

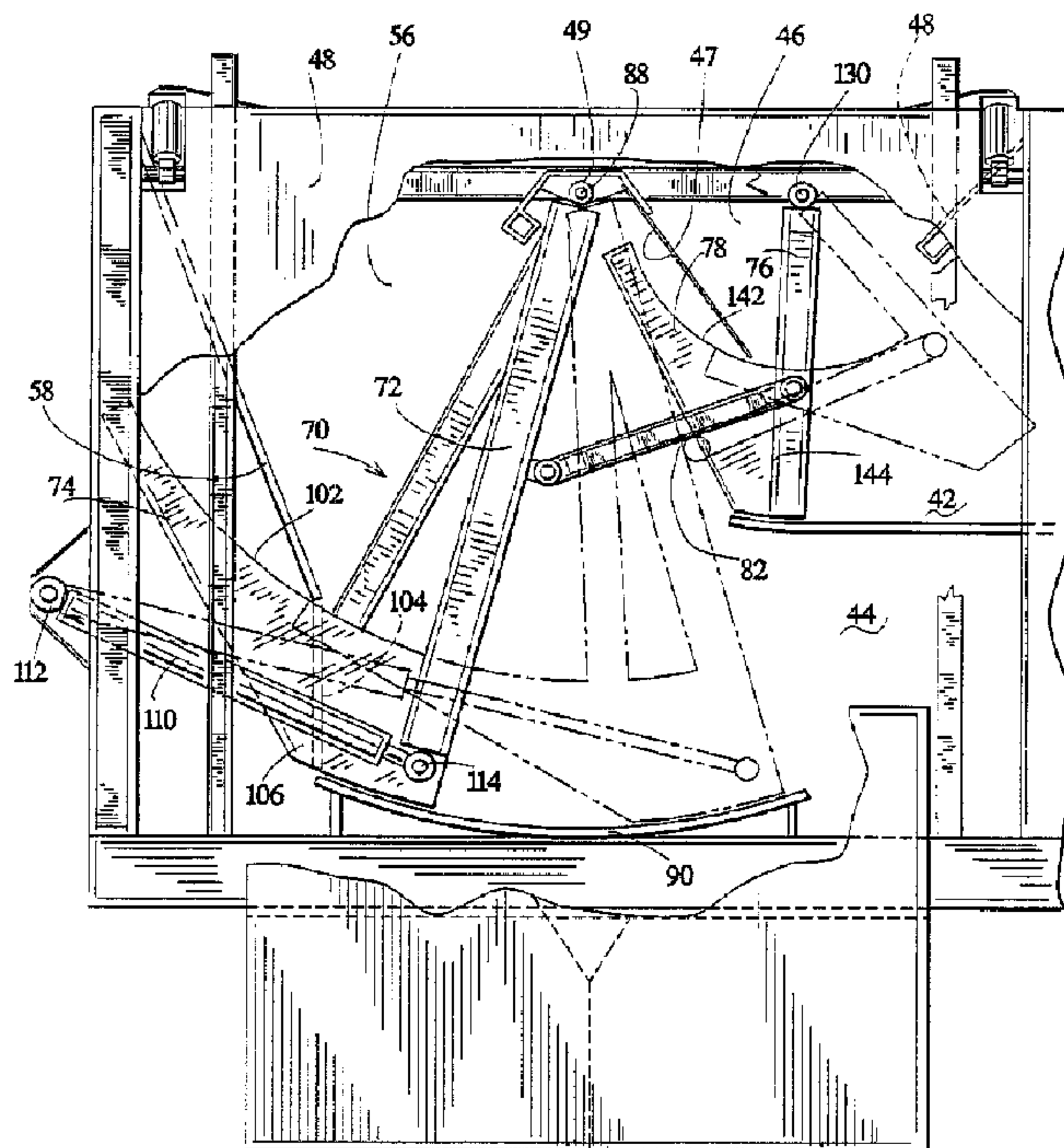


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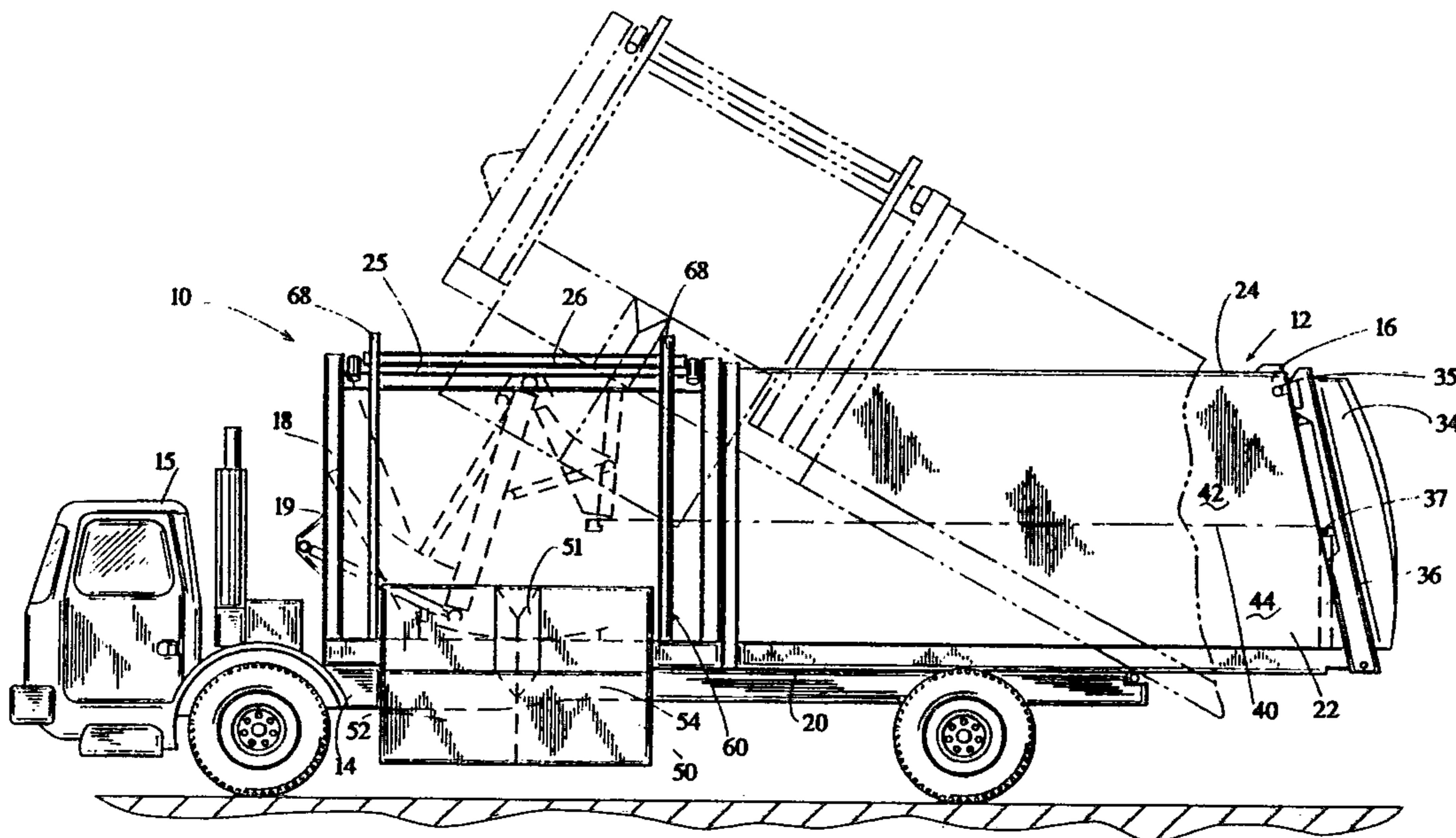
An apparatus for packing separated refuse materials includes a refuse receiving container (12) having at least one horizontal longitudinally extending partition (40) subdividing the container (12) into upper and lower compartments (42, 44). The container (12) is provided with a packing device (70) for simultaneously compacting the refuse materials in the upper and lower compartments (42, 44). The packing device (70) includes a lower packing platen (74) mounted to lower swing arms (72) pivotally mounted for pendular movement within the lower compartment (44), an upper packing platen (78) mounted to upper swing arms (76) pivotally mounted for pendular movement within the upper compartment (42), and swing links (82) pivotally connecting the upper and lower swing arms (76, 72) so that the upper and lower packing platens (78, 74) move simultaneously.



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| <p>(21) International Application Number: PCT/US93/08244 (22) International Filing Date: 1 September 1993 (01.09.93) (30) Priority data: 07/940,532 4 September 1992 (04.09.92) US (71) Applicant: THE HEIL COMPANY [US/US]; P.O. Box 8676, Uptain Building, Eastage Center, Chattanooga, TN 37411 (US). (72) Inventor: RATLEDGE, Ralph, H., Jr. ; 3800 Provence Street, Unit 4, Chattanooga, TN 37411 (US). (74) Agent: GALLAGHER, Priscilla, F.; McAndrews, Held & Malloy, Ltd., 500 West Madison, Suite 3400, Chicago, IL 60661 (US).</p> | | <p style="text-align: center; font-size: 2em;">2143852</p> <p>(81) Designated States: AU, CA, FI, NO, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> |

(54) Title: APPARATUS FOR PACKING SEPARATED RECYCLABLE MATERIALS



(57) Abstract

An apparatus for packing separated refuse materials includes a refuse receiving container (12) having at least one horizontal longitudinally extending partition (40) subdividing the container (12) into upper and lower compartments (42, 44). The container (12) is provided with a packing device (70) for simultaneously compacting the refuse materials in the upper and lower compartments (42, 44). The packing device (70) includes a lower packing platen (74) mounted to lower swing arms (72) pivotally mounted for pendular movement within the lower compartment (44), an upper packing platen (78) mounted to upper swing arms (76) pivotally mounted for pendular movement within the upper compartment (42), and swing links (82) pivotally connecting the upper and lower swing arms (76, 72) so that the upper and lower packing platens (78, 74) move simultaneously.

* (Referred to in PCT Gazette No. 19/1994, Section II)

APPARATUS FOR PACKING SEPARATED RECYCLABLE MATERIALS

BACKGROUND OF THE INVENTION

This invention relates to refuse vehicles having a refuse-receiving container with one or more longitudinally extending compartments for separating recyclable waste material, such as newsprint, from non-recyclable waste material. More particularly, the invention relates to an improved apparatus for packing the separated waste materials into the longitudinal compartments.

Refuse vehicles having compartments for separating the waste material are known. For example, U.S. Patent No. 4,425,070 to Howells et al. discloses a conventional, rear-loading trash compactor having an intermediate space between the front cab and the rear compactor which contains separate compartments for recyclable materials. Howells et al. do not, however, disclose any means for compacting the recyclable materials in the separate compartments.

Another prior art reference, German Patent No. DE 3537546 A1, discloses a partitioned refuse vehicle that employs a hydraulically actuated packing platen in each longitudinally extending compartment. The packing platens slide lengthwise of the refuse compartment along longitudinal guide rails or tracks secured to the sidewalls or bottom wall of the refuse compartments.

The rail or track system for guiding the packing platens presents several disadvantages. The rails or tracks are subject to heavy wear because of the strong forces needed to slide the packing platens along. This, in turn, leads to higher maintenance costs and downtime for the refuse vehicle. In addition, the rails or tracks add significantly to the gross weight of the refuse vehicle, resulting in a vehicle that is undesirably

2143852

heavy and expensive, and significantly reduces the net payload the refuse vehicle can haul.

5 The present invention is directed to overcoming these and other disadvantages inherent in a track system for guiding the packing platens. In the present invention, the packing platens are carried by swing arms that are pivotally linked together and supported on pins and bearings rather than tracks.

73164-82

3

SUMMARY OF THE INVENTION

An object of the invention is to provide an improved packing apparatus in a partitioned refuse vehicle that overcomes the deficiencies of prior art designs.

5 Another object of the invention is to provide a packing apparatus that is relatively lightweight in order to maximize the net payload the refuse vehicle can haul.

A further object of the invention is to provide a packing apparatus that is subject to reduced wear, thus
10 decreasing maintenance costs and downtime of the refuse vehicle.

Yet another object of the invention is to provide a packing apparatus that permits continuous loading and packing operations without commingling the separated refuse.

15 A still further object of the invention is to provide a packing apparatus that provides increased compaction forces.

These and other objects are achieved by an improved storage and packing apparatus for refuse material
20 comprising: a refuse material-receiving container (12) having a bottom wall (20), two opposed sidewalls (22) and at least one partition (40) subdividing the container (12) into a first refuse material-receiving compartment (44) and a second refuse material-receiving compartment (42),
25 characterised in that the refuse material-receiving container has a discharge end (16) and a non-discharge end (18), the first and second refuse material-receiving compartments (44,42) each have a refuse material-discharge end, the refuse material-receiving container (12) further as

73164-82

4

refuse material-discharge opening; and a first packer blade disposed within the first refuse material-receiving compartment, (44) and moveable between a first position adjacent to the non-discharge end of the first compartment
5 along a non-linear path to a second position so as to compact refuse material; a second packer blade disposed within the second refuse-receiving compartment (42), and moveable between a first position adjacent to the non-discharge end of the second compartment along a non-linear
10 path to a second position so as to compact refuse material; connecting links (82) for connecting the first and second packer blades so that the first and second packer blades move simultaneously between their first and second positions; and power operated means for moving the first and
15 second packer blades between their first and second positions.

In a preferred embodiment, the first and second packer blades are connected for coordinated and simultaneous pendular movement within lower and upper compartments
20 respectively, by means of connecting links. The connecting links each have a first end which is pivotally connected to a first pair of swing arms on which the first packer blade is mounted, and a second end which is pivotally connected to a second pair of swing arms on which the second packer blade
25 is mounted. The pendular movement of the swing arms and the packing platens, acting in concert with the pivotally mounted connecting links, create a condition of force amplification that results in a greater packing force with a relatively small input force. Generally, the concerted

73164-82

4a

movement of the swing arms and the connecting links results in a packing force for the second packing platen that is double that of the first packing platen. This is advantageous because it permits items requiring high compacting forces to be compacted in the upper compartment, while items that require lower compacting forces can be compacted simultaneously in the lower compartment. In addition, the relatively small force needed to achieve the increased packing force permits the utilization of smaller hydraulic cylinders and/or lower hydraulic pressures, thus making the packing device less costly to manufacture and operate.

5
BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

5 FIG. 1 is a side elevation view of a refuse collecting vehicle, showing in phantom the vehicle in dumping mode;

 FIG. 2 is a partial side elevation cut away to show the packing device of the present invention;

10 FIG. 3 is a perspective view of the packing device of the present invention;

 FIG. 4 is a partial cross-sectional view taken along the line 4-4 in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 4, a rear discharge refuse collection vehicle, generally indicated at 10, includes a refuse-receiving hopper 12 mounted on a vehicle chassis 14. The refuse-receiving hopper 12 has an open discharge end 16 and a closed non-discharge end 18, and includes a bottom wall 20, lateral side walls 22 and a top wall 24. A horizontal partition 40 extends longitudinally toward the discharge end 16 and divides the hopper 12 into separate upper and lower compartments 42 and 44, respectively. The upper and lower compartments permit different types of refuse, such as recyclable and non-recyclable materials, to be separately stored and compacted.

The discharge end 16 of the hopper is provided with a primary discharge tailgate 34 secured to the rearward portion of the hopper 12 by pivotal mounting 35. The primary discharge tailgate 34 functions to close the discharge end 16 to permit the packing and retention of refuse material within the upper compartment of the hopper. The discharge end 16 is also provided with a secondary discharge tailgate 36 pivotally mounted at 37 to the hopper 12 adjacent the horizontal partition 40. The secondary discharge tailgate 36 is positioned forward of the primary discharge tailgate and closes the rear end of the lower compartment 44 to permit refuse material to be packed and retained in the lower compartment. The non-discharge end 18 includes a solid front wall 19 that separates the container 12 from the cab 15 of the refuse vehicle. The top wall 24 is provided with upper loading openings 25 and 26, at the non-discharge end, through which the hopper 12 receives refuse.

A refuse-receiving trough 50 and means 60 for lifting the trough are arranged at the non-discharge

end of each side wall 22, (only one side wall is shown in FIG 1), to permit dual sided loading of the hopper 12. The trough 50 is divided by a vertical divider deflector 51 into two separate lateral bins 52 and 54. Each bin may be selected for a separate type of refuse material, such as non-recyclable material in bin 52 and recyclable material in bin 54. The divider deflector 51 not only divides the trough 50 into bins, but also serves to deflect the separated material properly into the hopper 12 to prevent commingling. The trough 50 is positioned at curbside for receiving the refuse material and is raised and tipped by the lifting means 60, as shown in phantom in FIG. 4, so that refuse falls from the bins 52 and 54 into the upper loading openings 25 and 26, respectively. Two L-shaped roofs 28 and 29 are pivotally mounted on the top wall 24 so that the horizontal portions 30 and 31, respectively, of each roof overlie the loading openings 25 and 26, and the vertical portion 32 (only one of which is shown) forms a portion of the sidewall 22. As will be explained in more detail, the lifting means 60 functions to raise the roof 28 simultaneously with lifting the trough 50 so that the loading openings 25 and 26 are partially exposed for receiving the refuse from the trough.

The lifting means 60 includes a pair of hydraulically actuated lift cylinders 62 (only one of which is shown) pivotally mounted at 63 to each side of the roof 28 and attached to the lateral wall 22 at pivot 64. The vertical portion 32 of the roof 28 is pivotally connected at its bottom end to a connecting link 66 which, in turn, is pivotally connected to the trough 50. The connecting link 66 permits elevation of the trough 50 simultaneously with elevation of the roof 28 upon actuation of the lift cylinders 62, as shown in FIG. 4.

The lifting means 60 also includes a pair of fixed vertical guide tracks 68 positioned along each lateral wall 22 of the hopper. The guide tracks are longitudinally spaced apart a sufficient distance to permit each guide track to receive a pair of guide rollers 55 positioned on each end of the trough 50. The upper ends of the guide tracks curve approximately 180 degrees inward, toward the center of the hopper 12, and overlie the openings 25 and 26. As the guide rollers 55 on the trough 50 reach the upper ends of the guide tracks 68, the top of the trough is inclined toward the openings 25 and 26 on an angle that permits the contents of the trough to be discharged into the hopper 12.

As best seen in FIGS. 2 and 3, the upper compartment 42 includes a material chute 46 at its forward end which is in communication with the upper loading opening 26. The material chute 46 is formed by a rearwardly inclined front wall 47, a forwardly inclined rear wall 48 and the two hopper sidewalls 22. The material chute functions to funnel refuse through the chute and into the upper compartment 42. The lower compartment 44 also includes a material chute 56 at its forward end which is in communication with the upper loading opening 25. The material chute 56 is formed by a rearwardly inclined front wall 58 and the two hopper sidewalls 22, and funnels refuse received from the loading opening 25 into the lower compartment 44. A horizontal bearing header 49 extends between the side walls 22 of the hopper 12 and is integral with the front wall 47 of the material chute 46. The bearing header separates the material chute 46 from the material chute 56 and helps to prevent commingling of the refuse as it is discharged from the trough 50. The bearing header and the divider deflector 51 of the trough are aligned when the

trough is in its raised position, so that refuse placed in bin 52 is discharged through loading opening 25 and into the lower compartment 44, and refuse placed in bin 54 is discharged through loading opening 26 and into the upper compartment 42.

An improved packing device, generally indicated at 70, is mounted within the hopper and compacts the refuse contained within the upper and lower compartments 42 and 44. The packing device comprises a first pair of swing arms 72 on which is mounted a lower packing platen 74, for compacting the refuse in the lower compartment, and a second pair of swing arms 76 on which is mounted an upper packing platen 78, for compacting the refuse in the upper compartment. A pair of connecting links 82 are pivotally mounted to the first and second pairs of swing arms to permit simultaneous and coordinated movement of the lower and upper packing platens within the lower and upper compartments, respectively.

The swing arms 72 are roughly A-shaped, with each arm having a main leg 84 adjacent one of the lateral walls 22 of the hopper, and a support leg 86 angled downwardly and forwardly from the main leg. Each swing arm is pivotally mounted on the bearing header 49, adjacent the top of the hopper, through a pin and bearing mounting 88 positioned on the top of each swing arm. The pin and bearing mounting 88 permit the swing arms 72 to move pendularly toward and away from the discharge end of the hopper 12 within the lower compartment 42.

The lower packing platen 74 is mounted on the lower ends of the legs 84 and 86 and moves pendularly therewith. The packing platen 74 has a forwardly extending upwardly curved portion 102 that terminates at its rearward end in a substantially

2143852

vertical packing face plate 104, and laterally spaced inner and outer side panels 105 and 106, respectively, at each side of the packing platen. The side panels 105 and 106 extend rearwardly of the packing face plate and are mounted to the lower end of the main leg 84. The side panel 105 is mounted to the inside surface of the main leg and the side panel 106 is mounted to the outside surface of the main leg so that the main leg is sandwiched between the two side panels. An upwardly curved top panel 108 overlies the side panels 105, 106 and is integral with the upwardly curved portion 102. The top panel prevents refuse from falling between the two side panels.

A hydraulic compacting cylinder 110, on each side of the packing platen, is attached to the front wall 19 at pivot 112 while the piston end is pivotally attached at 114 to the base of the main swing leg 84. The hydraulic compacting cylinder is sandwiched between the side panels 105 and 106, and is protected from the refuse in the lower compartment 44 by a protecting panel 120 that extends downward from the bottom of the main swing leg 84. The floor of the lower compartment is provided with an arcuately shaped bottom ramp 90 closely spaced to the protecting panel 120 and the bottom of the packing platen 74 throughout the pendular travel positions to prevent refuse from getting trapped underneath or forward of the packing platen 74. The compacting cylinder is reciprocally moveable from a closed forward position, shown in FIG 2, to an extended rearward position shown in phantom in FIG. 2. As the compacting cylinder extends rearwardly, the movement of the cylinder causes the swing arms 72 and the packing platen 74 to swing rearwardly, which in turn causes the packing face plate to contact the refuse material

within the lower compartment 44 and force the material rearwardly toward the discharge end of the hopper. The compacting cylinders 110 are connected to a fluid pump and a control mechanism (not shown) external of the hopper 12 for actuating the extension and retraction of the piston within the compacting cylinders.

The second pair of swing arms 76 are each pivotally mounted on a bearing header 130, adjacent the top of the hopper 12 and rearward of the bearing header 49, through a pin and bearing mounting 132 positioned on the top of each swing arm 76. The pin and bearing mounting 132 permit the swing arms 76 to move pendularly toward and away from the discharge end of the hopper within the upper compartment. Each swing arm extends downward toward the horizontal partition 40 and is adjacent to one of the lateral walls 22.

The upper packing platen 78 is mounted on the lower end of the swing arms 76 and moves pendularly therewith. The packing platen 78 is similar in shape to the packing platen 74 and includes a forwardly extending upwardly curved portion 142 that terminates at its rearward end in a substantially vertical packing face plate 144. The packing platen 78 also includes laterally spaced inner and outer side panels 146 and 148, respectively, that are mounted to the inner and outer sides, respectively, of each swing arm 76 to sandwich the swing arm therebetween. An upwardly curved top panel 150 overlies the side panels 146 and 148 and is integral with the upwardly curved portion 142.

The connecting links 82 are pivotally attached at 152 to the main legs 84 of the swing arms 72 and are pivotally attached at 154 to the swing arms 76. As the compacting cylinder 110 extends rearwardly, causing the swing arms 72 and the packing platen 74

to swing rearwardly, the compacting force is transmitted via the connecting links 82 to the second pair of swing arms 76 and the upper platen 78 to cause simultaneous and coordinated pendular movement of the packing platens 74 and 78, within the lower and upper compartments, respectively. Although a second pair of hydraulic cylinders could be provided to move the upper packing platen 78, use of a single pair of cylinders to move both platens is more advantageous because the hydraulic schematic is greatly simplified.

A reversing of the hydraulic control valve (not shown) causes the upper and lower packing platens to return to their forward-most starting positions, as shown in FIG. 2. In this position, the lower packing face plate 104 is aligned with the bottom of the front wall 58 of the material chute 56 and the upper packing face plate 144 is aligned with the bottom of the front wall 47 of the material chute 46. It will be appreciated that the upwardly curved portions 102 and 142 of the lower and upper packing platens serve as material collectors to prevent material from falling behind the packing face plates during the various travel positions of the packing platens. Any material that might collect on the upwardly curved portions is swept clean by the front walls 58 and 47 of the material chutes when the packing platens return to their starting positions.

Continued loading of the trough, elevating and discharging its contents and the repeating actuation of the compacting process results in filling to capacity the upper and lower compartments. Once the compartments are filled, the non-discharge end 18 of the hopper is elevated approximately 30 degrees, as shown in phantom in FIG. 1, to begin the discharging procedure. The primary discharge tailgate 34 is then hydraulically opened to discharge the refuse in

the upper compartment while the secondary discharge tailgate 36 remains closed. Once the refuse material in the upper compartment is discharged, the refuse vehicle is moved to another area and the secondary discharge tailgate 36 is hydraulically opened to discharge the refuse material in the lower compartment. Thus, the primary and secondary discharge tailgates permit the refuse material in the upper and lower compartments to be separately discharged to prevent commingling of the separated materials. The discharging process in each compartment may be initially assisted by powering the upper and lower packing platens.

Although a side-loading refuse vehicle is illustrated, it will be appreciated that the packing apparatus may be adapted for use with a front-loading refuse vehicle. In addition, the packing apparatus need not be mounted on a truck chassis and can be adapted for stationary packing operations.

It will be appreciated that the packing device disclosed therefore herein may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The preferred embodiment described herein is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, rather than by the foregoing description of the preferred embodiment, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

73164-82

14

CLAIMS:

1. An improved storage and packing apparatus for refuse material comprising:

a refuse material-receiving container (12) having
5 a bottom wall (20), two opposed sidewalls (22) and at least
one partition (40) subdividing the container (12) into a
first refuse material-receiving compartment (44) and a
second refuse material-receiving compartment (42),
characterized in that the refuse material-receiving
10 container has a discharge end (16) and a non-discharge end
(18), the first and second refuse material-receiving
compartments (44, 42) each have a refuse material-discharge
end and a refuse material-non-discharge end, the refuse
material-receiving container (12) further has a refuse
15 material-receiving opening and a normally closed refuse
material-discharge opening; and

a first packer blade disposed within the first
refuse material-receiving compartment, (44) and moveable
between a first position adjacent to the non-discharge end
20 of the first compartment along a non-linear path to a second
position so as to compact refuse material;

a second packer blade disposed within the second
refuse-receiving compartment (42), and moveable between a
first position adjacent to the non-discharge end of the
25 second compartment along a non-linear path to a second
position so as to compact refuse material;

connecting links (82) for connecting the first and
second packer blades so that the first and second packer
blades move simultaneously between their first and second
30 positions; and

73164-82

15

power operated means for moving the first and second packer blades between their first and second positions.

2. The improved refuse material storage packing apparatus of claim 1 wherein the refuse material-receiving container (12) includes at least one horizontally longitudinally extending partition (40) that defines the first and second compartments (44, 42) in the refuse material-receiving container (12) so that the first and second compartments (44, 42) are arranged in the container one on top of the other.

3. The improved refuse material storage and packing apparatus of claim 1, which includes means for introducing refuse material into the first compartment and the second compartment.

4. The improved refuse material storage and packing apparatus of claim 1 wherein the discharge ends of the first and second compartments are each adjacent to the discharge end (16) of the refuse material-receiving container (12);

20 and wherein the discharge end (16) of the refuse material-receiving container (12) is normally closed when the first and second packer blades are moved between their first and second positions.

5. The improved refuse material storage and packing apparatus of claim 4, which includes means for opening the discharge end (16) of the refuse material-receiving container (12) so that compacted refuse material is discharged from at least one of the first and second compartments (44, 42).

73164-82

16

6. The improved refuse material storage and packing apparatus of claim 1 wherein the first packer blade includes a first packing platen (74) connected with a first pair of swing arms (72) for pendular movement therewith; and

5 wherein the second packer blade includes a second packing platen (78) connected with a second pair of swing arms (76) for pendular movement therewith.

7. The improved refuse material storage and packing apparatus of claim 6, wherein the refuse material-receiving
10 container (12) also includes a top wall (24); and

wherein the first pair of swing arms (72) are each pivotally mounted adjacent to the top wall (24) of the refuse material-receiving container (12); and

15 wherein the second pair of swing arms (76) are each pivotally mounted adjacent to the top wall (24) of the refuse material-receiving container (12).

8. The refuse storage and packing apparatus according to claim 7, wherein the first packing platen (74) includes a forwardly extending, upwardly curved portion
20 (102) that terminates at its rearward end in a first packing face plate (104).

9. The refuse storage and packing apparatus according to claim 8, wherein the first packing platen (74) includes inner and outer laterally spaced apart side panels
25 (105, 106) at each side of the packing platen (74), the side panels extending rearward of the first packing face plate (104).

10. The refuse storage and packing apparatus according to claim 9, wherein each member of the first pair of swing
30 arms (72) has an outer surface adjacent the side wall (22)

73164-82

17

of the container (12) and an inner surface away from the side wall (22), and the first packing platen (104) is mounted on the swing arms (72), with the inner side panels (105) mounted on the inside surfaces of the swing arms (72) and the outer side panels (106) mounted on the outside surfaces of the swing arms (72).

11. The refuse storage and packing apparatus according to claim 10, wherein the power operated means comprises a pair of expandable hydraulic cylinders (110), each of which is pivotally connected to a member of the first pair of swing arms (72) and is sandwiched between the inner and outer side panels (105, 106).

12. The refuse storage and packing apparatus according to claim 11, wherein the hydraulic cylinders (110) cause reciprocal pendular movement of both the first packing platen (74) and the second packing platen (78).

13. The refuse storage and packing apparatus according to claim 12, wherein the top wall (24) of the container (12) has a material receiving opening through which the container (12) receives refuse material, and the container (12) is provided with a lateral divider (49) mounted adjacent the top wall, for laterally dividing the material receiving opening into a forward section (25), through which the first compartment (44) receives refuse material, and a rearward section (26), through which the second compartment (42) receives refuse material.

14. The refuse storage and packing apparatus according to claim 13, wherein the first compartment (44) includes a first material chute (56) aligned with the forward section of the material receiving opening (25) for guiding refuse material into the first compartment (44).

73164-82

18

15. The refuse storage and packing apparatus according to claim 14, wherein the second compartment (42) includes a second material chute (46) aligned with the rearward section of the material receiving opening (26) for guiding refuse
5 material into the second compartment (42).

16. The refuse storage and packing apparatus according to claim 15, wherein the first material chute (56) includes a rearwardly inclined front wall (58), the base of which is aligned with the first packing face plate (104) when the
10 first packing platen (74) is in its forward-most position.

17. The refuse storage and packing apparatus according to claim 8, wherein the refuse material-receiving container (12) is supported on a vehicle including an elongated vehicle chassis (14) and wheels supporting the chassis.

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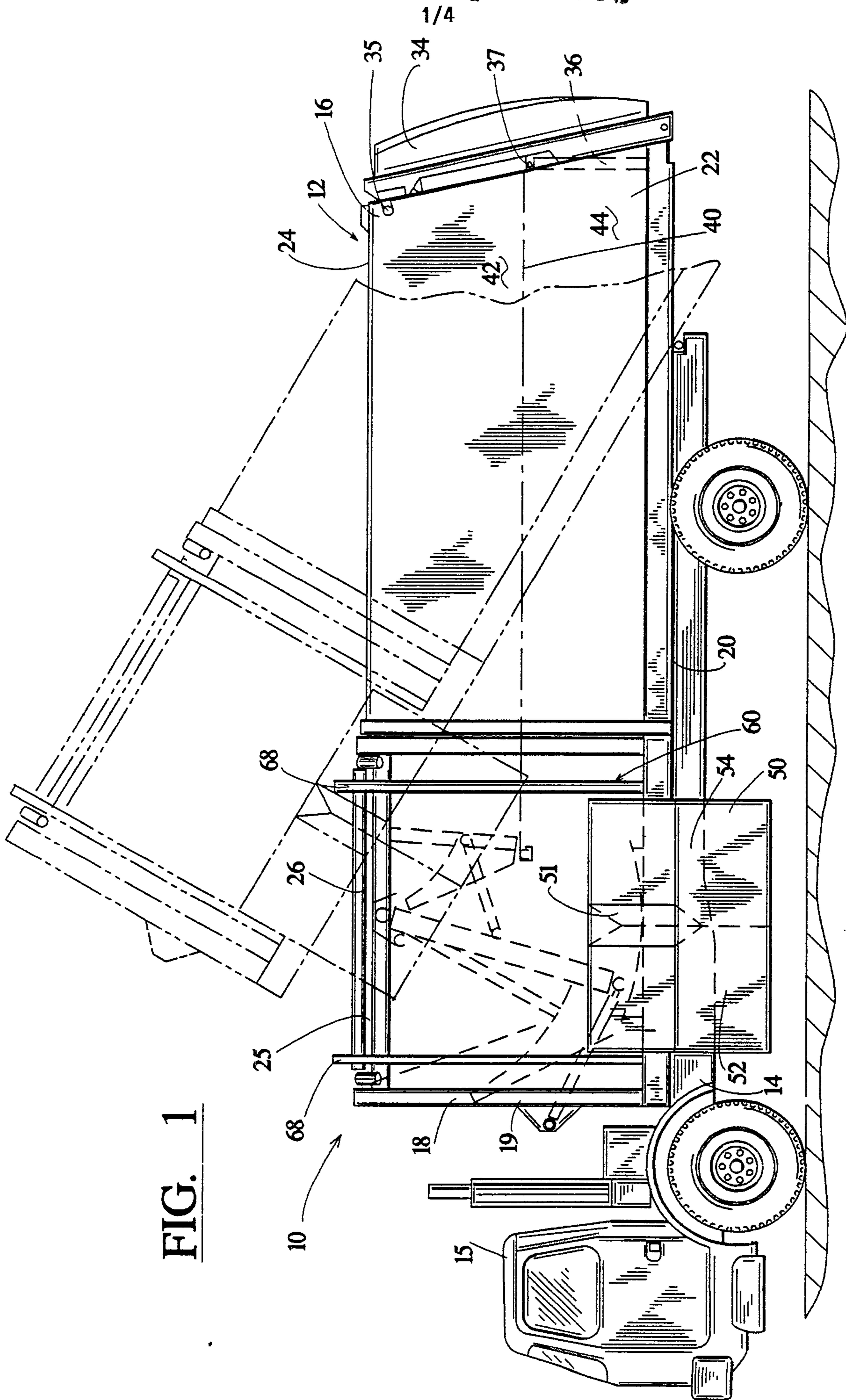
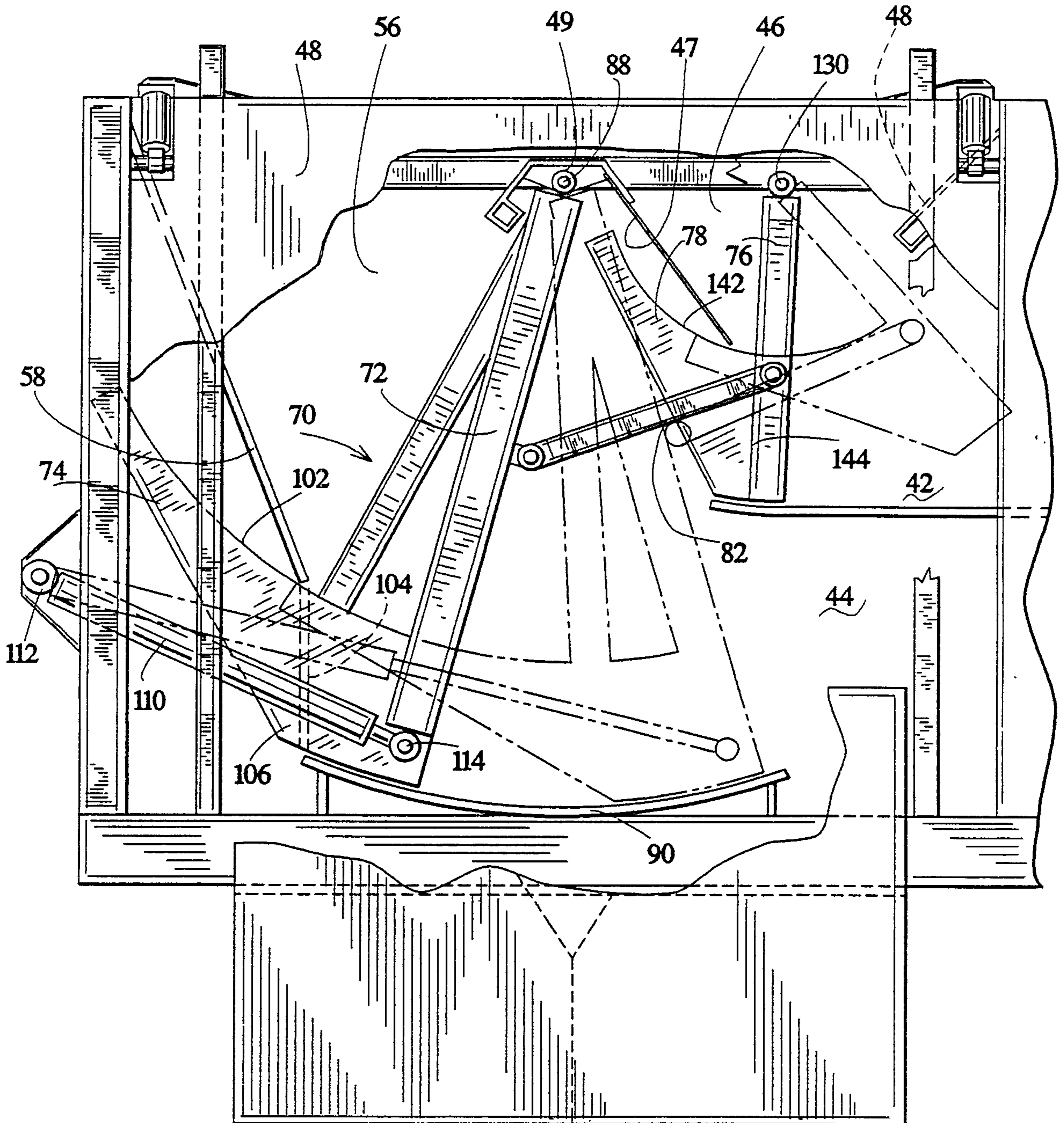


FIG. 2



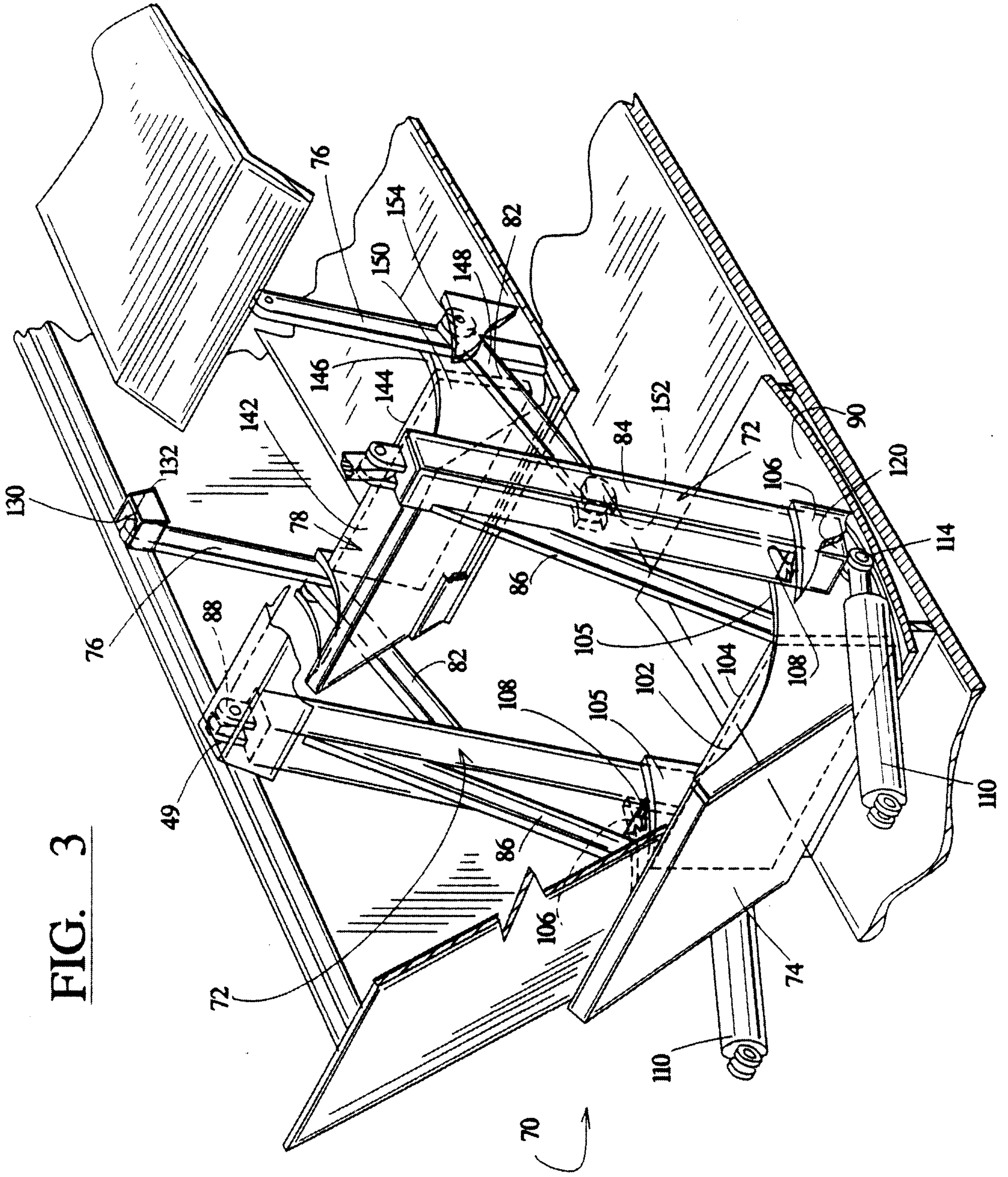


FIG. 3

4/4

FIG. 4

