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Schuerman et al.

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[54] COMPACTOR CYCLE CONTROL

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[52] **U.S. Cl.** **307/112,** 100/52

[51] **Int. Cl.** **H02b 1/24**

[58] **Field of Search** ..... 100/52, 53, 50; 307/116, 307/117, 112, 149, 119, 120, 92; 318/207 A, 207 C, 207 R

[56] **References Cited**

UNITED STATES PATENTS

3,720,844 3/1973 Sahs 307/112

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Attorney, Agent, or Firm—Biebel, French & Bugg

[57] **ABSTRACT**

A compacting machine has a reversible motor drive for a ram movable in a compacting stroke and a retracting stroke. Directional controls prepare the drive for a compacting stroke when the ram is at its fully retracted starting position and prepare the drive dor a retracting stroke as soon as the ram leaves the starting position. A cycle ending switch is momentarily actuated as the ram nears the end of its retracting stroke to cut off power from the drive before the directional switch is reversed at the starting position in preparation for the next operating cycle.

6 Claims, 4 Drawing Figures

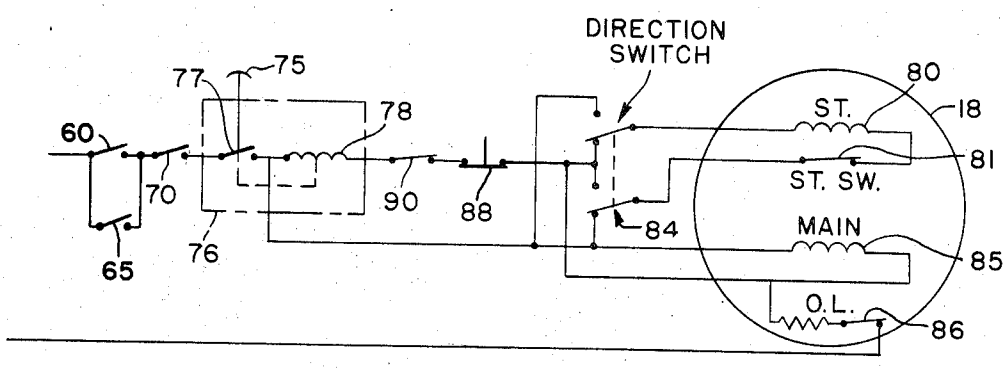


FIG-1

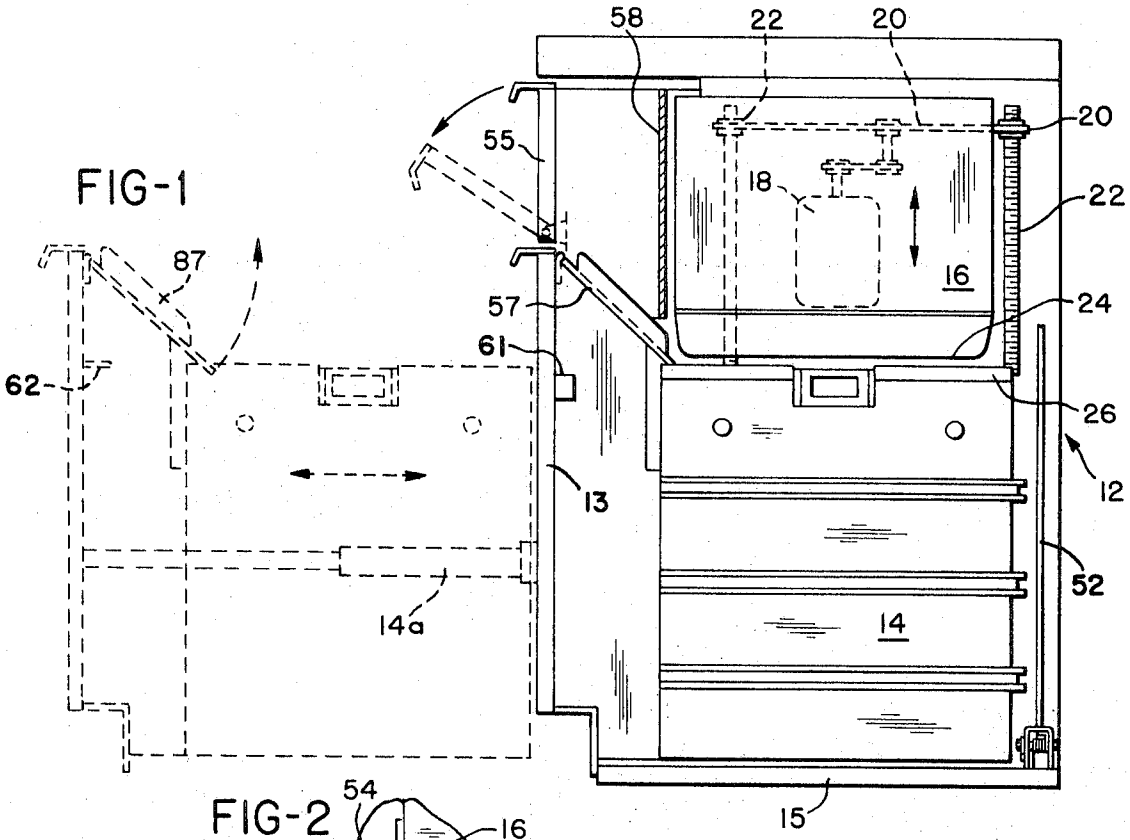


FIG-2

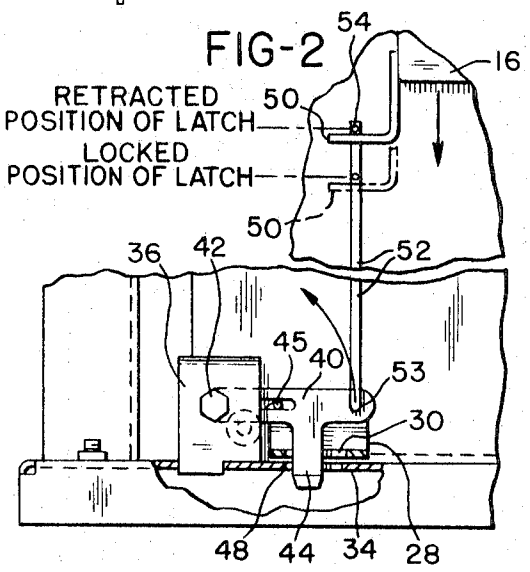


FIG-4

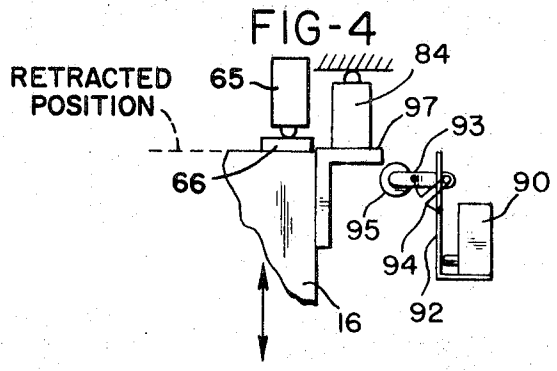
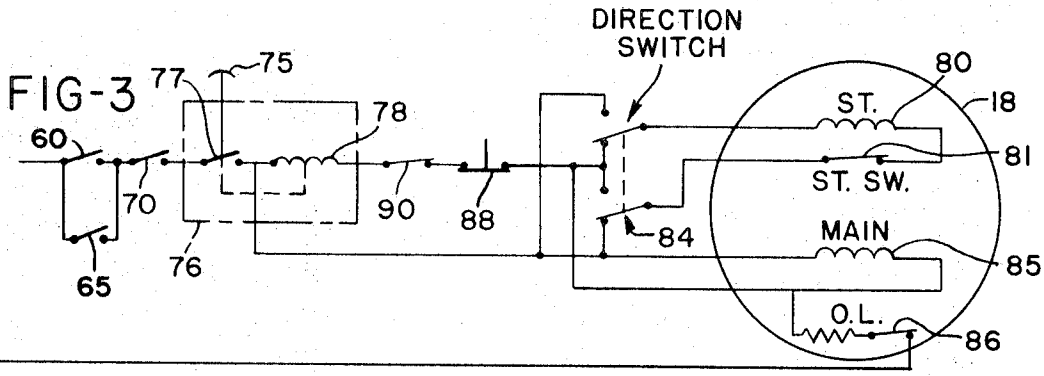


FIG-3



COMPACTOR CYCLE CONTROL

CROSS REFERENCE TO RELATED APPLICATIONS

This application is related to copending U.S. application Ser. No. 224,897, filed Feb. 9, 1972, entitled COMPACTOR, and U.S. application Ser. No. 279,985, filed concurrently herewith, entitled COMPACTOR INTERLOCK CONTROL, both assigned to the assignee of this application.

BACKGROUND OF THE INVENTION

This invention relates to trash compacting machines and the like, and particularly to the controls for a reversible electric motor driving a compacting ram in such a machine. A number of such machines have controls provided with a limit switch which is opened in response to movement of the ram into its fully retracted or withdrawn position. Opening of the limit switch terminates the power supply to the motor, which in turn stops the ram motion. Typically, the limit switch is in a holding circuit for the motor power supply.

Upon starting the next operating cycle it is necessary to hold the starting circuit energized until the ram has advanced sufficiently to allow the limit switch to close. Such controls are shown, for example, in U.S. Pat. No. 3,204,550 of Sept. 7, 1965, No. 3,232,220 of Feb. 1, 1966, No. 3,543,676 of Dec. 1, 1970, and No. 3,613,560 of Oct. 19, 1971.

SUMMARY OF THE INVENTION

A control for a reversible electric motor driving the ram of a compactor, includes a starting circuit with a manually operable starting switch that needs to be closed only long enough to energize a holding circuit which continues power supply to the motor. A directional switch is responsive to ram location at its retracted limit, which is also the cycle starting position, and is moved to cause forward (compacting) motor operation only when the ram is at this position. When the ram leaves its starting position the directional switch transfers to reverse or retracting connections preparatory to any slowing of the motor to a speed where its centrifugal starting switch will again close.

A cycle ending switch is located and arranged to respond to ram movement only in the retracting direction and as the ram approaches its starting position, at which time this switch will be actuated momentarily. The cycle ending switch is wired to open the holding circuit when it is momentarily actuated, hence power to the motor is terminated as the ram approaches the starting position at the end of the retracting stroke. The ram and motor coast to a stop, by which time the starting position is reached and the directional switch is moved to the forward starting position. The cycle ending switch is again closed. Thus, a momentary closing of the manually operated starting switch will be sufficient to start the motor in the forward or compacting direction.

Safety interlock switches and a key switch are provided to assure the machine can be operated only with the mechanism properly enclosed and protected, and only by authorized persons. The motor circuit includes overload protection and a manually operable stop switch. If any of these switches break the power supply to the motor after a compacting stroke has begun, immediately upon restoration of the power the motor will start in the reverse direction and retract the ram to its starting position.

The principal object of the invention is thus to provide a compacting machine with a control of the above-described type, in which a compacting cycle can be initiated with only a momentary acutation of a starting switch; in which unsafe operation of the machine is prevented; and in which, following stopping of the ram in its compacting stroke for any reason, subsequent ram movement will automatically be in the reverse direction to the starting position.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the compactor showing the receptacle thereof in both its compacting and non-compacting positions;

FIG. 2 is an enlarged view of a portion of the rear of the compactor with some parts broken away to shorten the view;

FIG. 3 is a representation of a wiring diagram of the present invention; and

FIG. 4 illustrates the manner in which the direction switch and cycle ending switch are operated in relation to ram movement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As seen in FIG. 1 of the drawings, the compactor includes an upstanding housing **12** having a reciprocating door **13** behind which a receptacle **14** is located over the base **15.** As shown in FIG. **1,** the receptacle **14** may take the form of a drawer mounted on slides **14***a* between a compacting position fully within the housing **12** and a non-compacting or loading position outwardly of the housing, as shown in dotted lines in FIG. **1.**

A ram **16** is also positioned in the housing and carries a motor **18** which, through a suitable drive chain, drives sprockets **20** to cause the entire ram mounted assembly to move upwardly and downwardly along the stationary jack screws **22.** Preferably, three such jack screws will be utilized, arranged in triangular relationship with two jack screws positioned adjacent the front of the housing and one jack screw positioned centrally adjacent a rear wall of the housing.

Thus, the ram is movable between an inactive or retracted position wherein its lower surface **24** clears an upper edge **26** of the receptacle, permitting the receptacle to be moved outwardly to the noncompacting position where loading and unloading can occur, and a compacting position within said receptacle when the receptacle is fully positioned with the housing **12.**

The drive motor **18** for the ram is provided with a starting and reversing control (FIG. **3**) which will automatically initiate a compacting stroke of the ram, and will cause the ram to retract to its inactive position after some predetermined load is imposed on the motor as it drives the ram in the compacting stroke.

Mounted on a rear surface of the drawer **14,** as seen in FIG. **2,** is an angle shaped strike member **28** having a slot **30** formed through its rearwardly projecting bottom leg **34.** An inverted U-shaped bracket **36** is attached to the housing adjacent the rear thereof and carries a substantially T-shaped latch member **40** rotatably mounted on a bolt **42** extending through the bracket.

The latch member has a downwardly projecting stem **44** receivable in the slot **30.** A spring **45** acts between bracket **36** and latch member **40.** A portion of the base **15** is also provided with a slot **48** which aligns with the slot **30** when the receptacle **14** is in the compacting position.

As seen in FIG. **2,** the ram **16** is provided with an L-shaped bracket **50** projecting to one side thereof and connecting rod **52** has its lower, forwardly bent end **53** rotatably received in an opening formed in latch **40.** The connecting rod is loosely received in an opening formed through the bracket **50** and has its upper end bent at an angle to form a stop member **54.** By properly proportioning the length of the connecting rod **52,** the latch member **40** will be pulled upward about its pivot such that it clears the slot **30** in member **28** when the ram **16** is in its retracted or withdrawn position as shown in FIG. **1.** However, a small initial movement of the ram **16** toward the receptacle will permit the latch to be urged by spring **45** into slots **30** and **48,** locking the receptacle **14** in the compacting position within the housing.

While the receptacle **14** is locked in position during compacting initial movement of the ram, access may still be had to the interior of the compactor through the upper recess door **55.** Waste material, particularly small items such as milk cartons, bottles, cans, etc., can be deposited in the compactor, where they will rest in a small compartment formed by the inclined shelf **57** and the protective wall **58,** until such time as the receptacle **14** is moved outwardly of the housing. This will allow articles laying on shelf **57** to fall into the receptacle **14.** The user, therefore, need not wait until the receptacle is unlocked to deposit material in the compactor, but he is of course protected against injury, etc., during operation of the ram by the wall **58.**

A safety interlock switch **60,** the housing for which is shown at **61,** is mounted inside the front of the housing, as seen in FIG. **1,** and is engaged by a pin **62** when the receptacle **14** is in its compacting position.

A further interlock is provided by the normally closed switch **65** which is wired in parallel with switch **60.** Switch **65** is operated by a bracket **66** (FIG. **4**) carried by ram **16,** and arranged such that the switch is opened when the ram lower surface **24** is slightly below the upper edge **26** of the receptacle, preferably about one inch below this edge. In other words, switch **65** is closed only when the ram has entered, or not yet cleared, the receptacle.

Referring to FIG. **3,** the control system is shown. Interlock switch **60** is closed only when drawer **14** is closed, and it controls all power to the unit together with key switch **70.** Contacts are shown in the position with the drawer open, the ram up, motor stopped, and the key safety switch open. With the key switch **70** operated to close, and the drawer closed, pushing the start button **75** on starting relay **76** will close its contact **77** and energize its coil **78** to seal in the relay. This also applies power to the starting winding **80** of the ram motor **18,** through the motor's centrifugal starting switch **81,** and through the contacts of a directional switch **84.** The power circuit is completed to main winding **85** through the overload protector **86.**

The holding circuit for relay **76** includes its coil **78,** manual stop switch **88** which is normally closed, a normally closed ram-operated switch **90,** and the overload protector **86.** Switch **90** is arranged to be opened momentarily by the ram only when it is nearing the top of its return stroke. Its operating lever **92** has an outwardly extending arm **93** pivoted thereon, normally held by a spring **94** in the extended position as shown. A roller **95** on the arm is in position to engage an arm **97** extending from the ram **16.** On the downward stroke switch **90** is unaffected and remains closed, but on the upwardly retracting stroke the switch is momentarily opened just as the ram approaches its fully retracted position. Directional switch **84** is carried by the ram and is held in the position shown only when the ram is fully up. When the ram is in any other position, the blades of switch **84** transfer to the contacts shown open.

Thus, as power is first applied the motor **18** starts in a direction to lower the ram in a compacting stroke. The motor immediately comes up to speed, since it is under only a slight load, and switch **81** opens and transferring of the contacts of switch **84** has no effect on motor direction. However this change in the direction switch prepares the circuit for reversing the motor as soon as the compaction stroke is resisted enough to slow the motor to a speed where switch **81** closes. The motor immediately reverses, withdrawing the ram, and near the end of the upward stroke switch **90** momentarily opens, deenergizing coil **78** of the starting relay. The motor coasts to a stop past the actuation position of switch **90,** so that it again closes. Switch **84** is moved to the position shown, such that the circuit is ready for the next compacting stroke, just before switch **90** is actuated.

After a compacting stroke begins switch **65** closes, bypassing interlock switch **60** since the ram is now inside the receptacle and latch **40** is engaged. Thereafter, if stop switch **90,** or key switch **70,** is opened, or the motor overload protector **86** opens, the circuit energizing relay **76** will be broken, and the motor will stop. Subsequent operation of the start button **75** will energize the motor to drive the ram upward, provided the appropriate switch contacts are then closed.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A control for a compacting machine having a receptacle for trash material, a ram mounted for compacting movement in a compacting stroke entering said receptacle and an opposite retracting stroke to a retracted starting position, a power supply, a reversible motor connected to drive said ram, a directional switch connected to control the forward and reverse operation of said motor corresponding to the compacting and retracting strokes of said ram, means normally holding said directional switch in its reverse position, and a starting switch connected between said directional switch and said power supply;

the improvement comprising means operated by said ram for moving said directional switch to its forward position only when said ram is at its starting position,

relay means associated with said starting switch and connected to complete a power circuit to said directional switch once said starting switch has been momentarily closed,

a cycle ending switch controlling the connection of said relay means to said power supply,

and means for momentarily actuating said cycle ending switch in response to approach of said ram in its retracting stroke to its starting position to cut off power from said motor before said directional switch is moved at the starting position.

2. A control as defined in claim **1**, said motor having a running winding and a starting winding and a motor speed responsive switch connected between said directional switch and said starting winding, whereby said motor will start and run in the reverse direction at any time said ram is away from its starting position and said speed responsive switch closes due to predetermined slowing of said motor.

3. A control as defined in claim **1**, said means for actuating said cycle ending switch including an operating lever for said cycle ending switch, an arm pivoted to said lever and extending to a location near said starting position, strike means on said ram operative to engage said lever as said ram moves through its compacting and retracting strokes, and resilient means acting between said lever and said arm holding said arm in position to transmit motion from said strike to said lever in the retracting stroke and allowing relative movement between said arm and said lever in the compacting stroke whereby said cycle ending switch is not actuated during the compacting stroke.

4. A control as defined in claim **1**, wherein said motor is an electric motor with a starting winding, a motor speed responsive switch controlling said starting winding, a main winding, and said directional switch is connected to reverse the phasing of said starting winding with respect to said main winding, said relay means including a coil connected in series circuit with said starting switch, said power supply, said cycle ending switch and said main winding, said relay means also having an armature controlled by said coil and effective to hold said starting switch closed when said coil is energized.

5. A control for a trash compacting machine having a ram mounted for movement in a compacting stroke to compact material and an opposite retracting stroke to a retracted starting position, a power supply, a reversible electric motor connected to drive said ram, and including a motor speed responsive switch and a starting winding, a directional switch connected to switch the power supply to said starting winding for forward and reverse operation corresponding to the compacting and retracting strokes of said ram, and a starting circuit connecting said directional switch to said power supply and including a starting switch;

the improvement comprising means operated by said ram for moving said directional switch to its forward position only when said ram is at its starting position,

relay means in said starting circuit connected to maintain power to said directional switch once said starting switch has been momentarily closed,

a cycle ending switch connected in series with said relay means and said power supply,

and means for momentarily opening said cycle ending switch in response to approach of said ram in its retracting stroke to its starting position to terminate power to said relay means as said directional switch is moved at the starting position.

6. A control for a trash compacting machine having a housing and a ram mounted for movement in a forward compacting stroke to compact material and a reverse retracting stroke to a retracted starting position, a power supply, a reversible electric motor connected to drive said ram, a directional switch connected to control the forward and reverse operation of said motor corresponding to the compacting and retracting strokes of said ram, and a starting circuit connecting said directional switch to said power supply and including a starting switch;

the improvement comprising said motor being carried in said ram and means supporting said directional switch on said ram in position to engage a part of said housing to move said directional switch to its forward position only when said ram is at its starting position.

* * * * *