OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

(12) (19) (CA) **Demande-Application**

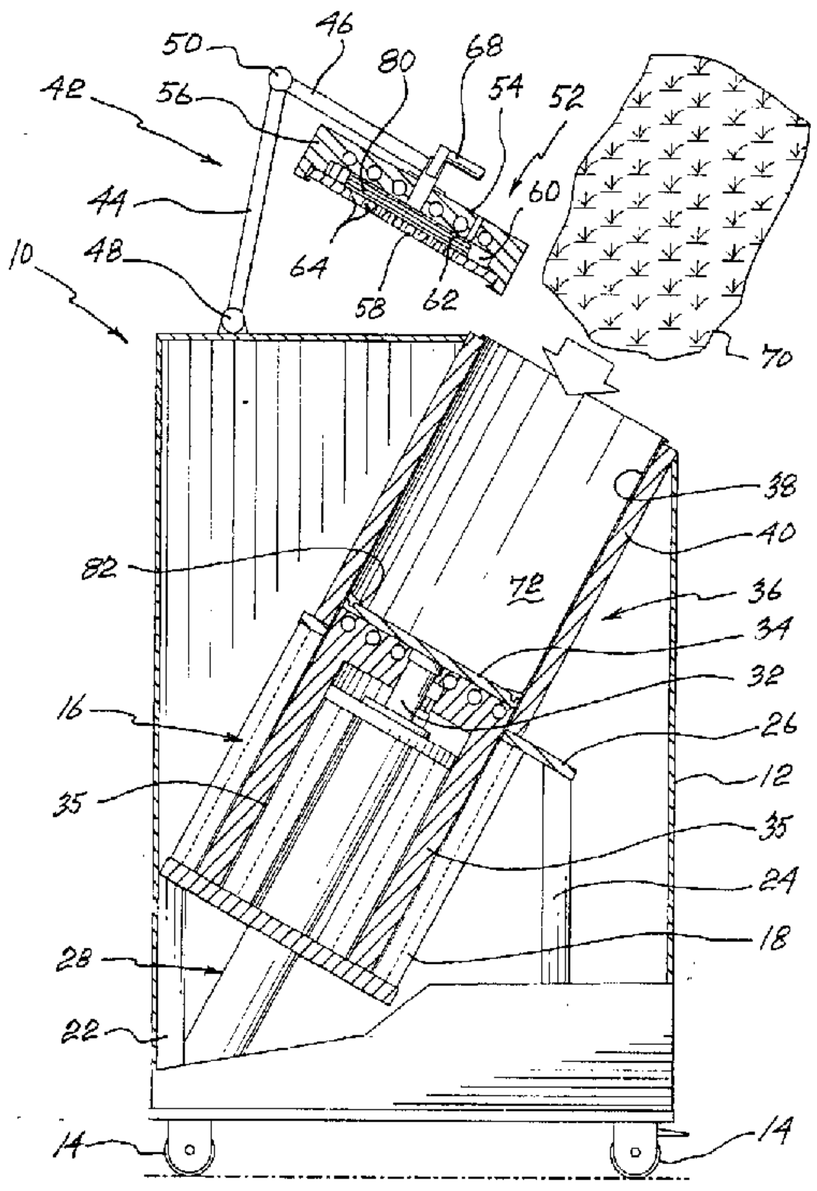
(21) (A1) **2,303,290**
(86) 1998/08/28
(87) 1999/03/11

(72) AUBERT, BRUNO, FR
(71) AUBERT, BRUNO, FR

(51) Int.Cl.[7] A61L 2/04, A61L 11/00
(30) 1997/08/30 (97 10990) FR

(54) **PROCEDE DE DESINFECTION THERMIQUE DE DECHETS ET DISPOSITIF DE MISE EN OEUVRE DE CE PROCEDE**

(54) **PROCESS FOR THERMAL DISINFECTION OF WASTE AND DEVICE FOR IMPLEMENTING THIS PROCESS**



(57) L'invention concerne un dispositif et un procédé de désinfection thermique de déchets biologiques dans lesquels les déchets sont placés dans un sac en matière polymère puis compactés alors que les gaz libérés sont filtrés, consistant ensuite à fermer hermétiquement la chambre et à appliquer de la chaleur aux déchets compactés, le procédé étant caractérisé par une libération de la pression exercée sur les déchets biologiques après compactage et un contrôle de la pression pendant l'étape d'application de chaleur à ces derniers. Le dispositif fonctionne de manière à éjecter automatiquement les déchets compactés de la chambre de compactage.

(57) A device and process for the thermal disinfection of biological waste wherein the waste is placed in a sack of polymeric material and compacted while the gases which are released are filtered and subsequently sealing the chamber and applying heat to the compacted waste, the process being characterized by releasing the pressure on the biological waste after compacting and monitoring the pressure during the step of applying heat thereto. The device operates such that the compacted waste may be automatically ejected from the compacting chamber.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A61L 2/04, 11/00

A1

(11) International Publication Number: WO 99/11299

(43) International Publication Date: 11 March 1999 (11.03.99)

(21) International Application Number: PCT/IB98/01353

(22) International Filing Date: 28 August 1998 (28.08.98)

(30) Priority Data:
97/10990 30 August 1997 (30.08.97) FR

(71)(72) Applicant and Inventor: AUBERT, Bruno [FR/FR]; 250, ancienne route de Cavillargues, F–30330 Connaux (FR).

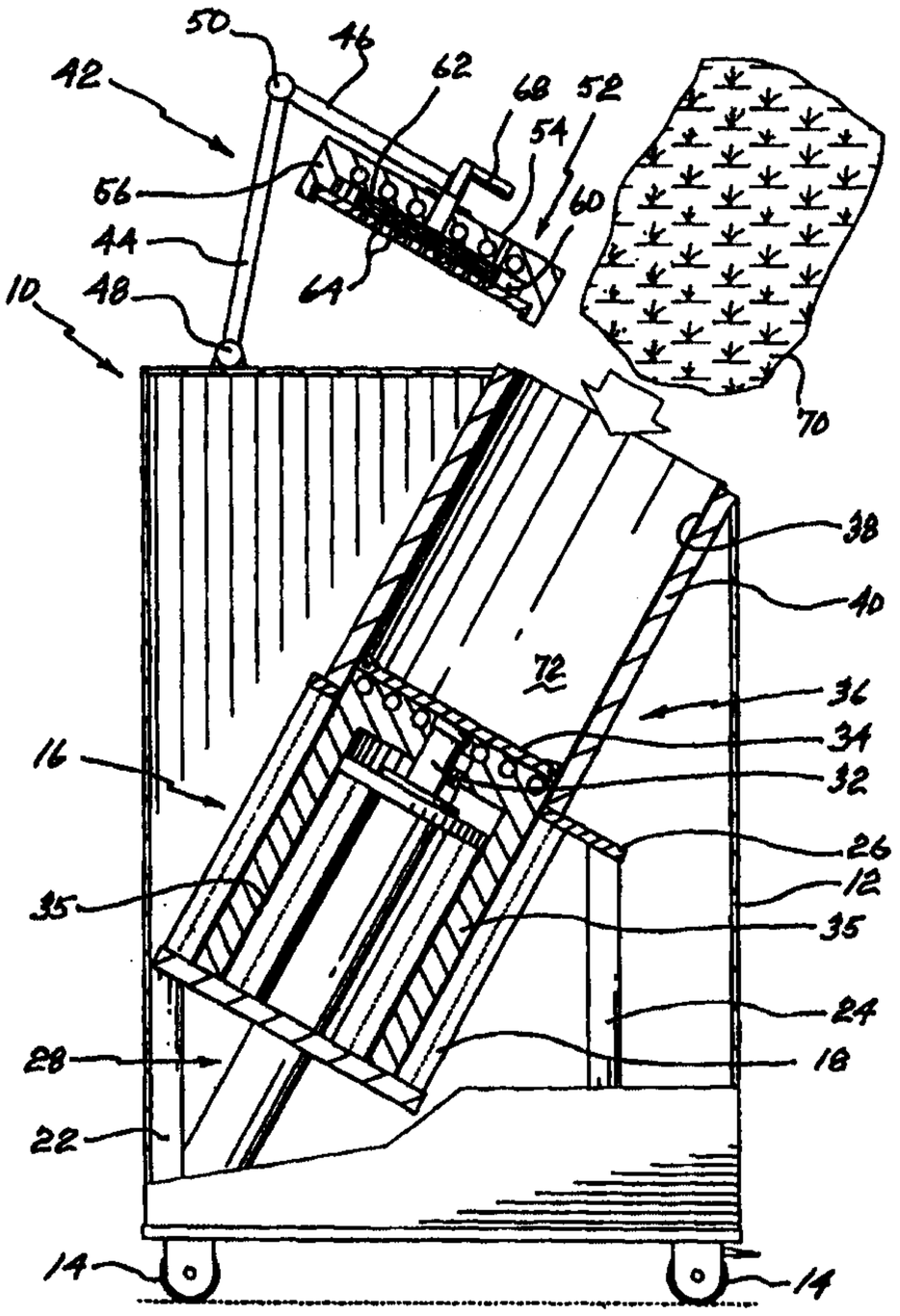
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: PROCESS FOR THERMAL DISINFECTION OF WASTE AND DEVICE FOR IMPLEMENTING THIS PROCESS

(57) Abstract

A device and process for the thermal disinfection of biological waste wherein the waste is placed in a sack of polymeric material and compacted while the gases which are released are filtered and subsequently sealing the chamber and applying heat to the compacted waste, the process being characterized by releasing the pressure on the biological waste after compacting and monitoring the pressure during the step of applying heat thereto. The device operates such that the compacted waste may be automatically ejected from the compacting chamber.



WO 99/11299 PCT/IB98/01353

PROCESS FOR THERMAL DISINFECTION OF WASTE AND DEVICE FOR IMPLEMENTING THIS PROCESS

This invention relates to a process for thermal disinfecting of waste, particularly that with biological risks, and also to a device for implementing this process.

As taught in French Patent 96 01828 filed on February 9, 1996, it is known to compact biological waste and then heat the waste to thermally disinfect the same. The process and device shown therein do, however, suffer from some disadvantages.

For example, changing the filter becomes difficult because the filter is integrated within the piston head, making it necessary to dismantle the whole piston to change the filter. As shown in this reference, the piston head is located above the waste sack and the removal of the compacted and disinfected sacks from the compaction chamber is only possible if the polymer of the sack flows around the hooking lugs located on the inside face of the piston which is in contact with the compacted wastes. It is possible that when the sacks are filled to capacity, there is insufficient polymer flowing around the lugs; in that case, the compacted sack does not climb up and is not released. A manual removal then becomes necessary. Furthermore, the presence of lugs requires that the sack be of a certain minimum size; good compacting generally requires that the thickness of the compacted sack is more than or equal to the size of the lugs.

The device also imposed a limit to the quantity of liquids that could be placed in the waste sack; when too much liquid is present, the exuded matter can not be eliminated directly into the sack of compacted wastes. To remedy this, a valve for the evacuation of liquids was located at the bottom of the mould. This valve can become blocked and then require cleaning.

It is an object of the present invention to provide a process and a device for the treatment of biological waste which permits the filter to be easily changed.

It is a further object of the present invention to provide a process and a device for the treatment of biological waste wherein the thermally treated waste material may be easily removed.

It is a further object of the present invention to provide a process and a device suitable for the treatment of biological waste wherein liquids in the biological waste may be treated.

According to one aspect of the present invention, there is provided a process for the thermal disinfection of biological waste, the process comprising the steps of compacting the biological waste in a chamber by applying a pressure thereto; filtering gases released during the step of compacting the biological waste; sealing the chamber after the biological waste has been compacted; applying heat to the compacted waste and the chamber to raise the compacted waste to a temperature of between 100°C and 200°C;

maintaining the compacted biological waste at the temperature for a period of time sufficient to thermally disinfect the biological waste; and subsequently cooling the compacted waste; the process being characterized by releasing the pressure on the biological waste after compacting the biological waste and before cooling thereof; and monitoring the pressure in the chamber during the step of applying heat to the compacted waste.

According to a further aspect of the present invention, there is provided a device for the thermal disinfection of biological waste, the device comprising a housing, a chamber formed within the housing, compacting means having a piston head moveable within the chamber for compacting material therein, heating means for heating the chamber, means for sealing the piston head with respect to the chamber, the device being characterized by having a cover member on the chamber, the cover being moveable between open and closed positions, the piston head being moveable from a lower non-compacting position to a position proximate the cover, gas outlet means located in the cover, the gas outlet means extending between the compaction chamber and an exterior side of the cover, and filter means located in the gas outlet means.

The process for thermal disinfection of waste thus may include a disinfecting step in which the wastes are covered beforehand with polymer or placed in a polymer sack and are brought into a compaction area and put under pressure. The gasses emitted by the compaction of the

wastes are filtered before being released; the chamber is then leak proofed and heat is applied while simultaneously controlling the temperature and the pressure inside the chamber. The temperature is maintained within a range of 100°C and 200°C and preferably between 134°C and 200°C. All parts having been into contact with the wastes are also disinfected at the same time.

Preferably, there is provided a step for the removal of the compacted waste following the cooling of the chamber and its compacted waste to below 60°C and the return of the area to atmospheric pressure. The process is preferably practiced by an arrangement wherein the compacting is achieved through pressure of a piston head located under or behind the waste to be compacted against the cover of the compaction chamber. The removal is effected by the movement of the piston head which pushes the compacted wastes toward the exterior.

Advantageously, the compacted wastes are ejected toward a waste bin or other appropriate recipient, without manual handling.

According to a preferred embodiment of the invention, the process also includes the monitoring of the pressure and the temperature as well as the evolution of pressure in relation to temperature.

The device preferably includes a liner for the compaction area in which a waste sack is placed with a thermal block thereabout. The compaction area is equipped

with a piston head and a hydraulic or mechanical piston may be operated by an electric motor. The means of heating may include known methods such as electrical resistance and/or voltage-dependent resistors.

The means of filtration may include at least one filter made of stainless steel fiber or a PTFE material.

According to a particular method of the invention, the part of the cover which is in contact with the waste is made up of stainless steel and has at least one orifice therein and which orifices are calibrated and relatively small.

Advantageously, the cover also houses means for heating of the compaction area. These may be electrical resistance or voltage-dependent resistors or any other appropriate means of heating.

Preferably, the upper part of the cover is made of a PTFE material such as the material known as Teflon TM by the Dupont de Nemours Company.

According to a preferred embodiment of the invention, the piston head is located under or behind the waste sack. Advantageously, the piston is partly located in the lower part of the compaction chamber. Preferably, the ensemble made up of at least the collar, the piston head, the piston, the compaction chamber and the cover, are at an incline of at least 20 degrees from vertical.

It is advantageous that the means of leak proofing the device are O-ring seals and/or inflatable and/or

dilatable rings strategically placed, or insulation gates.

Preferably, the sack in which wastes are placed prior to their being placed in the compaction area, is made of a polymer composite with polypropylene or polyamide exterior covering and a polyethylene interior lining.

It is advantageous to have the collar, the piston, the compaction chamber and part of the cover partially or entirely made of a metal of high thermal conductivity.

Preferably, the collar, the piston head, the compaction chamber, and the part of the cover in contact with the waste are covered with a liner of a material such as stainless steel of sufficient hardness to withstand scratching and deterioration by needles and scalpels during compacting.

According to a particularly preferred embodiment of the invention, the device is controlled by a computer using a program capable of measuring, controlling and regulating the temperature, the pressure and the evolution of the temperature in relation to the pressure based on time. The computer can check the functioning of each of the elements of the device such as checking the piston head's hydraulic leak proofing and the gas leak proofing of the compaction area and detecting the presence of liquid with a vapor pressure higher than that of water. The device may include means to eventually distill this liquid. The computer can monitor all steps and take appropriate action to shut down upon any malfunction.

Having thus generally described the invention, reference will be made to the accompanying drawings illustrating an embodiment thereof, in which:

Figure 1 is a side view in section of one embodiment of a device according to the present invention;

Figure 2 is a view similar to Figure 1 illustrating the closing of the cover and beginning of the compaction process;

Figure 3 is a view similar to Figure 1 illustrating the compaction process; and

Figure 4 is a view similar to Figure 1 illustrating the finishing of the compaction process and ejection of the disinfected waste.

Referring to the drawings in greater detail and by reference characters thereto, there is illustrated a device generally designated by reference numeral 10 and which device is suitable for the thermal disinfection of biological waste.

Device 10 includes a housing or a cabinet 12 having wheels 14 thereon for easy maneuverability of the device. Mounted within cabinet 12 is a compacting mechanism which is generally designated by reference numeral 16.

Compacting mechanism 16 includes a cylindrical side wall 18 and a bottom wall 20. A first support member 22 mounted interiorly of cabinet 12 supports one end of bottom wall 20 while a second support member 24 is arranged to

support a flange 26 which extends outwardly from an upper peripheral edge of side wall 18.

Compacting mechanism 16 includes a jack 28 having a piston 32 and a piston head 34. It will be noted that piston head 34 includes, and carries with it, a thermal block generally designated by reference numeral 35 and which thermal block 35 has a cylindrical wall extending downwardly therefrom. Sealing means 82 are provided on piston head 34.

Extending upwardly from side wall 18 is a collar which is generally designated by reference numeral 36 and which collar 36 has a liner 38 of a stainless steel material. Collar 36 also includes a thermal block 40 of a material having a high thermal conductivity.

Mounted on the top of cabinet 12 is an articulated arm generally designated by reference numeral 42 and which articulated arm 42 includes a first arm segment 44 and a second arm segment 46. First arm segment 44 is connected at one end thereof to cabinet 12 as designated by reference numeral 48 while a second end thereof forms a pivot attachment 50 with an end of second arm segment 46. A second end of second arm segment 46 is attached to a cover generally designated by reference numeral 52. Suitable means (not shown) are provided for moving articulate arm 42 as required and as will be discussed hereinbelow.

Cover 52 includes a top wall 54 having a peripherally downwardly extending side wall 56. Extending across cover 52 between side wall 56 is a lower cover

portion 58. Between lower cover portion 58 and top wall 54 there is provided a cavity 60, and which cavity 60 is designed to receive a filter 62. Provided within lower cover portion 58 are a plurality of relatively small apertures 64.

Cover 52 also includes a handle 68 for locking the cover in position on top of collar 36 in a conventional manner.

Heaters 80 are provided for cover 52 and block 35.

In operation, biological waste is placed in a bag 70 and which bag 70 is preferably of a composite polymeric material and is placed in cavity 72 defined between collar 36 and piston head 34. Articulated arm 42 is then actuated as shown in Figure 2 and designated by arrow 74 to place cover 52 in position on the top of collar 36. Handle 68 is then actuated as indicated by arrow 76 to lock the cover in position.

Subsequently, piston 32 is actuated as shown in Figure 3 to drive piston head 34 against sack 70 to compact the same. When the waste in bag 70 is compacted, pressure on piston head 34 is reduced or eliminated and heating means are then actuated for a period of time to thermally disinfect the biological waste.

Following the thermal disinfection of the waste, the material is cooled, articulated arm 42 is actuated to remove cover 52 as shown in Figure 4. The compacted waste

material 70 may then be ejected by a further upward movement of piston 32 into a suitable container 78.

As aforementioned, measurement of the pressure, the temperature and the evolution of the pressure in relation to the temperature during the various stages of the process is provided by suitable sensors. This is advantageous in that it makes it possible to avoid an over pressure within the system such as may occur when liquids having a much lower vapor pressure than water are present or when temperature increases are larger than the capacity of the device. The sensors make it possible to regulate the temperature any time according to the pressure. The measurement also allows one to know when the point of compaction is reached when the wastes are primarily liquids; in this case, as soon as all the air is evacuated from the chamber, the pressure rises very abruptly indicating the end of compaction.

The filter 62 may be made of suitable material such as a mineral membrane and/or activated carbon and/or a Teflon TM felt. Preferably, the filter has a 99.999% efficiency and will remove all particles down to a size of 0.01 μm.

I CLAIM:

1. A process for the thermal disinfection of biological waste, the process comprising the steps of:

compacting said biological waste in a chamber by applying a pressure thereto;

filtering gases released during said step of compacting said biological waste;

sealing said chamber after said biological waste has been compacted;

applying heat to said compacted waste and said chamber to raise said compacted waste to a temperature of between 100°C and 200°C;

maintaining said compacted biological waste at said temperature for a period of time sufficient to thermally disinfect said biological waste; and

subsequently cooling said compacted waste;

the process being characterized by;

releasing said pressure on said biological waste after compacting said biological waste and before cooling thereof; and

monitoring the pressure in said chamber during said step of applying heat to said compacted waste.

2. The process of Claim 1 further including the step of placing said biological waste in a polymeric container prior to compacting said biological waste.

3. The process of Claim 2 further including the step of cooling said compacted waste and ejecting said compacted waste in said polymeric material from said chamber.

4. A device (10) for the thermal disinfection of biological waste, the device comprising a housing, a chamber (72) formed within said housing, compacting means having a piston head (34) moveable within said chamber (72) for compacting material therein, heating means (80) for heating said chamber, means for sealing (82) said piston head with respect to said chamber, the device being characterized by having a cover member (52) on said chamber (72), said cover being moveable between open and closed positions, said piston head being moveable from a lower non-compacting position to a position proximate said cover, gas outlet means (64) located in said cover, said gas outlet means extending between said compaction chamber and an exterior side of said cover, and filter means (62) located in said cover and connected to said gas outlet means.

5. The device of Claim 4 wherein said filter means comprises a filter of PTFE felt having a filtration of 0.01 μm.

6. The device of Claim 4 wherein an outer surface of said piston head (34) and the inner surface (38) of said chamber (72) are formed of stainless steel.

7. The device of Claim 4 wherein said gas outlet means includes a plurality of apertures (64) formed in said cover.

8. The device of Claim 4 wherein said heating means (80) for heating said chamber include heating means for heating said chamber and said filter means located in said gas outlet means, said heating means comprising electric resistance heating.

9. The device of Claim 4 wherein an inner portion of said cover is formed of PTFE.

10. The device of Claim 4 wherein said chamber comprises a substantially cylindrical chamber, said chamber being inclined with respect to the vertical by at least 20 degrees.

11. The device of Claim 4 further including means for measuring pressure and temperature within said chamber.

12. The device of Claim 4 further including computer control means.

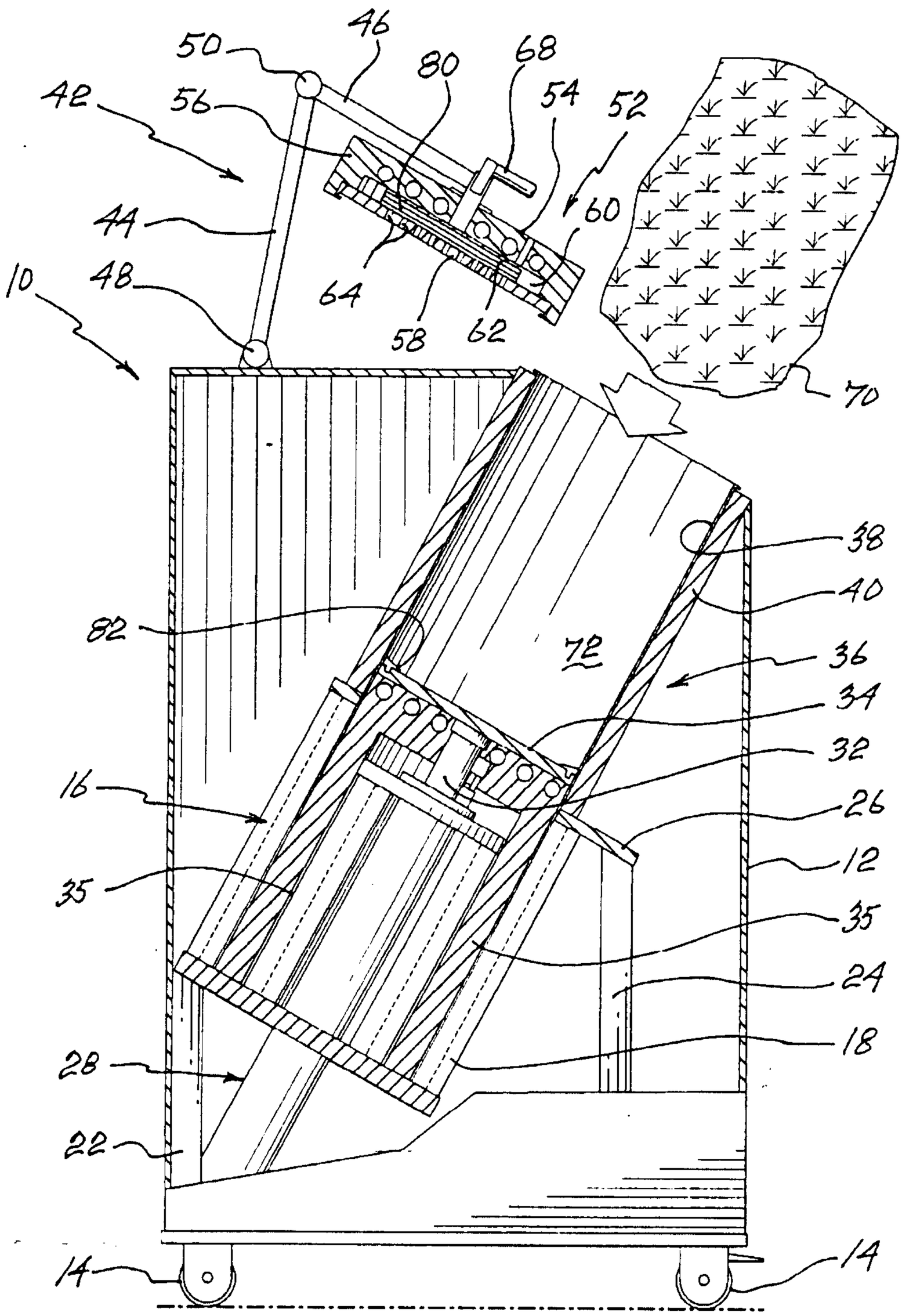


Fig. 1

AMENDED SHEET

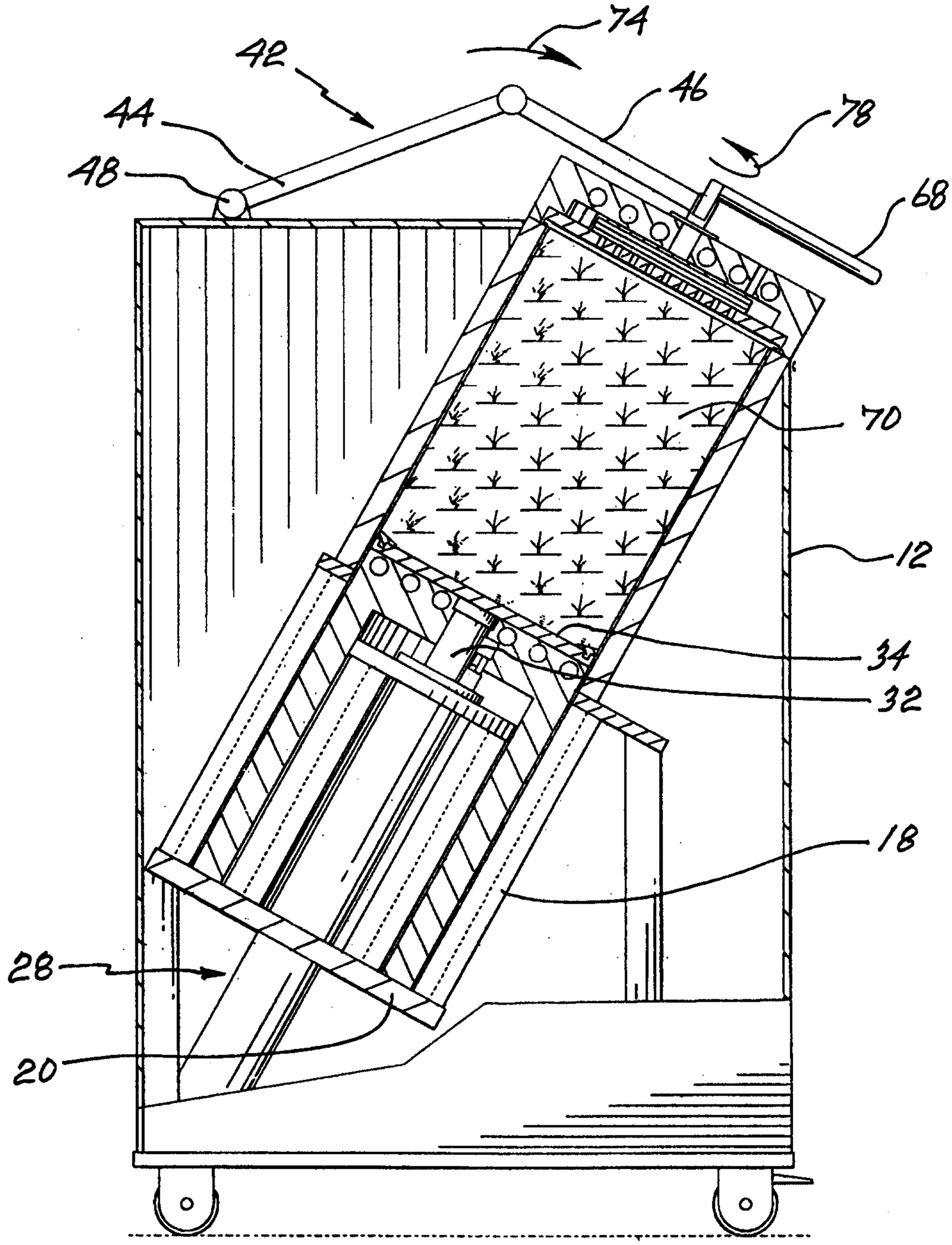


Fig. 2

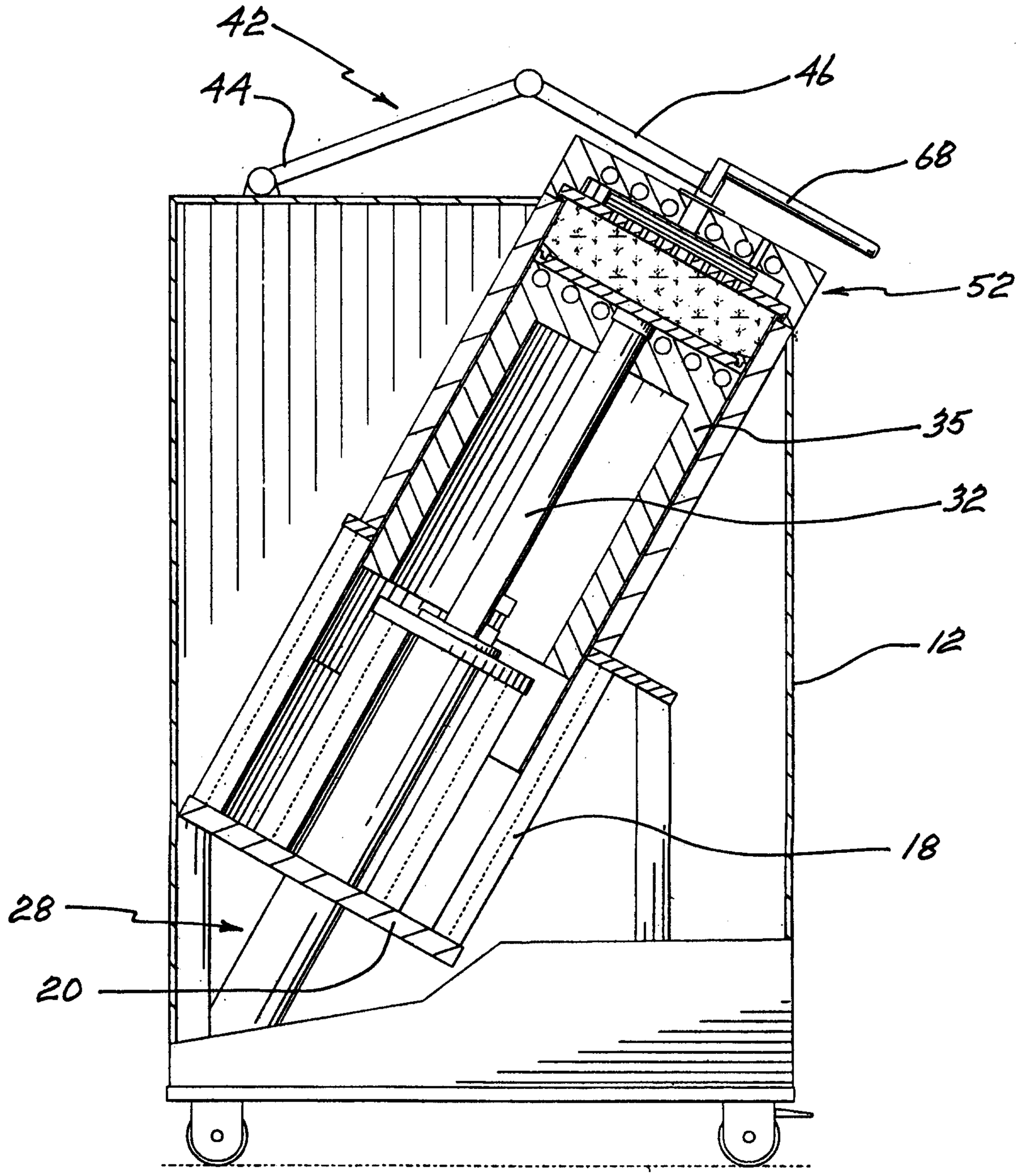


Fig. 3

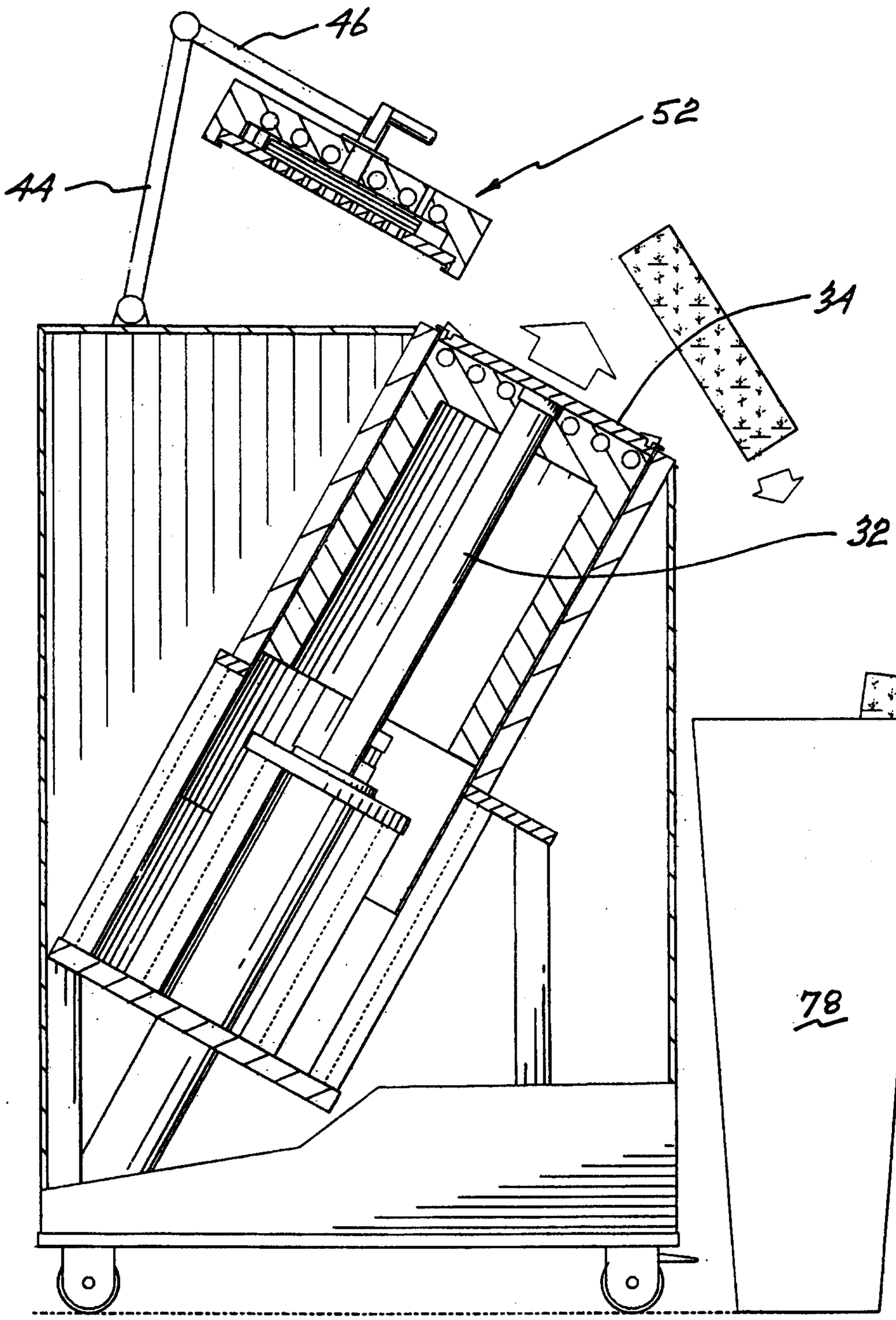


Fig. 4