United States Patent [19]

Wise

[11] **3,893,386**

[45] **July 8, 1975**

[54] **BOX BALING MACHINE AND CART**

[75] Inventor: **William P. Wise**, Napoleon, Ohio

[73] Assignee: **Ohio Baler Corporation**, Napoleon, Ohio

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[52] **U.S. Cl.** ..... **100/50;** 100/3; 100/50; 100/53; 100/139; 100/209; 100/229 A; 100/233; 100/282; 214/833

[51] **Int. Cl.** **B30b 15/14**

[58] **Field of Search** ..... 100/295, 229 A, 193, 233, 100/282, 3, 48, 50, 53, 208, 137, 138, 139, 140, 141, 209, 215, 237; 241/29, 164; 53/124 B; 214/83.3

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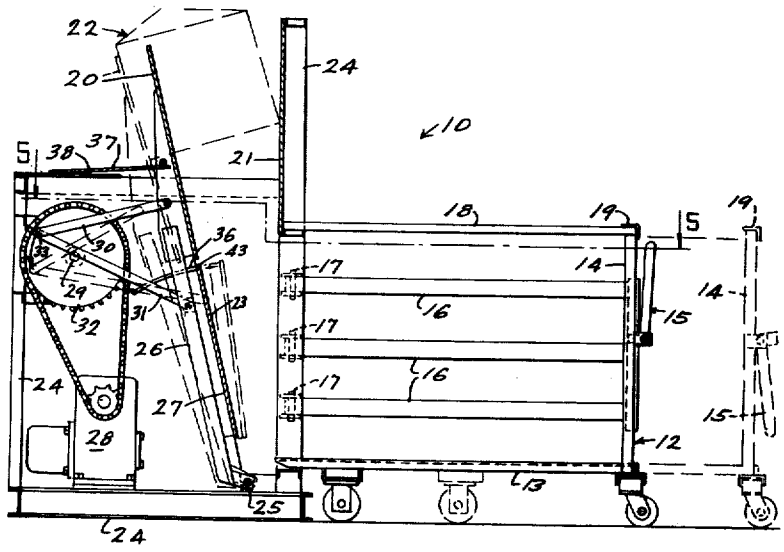
Primary Examiner—Billy J. Wilhite

Attorney, Agent, or Firm—Richard D. Emch; Thomas M. Freiburger

[57] **ABSTRACT**

The invention is a baling machine apparatus particularly suited for baling cardboard boxes and similar objects. The apparatus includes a stationary portion for crushing and compacting and a movable cart attachable thereto for receiving the compacted materials and for transferring them in baled form to a bale storage area. Included in the stationary portion are two pivoted platens, one for crushing the initially loaded boxes against a rigid abutment and another immediately below for compacting the crushed boxes into the cart. The top and sides for the cart are permanently attached to the stationary portion of the apparatus rather than to the cart so that the cart is open during transfer of the baled materials. The platens are linked to an eccentric drive powered by an electric motor.

14 Claims, 6 Drawing Figures



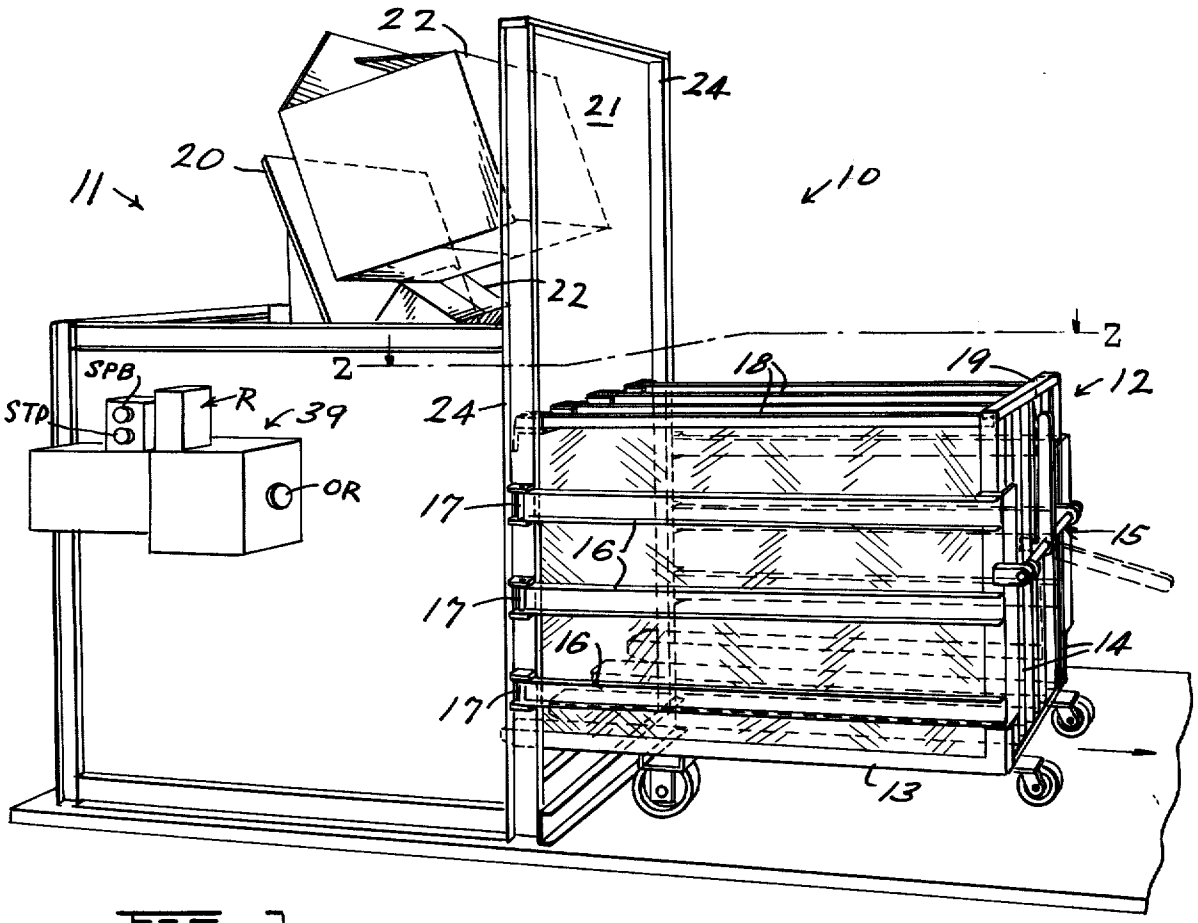

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FIG-1-

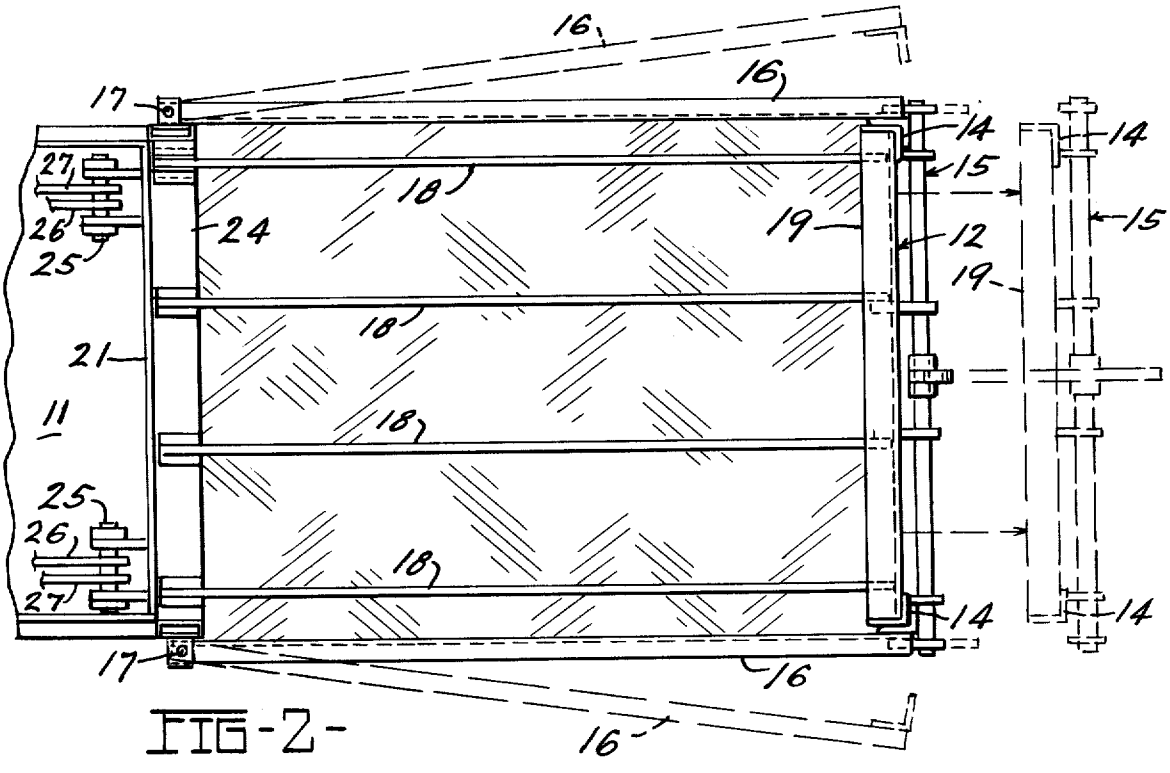

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FIG-2-

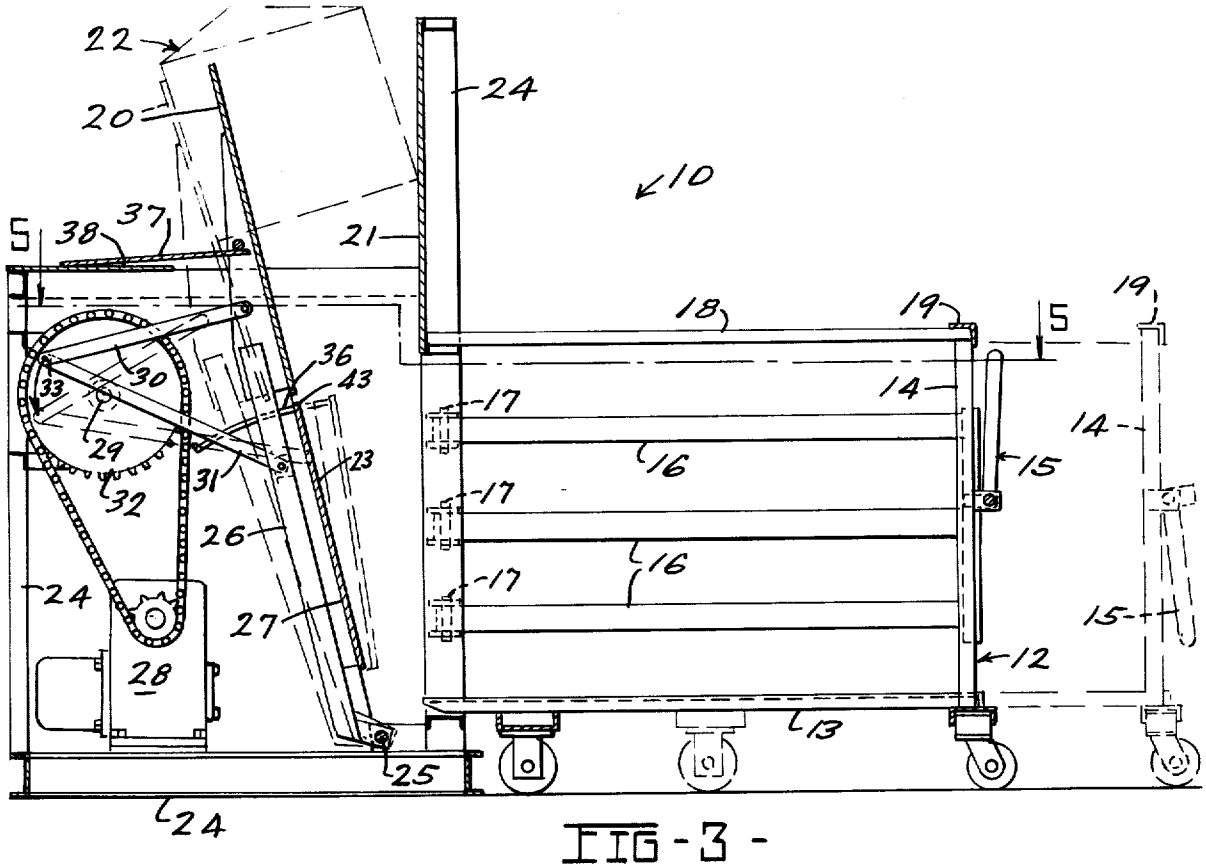

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FIG-3-

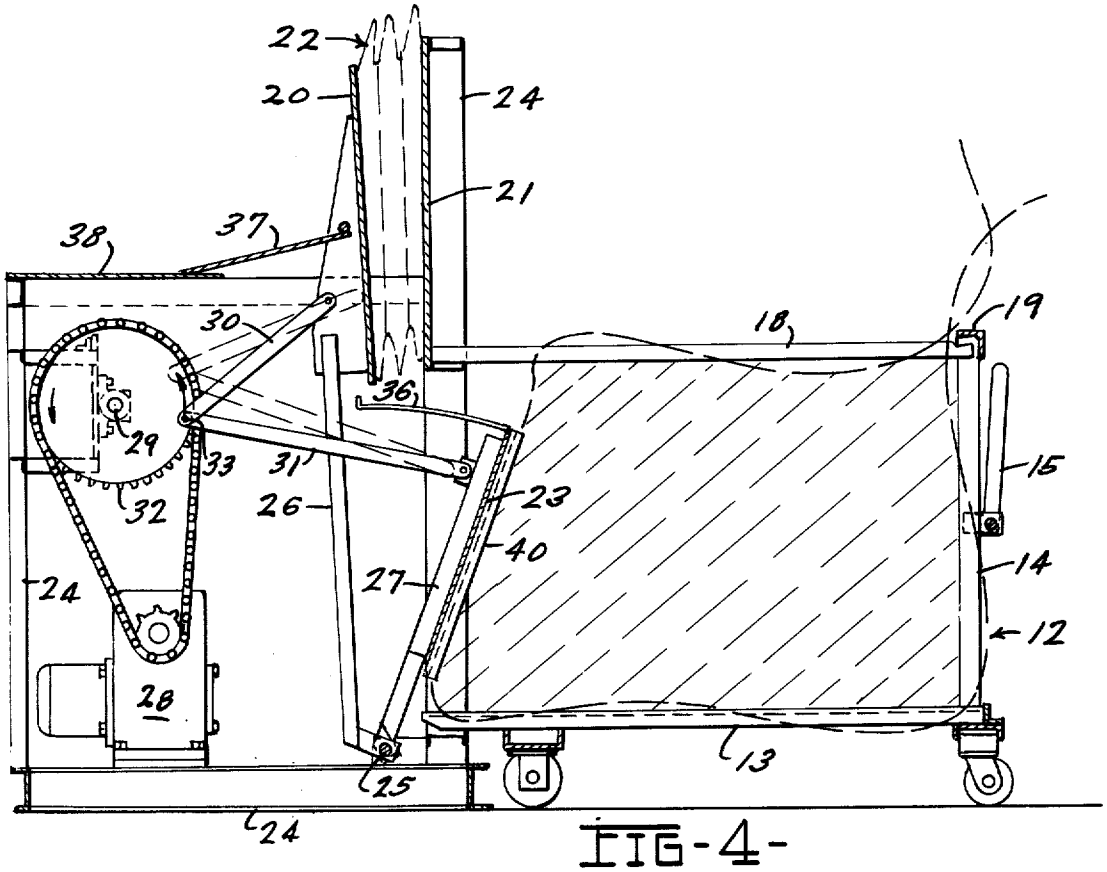

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FIG-4-

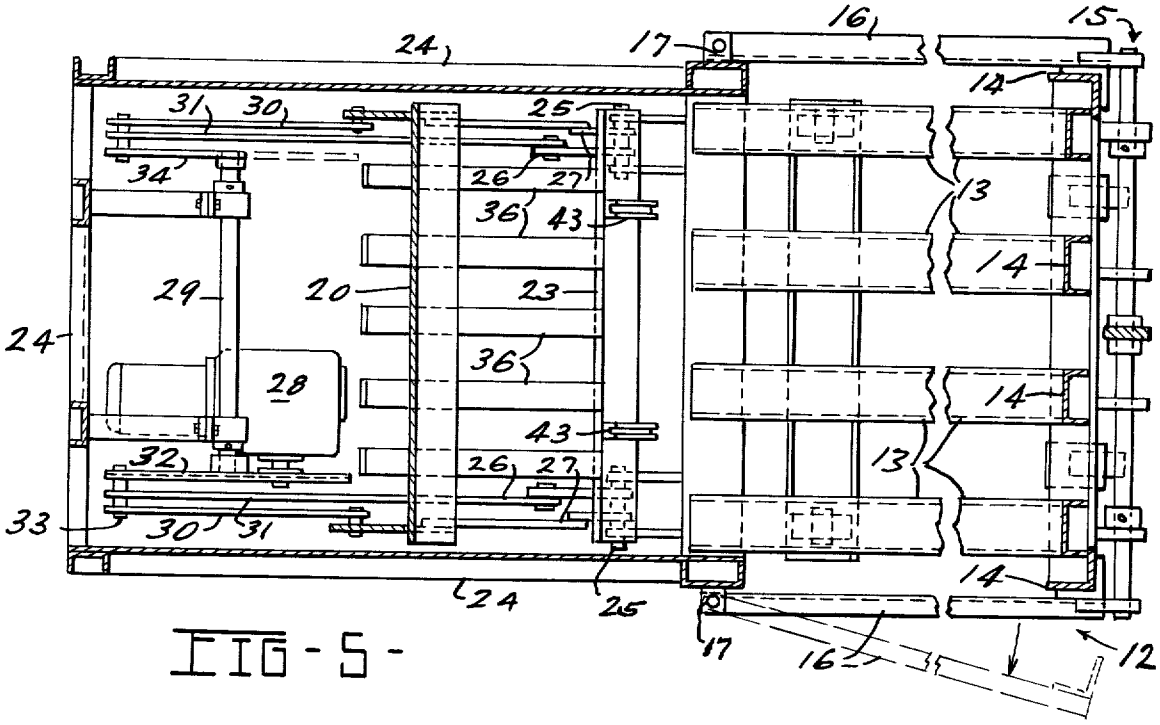

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FIG-5-

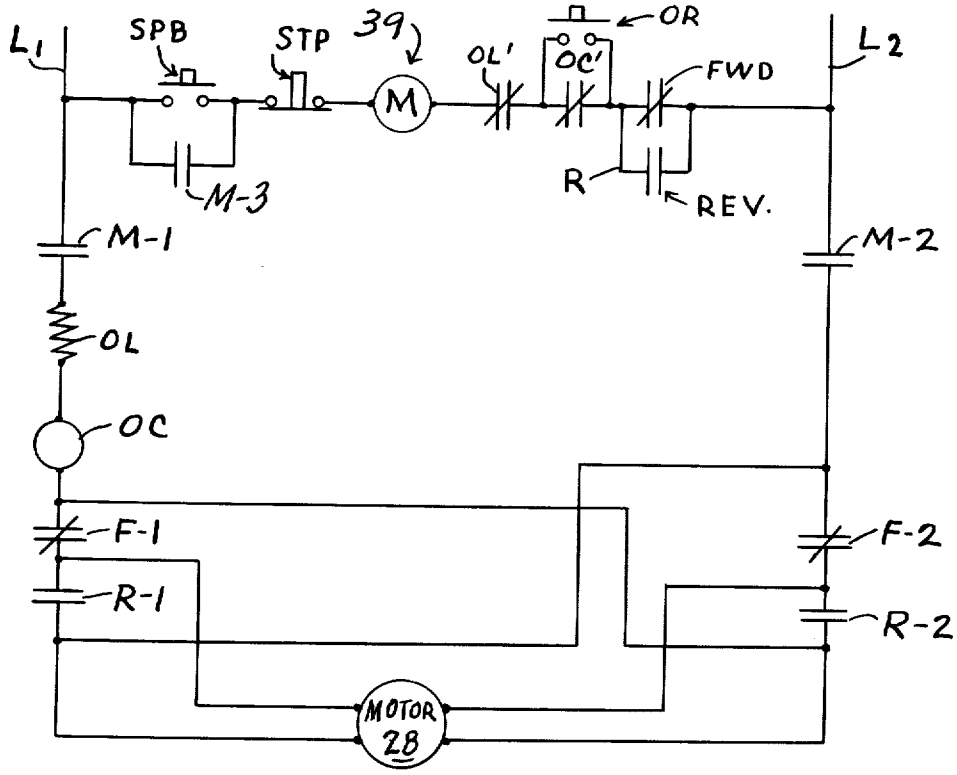

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OC'
OR
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OC
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F-2
R-1
R-2
MOTOR
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FIG-6-

BOX BALING MACHINE AND CART

BACKGROUND OF THE INVENTION

The problem of refuse disposal has become acute in recent years due to continued increases in the use of disposable materials and to restrictions against burning and other environmental concerns. This is particularly true with respect to cardboard boxes, which occupy a great deal of space and which cannot be burned in many localities where they are emptied. Large supermarkets and merchandising stores, for example, receive a very heavy and continuous influx of goods in cardboard boxes. These establishments generally cannot economically store large volumes of empty boxes pending their removal by waste collectors. Disassembly of boxes for flat stacking generally requires too much labor cost to be feasible.

Accordingly, there is need for an inexpensive method of compacting these cardboard boxes into tightly packed bales for easy handling and economical storage pending removal. Some prior art compacting machines can be employed to confine boxes to a relatively small volume in a container. However, the boxes must remain in the container to await removal, since these compacting machines generally do not provide for tying the compacted boxed into bales.

Another shortcoming of most prior art compacting machines as applied to cardboard box packing is the expense involved. The machines generally have a single slidable compacting platen driven by a hydraulic system, as shown, for example, in Chaney U.S. Pat. No. 3,606,830 and Bowles U.S. Pat. No. 3,610,139. Hydraulic systems are invariably very heavy nd expensive to purchase, install, maintain and operate, and sliding platens necessitate even greater maintenance expense due to increased wear. Moreover, when a single platen is used both to crush refuse and to compact it into a container, a large platen throw is required to initially receive large items such as boxes. This again involves increased weight and cost, as well as additional space.

SUMMARY OF THE INVENTION

The present invention provides a baling apparatus particularly suited for cardboard boxes and virtually free of the disadvantages inherent in prior art compactors as applied to cardboard boxes.

Rather than a single slidable hydraulic platen, the invention employs two pivoted platens driven by a small electric motor and eccentric drive mechanism. This apparatus is located within a stationary portion of the invention. The upper crushing platen, pivoted from below, reciprocates between a rearward open position and a forward position of spaced proximity with a rigid abutment. Meanwhile the lower compacting platen, also pivoted from below, reciprocates through a similar throw but has its maximum positions forward from those of the upper platen. Adjacent to the lower platen is a baling container made up of a cart with retractable sides and open at the end adjacent the platen. The lower compacting platen communicates with this container by pivotally traveling from its rearward position, where it receives partially flattened boxes from the upper platen, to its forward position inside the container, where it delivers and compresses the boxes.

By employing two platens rather than one, the baler of the present invention may be powered by a very small electric motor with eccentric drive means. The

pivoted compacting platen needs only a relatively short throw since it receives pre-flattened charges rather than large, bulky charges. This allows the eccentric to be of rather short throw and thus of relatively high mechanical advantage. In addition, gear reducing mechanism is employed between the motor and the eccentric drive shaft so that the shaft turns quite slowly, preferably about 3 or 4 revolutions per minute. Accordingly, an electric motor even as small as one horsepower may adequately drive the machine.

The upper crushing platen is eccentrically driven preferably from the same shaft and same eccentric point as the lower platen, and thus has the same eccentric throw. However, its maximum separation from the rigid abutment is adequate to receive very large boxes. The major portion of the upper platen extends above the point of connection with its eccentric linkage member. Since the platen is pivoted from below and leans rearwardly when open, this creates a large V-shaped opening between the extended portion of the upper platen and the rigid abutment.

The present apparatus also provides a baling container which when full serves as a wheeled, open transfer cart having only a support bed and one end. The cover deck and both sides of the container are retained to the stationary portion of the apparatus for releasable latching to the cart during loading. The sides, top, bottom, and end of the container preferably comprise ribs with intermediate openings. Provision is made for tying the compressed boxes into a bale while the container is latched together. The cart can then be unlatched from its top and sides and used to transport the compressed baled boxes to a storage area.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a box baling machine according to the present invention;

FIG. 2 is a partially sectioned plan view of the cart portion, taken along the line 2—2 of FIG. 1;

FIG. 3 is a side elevational cutaway view of the baling machine apparatus of FIG. 1;

FIG. 4 is a side elevational cutaway view of the apparatus indicating the upper platen crushing a box and the lower platen compacting a container full of previous charges;

FIG. 5 is a sectional view of the apparatus taken along the line 5—5 of FIG. 3 indicating the platen drive mechanism and the method of operation of the cart and baling container; and

FIG. 6 is an electrical circuit diagram of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1, a box baling machine and cart according to the invention is generally indicated by the reference number 10. The apparatus includes a packer portion and a baling cart generally indicated by the reference numbers 11 and 12, respectively. The cart 12 preferably comprises a wheeled bed 13, a vertical end 14, and a latch 15. A pair of pivoted sides 16 are engaged by the latch 15 and are attached to the stationary packer 11 at pivot points 17. A top or cover deck 18 for the cart 12 is also attached to the stationary packer 11 and engaged underneath a protruding flange 19 of the cart 12 when the cart 12 is in latched baling position. When latched, the cart 12 thus

becomes a baling container for receiving compressed boxes from the stationary packer **11**, when unlatched, it becomes an open transfer cart for baled boxes.

Referring again to FIG. **1**, the packer **10** includes a crushing platen **20**, shown in open position, opposite a rigid abutment **21**. Loaded between the platen **20** and abutment **21** is a charge of boxes **22**, about to be crushed as shown in FIGS. **3** and **4**.

As shown in FIGS. **3** and **4**, the packer **10** also includes a lower compacting platen **23**. Both platens **20** and **23** are pivoted from a frame **24** of the stationary packer **11**, preferably at a common pivot point **25** low on the frame **24**. Extending legs **26** and **27** from the upper and lower platens **20** and **23** meet at the pivot point **25**.

The drive means for the platens, seen in FIGS. **3**, **4**, and **5**, preferably comprises a gear-reduced electric motor **28** driving a shaft **29** which is eccentrically connected to eccentric links **30** and **31**. The links **30** and **31** are pivotally connected to the upper and lower platens **20** and **23**, respectively. FIGS. **3** and **4** illustrate that at one end of the shaft **29** a chain driven sprocket wheel **32** both drives the shaft **29** and provides an eccentric pivot point **33** for both eccentric links **30** and **31**. As shown in FIG. **5**, the other end of the shaft **29** is connected to an idler arm **34** which provides an eccentric pivot point **35** for the links **30** and **31** on that side of the axle **29**. This second pair of eccentric links **30** and **31** are always lined up with the first pair and provide a correspondence of motion between the two ends of each platen.

Referring again to FIGS. **3**, **4**, and **5**, the lower compacting platen **23** is provided with a drop shield **36** attached to its upper edge for preventing crushed boxes **22** from dropping behind this lower platen **23**. The shield **36** is arcuately shaped for close communication with the upper platen **20** and remains below the upper platen in all platen positions. It thus tends to catch boxes **22** after they are crushed by the upper platen **20** and hold them until the lower platen **23** moves back far enough to receive them. This occurs, if not sooner, when the two platens are in the position of alignment shown in FIG. **3**.

Another shield **37** is pivotally connected to the upper platen **20**. The shield **37** slides along a deck portion **38** of the stationary packer **11**, closing the space between the deck **38** and the platen **20**. Refuse and other foreign matter are thus prevented from falling into the drive mechanism.

Electrical controls **39** for the baling machine **10** are indicated in FIG. **1** and in the electrical circuit diagram of FIG. **6**. To start the motor **28**, a start push button SPB, comprising a momentary spring biased button, is pushed. This energizes a motor starter M which includes a solenoid coil. The motor starter M closes sets of line contacts M–1 and M–2 as well as hold-in contacts M–3, all of which are normally open as shown in FIG. **6**. The motor **28** operates in a forward direction.

As over current coil OC is included to shut down the baling machine **10** when the compacted materials within the cart **12** have reached a predetermined level of compaction. The coil OC is adjustable, preferably being set at **14** amps. If the current load increases beyond **14** amps, the coil OC opens normally closed contacts OC′ which de-energizes the motor starter M. In turn, M–1, M–2 and M–3 are opened and the motor **28** stops. This shutoff means also operates as a safety device to shut down the machine if a hard, relatively noncompactible object accidentally finds its way between the upper crushing platen **20** and the rigid abutment **21**.

The cause of the current overload, whether it is associated with the crushing platen **20** or the compacting platen **23**, must be removed before restarting in the forward direction or the over current coil OC will reopen the contacts OC′ immediately after energization. However, a reversing switch R which is normally set in a forward FWD position may be manually switched to reverse REV position. Then when the start push button SPB is pushed, contacts F–1 and F–2 will be opened and contacts R–1 and R–2 closed, reversing the polarity of the motor **28** so that it runs in reverse and the platens **20** and **23** are backed off.

An over current override push button OR is included to bypass the over current contacts OC′. This enables an operator to further run the baling machine **10** in the forward direction in order to make final compactions beyond the limit of the over current coil OC before tying the baled boxes. The push button OR is a momentary spring biased button and must be initially pushed simultaneously with the start push button SPB to energize the system and then held for the duration of the override compacting.

An overload heater OL is also provided in the motor circuit. This heat is set to trip open contacts OL′ at an amperage much higher than **14** amps, its purpose being to prevent damage to the motor **28**. The motor **28** cannot be restarted until the cause of the overload is removed or repaired. The contacts OL′ may then be manually reset.

For shutting down the machine, a stop push button STP is provided. When this momentary, normally closed spring biased button STP is pushed, the motor starter M is de-energized and the contacts M–1, M–2, and M–3 are opened, stopping the motor **28**.

The baling machine **10** of the invention is preferably driven by a greatly gear-reduced electric motor **28** so that the platens **20** and **23** move quite slowly. The machine may thus be kept in operation continuously during the working day at relatively low cost. When a cardboard box **22** or other compactible refuse is ready for disposal, it is loaded on the open crushing platen **20** as shown in FIG. **1** and FIG. **3** (in phantom). There it is initially crushed between that platen **20** and the rigid abutment **21**, as seen in FIG. **4**. In maximum proximity of the crushing platen **20** and the rigid abutment **21**, sufficient space exists so that a small hard object or a human hand will not be engaged. When the platen **20** begins to retract, the crushed charge **22** descends onto the drop shield **36**, where it rests until the compacting platen **23** has retracted far enough to receive it. FIG. **3** shows the platens in a position of alignment wherein any charges previously crushed by the platen **20** will fall in the path of the compacting platen **23**. Thereafter the compacting platen **23** returns and forces the charge **22** into the baling cart **12** with engaged sides **16** and top **18**.

When the cart has been filled to a predetermined level of compaction, the over current coil OC opens the contacts OC′ to cut off the motor **28**, stopping the platens **20** and **23**. At this point an operator may wish to further compact the charges by manually operating the over current override push button OR as discussed

above. He then ties the compacted boxes into a bale within the cart **12**. Small channels **40** are provided on the compacting platen to hold baling wire or twine in preparation for this tying. Since the bed **13**, sides **16**, top **18** and end **14** of the enclosed cart **12** comprise spaced ribs, the tying or baling operation is easily accomplished.

Following tying, the reversing switch R is manually switched to reverse position and the start push button SPB is pushed to retract the platens **20** and **23** and release the compaction pressure on the bale of boxes. The stop button STP is pushed. Then the latch **15** is released, disengaging the pivoted sides **16** from the cart **12**. The cart **12** now comprises only a wheeled platform with a forward end; it may be transferred to a storage area and easily unloaded.

After unloading, the cart **12** is wheeled back to the stationary packer **11** and pushed into a position with its protruding flange **19** engaging the upper deck **18** of the stationary packer **11**. Then the sides are re-latched and the motor **28** is restarted in the forward direction by switching R to the forward position and again pushing SPB. Loading of boxes resumes.

The above described preferred embodiment provides a baling apparatus which is mechanically simple yet very effective for compacting and baling boxes. Its space saving function is further served by its own compactness. The apparatus is inexpensive in cost, maintenance and function and includes features which provide for timesaving and easy operation. Various other embodiments and changes to the preferred embodiment will be apparent to those skilled in the art and may be made without departing from the spirit and scope of the following claims.

I claim:

1. An apparatus for crushing, compacting and baling compactible charges, said apparatus comprising a frame having a rigid abutment thereon, a crushing platen adjacent said abutment, a baling container adjacent said frame, a baling and compacting platen adjacent said baling container and said crushing platen, shielding means positioned between said crushing platen and said baling and compacting platen for directing a charge between said compacting platen and said baling container, said shielding means including a generally horizontal shield member positioned below the lower edge of said crushing platen during various positions of said platens and eccentric driving means connected to said crushing platen and said compacting platen for effecting reciprocating communication between said crushing platen and said abutment and for effecting reciprocating communication between said compacting platen and said baling container, whereby a charge loaded between said crushing platen and said abutment is crushed by said crushing platen and forced by said compacting platen into said baling container.

2. Baling apparatus according to claim **1** wherein said eccentric driving means comprises a rotatable shaft, an eccentric member mounted on said shaft, motor means operatively connected to said shaft, and at least one pair of elongate links, each of said links having a first end pivotally connected to said eccentric member, one of said links having its second end connected to said crushing platen and said other link having its second end connected to said compacting platen.

3. Baling apparatus according to claim **2** wherein said pair of elongate links from a common pivot point at said first ends of said links.

4. Baling apparatus according to claim **2** wherein said motor means comprises an electric motor having reduction gearing drivingly connected to said shaft.

5. Baling apparatus according to claim **4** wherein said motor means further includes a circuit having an amperage-sensing cutoff switch responsive to a predetermined load on either of said platens.

6. Baling apparatus according to claim **5** wherein said motor means additionally includes motor reversal means for facilitating the retraction of said platens following the activation of said cutoff switch.

7. The baling apparatus of claim **1** wherein said crushing platen and said compacting platen are pivotally attached to said frame.

8. Baling apparatus, according to claim **1**, wherein said shield member extends from the upper edge of said baling and compacting platen.

9. Baling apparatus, according to claim **8**, wherein said shield member is arcuately shaped.

10. A baling apparatus comprising a packing portion including crushing and compacting means,

a movable baling cart adjacent said compacting means of said packing portion, said baling cart having a support bed, an end wall opposite said packing portion and wheels mounted below said bed,

a cover deck extending generally horizontally from said packing portion over said baling cart and forming a cover for said cart,

a pair of side walls each having a first end attached to said packing portion and a second end adjacent said end wall of said baling cart, and

means for holding said baling cart in baling position adjacent said packing portion,

whereby said baling cart when in baling position forms an enclosed bale chamber for receiving charges from said crushing and compacting means, and when not so retained forms a transfer cart for the baled charges.

11. The baling apparatus of claim **10** wherein said first ends of said side walls are pivotally attached to said packing portion.

12. The baling apparatus of claim **10** wherein said holding means comprises a latch on said end wall of said baling cart for releasably engaging said second ends of said side walls.

13. The baling apparatus of claim **10** wherein said end wall of said cart has an upper edge with a protruding lip and said cover deck has a first end attached to said packing portion and a second end extending under said lip when said cart is in its baling position, whereby said cover deck is rigid for receiving compressed charges.

14. An apparatus for crushing, compacting and baling compactible charges, said apparatus comprising frame having a rigid abutment thereon, a crushing platen adjacent said abutment, a baling container adjacent said frame, a baling and compacting platen adjacent said baling container and said crushing platen, said crushing platen is above said compacting platen and said compacting platen includes an elongate shield extending from its upper edge generally horizontally and away from said baling container, said shield extending below the lower edge of said crushing platen in all positions of said platens, whereby a crushed charge is re-

leased as said crushing platen recedes from said rigid abutment, falls downward and is temporarily retained by said shield, falls between said compacting platen and said baling connainer when said compacting platen has sufficiently receded from said baling container, and is subsequently forced into said baling container, and eccentric driving means connected to said crushing platen and said compacting platen for effecting reciprocating communication between said crushing platen and said abutment and for effecting reciprocating communication between said compacting platen and said baling container, whereby a charge loaded between said crushing platen and said abutment is crushed by said crushing platen and forced by said compacting platen into said baling container.

* * * * *