United States Patent [19]

Karls

[11] **3,863,561**

[45] **Feb. 4, 1975**

[54] **COMPACTOR**

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[73] Assignee: **Emerson Electric Co.,** St. Louis, Mo.

[22] Filed: **Apr. 25, 1973**

[21] Appl. No.: **354,430**

[52] **U.S. Cl.** ..... **100/53,** 100/100, 100/215, 100/221, 100/226, 100/229 A, 100/256, 100/295, 100/287, 100/294, 232/43.1

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

[58] **Field of Search** ..... 232/43.1; 74/521; 141/73.80; 53/124 B; 100/53, 226, 227, 229 R, 229 A, 100, 256, 294, 295, 221, 224, 225, 287, 289, 215, 295

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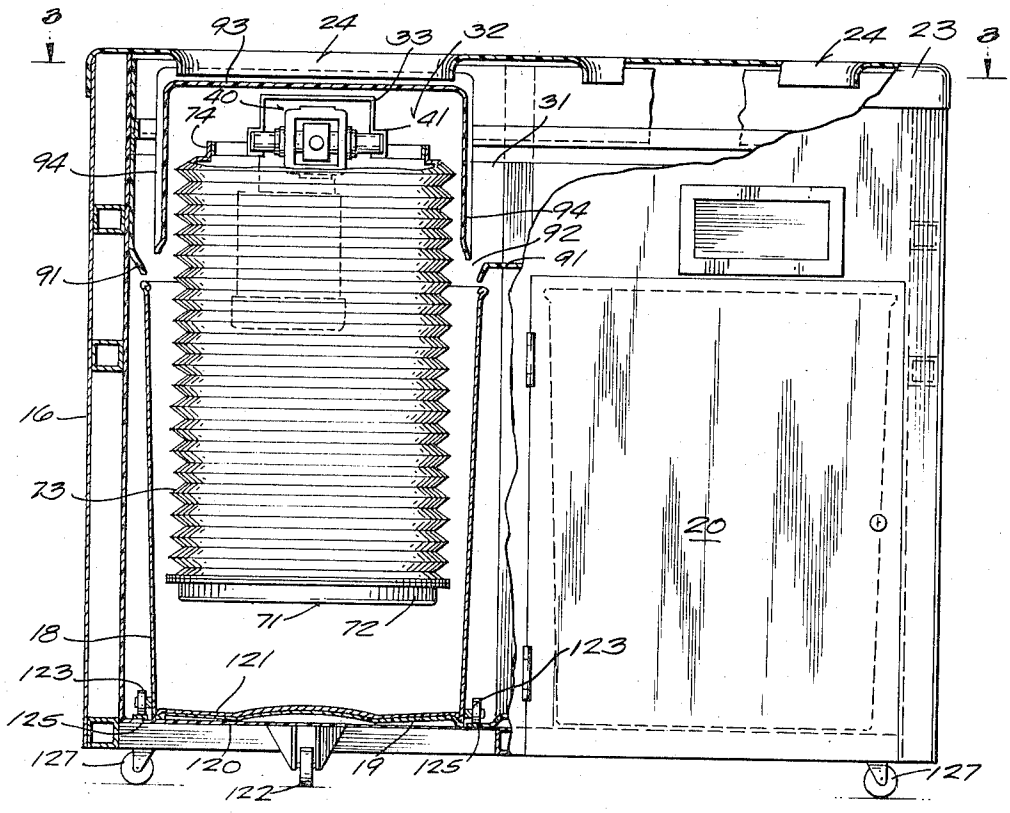
Primary Examiner—Billy J. Wilhite

Attorney, Agent, or Firm—Joseph P. House, Jr.

[57] **ABSTRACT**

A top-loading trash compactor primarily for institutional use and comprising a counter top height cabinet with two cubicles with trash containers therein, the cabinet top panel having two trash loading hatchways therein, one for each cubicle. The cabinet top panel is spaced above the containers to provide a ram shuttle way below the panel top and above the containers. A single ram is mounted in the shuttle way for shuttle movement from one cubicle to the other. When the ram is in one cubicle, it is utilized to compact trash previously loaded into the container in that cubicle. This exposes the other container to receive trash loaded thereinto through its open hatchway. The ram carries a hatch cover or shield to close the hatchway above the cubicle in which the ram is working and opens the hatchway above the other cubicle.

11 Claims, 11 Drawing Figures



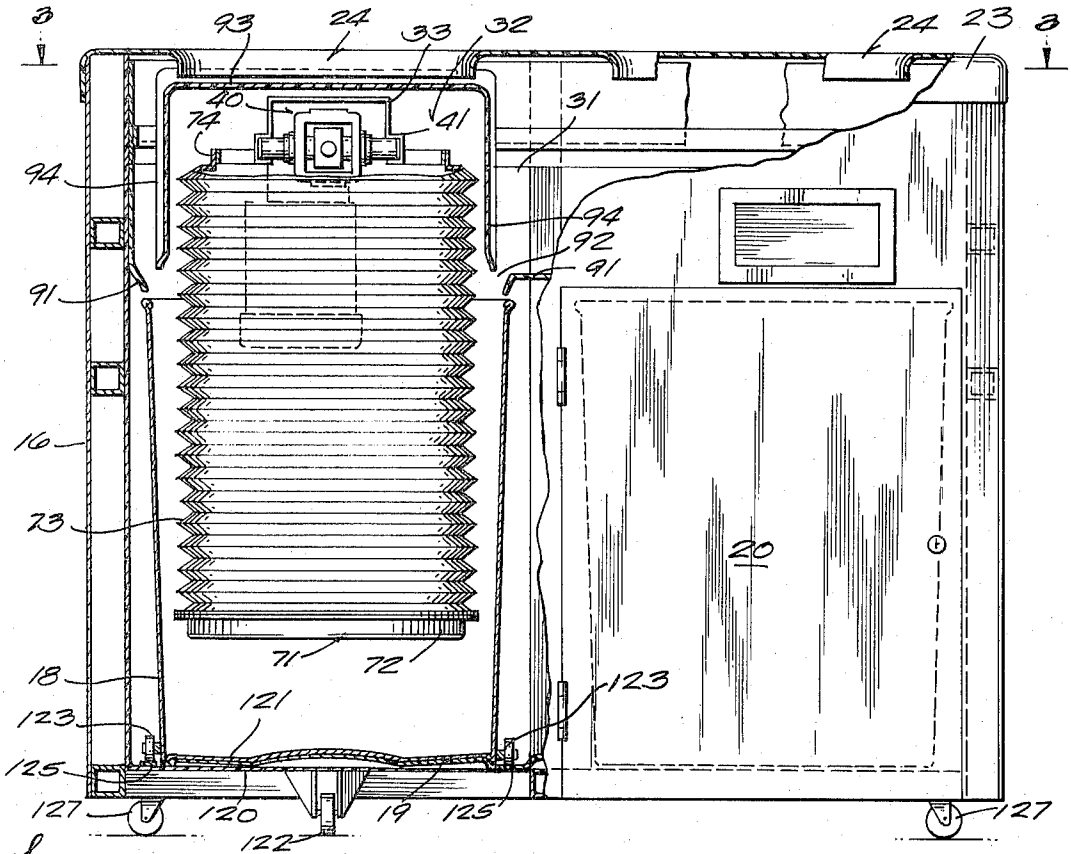

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Fig. 2

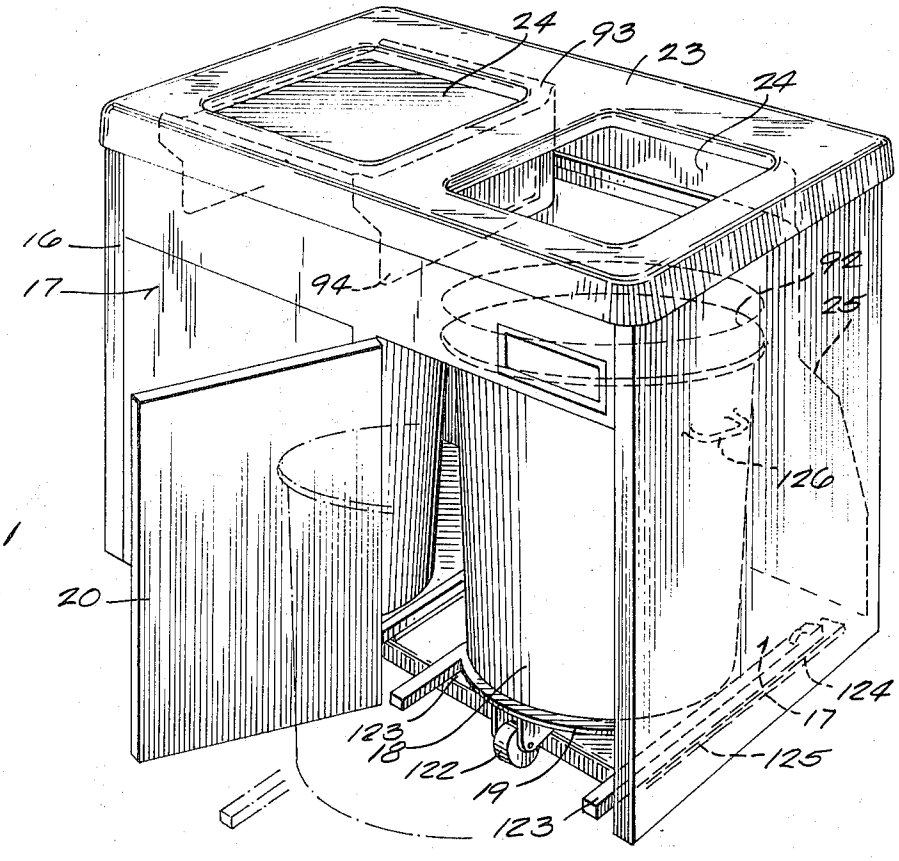
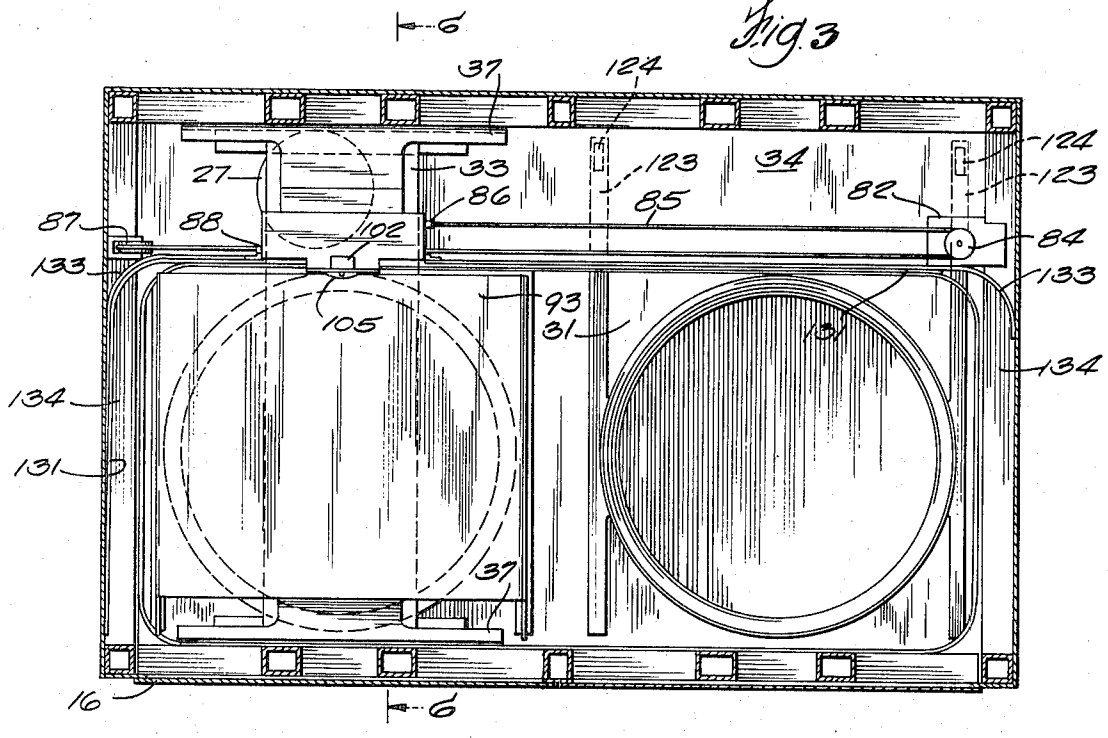

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Fig. 1

Fig. 3


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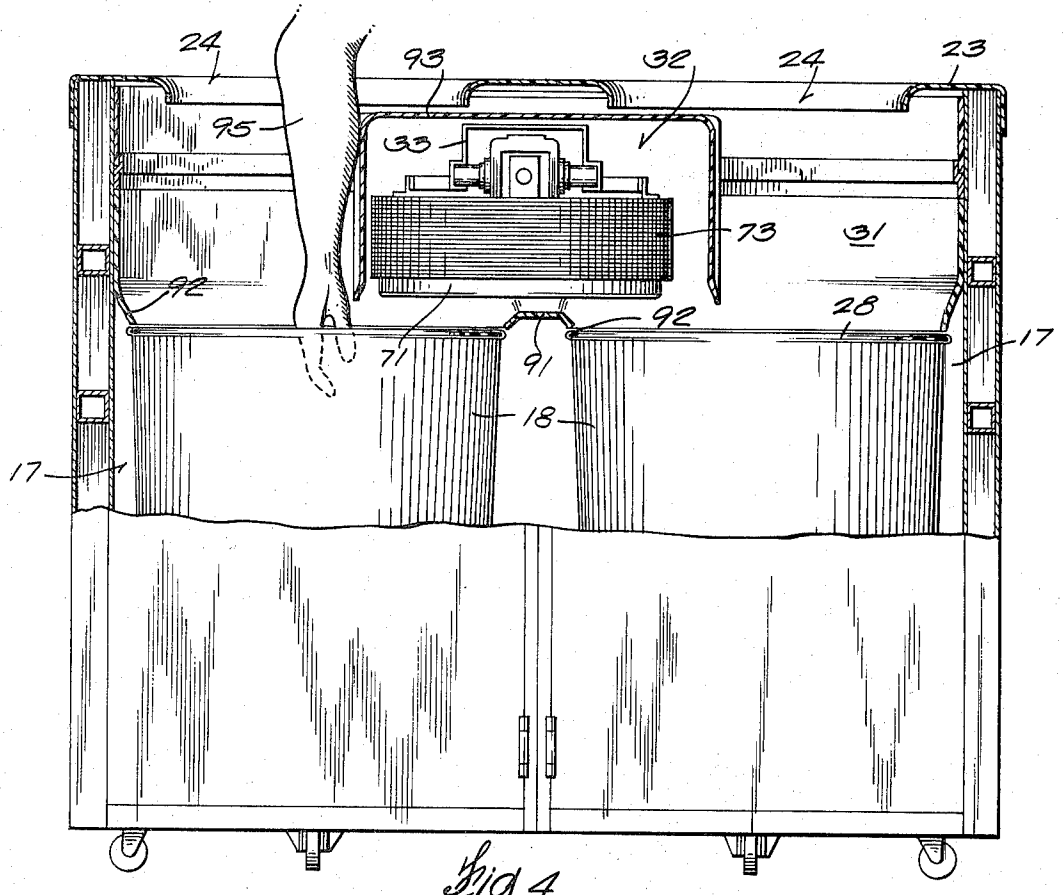
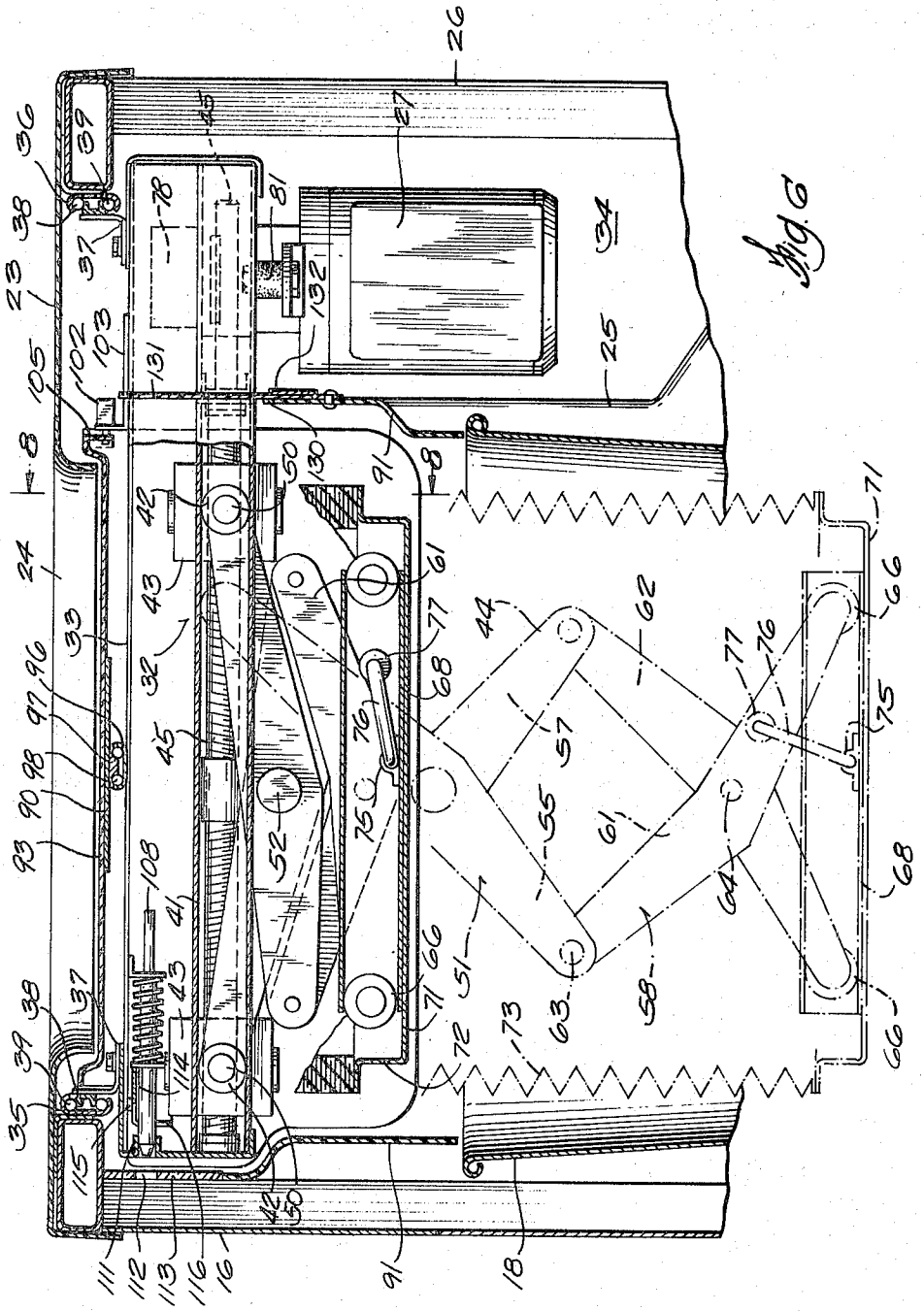

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Fig. 4


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Fig. 6

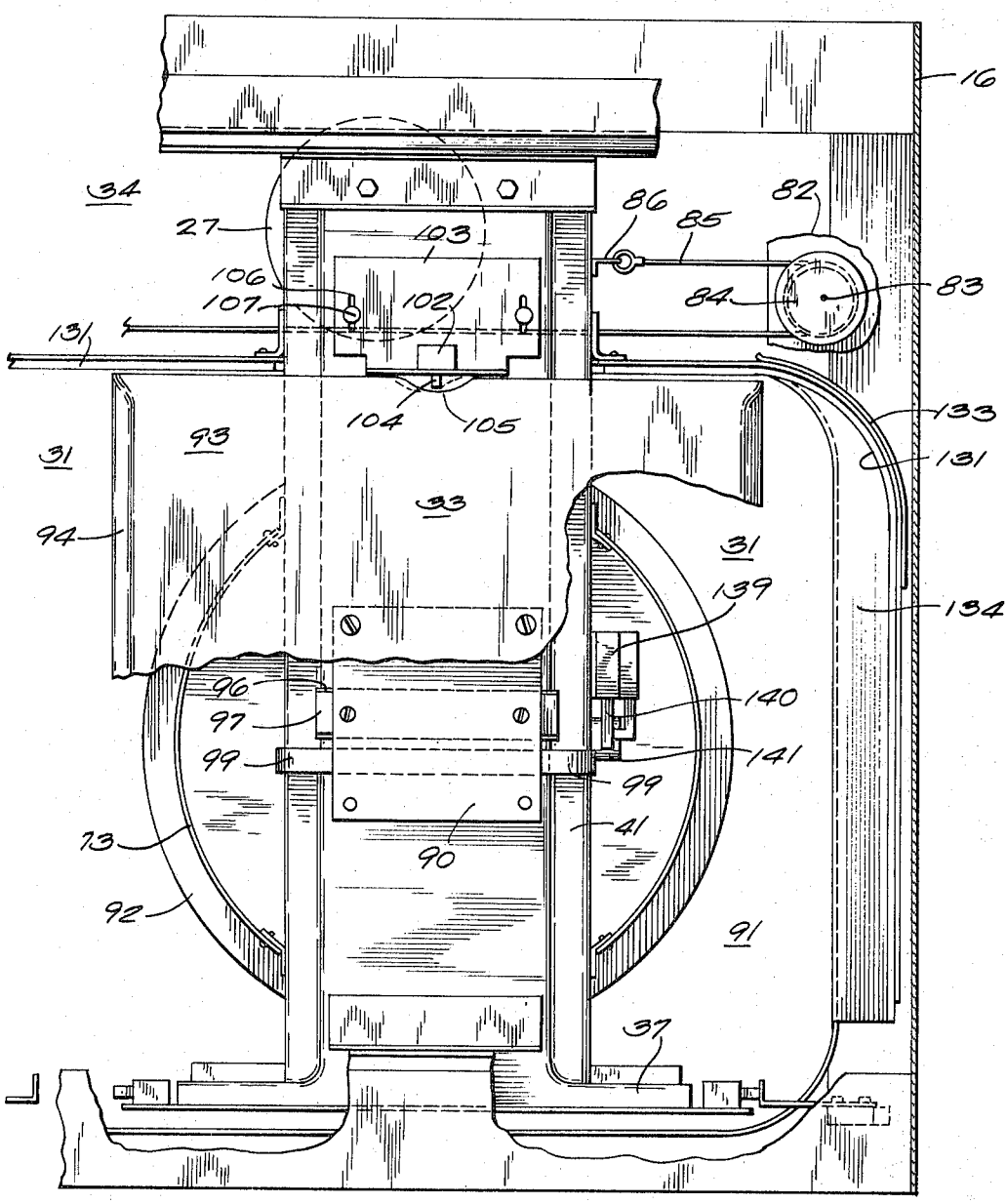

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Fig. 5

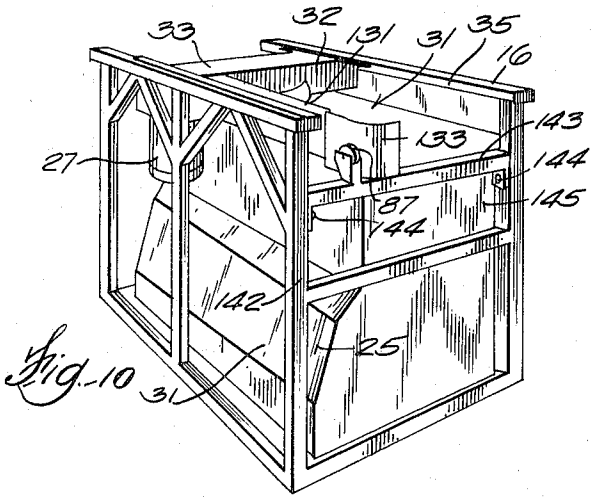


Fig. 10

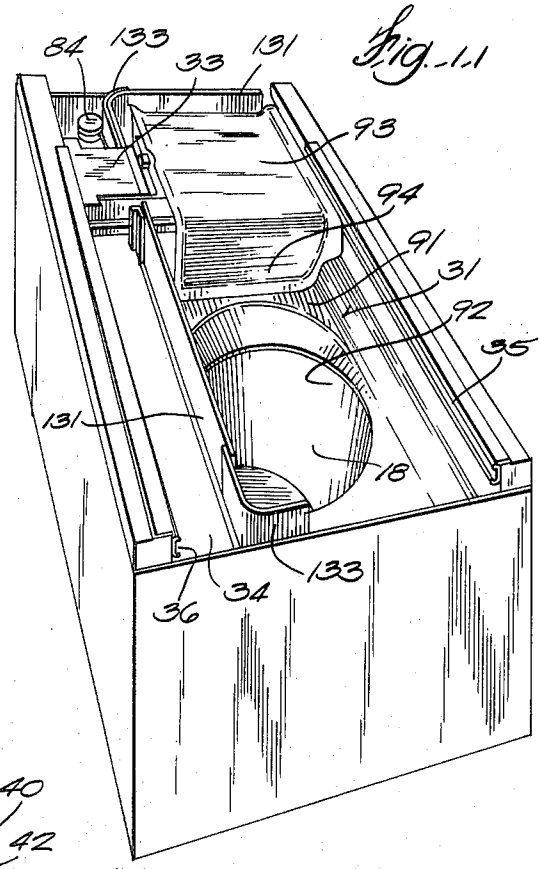


Fig. 11

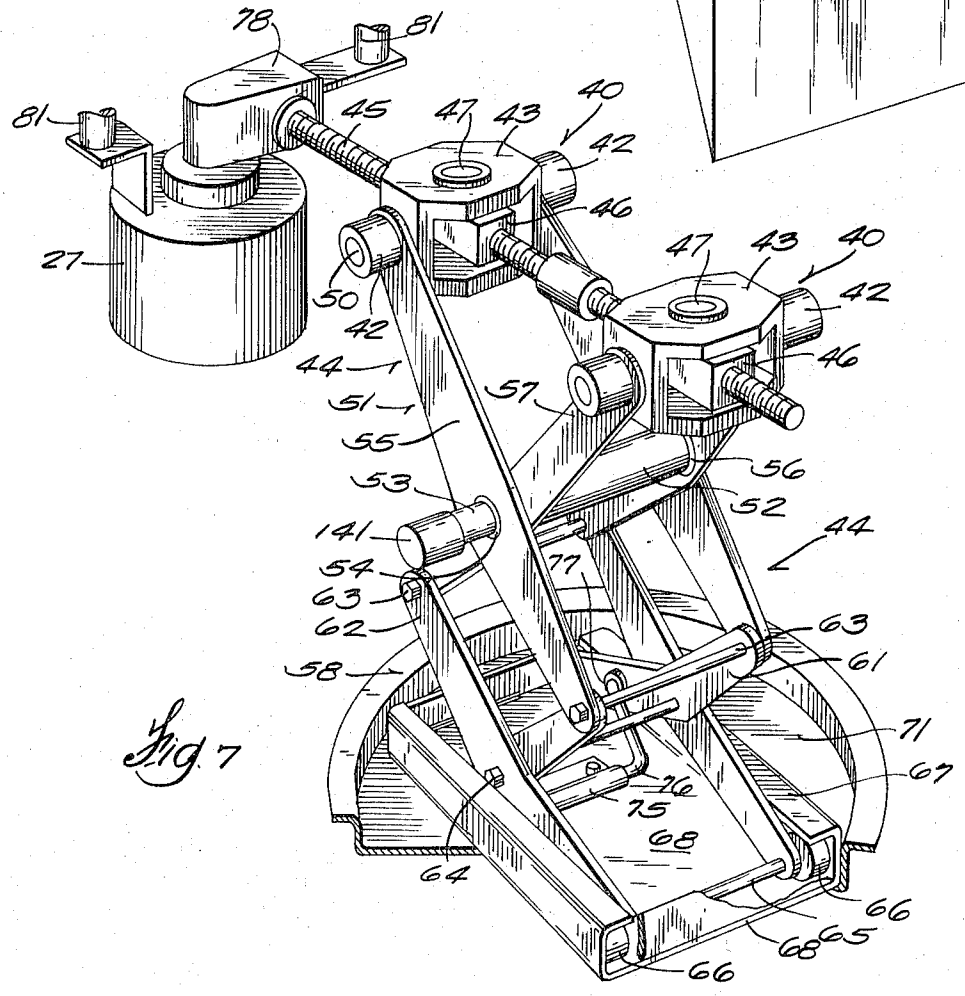


Fig. 7

Fig. 8

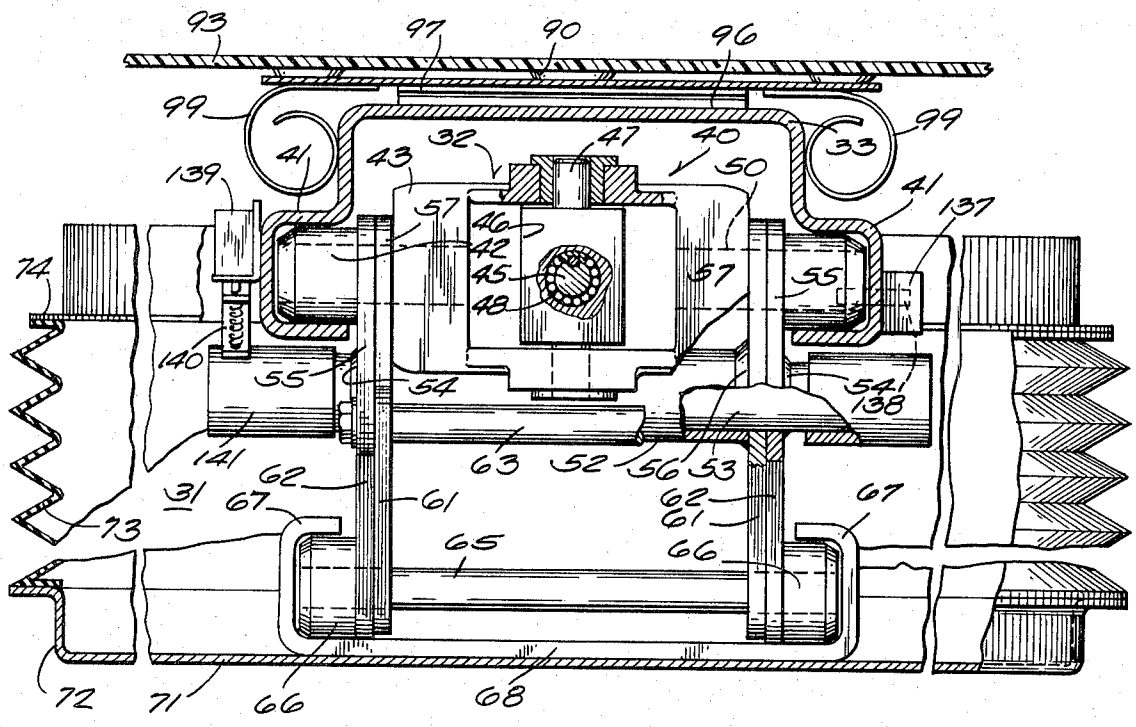
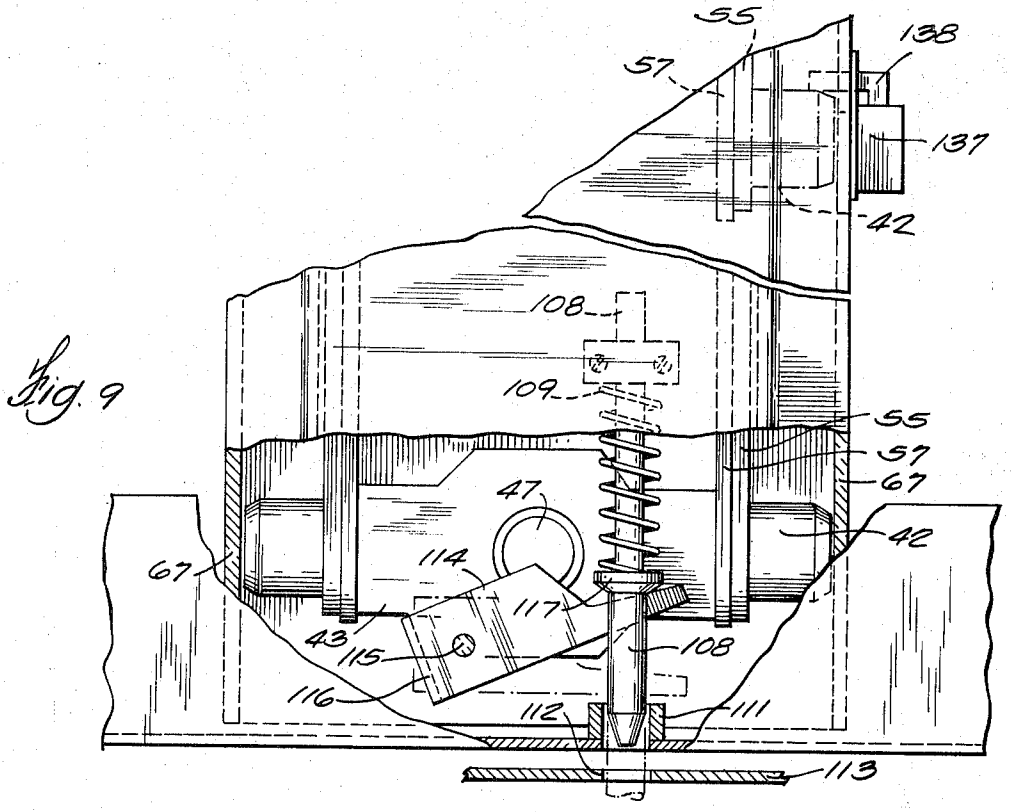

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Fig. 9


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COMPACTOR

BACKGROUND OF THE INVENTION

Institutional type compactors involving a single ram shuttling between multiple trash containers are generally old in the published literature, as shown, for example, in U.S. Pat. No. 3,438,321. The compactor of that patent, however, may be loaded only from one side, inasmuch as the compactor cabinet is quite high and its loading openings are formed in a cabinet side wall. Such an arrangement is dictated in the compactor of U.S. Pat. No. 3,438,321 because the compactor utilizes hydraulic cylinders to actuate the ram. Such cylinders are not readily adapted to retraction into a compact head space.

My copending U.S. patent application Ser. No. 177,385 filed Sept. 2, 1971, shows now U.S. Pat. No. 3,772,984 granted Nov. 20, 1973, a compactor ram actuating mechanism incorporating lazy tongs which are capable of a wide range of extension and retraction. Accordingly, such mechanism can be retracted into a compact space. This makes it possible to limit the height of the cabinet to counter height, without sacrifice of container capacity.

SUMMARY OF THE INVENTION

In accordance with the present invention, the cabinet has a relatively low profile, typically not exceeding counter height, with the loading doors or hatchways disposed on the top of the cabinet so that the compactor is top loading and the hatchways are accessible from all the way around (360°) the compactor cabinet. This is of considerable advantage in institutions as it greatly increases accessibility to the compactor, unlike the compactor of U.S. Pat. No. 3,438,321, where personnel must approach the compactor only from one side.

The compactor cabinet has a low profile because of the ability of the lazy tong linkage actuated ram to retract into a relatively small head space. Accordingly, the compactor of the present invention incorporates a relatively shallow ram shuttle way beneath the cabinet top and the upper edges of the trash containers within the cabinet. Full size trash containers can be utilized and the ram assembly can nevertheless be shuttled from one container to the other through the relatively shallow shuttle way, without exceeding counter-top height for the compactor cabinet. The ram will work in one trash container while the other trash container is exposed through its hatchway for loading trash thereinto.

An important feature of the present invention is the hatchway cover or shield which is carried by the ram support mechanism or bridge and which automatically closes the hatchway over the container in which the ram is working and automatically opens the hatchway above the other trash container. Safety mechanism is provided so that if in the course of shuttling from one cubicle to the other the hatchway cover contacts an obstruction, such as a trash item projecting upwardly from a container, the arm of a person reaching into the container, etc., such contact will trigger a switch to disengage the motor which shuttles the ram.

The lazy tong extension mechanism of the present apparatus also incorporates articulated connections between the lazy tong linkages and the drive screw so that uneven loading on the ram platen will not be transmitted to damage the drive screw or the connections, as these parts will pivot on their articulated connections to relieve stress and avoid damage to the parts.

Other features, objects and advantages of the invention will appear from the disclosure hereof.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a compactor cabinet, interior portions thereof being shown in phantom.

FIG. **2** is a front elevation of the trash compactor, the cabinet being partly broken away and showing interior details, partly in elevation and partly in cross section.

FIG. **3** is a horizontal cross section taken in part along the line **3—3** of FIG. **2.**

FIG. **4** is a partial vertical cross section and front elevation somewhat similar to FIG. **2,** but showing the ram assembly in the course of being shuttled from one container cubicle to the other and illustrating displacement of the hatchway cover when it engages an obstruction, thus to stop the shuttle motor.

FIG. **5** is an enlarged fragmentary cross section somewhat similar to FIG. **3,** but showing more details of the ram support bridge.

FIG. **6** is a fragmentary transverse cross section taken along the line **6—6** of FIG. **3.**

FIG. **7** is a diagrammatic perspective view of the lazy tong extension mechanism for the ram.

FIG. **8** is a fragmentary enlarged vertical cross section taken through the retracted lazy tong extension mechanism for the ram platen, and substantially along the line **8—8** of FIG. **6.**

FIG. **9** is a fragmentary detailed horizontal cross section taken through the retracted ram extension mechanism and illustrating the manner for actuating the shuttle lock.

FIG. **10** is a reduced scale perspective view of the rear quarter of a compactor from which the cabinet side walls and top have been removed to expose interior details.

FIG. **11** is a reduced scale perspective view of the rear quarter of a compactor from which the cabinet top has been removed to expose interior details.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

Compactor cabinet **16** contains two cubicles **17,** each housing a removable trash bin or container **18.** Each container **18** typically comprises a 30-gallon metal or plastic can which may be rolled into and out of the cubicle on a dolly **19.** If desired, a plastic liner bag may be inserted into the container. Each cubicle **17** has a side opening through which access may be had by a door **20.**

The top of the cabinet **16** is provided with a molded fiberglass or like panel **23** with hatchways or openings **24** aligned above the respective containers **18** in the respective cubicles **17.** Top panel **23** is desirably disposed at countertop height, approximately 42 inches from the floor. This gives the compactor cabinet a low profile for ease in all-around top loading.

The container cubicles 17 within the cabinet 16 are separated by wall or partition 25 from the rear wall 26 of the cabinet 16, thus to provide a separate chamber or way for the ram motor 27 which travels or shuttles with the ram assembly as hereinafter described. Cabinet top panel 23 is spaced above the upper edges 28 of the containers 18 a sufficient distance to provide a shallow shuttle way 31 (FIG. 4) in which the ram assembly 32 may be shuttled from a position over one container 18 to a position over the other container 18. An apron or liner 91 defines the bottom of the shuttle way 31. Liner 91 has openings 92 over the containers 18. The partition 25 and liner 91 form an enclosure for the trash containers 18 which can be kept clean, and separate the cubicles 17 from the shuttle way 31 and ram motor way 34.

Ram assembly 32 is mounted on a traveling bridge 33 which extends from the front of the cabinet 16 to its rear and spans across both the shuttle way 31 and the motor way 34. Bridge 33 is movably supported on elongated tracks 35, 36. As shown in FIG. 6, track 35 is mounted longitudinally of the compactor along the front margin of the cabinet 16. Track 36 is mounted longitudinally along the cabinet near its rear margin. Bridge 33 has front and rear stabilizer slide arms 37 which are elongated in the direction of elongation of tracks 35, 36 and which mount carriage slides 38 which ride on ball bearings 39 in the tracks 35, 36. Accordingly, the bridge 33 with its ram assembly 32 can move from one end of cabinet 16 to the other in the course of shuttling the ram assembly from one cubicle 17 to the other.

As best shown in FIG. 8, traveling bridge 33 comprises a heavy guage sheet metal channel extending transversely across the shuttle way 31. The bridge channel desirably has marginal integrally formed tracks 41. Tracks 41 support the ram assembly 32 on carriages 40 (FIGS. 7 and 8) which comprise hollow cross yokes 43 having shafts 50 to which a pair of laterally spaced lazy tong linkages 44 are pivotally connected. Shafts 50 carry end rollers 42 which ride in the tracks 41. As best shown in FIGS. 6, 7 and 8, the carriages 40 are interconnected by a drive screw 45 which has oppositely pitched portions which engage a pair of drive nuts 46, one on each yoke 53. The nuts 46 are pivotally mounted within the hollows of the yokes on upright trunnions 47 (FIG. 8) so that the nuts 46 have limited pivotal articulate movement with respect to the yokes 43. Accordingly, unbalanced loading on the ram platen and which tends to cock one lazy tong 44 with respect to the other and cause the yokes 43 to swing somewhat in the plane of tracks 41, will not stress the threaded interconnection of drive screw 45 with nuts 46. The nuts 46 will simply pivot on their trunnions 47 with respect to the yokes 43, thus relieving such stress.

In preferred embodiments of the invention, the drive screw 45 has its threads interengaged with the threads of the nuts 46 via anti-friction ball bearings 48, thus to reduce friction losses between the screw 45 and the nuts 46.

Each lazy tong 44 consists in the disclosed embodiment of two sets of tandem connected scissors links. The first set 51 comprises crossed links 55, 57 having corresponding ends pivotally connected to the shafts 50 of yokes 43. At their crossing point, the links 55, 57 of one lazy tong 44 are rigidly interconnected to the corresponding links 55, 57 of the other lazy tong 44 by telescopically related torque tubes or arms 52, 53. Innermost torque tube 53 is rigidly secured by welds 54 to the outer corresponding links 55 of set 51 and the outermost torque tube 52 is rigidly connected by welds 56 to the inner corresponding links 57 of sets 51. Accordingly, the corresponding links 55, 57 of the first paired set of scissors links 51 are rigidly interconnected.

The second set of scissors links 58 comprise cross links 61, 62, both having corresponding ends pivotally connected to the extreme ends of links 55, 57 of the first set 51, on pins 63. The crosssing points of the links 61, 62 are interconnected on cross pins 64 and their remote ends are pivotally connected to cross rods 65 which carry end rollers 66. Rollers 66 are disposed in channel tracks 67 formed on a rectangular base plate 68 which function as a ram platen.

To the bottom of ram platen 68 is attached a circular disk 71 with a turned up rim 72 to which the lower end of a collapsible bellows type apron shield 73 is connected. The upper end of the bellows type shield is connected to the margin of a bracket plate 74 carried by traveling bridge 33. Bellows shield 73 keeps trash out of the scissors linkage.

As in my prior application Ser. No. 177,385 aforesaid, the ram platen 68 is pivotally connected on the eye 75 to a crank arm 76 which is pivotally connected on pins 77 to the arms 61 of the second set 58 of scissors linkages, thus to maintain the platen 68 centered with respect to the scissors linkage. Accordingly, the rollers 66 will roll along the tracks 67 as the lazy tongs 44 are extended and retracted, while the link 76 will maintain the platen 68 centered as aforesaid.

Drive screw 45 has its inner end connected to a gear box 78 mounted on that portion of the traveling bridge 33 which is within the motor way 34. Motor 27 is supported from the bridge 33 on rubber or like resilient bushing mounts 81, and travels with the bridge 33 as it moves. The motor shaft drives the gearing in gear box 78 to drive the screw 45.

The bridge 33 which carries the ram assembly 32 in the shuttle way 31, and ram drive motor 27 in the motor way 34 is propelled in its shuttling movement by a separate power means, such as motor 82 (FIGS. 3 and 5) which has a fixed position at one end of the motor way 34. Motor shaft 83 is fast to a capstan 84 about which is reeved a drive cable 85 connected at one end to bracket 86 on the bridge 33. At one end of the cabinet 16 the cable 85 is reeved about the capstan 84 and at the other end of the cabinet it is reeved about a pulley 87 (FIG. 3). The end of cable 85 beyond pulley 87 is connected to bridge 33 by bracket 88. Accordingly, actuation of motor 82 will drive the cable 85 and bridge 33 in its shuttling action from a position above one of the trash containers 18 in one cubicle 17 to a position above the other container 18 in its cubicle 17.

To shield the ram assembly 32 from personnel, the ram mechanism 32 is provided with a traveling shield or hatch cover which embraces the top and sides of the ram assembly. Hatch cover 93 is generally in the shape of an inverted U, as indicated in FIG. 1, and includes a flat top panel with depending side panels 94 which extend across the shallow shuttle way 31. The top panel of the hatch cover 93 spans across the hatchway 24 with which the ram assembly is aligned to function as a door or cover therefor. Accordingly, personnel are isolated from the cubicle in which the ram is operating.

However, the other hatchway is concurrently open for loading trash into the other cubicle.

When the ram assembly **32** moves from one cubicle **17** to the other, it carries the shield **93** with it, as indicated in FIG. **4**, thus to automatically open one hatchway as it closes the other hatchway **24**.

The traveling hatchway cover or shield **93** is also utilized as a sensor for sensing obstructions, such as trash or possibly the arm **95** of a person reaching into the hatchway **24** as the bridge is in motion. The top panel of the hatchway **93** is slidably mounted on the bridge **33**, as illustrated in FIGS. **6** and **8**. The top of bridge **33** is provided with a short slide channel **96** aligned longitudinally of the cabinet **16**. The undersurface of the hatchway cover top panel **93** is provided with a bracket **90** from which depends a complementary track **97** which engages in slide channel **96**. If desired, ball bearings **98** may be incorporated between the two tracks for reducing friction. Accordingly, the hatch cover **93** is capable of relative sliding movement with respect to the bridge and in the longitudinal direction of the cabinet.

To limit this movement, bracket **90** carries curled spring leaves **99**. These springs embrace the channel-shaped bridge **33**, as indicated in FIGS. **5** and **8**, and limit shield movement along track **96, 97**. Accordingly, if the bridge meets an obstruction, such as arm **95** shown in FIG. **4**, the shield **93** will yield against spring **99** and will move with respect to the bridge **33**, as illustrated in FIG. **4**. This movement will actuate control means, such as switch **102** in the electric circuit to motor **82**, thus to open the circuit and stop the motor and the ram assembly before any injury is done to the arm **95** or other obstruction which is engaged by the shield **93**.

As best shown in FIGS. **5** and **6**, switch **102** is mounted from bridge **33** on a bracket **103** and has a projecting switch actuating button **104** normally centered with respect to the cam **105** formed in an edge of the top panel of shield **93**. However, if the shield **93** contacts an obstruction and moves as just described, cam surface **105** will actuate the switch **102**, thus stopping the motor **82**. Switch mounting bracket **103** is transversely slidably mounted on the bridge **33** by reason of the slots **106** engaged in the bolts **107** by which the position of the bracket **103** toward and away from the cam **105** can be adjusted.

FIGS. **6** and **9** illustrate latching mechanism by which the bridge and ram mechanism is latched in position over one cubicle **17** or the other when the ram is operational, thus mechanically interlocking the bridge against shuttling movement. The interlock is engaged when the ram is in any position other than its completely retracted position. The bridge **33** carries a latch pin **108** biased by spring **109** toward a position in which its beveled end is engaged through complementary sockets **111** and **112**. Socket **112** is formed in an inner wall **113** of cabinet **16** and socket **111** is formed in a wall of the bridge **33**. FIG. **9** illustrates in broken lines the pin **108** engaged in both sockets under pressure of spring **109**, thus to lock the bridge **33** and ram assembly **32** in position over one of the trash containers **18**. Spring **109** functions to actuate the pin **108** in any and all positions of the ram, other than its completely retracted position.

For the purpose of delatching pin **108** when the ram retracts, bridge **33** also carries a swinging latch retracting finger **114** mounted on a pintle **115**. Finger **114** has a depending trigger arm **116** which is in the path of movement of one of the ram yokes **43**. Accordingly, when the ram assembly is in its fully retracted position and in which the respective yokes **43** are in their most widely spaced position, the trigger **116** of latch release finger **114** is engaged as illustrated in full lines in FIG. **9**, thus to pivot finger **114** about pintle **115** and swing the finger **114** against the pad **117** mounted on pin **108**, thus to compress spring **109** and retract the pin **108** clear of socket **112** in cabinet wall **113** so that the bridge **33** and ram assembly **32** are no longer latched against shuttling movement. Motor **82** may now be actuated to shuttle the bridge **33**.

Dolly **19** has a platform **120** which is desirably contoured complementary to the bottom **121** of trash container **18**. Accordingly, it will provide good support for the container bottom during compaction. The front edge of each dolly **19** has a floor contacting wheel **122** and the sides of the dolly **19** are provided with slide bars **123**, the rear ends of which have wheels or rollers **124**. Cabinet **16** has complementary tracks **125** for rollers **124** and slide bars **123**. Accordingly, the containers **18** can be rolled out of their cubicles **17**, when doors **20** are opened, for ease in handling, and the containers can be lifted by their handles **126** off of dollies **19**. When positioned inside cubicle **17**, the dooly **19** transmits the load of trash compaction to the cabinet **16** and floor, without unduly stressing the containers **18**. dolly

Cabinet **16** may be provided with casters **127** to facilitate moving it from place to place.

In one practical embodiment of the invention, the lazy tongs **44** of the ram extension mechanism **32** are capable of a total extension of **26** inches and when fully retracted occupy a height of only **6** inches. The ram can exert a pressure of 5,000 pounds at maximum extension and will typically compress trash to one-fifth of its uncompressed volume. The lazy tongs move the ram platen relatively quickly near the beginning of extension movement and the end of retraction movement. However, near maximum extension the ram platen moves relatively slowly and the lazy tongs have increased mechanical advantage for increased pressure of the ram on the trash.

Partition wall **25** cannot completely close off the motor way **34** from the shuttle way **31** because bridge **33** extends between the two. Accordingly, wall **25** terminates at top edge **130** thereof (FIG. **6**). In order to complete the closure between motor way **34** and shuttle way **31**, bridge **33** carries two flexible panel strips **131**, usually plastic or fiberglass, which extend longitudinally of the cabinet and span across the gap between the top edge **130** of wall **25** and the panel top **23** of the cabinet. These strips **131** are supported edgewise in tracks **132** formed in the top **130** of wall **25**.

As best shown in FIGS. **3** and **5**, curved guides **133** are formed at the end walls of the cabinet, and a shield way **134** is formed at the cabinet ends. Accordingly, as the traveling bridge **33** moves to the left in FIG. **3**, flexible shield strip **131** will follow curved guide **133** and will enter shield way **134** at that end of cabinet **16**, as the other shield strip **131** is pulled out of shield way **134** at the other end of cabinet **16** and is straightened out to maintain closure between the shuttle way **31** and motor way **34**. Conversely, as bridge **33** moves to the right in FIG. **3**, the shield **131** at the right moves into stored position in shield way **134** as shown in FIG. **5**,

and the shield **131** at the left is withdrawn from storage and maintains closure between the motor way **34** and shuttle way **31** at the left of the bridge **33.**

Accordingly, the flexible shields **131** prevent trash from entering the motor way **34,** regardless of the position of the bridge **33.** The shields **131** are long enough to close the gap between the motor way **34** and a shuttle way **31** in all positions of bridge **33,** and the shield storage ways **134** are long enough to store the retracted shield **131** at the ends of the shuttling movement of the bridge **33.**

FIG. **9** also illustrates switch **137** which has an actuating arm **138** extending into the path of horizontal movement of one of the end rollers **42** of the lazy tong extension mechanism. When the lazy tongs are completely extended, the yokes **43** approach each and switch actuator **138** will be engaged by roller **42,** thus to actuate switch **137** and reverse the ram actuating motor **27** to withdraw the ram from the container.

FIG. **8** shows another ram control switch **139** mounted on one of the tracks **41** of the traveling bridge **33.** Switch **139** has an actuating arm **140** which extends into the path of movement of the protruding end of the inside torque arm **53.** Actuating arm **140** is engaged when the extension mechanism is completely retracted. Switch **139** is in the circuit to the motor **27** to stop the motor when the ram is fully retracted.

FIG. **10** illustrates how the bridge **33** and the ram assembly **32** and motor **27** attached thereto can be removed as a unit endwise from the cabinet **16.** The tracks **35, 36** extend to the extreme ends of the top margins of the cabinet **16.** The cabinet includes a frame indicated generally by reference character **142.** A cross brace **143** which is part of the frame is attached thereto by bolts **144.** Accordingly, it may be removed from the frame to open up an exit port **145** so that the bridge **33** and all parts connected thereto may be withdrawn endwise from the cabinet **16.** Prior to such removal, the cabinet top **23** is removed and the electrical wiring to the motor **27,** cable connections **86, 88,** etc., are disconnected. This arrangement facilitates repair or replacement of the ram assembly, motor, etc.

I claim:

1. A top loading trash compactor comprising a low profile cabinet having two cubicles for trash containers therein, a cabinet top with two trash loading hatchways therein, one for each cubicle, said top being spaced above the containers to provide a ram shuttle way below the top and above the containers, a single ram, means mounting said ram in said shuttle way for shuttling movement from one cubicle to the other whereby when the ram is in one cubicle it is clear of the other cubicle to permit loading of trash into said other cubicle through its said hatchway, said ram having a ram platen and means for extending the ram platen deep into a trash container for compaction of trash therein and retracting said ram platen above the level of the container top and into said shuttle way for clearance of said containers during shuttling movement of said ram, and hatch cover means to close the hatchway above one cubicle in which the ram is working and open the hatchway above the other cubicle and permit trash loading into said other cubicle concurrently with ram operation in the one cubicle.

2. The compactor of claim **1** in which said hatch cover means comprises a shield over said ram and movable therewith.

3. The compactor of claim **2** in combination with power means to move the ram along said shuttle way, and control means for said power means responsive to engagement of said hatch cover panel with an obstruction to disengage said power means in the event of such engagement.

4. The compactor of claim **3** in which said control means comprises a switch, a switch actuator on the shield and a yieldable mounting for the shield whereby such engagement will cause the shield to yield and engage the switch actuator with the switch and disengage the power means.

5. The compactor of claim **4** in which the yieldable mounting comprises a slide mount for the shield and spring means centering said shield on said slide mount.

6. The compactor of claim **1** in which the means for extending and retracting the ram platen comprises a lazy tong assembly.

7. The compactor of claim **1** in which the means for extending and retracting the ram platen comprises paired laterally spaced lazy tongs, corresponding ends thereof being connected by cross yokes, drive nuts pivotally mounted in said yokes and a drive screw engaged in said nuts, the pivotal mounting of the nuts in the yokes relieving stresses which would otherwise be exerted between the nuts and drive screw in the event of uneven loading on said paired lazy tongs.

8. The compactor of claim **1** in which the means mounting the ram comprises a bridge with a ram motor mounted near one end thereof, said cabinet having a motor way aligned with the motor and within which the motor travels as the ram shuttles from one end of the cabinet to the other, and a flexible shield mounted on the bridge and movable therewith to partition the shuttle way from the motor way in all positions of the bridge.

9. The compactor of claim **8** in which the bridge extends across both the shuttle way and the motor way, said cabinet having tracks extending longitudinally of the cabinet and said bridge having carriages movable along said tracks.

10. The compactor of claim **9** in which the bridge has elongated stabilizer arms on which said carriages are mounted.

11. The compactor of claim **1** in which the bottom of the cabinet is provided with dollies for the containers, each said dolly having a platform directly supporting its container, a floor contacting wheel at the front edge of the dolly, tracks along the cabinet bottom and slides complementary to said tracks along the sides of the dolly platform.

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