaded shaft closest to said fixed pivot means.

12. A refuse compactor comprising a framework, a receptacle removably received in said framework adjacent one end of said framework and having an open end facing the end of the framework opposite said one end, a compacting mechanism mounted in said framework adjacent said opposite end thereof including a presser platen movable into and out of the open end of said receptacle between extended and retracted positions thereof, said mechanism comprising an extensible toggle linkage means having first connector means operably connected to said framework, second connector means operably connected to said platen and movable therewith, and third connector means intermediate said first and second connector means and comprising first and second spaced pivot means movable relative to one another transversely of the direction of movement of said platen to extend and retract said linkage means, and a motor mounted on and carried by said

toggle linkage means for bodily movement therewith, said toggle linkage means including force transmitting means operably coupling said motor with said toggle linkage means for causing said relative movement of said spaced pivot means to thereby move said platen between said extended and retracted positions thereof, said force transmitting means comprising a threaded shaft and nut rotatable relative to one another by said motor and mounted for bodily movement with said toggle linkage means.

13. The compactor as defined in claim 12 wherein said compacting mechanism includes means associated with said linkage means for stabilizing motion of said platen for movement in a generally rectilinear path of travel, said stabilizing means comprising stabilizing members interconnected with said toggle linkage means and pivotable in response to extension and retraction of said linkage means to cause said linkage means to move said platen in said path whereby said linkage means is self-guiding and thus free of engagement with said framework except via said first connector means.

14. The compactor as defined in claim 13 wherein said stabilizer members comprise first and second stabilizer links respectively coupled to said first and second spaced pivot means and extending in opposite directions therefrom to respective connections with said linkage adjacent said first and third connector means.

15. A refuse compactor comprising a framework, a receptacle removably received in said framework adjacent one end of said framework and having an open end facing the end of the framework opposite said one end, a compacting mechanism mounted in said framework adjacent said opposite end thereof including a presser platen movable into and out of the open end of said receptacle between extended and retracted positions thereof, said mechanism comprising an extensible toggle linkage means having first connector means operably connected to said framework, second connector means operably connected to said platen and movable therewith, and third connector means intermediate said first and second connector means and comprising first and second spaced pivot means movable relative to one another transversely of the direction of movement of said platen to extend and retract said linkage means, and a motor mounted on and carried by said toggle linkage means for bodily movement therewith, said toggle linkage means including force transmitting means operably coupling said motor with toggle linkage means for causing said relative movement of said spaced pivot means to thereby move said platen between said extended and retracted positions thereof, said toggle linkage means comprising first and second sets of crossed-bar linkages, two crossed links of said first set being operably connected at one of their ends to said first connector means and at their other ends to said third connector means, two crossed links of said second set being operably connected at one of their ends to said second connector means and at the other of their ends to said third connector means, said force transmitting means comprising a threaded shaft coupled to one of said movable connector means for bodily movement therewith in the direction of extension and retraction of said toggle linkage means, nut means threadably engaged with said shaft and connected to one of said crossed links of at least one of said first and second sets, shaft coupling means connected to the other one of said crossed links of said first and second sets and having said shaft mounted therein to produce axial movement thereof relative to said nut means in response to rotation of said shaft and said nut means relative to one another to thereby articulate said linkage and thus cause said movement of said platen, said force transmitting means operably coupling said motor to said shaft and nut means to produce said relative rotation.

16. The compactor as set forth in claim 15 wherein said threaded shaft and said linkage means are dimensioned and positioned relative to said receptacle and said framework to clear said receptacle and move into and out of the open end thereof in response to movement of said platen between its retracted and fully extended positions.

17. The compactor as defined in claim 15 wherein said motor is mounted on one of said nut and shaft coupling means.

18. The compactor as defined in claim 17 wherein said motor means extends adjacent said threaded shaft.

19. The compactor as defined in claim 18 wherein said toggle linkage means comprises third and fourth crossed-bar linkages corresponding to said first and second crossed-bar linkages, said third and fourth linkages being mounted in side-by-side relationship with said first and second linkages and being spaced therefrom in a direction perpendicular to the axis of said threaded shaft, said motor being disposed in the space defined between said first and second linkages and said third and fourth linkages in the extended position of said toggle linkage means.

20. The compactor as set forth in claim 19 wherein said nut means comprises a trunnion in the form of a yoke having a center section threadably receiving said threaded shaft therethrough and being pivotally connected at its ends to said one set of said crossed links, said center section of said yoke being disposed closer to said shaft coupling means than said ends of said yoke to thereby enable said threaded shaft to produce sufficient extension of said linkage with a length of the shaft short enough such that said threaded shaft enters said receptacle with a clearance during movement of said platen to its fully extended position.

21. A refuse compactor comprising a framework, a receptacle removably received in said framework adjacent one end of said framework and having an open end facing the end of the framework opposite said one end, a compacting mechanism mounted in said framework adjacent said opposite end thereof including a presser platen movable into and out of the open end of said receptacle between extended and retracted positions thereof, said mechanism comprising an extensible toggle linkage means having first connector means operably connected to said framework, second connector means operably connected to said platen and movable therewith, and third connector means intermediate said first and second connector means and comprising first and second spaced pivot means movable relative to one another transversely of the direction of movement of said platen to extend and retract said linkage means, and a motor mounted on and carried by said

toggle linkage means for bodily movement therewith, said toggle linkage means including force transmitting means operably coupling said motor with said toggle linkage means for causing said relative movement of said spaced pivot means to thereby move said platen between said extended and retracted positions thereof, said framework comprising a cabinet having at least a pair of spaced first and second upright exterior walls and top and bottom supports respectively connected to the top and bottom ends of said upright walls, said compacting mechanism being mounted to said upright walls and said receptacle being supported on said bottom support whereby compression force exerted by said platen on material contained in said receptacle is resisted by tensile forces taken by said upright walls.

22. The compactor as defined in claim **21** wherein said cabinet includes drawer slide means mounted to said upright walls of said cabinet adjacent said one end of said framework, and including a pull-out drawer having panels defining a third upright wall and bottom wall of said cabinet and adapted to receive said receptacle, said drawer being mounted on said drawer slide means for movement from a closed position wherein said cabinet bottom wall is aligned vertically beneath said platen and an open position wherein said bottom wall is disposed outwardly of said cabinet to permit removal of said receptacle, said first and second upright walls having lateral support means at the bottom thereof defining said bottom support, said drawer slide means comprising tracks operably connected to said first and second upright walls of said cabinet and to said drawer, said tracks being inclined downwardly and rearwardly at a slight angle from the horizontal such that said drawer bottom wall rests on said lateral support means of said first and second upright walls in the closed position of said drawer and is elevated clear of said lateral support means as said drawer is pulled outwardly toward its open position.

23. The compactor as defined in claim **21** wherein said receptacle is disposed in free standing relationship in said cabinet and has spaced upright walls proximate said upright cabinet walls adapted to receive support from said upright cabinet walls tending to resist bulging of the associated receptacle walls caused by compaction of refuse in said receptacle by said compacting mechanism.

24. The compactor as defined in claim **21** wherein said compacting mechanism comprises a pair of laterally spaced beams secured at the opposite ends thereof to said first and second upright walls, and wherein said toggle linkage means comprises a pair of laterally spaced duplicate sets of linkage laterally interconnected by said first, second and third connector means, one pair of said sets of linkage being operatively connected to one of said beams and the other pair of said sets of linkage being operatively connected to said other beam, and wherein said motor is adapted to move between said beams in response to movement of said platen to its fully retracted position.

25. The compactor as defined in claim **24** wherein each of said beams are secured to said spaced first and second upright walls by a pair of angle brackets, one at each of the opposite ends of the associated beam, said brackets each having a first leg detachably connected by fastener means to the side of the associated beam remote from said platen and a second leg perpendicular to said first leg and extending away from said platen and secured to the associated upright cabinet wall whereby compaction produces a load in shear on said connection of said second leg to said upright wall.

26. The compactor as defined in claim **21** wherein said motor and force transmitting means are mounted within the confines of said linkage means and said linkage means are disposed generally on the lateral centerline of said framework and said receptacle to thereby reduce to a minimum couples and bending moments acting to force said linkage laterally out of its path of movement.

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