United States Patent [19]

Toppins

[11] **3,802,336**

[45] **Apr. 9, 1974**

[54] **REFUSE COMPACTING DEVICE**

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[22] Filed: **Nov. 24, 1972**

[21] Appl. No.: **309,394**

[52] **U.S. Cl.**..... **100/49,** 100/179, 100/269 R, 100/295

[51] **Int. Cl.**..... **B30b 15/16**

[58] **Field of Search**..... 100/295, 179, 269 R, 43, 100/48, 49, 52, 256

[56] **References Cited**

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3,384,007	5/1968	Boje et al.	100/295
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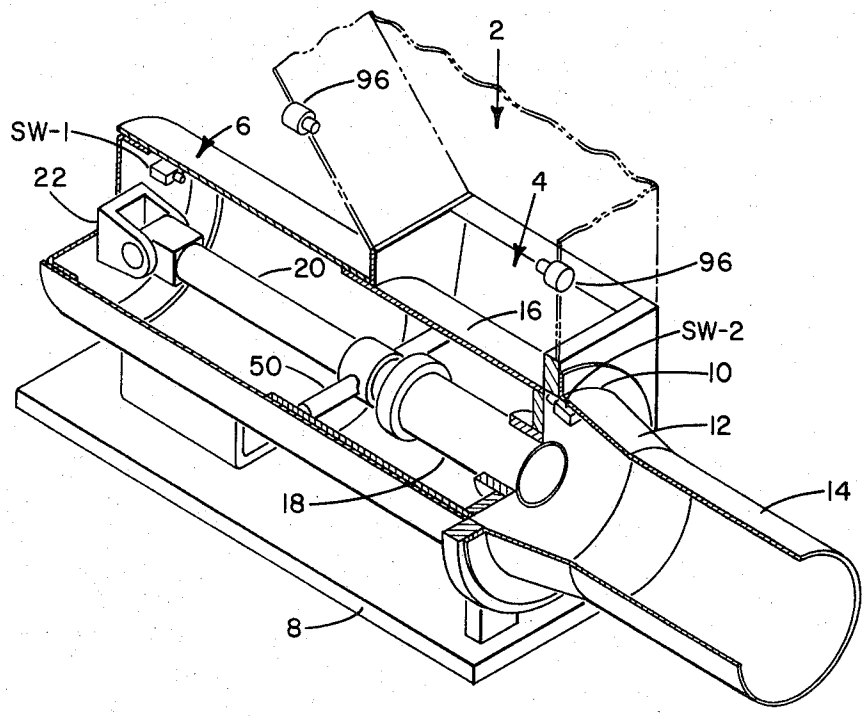
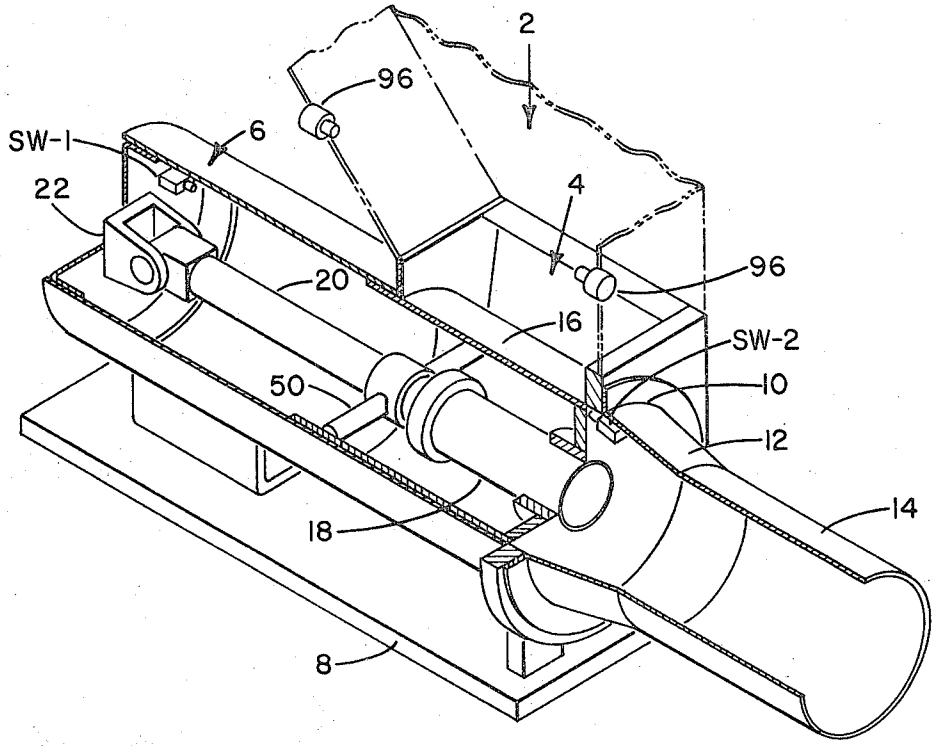
Attorney, Agent, or Firm—Donald F. Daley

[57] **ABSTRACT**

A telescopic fluid cylinder for use in a waste compactor having a rod fixed to the compactor, an intermediate cylinder surrounding the rod and supporting the main ram, an auxiliary ram surrounding the intermediate cylinder and mounted in and movable relative to the main ram. A sequence valve responsive to fluid pressure in the system actuates the auxiliary ram for jam clearing purposes.

2 Claims, 6 Drawing Figures

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96
SW-1
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SW-2
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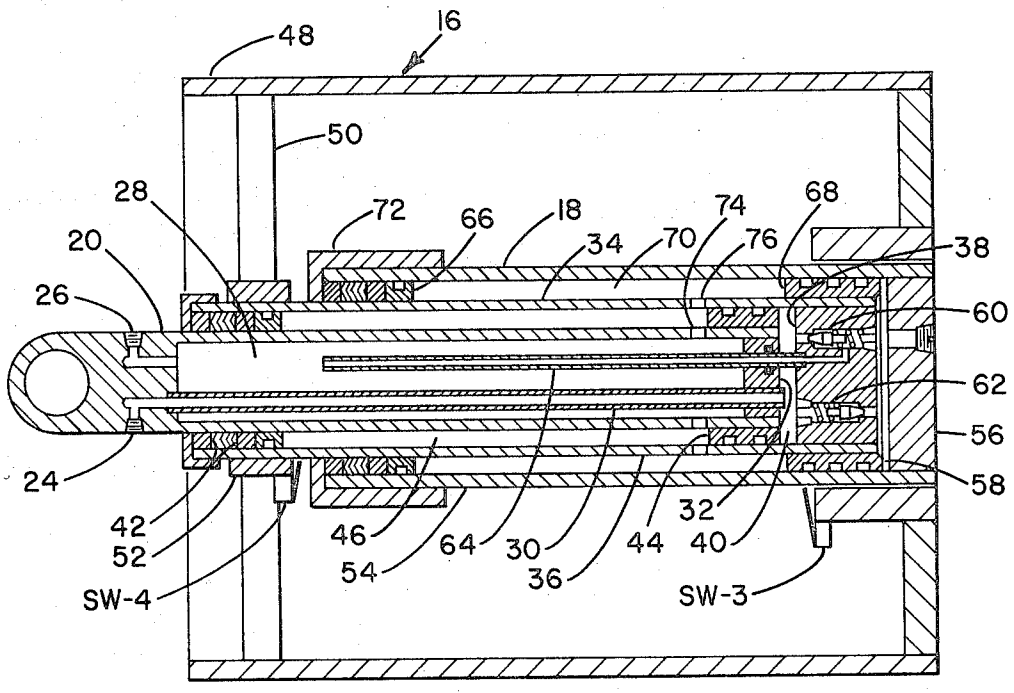
FIG. 1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SW-4
SW-3

FIG. 2

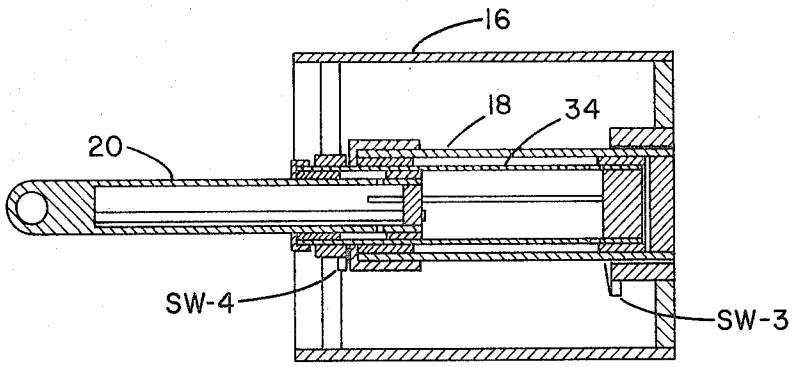

FIG. 3

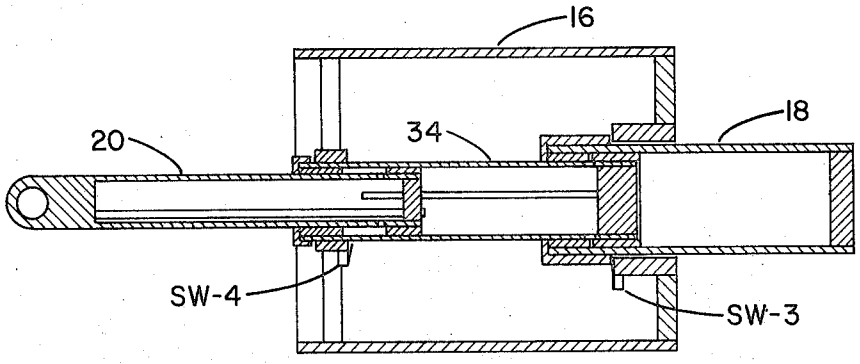

FIG. 4

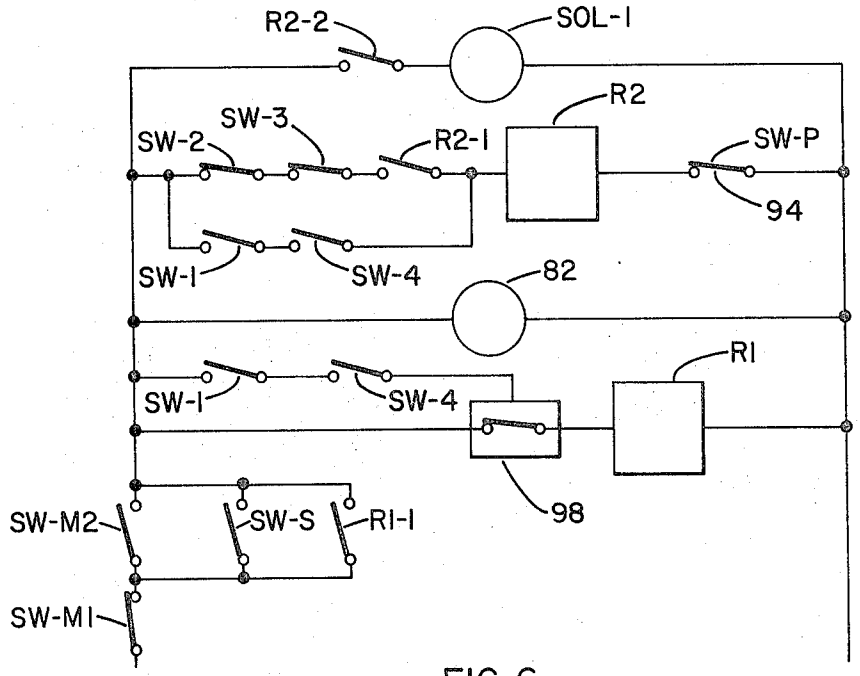

FIG. 6

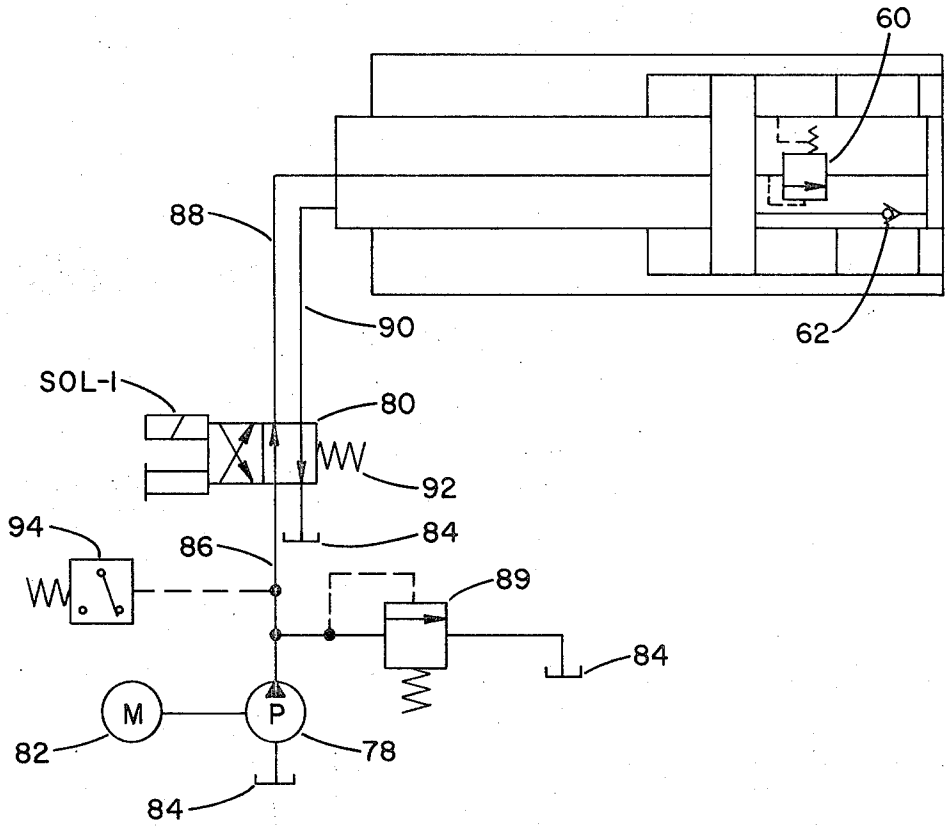

FIG. 5

REFUSE COMPACTING DEVICE

BACKGROUND OF THE INVENTION

This invention relates generally to refuse compacting devices and more specifically, to a fluid power system for use in refuse compacting devices.

Refuse compactions devices of the type using a reciprocating compaction ram generally fall into two categories. The first utilizes a ram to compact refuse into a closed chamber wherein a bale of refuse is ejected from the chamber after compaction by forward movement of the ram into the chamber. This type of compaction device is usually used in large installations where the bales of refuse are loaded into truck bodies or portable containers. Large volumes of refuse can be handled and the available space in the truck body or container can be efficiently utilized. The second type of compaction device ejects a substantially continuous mass of compacted refuse by moving a ram to force refuse through a funnel shaped opening. The pressure of the ram forces the refuse through the funnel causing compaction by extrusion and eventually ejection through the smaller end of the funnel. A device of this type is disclosed in the Boje et al, U.S. Pat. No. 3,384,007, issued May 21, 1968. Machines of this type are utilized for intermittent, unattended operation. A common usage is in residential apartments wherein trash and waste are deposited by tenants into chutes which deposit the trash into a bin which feeds the waste compactor.

In both the closed chamber and funnel type of compactors all types of normal waste material, including cartons and irregular shaped objects are deposited for compaction. The non-uniformity of material results in varying amounts of pressure required to compact the material and force it through the funnel or into the chamber. Occasionally material will jam, resulting in excessive pressure build-up, causing the ram to stall or go through repeated cycling to break up the jam. In the prior art, devices such as the Boje et al, patent cited above, a smaller auxiliary ram concentrically located in the center of the main ram has been used. The main ram is driven forward by a hydraulic cylinder and, upon occurrence of a jam, the small auxiliary ram is forced forward through a separate hydraulic system in an attempt to break up the jam ahead of the main ram. Devices of this type have been successful, however, they increase the cost of the compactor unit, in that they require separate hydraulic systems for each ram and a control system associated therewith. The Boje et al, U.S. Pat. No. 3,384,007, for example, utilizes three separate hydraulic cylinders with valving and control between the cylinders.

The present invention is usable in both closed chamber and funnel type of compactors and eliminates the need for separate hydraulic systems for the main ram and the jam clearing or auxiliary ram while, at the same time, maintaining the operation and function of each ram. One hydraulic system can be used to drive both the main ram for compaction purposes and the auxiliary ram for jam relieving purposes.

SUMMARY OF THE INVENTION

It is an object of this invention to drive a compaction ram and a jam clearing ram in a refuse compactor from a single hydraulic system;

it is also an object of this invention to provide a refuse compaction device with an automatic jam clearing capability by utilizing the jam clearing ram as the hydraulic cylinder in the fluid system used to power the compaction ram;

it is also an object of this invention to reduce the fluid system piping and space requirements in a refuse compactor by telescoping the fluid cylinder used to power the main compaction ram.

These, and other objects of this invention are attained by means of a hydraulic main ram head mounted in a refuse compaction device and having an auxiliary ram mounted in the main ram which serves as part of the fluid cylinder used to drive both the main ram and the auxiliary ram. Fluid pressure sequence valves are incorporated in the fluid system to drive the auxiliary ram when the main ram encounters pressure build-up during compaction of refuse.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be hereinafter more fully described with reference to the accompanying drawings in which:

FIG. **1** is an isometric view of a funnel type refuse compacting device with portions broken away to show internal structure;

FIG. **2** is a cross sectional view of a compaction ram and the fluid cylinders used in the compacting device shown in FIG. **1**;

FIG. **3** is a sectional view of the rams and fluid cylinder of the compactor shown in FIG. **1**, with the main ram in the extended position;

FIG. **4** is a cross sectional view of the rams and fluid cylinders of the compactor shown in FIG. **1**, with the main ram and the auxiliary ram in the extended position;

FIG. **5** is a diagramatic representation of a hydraulic system usable with the present invention;

FIG. **6** is a diagramatic representation of an electrical circuit usable with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention is disclosed herein in a ram and funnel type of refuse compactor. It should be understood that the invention is applicable to any type of compactor which utilizes a main compaction ram and an auxiliary or jam clearing ram.

Referring to the drawings, and specifically to FIGS. **1–4**, there is shown a waste material compactor embodying the present invention. The waste compactor shown in FIG. **1** receives refuse material from a chute **2** wherein waste material is accumulated prior to compaction. The chute deposits refuse or waste material into a compaction chamber **4** enclosed in an elongated casing or body **6**. The compactor assembly is usually mounted on a foundation or base indicated generally as **8**. Waste material deposited in the chute **2** falls into the compaction chamber **4** and is subsequently compressed and forced through an exit opening **10** into a funnel shaped member **12**. The large end of the funnel **12** receives refuse material from the exit opening **10**, and as the material is extruded through the funnel into the smaller end, it is compacted for subsequent disposal. In the end of the funnel **12**, there is a cylindrical tube **14** from which the refuse material is ejected into suitable containers.

Within the casing **6** there is slidably mounted a main compaction ram **16** which is capable of traversing the compaction chamber **4** to force waste material into the funnel **12.** An auxiliary ram **18** is mounted in the center of the main ram **16** and is utilized to clear jammed waste material ahead of the main ram and may also be used to force waste material into and through the funnel **12** at the end of the stroke of the main ram. It is not essential to the operation of the present invention that the auxiliary ram be located in the center of the main ram. Particularly in compactors of the type wherein the ram is not cylindrical, it may be desirable to locate the auxiliary ram in a position other than the center of the main ram. Heretofore, compactors of this type have utilized separate hydraulic cylinders to drive the main ram and the auxiliary ram. In the present invention the auxiliary ram comprises the cylinder portion of the hydraulic system used to drive both the main ram and the auxiliary ram. The main ram, the auxiliary ram, the piston rod and an intermediate section all telescope together to provide a compact unitary fluid power system to drive the rams through the compaction chamber.

The internal structure of the hydraulic system and of the auxiliary ram can be seen in the sectional views of FIGS. **2–4.** A fixed rod **20** which serves as a hydraulic piston and as a fluid line is secured to the rear of the casings **6** by means of a pivotal connecting bracket **22.** The rod **20** has a pair of hydraulic ports **24** and **26.** The port **24** is the fluid inlet port for the extend mode of operation and the port **26** is the drain port in the extend mode. In the return mode of operation the port **26** becomes the inlet port and the port **24** becomes the drain port. In each mode of operation the inlet port is connected to high pressure fluid and the drain port is connected to a fluid reservoir tank. The rod **20** has a hollow interior which forms a fluid passage chamber **28.** The fluid passage chamber is connected to the port **26** while a fluid line **30** is connected to the port **24** and extends through the passage chamber **28** and through the head end **32** of the rod **20.**

An intermediate section **34** of tubular shape surrounds the rod **20** and serves as a hydraulic cylinder relative to the piston function of the rod **20.** The intermediate section **34** is comprised of a cylindrical shell **36** and a head **38** which hydraulically seals the forward end of the cylinder. The fluid line **30** is opened to a chamber **40** formed between the head **38** of the intermediate section and the head **32** of the rod **20.** There are sealing rings or bushings **42** at the rear of the intermediate section **34** and sealing rings **44** at the forward end of the rod **20** which serve to hydraulically seal the fluid in the chamber **40** and in an intermediate expansion chamber **46** formed between the interior surface of the intermediate section **34** and the outside surface of the rod **20.** Sealing rings or bushings **42** and **44** also serve to guide the movement of the intermediate section **34** relative to the rod **20.** The sealing rings **42** are secured to the inside of the intermediate section **34** while the sealing rings **44** are secured to the outside of the rod **20.**

The shell **48** of the main ram **16** is secured to the intermediate section **34** by means of a rigid connecting rod **50.** The means of connecting the intermediate section **34** to the main packer ram **16** is illustrative only. Any suitable rigid connection may be used. As shown herein, however, the rod **50** is connected to the inside of the shell **48** and to a connector ring **52** secured about the outer surface of the intermediate section **34** at the rearward portion thereof. Linear movement of the intermediate section **34** will produce a corresponding movement in the main packer ram **16** by means of the connecting rod **50.**

The auxiliary packer ram **18** is concentrically mounted about the intermediate section **34** and comprises an outer shell or casing **54** and a compaction head **56.** The compaction head **56** and the intermediate section head **38** form an expansion chamber **58** within the inner diameter of the auxiliary ram **18.** The intermediate section head **38** has a sequence valve **60** and a check valve **62** interconnecting the expansion chambers **40, 58.** The operation of the sequence valve **60** and the check valve **62** will be described in more detail below. A fluid drain line **64** extends from the sequence valve **60** through the rod head **32** to the passage chamber **28.** The line **64** is mounted for sliding movement at the point where it passes through the head **32.** The line **64** is of a length sufficient to allow the end of the line to be in the chamber **28** when the compactor is in the fully extended position. The outer surface of the intermediate section **34** forms one wall of a third expansion chamber **70** between the intermediate section **34** and the auxiliary packer ram **18.** Chamber **70** is sealed by a sealing ring or bushing **66** secured to the rear inner wall of the auxiliary ram **18** and a bushing or sealing ring **68** secured to the outer forward surface of the intermediate section **34.**

When the compactor is functioning in the extend mode of operation high pressure fluid is admitted through the port **24** through the line **30** to the expansion chamber **40.** The expansion chamber **40** is essentially the head end of the hydraulic cylinder. The high pressure fluid acts against the inside of the head **38** of the intermediate section or cylinder **34** and against the head **32** of the rod **20.** Since the rod **20** is fixed at bracket **22** the intermediate cylinder **34** advances to the right, as seen in FIG. **3.** The intermediate section or cylinder **34** carries the main packer ram **16** and the auxiliary ram **18** forward until the position shown in FIGS. **1** and **3** is reached. That is, the main ram traverses the compaction chamber **4** forcing refuse forward through the funnel **12.** If the refuse ahead of the main compaction ram jams, causing the main ram to stall, the pressure in chamber **40** will increase until the actuating pressure of sequence valve **60** is reached. The sequence valve **60** is set for a predetermined pressure which, when encountered in the chamber **40,** will allow the fluid to pass through the head **38** of the intermediate cylinder. High pressure fluid passing through the sequence valve **60** into the expansion chamber **58** forces the auxiliary ram **18** forward ahead of the main ram **16.** At this point the intermediate cylinder **34** acts as a piston relative to the auxiliary ram **18.** The intermediate section **34** remains stationary and the auxiliary ram **18** is forced forward by the action of the high pressure fluid in the chamber **58.** The auxiliary ram will move forward into the jammed refuse material clearing the jam and forcing part of the refuse material forward into the funnel **12.** Forward movement of the auxiliary ram continues until the retaining ring **72** on the rear of the auxiliary ram **18** triggers a limit switch SW-3 mounted on the inside of the head of the main ram **16.** Actuation of the limit switch SW-3 will cause the high pressure fluid to be switched to the port **26** and the port **24** will be switched to a low pressure reservoir, all as

explained in detail below with respect to the operation of the circuit and hydraulic diagrams.

With the port **24** connected to the reservoir, the pressure in chamber **40** drops allowing sequence valve **60** to close. High pressure fluid entering port **26** provides pressure to the passage chamber **28.** The high pressure in the passage chamber **28** passes through a port **74** extending between the passage chamber **28** and the expansion chamber **46** between the rod **20** and the intermediate cylinder **34.** High pressure fluid in the expansion chamber **46** acts on the bearings or seals **42, 44,** causing the intermediate cylinder **34** to be moved in the rearward direction. The high pressure fluid acting on the smaller surfaces of the bearings **42, 44,** is sufficient to overcome the low pressure fluid in chamber **40** acting on the end of the rod **20** and the inside of the head **38.** As the cylinder **34** moves in a rearward direction, the chamber **40** decreases in size and fluid in the chamber **40** is forced through the line **30** out the port **24** to the reservoir. The high pressure fluid in the passage chamber **28** passes through the fluid line **64** to the sequence valve **60** assuring that the sequence valve **60** closes at the same time the switch SW-3 is closed.

The rearward movement of the intermediate cylinder **34** causes the main ram **16** to be withdrawn back through the compaction chamber **4** to its original or starting position. In addition, the rearward movement of the intermediate cylinder **34** moves a port **76** into open flow relationship with the expansion chamber **46.** The port **76** is in the outer wall of the intermediate cylinder **34** and provides a fluid opening between the expansion chamber **46** and the expansion chamber **70** formed between the outer surface of the intermediate cylinder **34** and the inner surface of the auxiliary ram **18.** High pressure fluid in the chamber **70** acts against the bearings **66, 68** to produce rearward movement of the auxiliary ram **18.** Here again, the action of the high pressure fluid against the surfaces of the bearings **66, 68** is sufficient to overcome the action of the fluid in the expansion chamber **58** acting on the head **38** of the intermediate cylinder and the head **56** of the auxiliary ram. The fluid pressure build-up in the chamber **58** by the rearward movement of the auxiliary ram **18** is released through the one-way check valve **62** to the chamber **40** to the fluid line **30** and the port **24.** The high pressure fluid in the chamber **70** continues to move the auxiliary ram rearward until the auxiliary ram is again positioned inside the main ram, as shown in FIG. **2.** The compactor is then in position to be recycled for further compaction of the material in the compaction chamber **4.**

OPERATION

The operation of the compactor shown in FIGS. **1–5** will be described with reference to the hydraulic system and the electrical circuitry shown in FIGS. **5, 6** respectively. The passage chamber **28** and the fluid line **30** of the hydraulic cylinder rod **20** are connected to a fluid pump **78** through a hydraulic four-way directional valve **80.** The pump **78** is driven by a motor **82** and pumps fluid from a reservoir **84** through line **86** to the four-way directional valve **80.** A hydraulic line **88** connects the four-way directional valve to the fluid line **30** of the rod **20** and a hydraulic line **90** connects the four-way valve to the passage chamber **28** in the rod **20.** A system relief valve **89** is provided in the line **86** to prevent excessive pressure build-up in the system.

A spring **92** holds the four-way directional valve in a straight through position wherein the pump **78** pumps fluid through the line **86,** through the four-way directional valve to the line **88** leading to the fluid line **30** of the rod **20.** In this position fluid is free to move from the expansion chambers **46, 70** through line **90,** through the four-way directional valve **80** back to the reservoir **84.** A solenoid sol-**1** has its plunger connected to the four-way directional valve **80** to actuate the valve to a position wherein fluid from the pump **78** will pass through the line **86** to the four-way directional valve, through the four-way directional valve to line **90** leading to the passage chamber **28.** Hydraulic fluid in the expansion chambers **40, 58** is free to move through the fluid line **30,** through the line **88,** through the four-way directional valve **80** back to the reservoir **84.** A pressure switch **94** is mounted in line **86** or **90** to respond to excess pressure in the system to disconnect solenoid sol-**1,** allowing the spring **92** to reverse the position of the four-way directional valve.

A light or sonic sensing switch **96** is mounted in the hopper **2** to detect the presence of refuse in the hopper and initiate operation of the compactor. The switch **96** has contacts SW-s mounted in the main power line to the compactor. When the light or sonic beam is broken, the contacts SW-s close, energizing the compacting circuit. A master switch SW-M1 is also mounted in the main power line to the compactor so that the entire compactor may be shut down to prevent operation at any time. The master switch SW-M1 must be closed prior to operation of the compactor. A manual switch SW-M2 is mounted in the compactor circuit in parallel with the contacts SW-s of the sensing switch **96,** to allow manual operation of the compactor. In the event there is insufficient refuse in the hopper **2** to actuate the sensing switch **96,** the compactor may be operated by manually closing the switch SW-M2.

Closing of the contacts of the sensing switch SW-s or the manual switch SW-M2, energizes the circuit and provides power through a counter **98** to a relay R1. The relay R1 has a set of normally open contacts R1-1 which are in parallel with the contacts of the sensing switch SW-s and the manual switch SW-M2 and which provide a holding circuit for the relay R1. Operation of the compactor allows the refuse in the hopper **2** to be depleted and the beam of switch **96** to be restored. The contacts SW-s are normally open, cutting off power to the compactor circuit. The holding circuit and the contacts R1-1 maintain power to the circuit throughout the cycle of operation. The counter **98** can be set to allow a predetermined number of cycles of operation prior to de-energizing relay R1 which, in turn, opens contacts R1-1 to shut down the compactor. The counter **98** is pulsed by sets of contacts to switches SW-1 and SW-4. The switch SW-1 is a limit switch located on the inside of the casing **6** at a position to be actuated by the return movement of the main ram **16.** The switch SW-4 is located on the intermediate cylinder **34** and is actuated by the auxiliary ram **18.** Both SW-1 and SW-4 must be closed to pulse counter **98,** therefore, both the main ram and the auxiliary ram must be in the start of cycle position withdrawn from the compaction chamber. If, for example, it is determined that the hopper **2** and the compaction chamber **4** hold approximately five times the volume of the compaction chamber, then the counter would be set to operate five cycles each time the sensing switch **96** is in-

terrupted. Each time that the main ram **16** and the auxiliary ram **18** return to their retracted position they would actuate switches SW-1 and SW-4 pulsing the counter **98.**

Closing of the sensing switch SW-s also energizes the motor **82** and provides power to a second relay R2 through a second set of contacts to switch SW-1. The line to relay R2 also has two sets of normally closed contacts for a second limit switch SW-2 and a third limit switch SW-3 mounted in series with the relay R2 and in parallel to the contacts of limit switch SW-1. The limit switch SW-2 is mounted in the compaction chamber **4** in a position to be actuated by the main ram head at the end of the compaction stroke.

Relay R2 has two sets of contacts, the first set R2-1 being normally open and mounted in the line to relay R2 parallel to contacts of switch SW-1. Contacts R2-1 provide a holding circuit for the relay R2. A second set of contacts R2-2 for the relay R2 are also normally open and control the power to the solenoid sol-1.

Prior to operation, main ram **16** is in the retracted position shown in FIG. 2 and the switches SW-1 and SW-4 are held in a closed position. When refuse is accumulated in the hopper **2** the circuit to the switch **96** is interrupted and the normally open contacts SW-s are closed, energizing relay R1 and providing the holding circuit through contacts R1-1. The motor **82** is energized, driving pump **78** to provide high pressure fluid to the system from reservoir **84.** With the switch SW-1 in a closed position, the relay R2 is energized, closing the holding circuit through contacts R2-1 and the circuit to solenoid sol-1 through contacts R2-2. With the solenoid energized, the four-way directional valve **80** is moved to the position wherein high pressure hydraulic fluid is supplied to the fluid line **30** and to expansion chamber **40.** Fluid in the expansion chamber **40** forces the intermediate cylinder **34** forward carrying the main ram **16** through the compaction chamber. Forward movement of the main ram **16** releases the switch SW-1 allowing the contacts of switch SW-1 to return to their normally open positions. The solenoid sol-1 continues to be energized by means of power through contacts SW-2, SW-3 and R2-1 to relay R2 and through contacts R2-2 to the solenoid sol-1. When the main ram **16** advances through the compaction cycle to the position shown in FIG. **1,** the switch SW-2 is actuated and the normally closed contacts SW-2 are open, breaking the circuit to relay R2. De-energization of relay R2 allows the contacts R2-2 to open, de-energizing solenoid sol-1. The four-way directional valve **80** is then moved under the action of the spring **92** to the position wherein high pressure fluid is supplied from the pump **78** to the passage chamber **28,** through line **90.** Pressure in the passage chamber **28** and the expansion chamber **46** between the outer surface of the rod **20** and the inner surface of the intermediate cylinder **34,** causes the intermediate cylinder **34** to move back towards the retracted position. Release of the switch SW-2 allows the contacts SW-2 to revert to their normally closed position, however, the contacts R2-1 are now in an open position since relay R2 has been de-energized. When the main ram **16** is in the fully retracted position, it actuates limit switch SW-1, again pulsing the counter through the closed contacts of switch SW-4. If the preset number of cycles has been completed, the counter **98** will de-energize relay R1 cutting off the entire circuit. However, if the counter has not reached the preset number then the second set of contacts to the switch SW-1 which also closed, re-energizes relay R2, repeating the compacting cycle.

In the event that the full compaction cycle cannot be completed because of excess resistance ahead of the ram, then the fluid pressure in the system will increase until sufficient pressure is reached to actuate the sequence valve **60.** The sequence valve **60** allows fluid from the expansion chamber **40** to pass through the head **38** of the intermediate cylinder **34** to the expansion chamber **58.** The fluid in the expansion chamber **58** will move the auxiliary ram **18** forward ahead of the main ram **16,** breaking up the refuse jam.

When the auxiliary ram **18** has moved forward through its full cycle, the limit switch SW-3 is actuated by the rear portion of the casing of the auxiliary ram **18.** Actuation of the switch SW-3 opens the circuit to the relay R2 which de-energizes the solenoid sol-1 in the same manner as described for the actuation of the switch SW-2. De-energization of the solenoid sol-1 allows the four-way directional valve **80** to move to the position wherein high pressure fluid is provided to the passage chamber **28** causing the intermediate cylinder **34** to move rearward under the action of high pressure fluid entering the expansion chamber **46** through the port **74.** When the intermediate cylinder **34** and the main ram **16** have moved to their original start cycle positions, the switch SW-1 is actuated and high pressure fluid in the expansion chamber **46** passes through port **76** to the expansion chamber **70.** At this time, the cycle is not re-energized since the switch SW-4 has not been actuated and a set of contacts to switch SW-4 mounted in parallel to the contacts of switch SW-1 which energized the relay R2, remain open. When the auxiliary ram has also returned to its fully retracted position, both switches SW-1 and SW-4 are closed, pulsing counter **98** and re-energizing the relay R2. If the counter **98** has not completed its full number of cycles, the relay R1 will continue to hold the circuit closed, allowing another cycle of operations.

In the event that the full compaction cycle cannot be completed and the jam ahead of the auxiliary ram provides sufficient pressure to prevent forward movement through the full cycle of the auxiliary ram, then the pressure build-up in the system will increase until sufficient pressure is reached to actuate a pressure switch **94.** The pressure switch **94** is located in the electrical circuit to the relay R2 and when actuated will open its normally closed contacts, de-energizing the relay R2 and the solenoid sol-1. When this situation is reached prior to the completion of the compaction cycle, the spring **92** moves the four-way directional valve **80** to the return stroke position, thus, the main ram **16** and the auxiliary ram **18** will return to the original retracted position and actuate switches SW-1 and SW-4 to initiate a complete new cycle of operation.

Having thus described the invention relative to the preferred embodiment disclosed, it is understood that various changes may be made by one skilled in the art, without departing from the spirit and scope of the invention.

I claim:

1. A telescopic fluid operated ram for use in a waste compacting device of the type wherein waste material is compressed by ram type members in a compaction chamber including:

a packer ram mounted in the waste compacting device for reciprocating movement through the compaction chamber;

an auxiliary ram concentrically mounted in the packer ram for reciprocating movement relative to the packer ram;

an intermediate cylinder telescopically mounted in the auxiliary ram and secured to the packer ram for movement with the packer ram;

a rod member secured at one end and extending into the intermediate cylinder in a piston-like relationship;

means to provide pressurized fluid between the rod and the intermediate cylinder to drive the intermediate cylinder and the main packer ram forward through the compaction chamber; and

means responsive to the fluid pressure to pass fluid between the intermediate cylinder and the auxiliary ram upon detection of a predetermined fluid pressure to thereby move the auxiliary ram relative to the packer ram.

2. In a waste material compacting device of the type utilizing reciprocating rams to compress waste material, a compaction system including:

a packer ram reciprocably movable through a compaction chamber and having a packer head and extending rearwardly from the head;

an auxiliary ram mounted in the body of the packer ram and extending through the head thereof for reciprocating movement relative to the packer ram;

said auxiliary ram having a packing head and a hollow, rearwardly extending body;

an intermediate hollow cylinder mounted in the auxiliary ram and having a cylinder head and a body with an outside diameter smaller than the inside diameter of the auxiliary ram;

seals mounted on the intermediate cylinder in contact with the auxiliary ram body to form a first expansion chamber between the intermediate cylinder head and the auxiliary ram head;

seals mounted on the inside of the auxiliary ram body in contact with the intermediate cylinder to form a second expansion chamber between the intermediate cylinder body and the auxiliary ram body;

a piston rod fixed at one end and extending into the intermediate cylinder and having a diameter smaller than the inside diameter of the intermediate cylinder;

seals mounted on the rod in contact with the intermediate cylinder body to form a third expansion chamber between the rod and the intermediate cylinder head;

seals mounted on the inside of the intermediate cylinder body in contact with the rod to form a fourth expansion chamber between the rod and the intermediate cylinder body;

means connecting said intermediate cylinder to the main ram for movement therewith;

a fluid supply system including a fluid passage chamber and a pressurized fluid source;

means connecting the fluid system to the third expansion chamber;

means responsive to fluid pressure in third expansion chamber to pass fluid under pressure from the third expansion chamber to the first expansion chamber;

means connecting the fourth expansion chamber to the fluid system and the second expansion chamber to the fourth expansion chamber;

means to allow passage of fluid from the first expansion chamber to third expansion chamber when the pressure in the third expansion chamber is lower than the pressure in the first expansion chamber; and

means to alternately connect the pressurized fluid source to the means connecting the third expansion chamber to the fluid system and the means connecting the fourth expansion chamber to the fluid system to thereby alternately provide pressurizing fluid to the third and first expansion chambers for forward movement of the packer ram and the auxiliary ram, and to the fourth and second expansion chambers for rearward movement of the packer ram and auxiliary ram.

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