



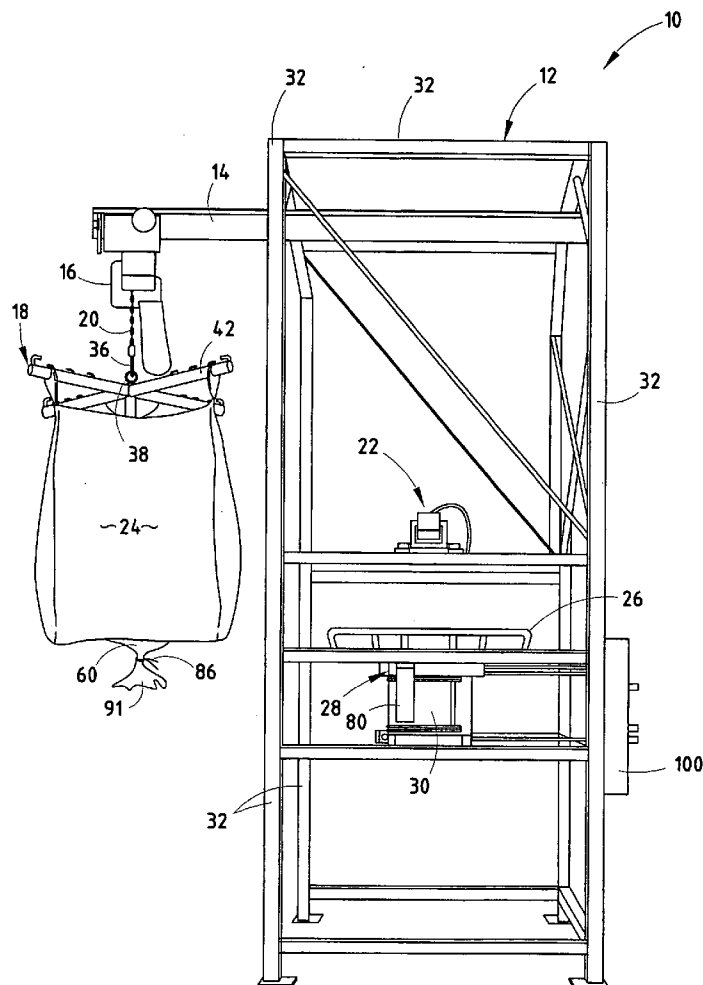
US 20050199650A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0199650 A1****Nyhof et al.**(43) **Pub. Date: Sep. 15, 2005**(54) **BULK BAG DISCHARGING SYSTEM
ASSEMBLY****Related U.S. Application Data**(63) Continuation-in-part of application No. 10/430,518,
filed on May 6, 2003.(60) Provisional application No. 60/378,298, filed on May
6, 2002.(75) Inventors: **Scott L. Nyhof**, Hamilton, MI (US);
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GRAND RAPIDS, MI 49501 (US)**(51) **Int. Cl.⁷** **B65D 35/56**(52) **U.S. Cl.** **222/105**(57) **ABSTRACT**

A material container discharge assembly including a main frame assembly; a spout access chamber engaging the main frame assembly; at least two independently movable material container impactors engaged to the main frame assembly and adapted to engage a material container when the material container is positioned within the main frame assembly and above the spout access chamber; and wherein the material container impactors include a conditioning frame.

(73) Assignee: **Material Transfer & Storage, Inc.**(21) Appl. No.: **11/118,986**(22) Filed: **Apr. 29, 2005**

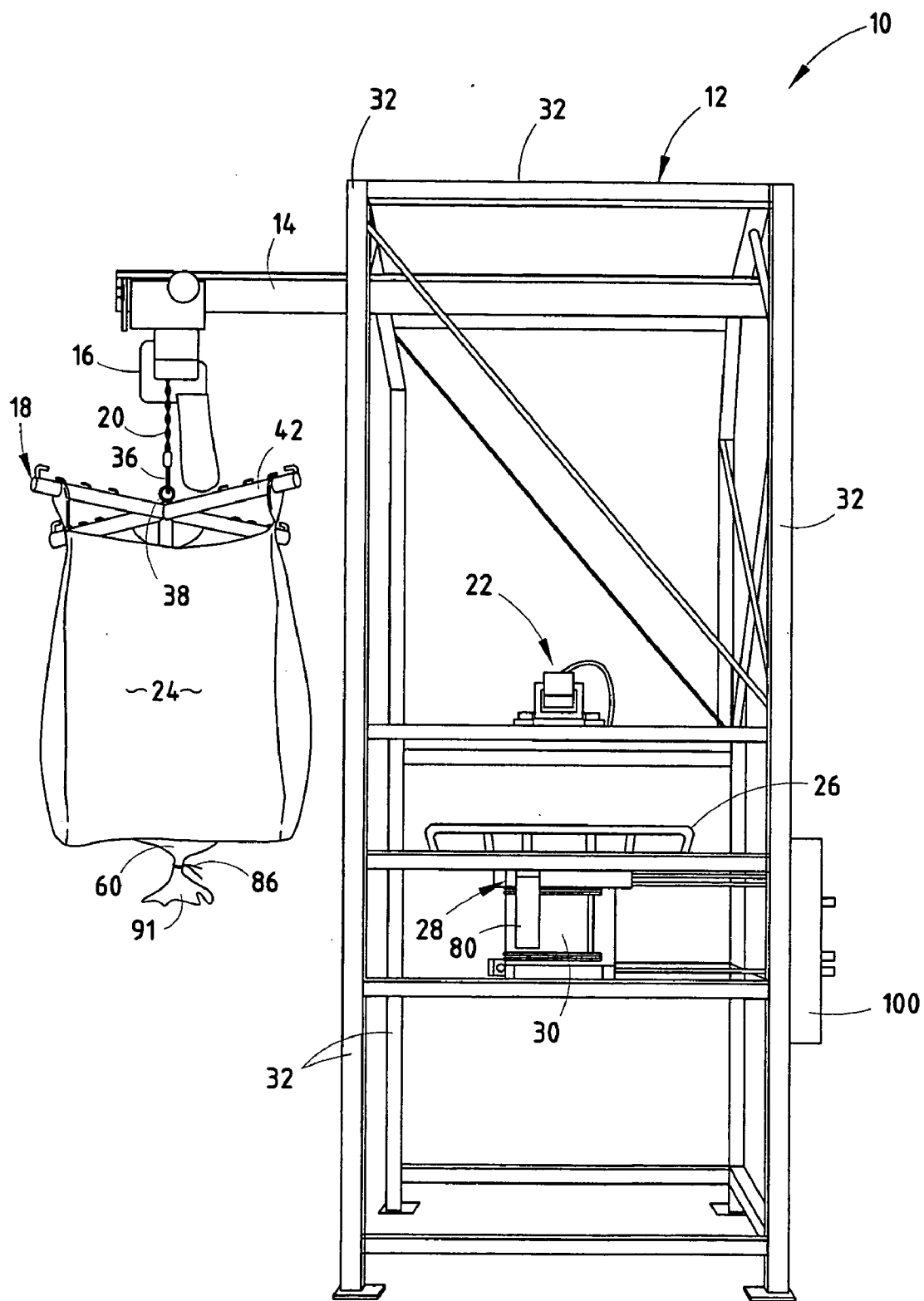


FIG. 1

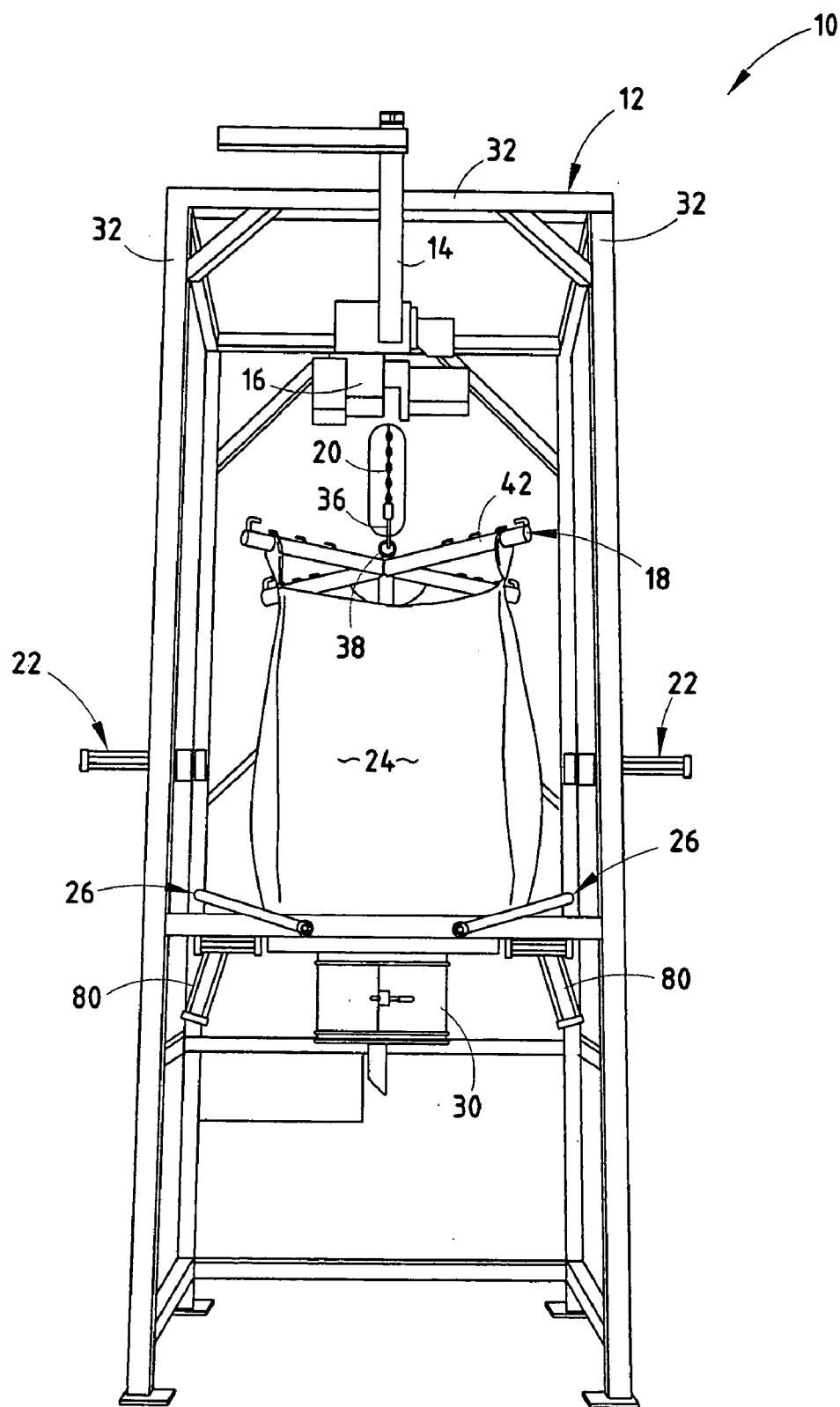


FIG. 2

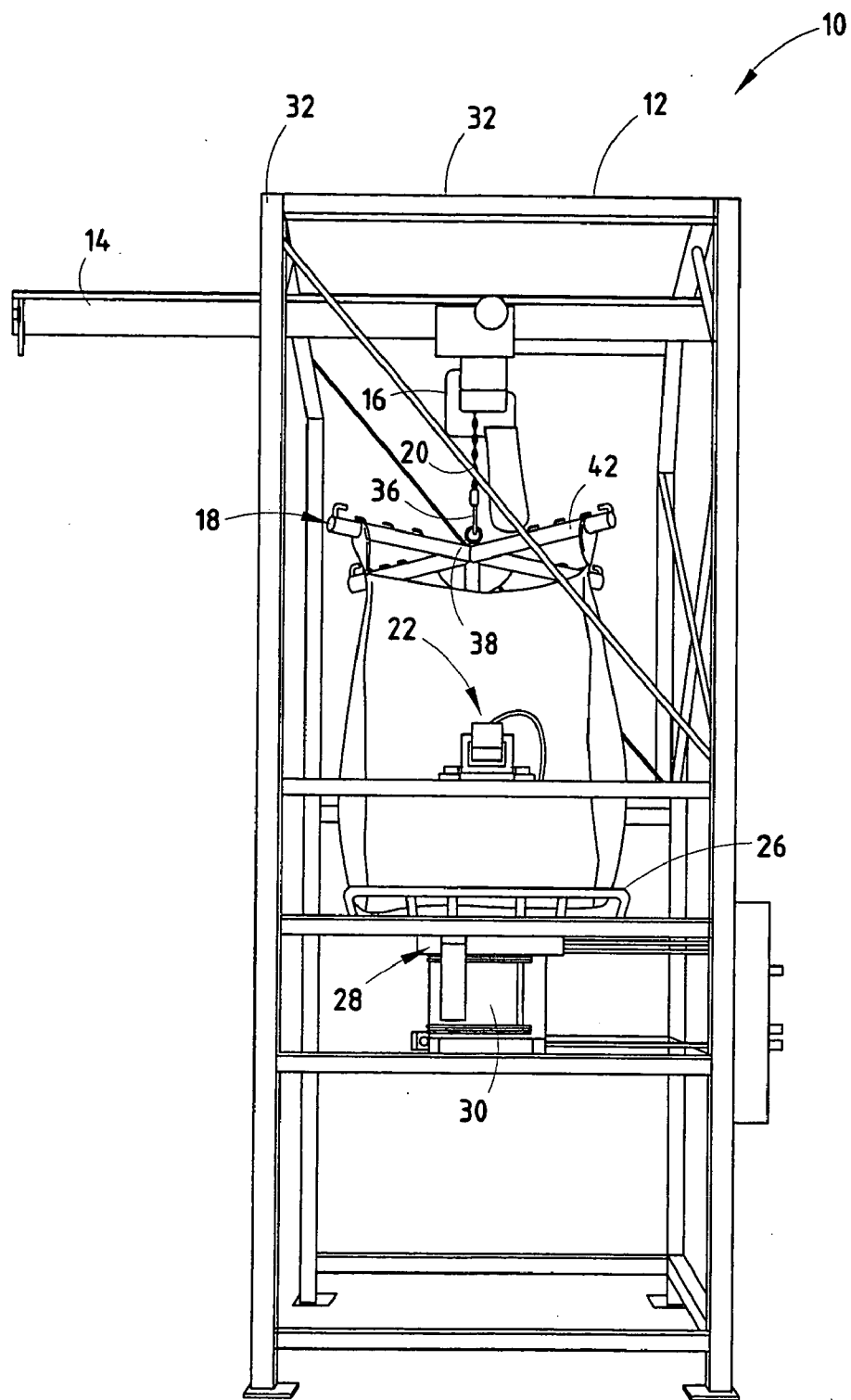


FIG. 3

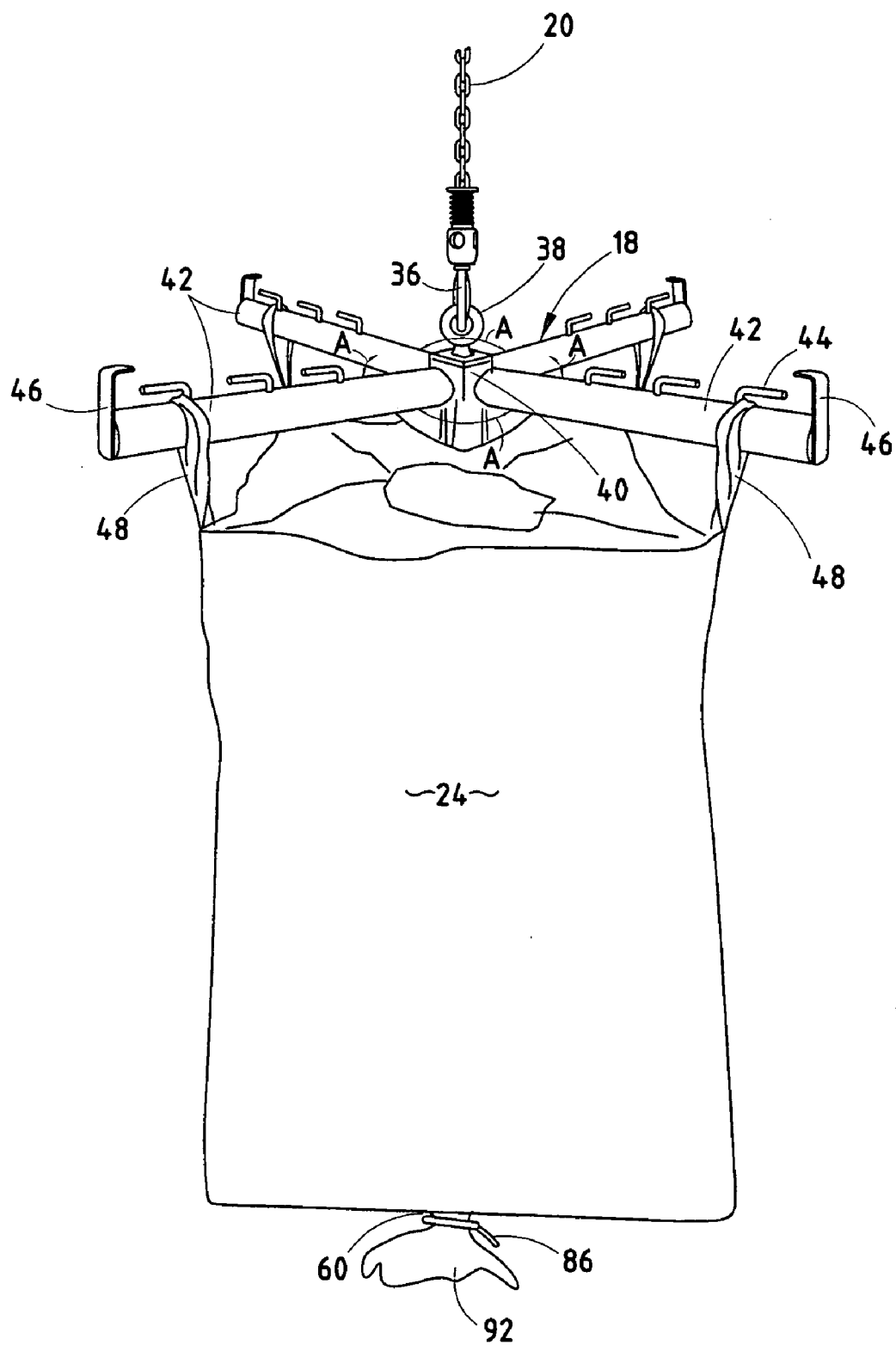


FIG. 4

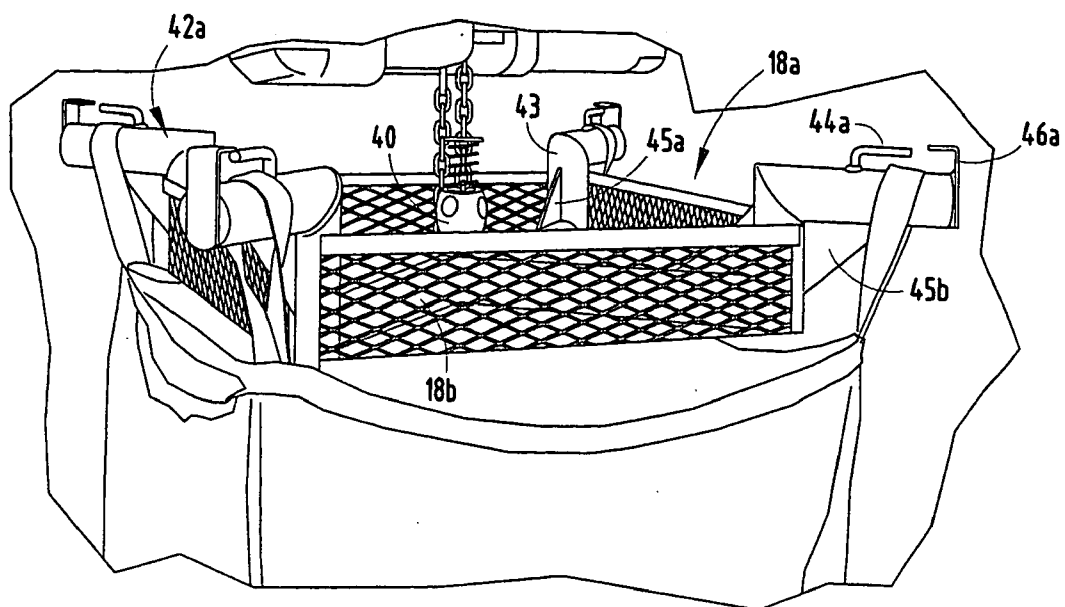


FIG. 4A

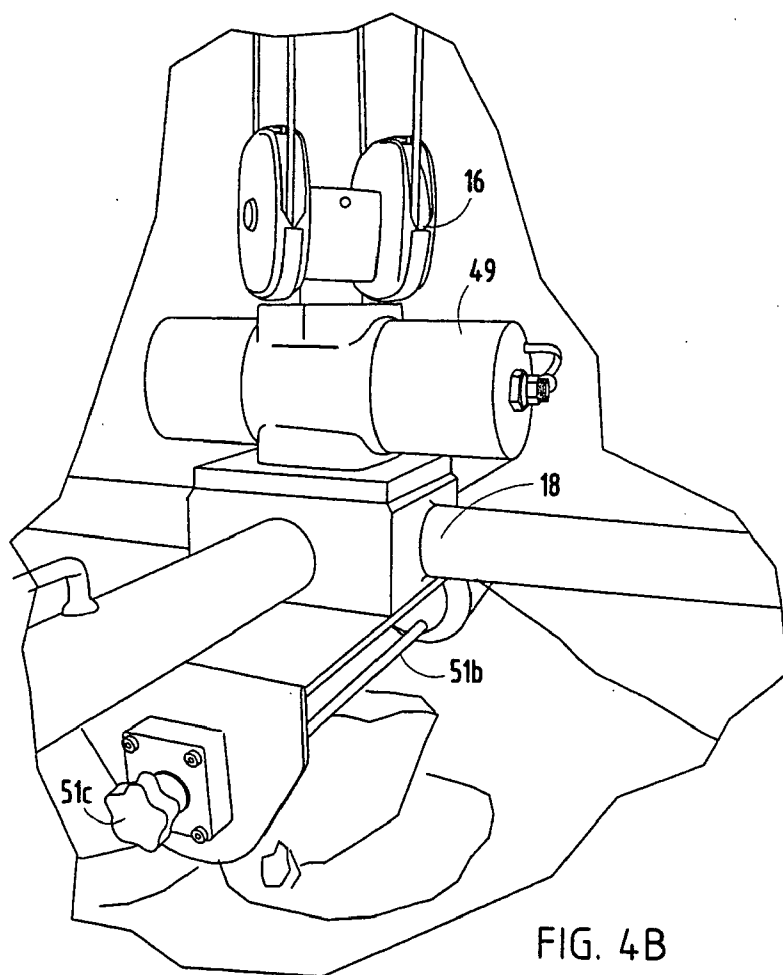


FIG. 4B

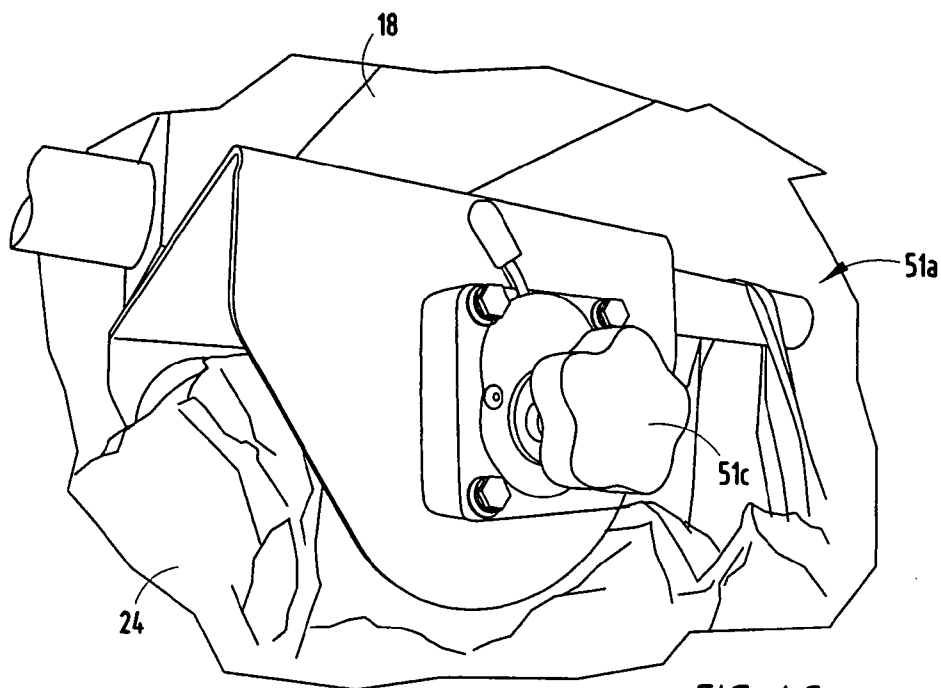


FIG. 4C

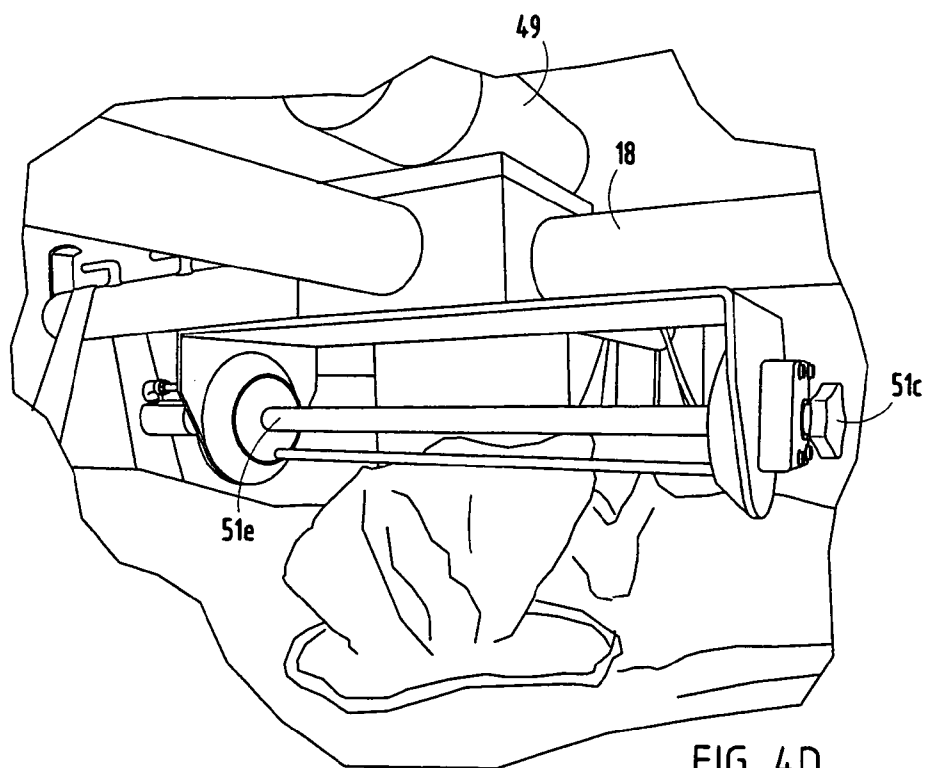


FIG. 4D

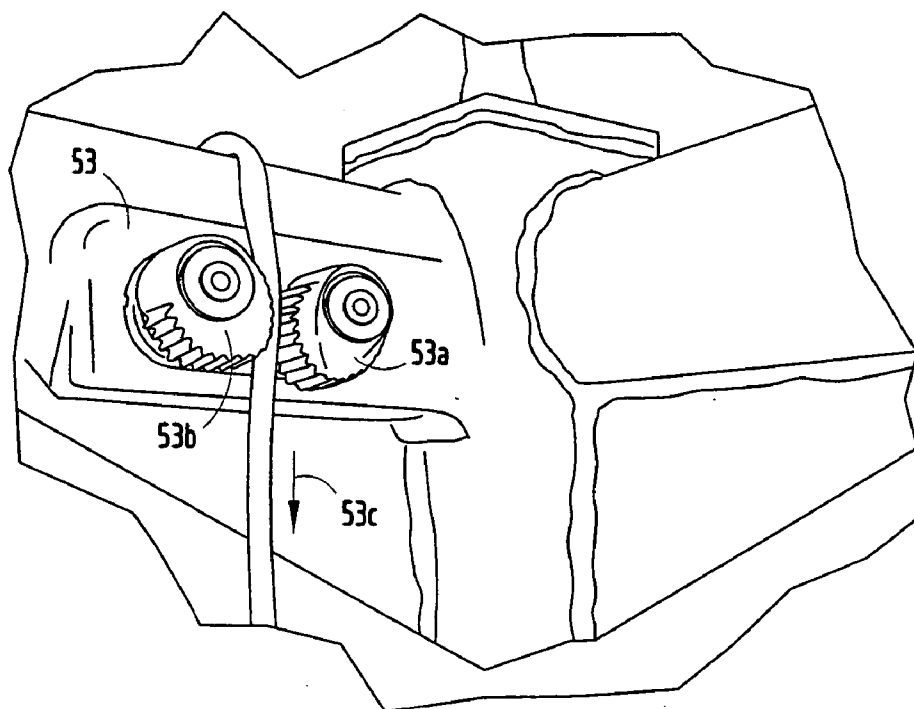


FIG. 4E

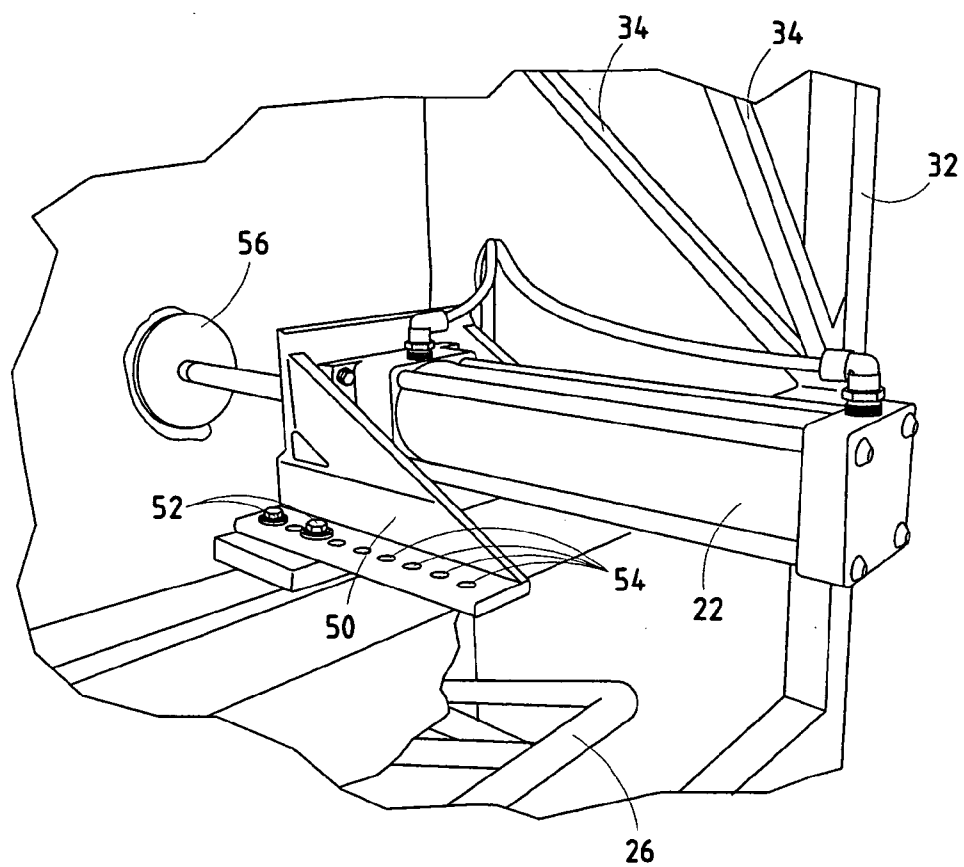


FIG. 5

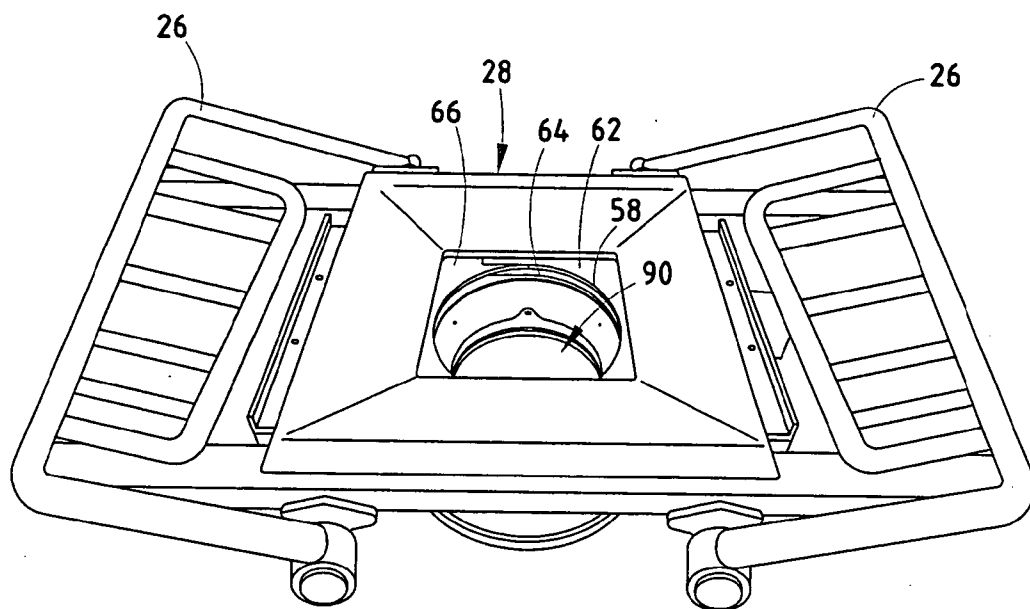


FIG. 6

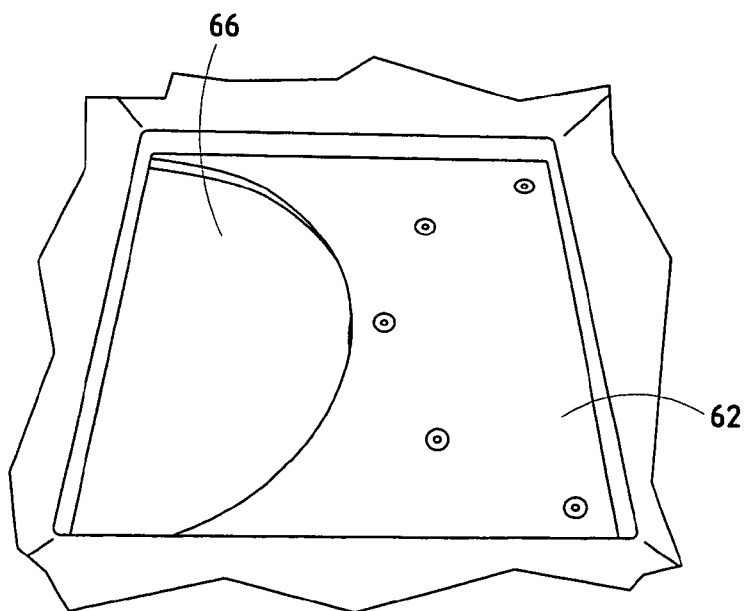


FIG. 7

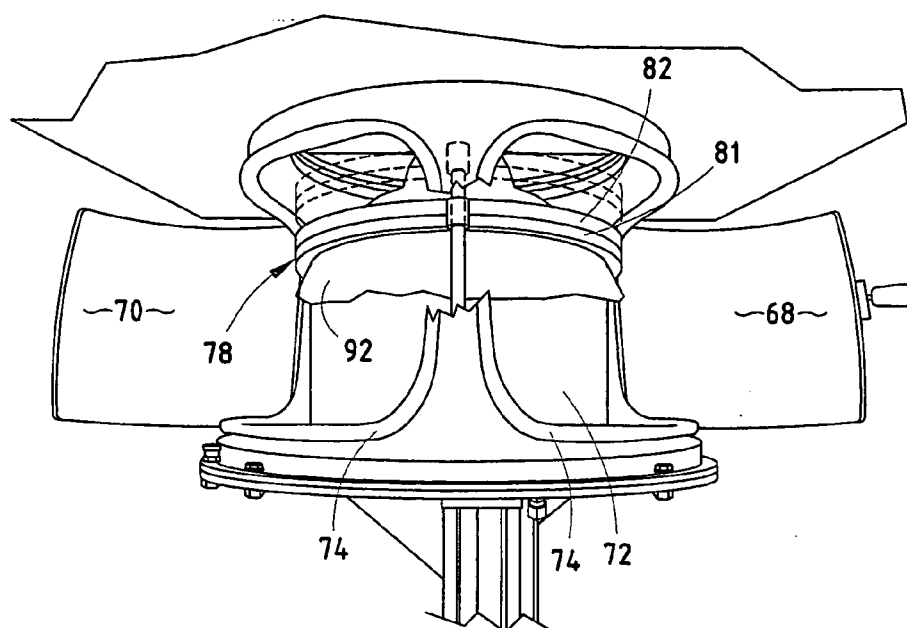


FIG. 8

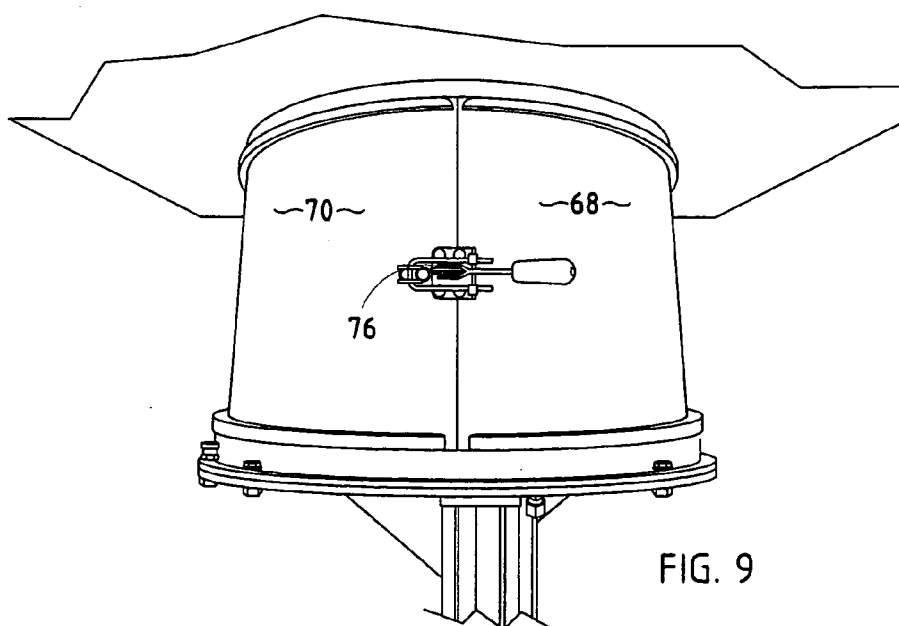


FIG. 9

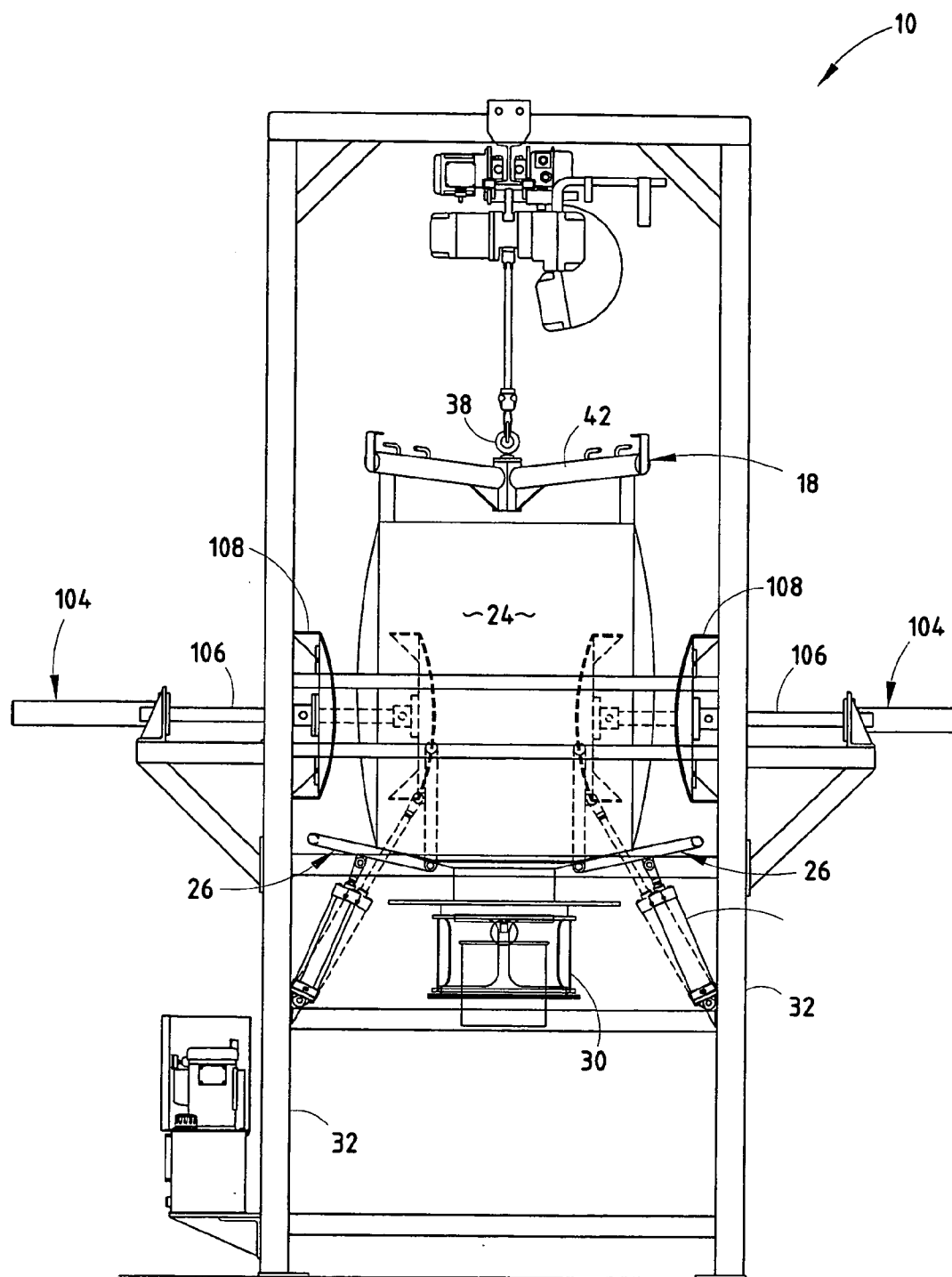


FIG. 10

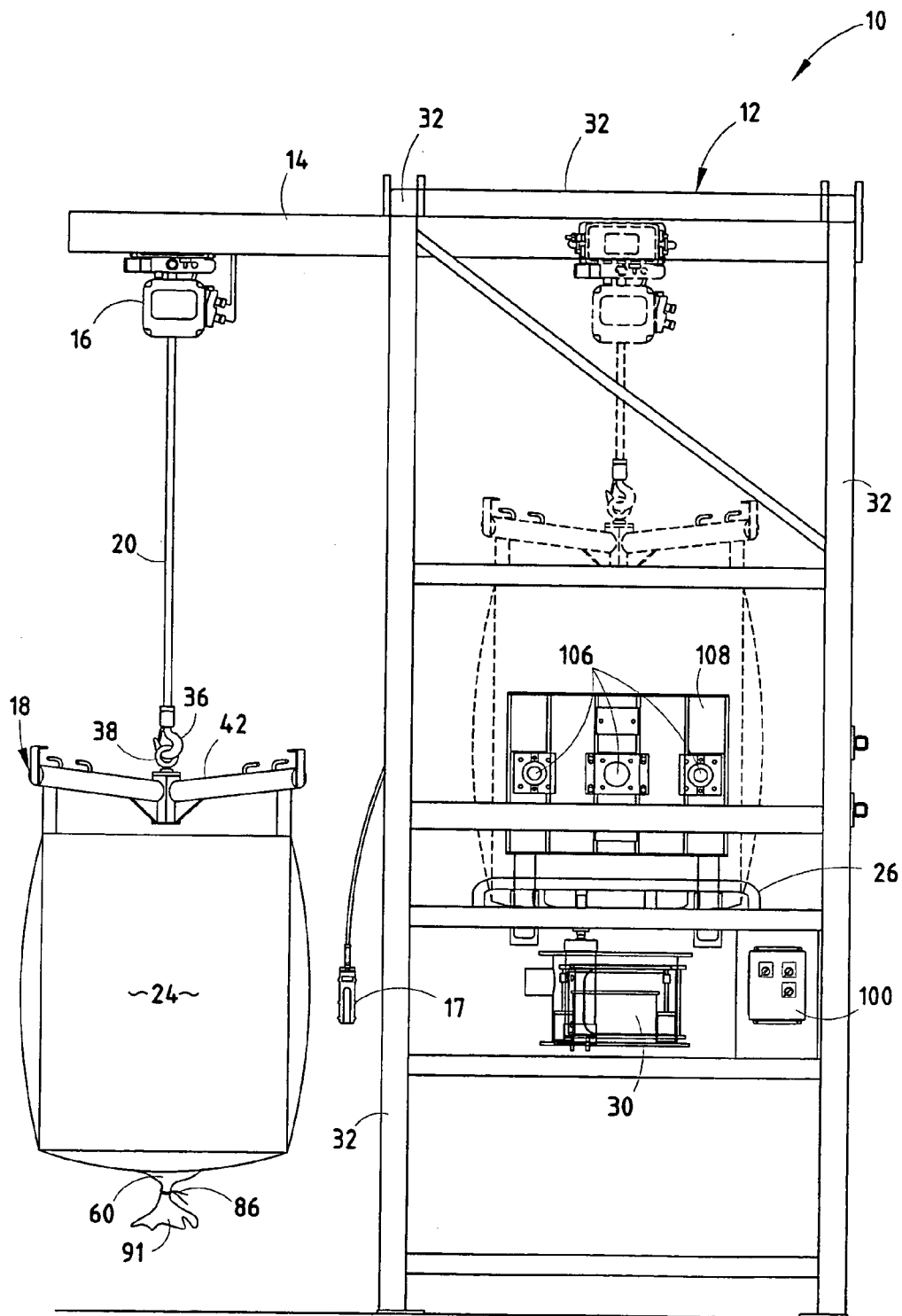


FIG. 11

BULK BAG DISCHARGING SYSTEM ASSEMBLY**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] This application is a continuation-in-part of application Ser. No. 10/430,518, filed on May 6, 2003, entitled BULK BAG DISCHARGING SYSTEM ASSEMBLY, the disclosure of which is hereby incorporated by reference in its entirety, which claims the benefit of U.S. Provisional Application No. 60/378,298, filed on May 6, 2002, the disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] Bulk bag discharging systems have been used to transfer materials, usually raw materials, from one container into another without contaminating the materials. Generally, bulk bag discharging systems lift a material-containing bag into a dispensing position. Once the bag is in position, an operator must somehow stretch the outlet portion of the bag material that is below a tie off point around a dispensing spout. This is extremely difficult in known bulk bag systems employing a dust free chamber around the dispensing spout because the dispensing spout is normally contained within a square chamber. When a dust free chamber is used, they only employ a single door on one side. As a result, there is no convenient way to seal the bag in a dust free manner because, before the bag is untied to release the contents, the loose bag material must be fitted around the dispensing spout, which is difficult if not impossible, for an operator when the only access point is a single door on one side of the chamber. The single door does not allow the operator to easily reach around the entire circumference of the spout and fit the loose bag material over the spout.

[0003] Additionally, prior bulk bag dispensing systems have used V-shaped impactors that run off one pneumatic cylinder and pinch together to squeeze the sides of the bulk bag, thereby preventing the formation of bridging/rat-holing, which is a condition whereby a material arches or bridges across a dispensing hole, resulting in sporadic flow or a complete cessation of flow. Massagers have also been used to help prevent rat-holing/bridging. The massagers used in the prior art are typically manufactured using square metal segments. As with the prior art impactors, the prior art massagers are typically positioned near the bottom of the bag and contact the bag on each side simultaneously.

[0004] Lastly, the prior art bulk bag dispensing apparatuses typically employ an iris type shut off valve above the dispensing aperture. Unfortunately, this design only allows the operator to stop the flow of material by closing the iris shut off valve when the material is flowing out of the bag. There simply is not enough strength in the prior art iris designs to close the container when the material itself is preventing the iris from closing.

[0005] Accordingly, there is a significant need for an easily operable, durable, heavy-duty bulk bag container discharging system, which can provide: an easily accessed dispensing chamber; a system for easily sealing the loose material of a bag container in a dust free fashion within the dispensing chamber; independently driven, adjustable impactors and massaging units, which will allow the operator to not only squeeze the bag using these systems but also

rock the bag container back and forth in the same or different directions; and a flow stopping discharge system, which allows an operator to close the bag container at any time, including when the material is not flowing.

SUMMARY OF THE INVENTION

[0006] One embodiment of the present invention includes a material container discharge assembly including a main frame assembly; a spout access chamber engaging the main frame assembly; at least two independently movable material container impactors engaged to the main frame assembly and adapted to engage a material container when the material container is positioned within the main frame assembly and above the spout access chamber; and wherein the material container impactors include a conditioning frame.

[0007] Another embodiment of the present invention includes a method for conditioning a material container including the steps of: providing a material container discharge assembly that includes a main frame assembly, a spout access chamber engaged with the main frame assembly, at least two independently moveable material container impactors including a conditioning frame and engaged with the main frame assembly and further providing a material container; positioning the material container within the main frame assembly and above the spout access chamber; actuating the conditioning frame of at least two of the material container impactors in a direction towards the material container; and applying force from the conditioning frames to opposite sides of the material container.

[0008] These and other features, advantages and objects of the present invention will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a side perspective view of the material discharge assembly of the present invention showing the material bag/container being moved into position;

[0010] FIG. 2 is a front perspective view showing the material bag/container in the dispensing position within the material discharge assembly;

[0011] FIG. 3 is a side perspective view showing the material bag/container in the dispensing position within the material discharge assembly;

[0012] FIG. 4 is a perspective view of the material bag/container transport assembly of the present invention;

[0013] FIG. 4a is a partial perspective view of the ultra low material container transport assembly of the present invention;

[0014] FIG. 4b is a partial perspective view of the powered turner of the present invention;

[0015] FIG. 4c is a partial perspective view of a hand crank of the motorized (or manual) rotary liner tensioner system of the present invention;

[0016] FIG. 4d is a partial perspective view of the motorized rotary liner tensioner system of the present invention;

[0017] FIG. 4e is a partial perspective view of the rotating cam jam-cleat liner retainer of the present invention;

[0018] FIG. 5 is a perspective view of one of the independently movable material container impactors engaged to the main frame assembly;

[0019] FIG. 6 is a perspective view of the at least two independently movable material container massaging frames and the discharge receiving gate, which is shown in the open position;

[0020] FIG. 7 is a perspective view of the discharge receiving gate, where the receiving aperture is closed by the curved first and third plates matingly receiving a second curved plate;

[0021] FIG. 8 is a perspective view of the spout access chamber to access doors in the open position and showing the movable sealing assembly in the open and bag sealing position;

[0022] FIG. 9 is a perspective view of the spout access chamber, where the two access doors are closed;

[0023] FIG. 10 is a side view of the material discharge assembly showing a side view of bag conditioning impactors of an embodiment of the present invention; and

[0024] FIG. 11 is a side view of the material discharge assembly showing a front view of the bag conditioning impactors of an embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT(S)

[0025] The discharge assembly 10 of the present invention typically includes a main frame assembly 12 that includes a hoist support 14 engaged to the main frame assembly 12 and a hoist 16 moveably engaged with the hoist support 14; a material container transport assembly 18 engaged to the hoist 16, typically by a heavy-duty chain 20; at least two independently movable material container impactors 22 adjustably engaged to the main frame assembly to accommodate different sized soft-sided material containers (bags) 24; at least two independently movable material container massaging frames 26 engaged to the main frame assembly 12; a discharge receiving gate 28; and a spout access chamber 30.

[0026] The main frame assembly 12 typically utilizes about three inch to about four inch square tubing having about ¼ inch to about ⅝ inch thick walls about the perimeter of the main frame assembly 12. These perimeter pieces 32 are typically continuously welded with one another to provide added strength. The main frame assembly 12 further includes a hoist support 14, which is typically an I-beam engaged to the top of the main frame assembly 12. The I-beam is typically about an eight inch S-flange, approximately 23 pound beam that conforms to ASTM A36 carbon steel specifications. The hoist I-beam is typically engaged to the main frame assembly 12 with about a one inch thick plasma cut mounting support bracket. The cross support members 34 are typically about 1½ by 1½ by about 1½ inch square metal segments. The cross support members 34 are typically continuously welded to the other portions of the main frame assembly 12 to provide optimum strength. While not preferred, the cross support members 34 may be anchored to the structural members by any other suitable means, such as bolts and angle irons.

[0027] The hoist 16 is typically a heavy-duty hoist capable of lifting loads from about 1 ton to about 3 tons. Typically, the hoist is controlled with a conventional controller 17. The lifting strength of the hoist may be increased or decreased to any strength, depending on user need. The hoist 16 is operably coupled with a heavy-duty chain 20 or other lifting member. The heavy-duty chain 20 typically employs a steel hook 36. The steel hook 36 is typically mounted to the heavy-duty chain 20 such that it is allowed to rotate without binding the chain, usually utilizing a bearing in a ball and socket type arrangement.

[0028] Optionally, a forklift may be used in conjunction with a bag-hanging frame, which engages the bag 24. The bag suspends from the bag hanging frame and is moved into position with the forklift. The bag-hanging frame engages the main frame assembly. The bag-hanging frame typically engages the top of the main frame assembly and sets upon the four corners of the assembly. There are typically stacking pads on the top four corners of the main frame assembly that position the bag and the bag hanging assembly in the proper discharging position.

[0029] As shown in FIG. 4, the material container transport assembly 18 of the present invention is typically engaged to the hoist 16 by placing the hook 36 in the eyelet portion 38 of the material container transport assembly 18. The material container transport assembly 18 typically includes a central hub portion 40, four material container support members 42 engaged to the central hub portion via weld, extending at an upward angle of from about three degrees to about seven degrees, but most typically about five degrees. The support members 42 typically are spaced at about 90 degree angles from one another (see Angle A in FIG. 4). Each of the material container support members 42 also typically include at least one outwardly extending bag loop retention member, which are typically L-shaped bent steel rods engaged to the support members via a weld or a nut and bolt type arrangement. In the preferred embodiment, there are three L-shaped outwardly extending bag loop support retention members 44 on each material container support member 42 to allow the transport assembly to easily accommodate material bags of various sizes.

[0030] Additionally, each material container support members 42 typically include an inwardly extending L-shaped bag loop retention member 46 engaged at or near the non-hub engaging end of the material container support members 42. These L-shaped inwardly extending bag retention members, while not necessary, assist in preventing the loops of the bag/container from falling off the ends of the material container support members when the bag is placed on the ground for removal from the material container transport assembly. Without the L-shaped inwardly extending bag loop retention members, the bag loops could unintentionally disengage from the material container support members of the transport assembly when the bag container is no longer held in position by gravity. The inwardly extending L-shaped bag loop retention members may be of any suitable height, but typically extend slightly higher than the outwardly extending bag loop retention members. Moreover, the inwardly extending L-shaped bag loop retention members are typically substantially flat bent members, while the outwardly extending bag loop retention members may be any suitable shape, but are typically cylindrical in shape.

[0031] Significantly, the fact that the material container support members 42 extend from the central hub portions at approximately five degrees accomplishes two significant functions. First, via gravity, the angle forces the loops of the bag containers into engagement with the L-shaped outwardly extending bag loop retention members 44 when the bag container is hoisted off of the ground, thereby providing safety benefits during such procedures. Secondly, this construction allows the distance from the bottom of the hoist hook 36 to the top of the bag loops 48 to be optimally minimized from zero inches to about 1½ inches. This allows manufacturers to install the entire bulk bag discharge assembly 10 in facilities with lower ceilings than were previously possible.

[0032] Alternatively, an ultra low clearance material container transport assembly 18a, as shown in FIG. 4A, can be used. The ultra low clearance material container transport assembly 18a optionally includes a chain basket 18b, which is typically integral with the support members 42a and may be made of solid panels or apertured (see FIG. 4A) panels. The chain basket 18b collects the heavy duty chain 20 or other lifting member as the hoist is elevated and lowered thereby eliminating the need for a chain bag and also preventing the chain from interfering with the operation of the discharge assembly (because in low clearance installation locations a chain bag may not be useable). The panels of the chain basket 18b may be constructed of any number of materials including wire mesh, sheet metal, or some form of perforated metal. Generally, support members 42a have a first substantially horizontal section, a substantially vertical section 43, and a second substantially horizontal section. The support members 42a each typically have an at least substantially vertical section 43 that raises the ends of the support members 42a. The vertical section 43 extends from the first substantially horizontal sections of the support members 42a at an angle of about 90 degrees (see FIG. 4A). In addition, the second substantially horizontal sections of the support members 42a extend from vertical sections 43 at an angle of about 90 degrees (see FIG. 4A). Each vertical section typically is reinforced using an internal triangular shaped reinforcing section 45a and an external triangular shaped reinforcing section 45b to strengthen the junction of the vertical section and the substantially horizontal sections of the support members 42a. Consequently, the ends of support members 42a are elevated above the central hub portion 40. Because of the additional clearance provided by the vertical sections 43, the ultra low assembly 18a reduces the overall height of the unit, which is especially useful because it allows the discharge assembly 10 to be utilized in areas where ceiling height is an installation issue or in low head room applications. The ultra low assembly 18a requires approximately 12 to 14 inches less clearance than the material container transport assembly 18. The height reduction is achieved because the ultra low assembly 18a has lifting arms that extend at a more aggressive angle, typically, at an angle of about 90 degrees. As similarly used in the embodiment of FIG. 4, the ultra low clearance material container transport assembly 18a typically utilizes L-shaped bag loop retention members 46a and outwardly extending bag loop retention members 44a.

[0033] FIG. 4B shows a powered turner 49 that can be disposed between the hoist 16 and the material container transport assembly 18. The powered turner 49 allows rotation of the soft-sided material containers 24. Frequently, in

operation, conditioning two sides of soft-sided material containers will not suffice. Rotating the bag by any degree such as about 45 degrees or about 90 degrees, but preferably about 90 degrees, allows the two unconditioned sides of the typically hexahedron, such as a cube, shaped bag 24 to be conditioned. Optionally, conditioning may be done after the bag has been rotated about 45 degrees and then optionally conditioned a third time after a subsequent rotation of about 45 degrees. The powered turner 49 may be activated remotely by a user on the ground when the material container 24 is elevated. In addition, the powered turner 49 keeps the material container 24 rotated at any predetermined angle thereby eliminating the need for a user to hold the position of the material container 24 at some angle from its original position thereby improving safety. The powered turner 49 may be powered by various devices, including a (hydraulic, electric, or pneumatic) motor, or an (pneumatic) actuator.

[0034] Oftentimes, liners, which may be disposable, are placed in the material container 24 so that the contents of the material container 24 contact the liner instead of the material container 24. However, previous to the present invention where a liner is used, the liner often falls through the spout of the bag during discharge. As shown in FIGS. 4B and 4C, a manual rotary liner tensioner system 51a may be used to keep a liner from discharging out of the soft-sided material container 24. The tensioner system prevents the liner from discharging through the discharge spout where it could become entangled in down-stream equipment. In the case of a powered or motorized liner, the excess liner is wound up on a spool that is entirely outside of the bag directly above it. This type of tensioner system typically consists of a spool drum 51b and manual hand crank 51c that are attached to the bottom of the material container support assembly 18. When attaching the liner to the tensioner system, the top of the material container 24 must be opened, typically by untying it. Thereafter, the untied or tied liner is engaged to the spool 51b, typically by securely wrapping the liner around the spool 51b. Thereafter, the liner is manually tensioned prior to raising the material container 24 into the discharge position to keep the liner in place. This type of tensioner initially tensions the liner, but simply acts as a retention device once discharging of the container contents begins.

[0035] Alternatively, a motorized rotary liner tensioner system 51d, as shown in FIG. 4D, may be used, which typically provides at least substantially constant tension on the liner throughout discharging of the container contents. Alternatively, tension may be applied to the liner at operator selected or predefined intervals using the motorized rotary liner tensioner system. The system may also only apply initial tension and thereafter operate to retain the liner in a similar fashion to the manual rotary liner tensioner system.

[0036] A motorized rotary liner tensioner system 51d typically has a powered spool drum 51e and hand crank 51c that are attached to the bottom of the material container system assembly 18 or to the bottom of the ultra low clearance material container transport assembly 18a (not shown). The liner is attached to the spool drum 51e and manually tensioned with the hand crank 51c prior to raising the material container 24 into the discharge position. Once in place, the powered spool drum 51e is actuated and typically applies substantially constant tension to the liner. As the material is removed from the material container 24,

the liner is retracted as required to keep tension and provide slope to the discharge. The motorized and manual liner tensioner systems also help prevent the liner from falling out of the discharge spout of the bag as material is discharged from the bag.

[0037] FIG. 4E illustrates a rotating cam jam-cleat liner retainer system 51f that can be used to hold the liner inside the material container 24. The rotating cam jam-cleat liner retainer system 51f typically consists of a manual, rotating cam jam-cleat 53 with a quick release capability that is typically attached or otherwise engages the material container system assembly 18. The rotating cam jam-cleat 53 has a first spring-biased toothed cam 53a and a second spring-biased toothed cam 53b. Cam 53a is spring-biased so that the distal end from the point of rotation for cam 53a rotates towards cam 53b. Likewise, cam 53b is spring-biased so that the distal end from the point of rotation for cam 53b rotates towards cam 53a. A line that is engaged to the liner can be inserted between cams 53a, 53b so that relatively minimal force will shift the line in the direction designated by 53c. When force in the direction of 53c is removed, the cam alignment prevents substantial movement of the line in a direction opposite to 53c. In application, the liner is typically manually tensioned prior to raising the material container 24 into the discharge position. The jam-cleat 53 can be instantly released once the material container 24 discharge is complete.

[0038] The bulk bag discharge assembly 10 also typically includes at least two independently driven pneumatic impactors 22 (FIG. 5), which are typically mounted to the main frame assembly 12 using a metal bracket 50 and a nut and bolt type arrangement 52 in spaced adjustment apertures 54 of the metal bracket 50. The spaced apart adjustment apertures 54 allow the impactors to be moved into a closer or more distant proximity to the material container/bag 24, as needed, to accommodate various sized material containers 24. The actual material container 24 contacting portion of the impactors is typically rounded and typically has a plastic or other soft material, which will not harm the bag container material, which is typically plastic or polyester. The contacting portion may also be made from steel or other metal. The impactors are typically located somewhere near the top $\frac{2}{3}$ of the bag material container. The impactors of the present invention provide a force of up to about 1000 pounds on each side of the bag to push the material and collapse the rat-holing or bridging that may occur in the bag. The preferred force applied is between about 350 pounds of force to about 1000 pounds of force, but any desired force may, of course, be utilized. Aligning the impactors in this fashion allows the force to be directly at the center of the bag where most rat-holing occurs. The force is typically horizontal.

[0039] The impactors are adjustable in force, frequency, and stroke. The force may be adjusted by setting the pressure regulator to the desired setting. The frequency may be adjusted by setting an adjustable timer. The stroke may be adjusted by moving the unit in or out using the spaced adjustment apertures 54. Also, because the impactors are independent from one another, they can be set to stroke into the bag in an alternating fashion such that the right impactor will stroke in when the left impactor retracts and visa versa. This imparts a rocking motion to the bag 24, which further assists in collapsing any rat-holing that may occur in the material contained within the bag material container 24.

[0040] The bulk bag discharging assembly 10 of the present invention also typically contains at least two, typically independently driven, bag massagers 26, which are mounted such that they massage the bottom portion, typically the bottom about two feet, of the bag material container 24. The massagers are typically made of steel tubing and are pneumatically driven. The rounded steel tubing allows the assembly to be easily washed down when required. The pneumatic mechanism 80, that moves the massagers, as with the impactors, each independently provide a force of up to 1000 pounds on each side of the bag. The massagers 26, like the impactors 22, are adjustable in force and in frequency. The force is adjusted by setting the pressure regulator to the desired setting and the frequency is adjusted by setting an adjustable timer. Also, as with the impactors, the massagers can be set to stroke into the bag in alternating fashion. The massager on the right will stroke in, then, as it retracts, the massager on the left will stroke in and visa versa. Alternatively, the massagers and the impactors can be set to stroke in and out simultaneously.

[0041] Further, because each of the impactors and massagers are typically independently driven, the impactors and massagers may be used in conjunction with one another to prevent bridging and rat-holing by any combination of forces. In particular, operators may find that the right impactor and massager should apply force in alternating fashion with the left impactor and massager such that the bag container rocks back and forth. Also, the operator may find that the impactors and massagers may work together in opposing fashion to rock the top of the bag container in one direction while the bottom of the bag container is massaged in opposite directions by the massagers. Of course, pressure may be applied from all impactors and massagers simultaneously as well.

[0042] The bulk bag discharge assembly 10 also typically includes a discharge-receiving gate 28 having a material container-receiving aperture 58, which receives the spout portion 60 of the bag material container 24. The discharge receiving gate 28 also includes three, typically ultrahigh molecular weight plastic (or other durable material not likely to damage the bag material container) plates, which are typically concavely curved and, in the open position, define the material container receiving aperture 58. Two of the plates 62, 64 are substantially aligned, typically engaged with one another, and define a plate receiving area 90 for receiving the middle plate when the plates are in the closed position.

[0043] In operation, pneumatic cylinders apply force to the two substantially aligned plates and the middle plate 66 in opposing fashion such that the middle plate 66 is received in the middle plate receiving area 90 and is sandwiched between the substantially aligned plates 62, 64 as the plates move toward one another. This action not only pinches the bag material spout portion 60 from two sides, but, due to the concave shape of the plates, also cinches the bag from all around. The two substantially aligned plates 62, 64 and the middle plate 66 can also be used as a material conditioning system or as a flow aid. By installing the substantially aligned plates 62, 64 and the middle plate 66 at a high position above the spout portion 60, the plates can be used to crush large chunks of material that may fall into the container receiving aperture 58. The diameter of the discharge receiving gate 28 is slightly smaller than any down-

stream restriction. This construction allows for chunks of material to be crushed by actuation of the discharge receiving gate 28. The discharge receiving gate 28 breaks the chunks and allows them to pass into the smaller orifice freeing the discharge area so that material can flow freely. This action closes the bag's spout portion and pulls it together such that the operator may easily tie off the bag. Moreover, when closed, the ultrahigh molecular weight (UHMW) plastic guide plates support the weight of the bag for better closure.

[0044] The discharge-receiving gate of the present invention provides significantly more force than previously allowed by other designs, thereby allowing a user to close off standing columns of materials while previous materials must have been flowing in order to close off the bag material containers. The material need not be flowing in order to close off the material containers using the discharge-receiving gate of the present invention. The discharge receiving gate 28 can further be used to meter the flow of material using a "bulk and dribble" arrangement. Substantially aligned plates 62, 64 may be in an open position relative to middle plate 66 or in a completely closed position relative to middle plate 66 or any position therebetween. By having a material container receiving aperture 58 a variable cross-sectional area, various flow rates of product are produced. This arrangement substantially eliminates back-ups caused by discharging material from the bulk bag too rapidly. More precise measurements of discharge may be measured in this manner. Further, the three plate construction of this design holds the size of the material container receiving aperture 58 as a fixed relationship and does not allow floating. Any forces applied by the material falling through the gate 28 against the container receiving aperture 58 do not further expand the aperture 58.

[0045] The bulk bag material discharge assembly 10 also typically includes a circular dust tight spout access chamber 30 having at least two access doors 68, 70. The spout access chamber 30 is typically circular, but may be of any suitable shape. When the spout access chamber 30 is circular, the doors 68, 70 are gull wing doors, which open wide, thereby allowing access to nearly $\frac{2}{3}$ of the spout access chamber. This allows significantly greater space than previous designs for operators to easily and more ergonomically attach a material container bag to the discharge spout. Better access to the spout also results in a significantly increased ability of the operator to achieve a successful seal between the bag spout portion 60 and the connection spool 72. The spout access chamber 30 typically has an airtight rubber seal 74 about the perimeter of the access openings. This allows for better dust tight sealing of the access chamber when the doors are closed. The doors 68, 70 are typically locked using a clamp 76 (see FIG. 8). Optionally, safety interlocks may be employed such that the discharge-receiving gate 28 and/or the bag container connection system discussed below cannot be moved or otherwise altered when the doors 68, 70 are open.

[0046] Contained within the spout access chamber 30 is a bag container connection system, which includes a pneumatically driven sealing ring that moves from a disengaged position to an engaged position (shown in FIG. 7). A sealing ring 81, which is typically a closed neoprene seal, is engaged to the bottom portion of the metal, typically steel, pneumatically driven ring 82. The pneumatic cylinders may be

positioned inside or outside, but typically are placed inside the access chamber 30. The neoprene sealing ring prevents damage to potentially fragile bag container material when it is sealed. In operation, the operator would open the doors of the spout access chamber 30, place the portion 92 of the bag container 24, which is below the tie 86 around the connection spool 72 or other outlet device while the bag connection system is in its disengaged state. Once the portion 92 below the tie 86 is positioned over the connection spool 72, the operator actuates the pneumatically or manually operated clamping mechanism into the engaged position, which seals the bag to the connection spout by clamping the portion 92 between the sealing ring and the connection spout. Optionally, a foot pedal may be used to operate the pneumatics and thereby actuate the bag connection system between the engaged and disengaged position, but great care should be used to avoid personal injury if such a control system is used.

[0047] Once the bag material is in position and properly sealed, the operator merely unties the bag, closes the doors of the spout access chamber, and the bag is ready to be discharged. When a pneumatically actuated clamp is used in the bag connection system, a constant pressure is applied to the sealing ring. If the bag spout portion should move, stretch, or otherwise change the way that the bag is being clamped, the mechanism responds with equal pressure, thereby maintaining a positive seal.

[0048] The hoist 16, impactors 22, massagers 26, discharge receiving gate 28, and the bag container connection system are typically all electronically controlled by the operator utilizing control panel 100. Optionally, a CPU (central processing unit) may be utilized in the present invention to control and automate these functions or any combination of these functions.

[0049] As seen in FIGS. 10-11, the material discharge assembly of the present invention may also optionally include bag conditioning impactors 104 that are designed to at least partially break up or condition material in bag material container 24, which may have become hardened during transportation or due to exposure to any number of environmental conditions prior to reaching the ultimate location where the material will be transferred from the material container 24 using the material discharge assembly. For example, if salt were transported in a humid or wet environment, such as on a ship, the salt might harden due to this exposure. The bag conditioning impactors 104 operate to break up or condition the material that has hardened inside the material container, thereby allowing material to be discharged from the material container. Typically, at least one and, more typically, at least two or more hydraulic or pneumatic cylinders 106 with carbon steel conditioning frames 108 are used to apply force to the outside of the bag material container 24. The force applied and the force required to condition the material typically determines the related cylinder quantity and size. Typically, the bag conditioning impactors provide from about 1,000 lbs. to about 25,000 lbs. of force, but more typically about 16,000 lbs. of force. The bag conditioning impactors, unlike the typical pneumatic impactors 22 that are typically used in the present invention to prevent rat-holing, typically move in unison to impact the bag substantially simultaneously. However, conditioning may also be achieved by impacting the bag material container with one bag conditioning impactor at a time.

Furthermore, while **FIGS. 10-11** show two bag conditioning impactors, conceivably, any number of impactors could be used. Typically though, either two or four bag conditioning impactors positioned substantially opposite from one another are used. The carbon steel conditioning frames **108** may be of any suitable shape, but are typically a slightly curved smooth surface to help prevent damage to the bag material container when it is struck with the impactor(s). The conditioning frames **108** are generally from about seven to about 12 square feet, such as about nine square feet.

[0050] If hydraulic conditioning impactors are used, the system typically employs a hydraulic pumping unit mounted on the side of the main frame assembly; however, the unit may also be free standing. The hydraulic pumping unit may also include a digital pressure switch to control and adjust unit operation and performance. The hydraulic pumping unit may be housed in an enclosure with a bolt on a louvered door for easy cleaning. If the conditioning impactors are pneumatic, the system may include all controls and other systems required to operate the unit in a similar fashion as the hydraulic unit.

[0051] Optionally, the bag conditioning impactors may be mounted on a separate bag conditioning frame assembly. Such an assembly would be used alone or in conjunction with the material discharge assembly.

[0052] Any component or combination of components discussed herein may also be manufactured from stainless steel, which is typically used for corrosion prevention, wash-down, and for food material applications.

[0053] The above description is considered that of the preferred embodiments only. Modification of the invention will occur to those skilled in the art and to those who make or use the invention. Therefore, it is understood that the embodiments shown in the drawings and described above are merely for illustrative purposes and not intended to limit the scope of the invention, which is defined by the following claims as interpreted according to the principles of patent law, including the doctrine of equivalents.

The invention claimed is:

1. A material container discharge assembly comprising:
 - a main frame assembly;
 - a spout access chamber engaging the main frame assembly;
 - at least two independently movable material container impactors engaged to the main frame assembly and adapted to engage a material container when the material container is positioned within the main frame assembly and above the spout access chamber; and
 - wherein the material container impactors comprise a conditioning frame.
2. The material container discharge assembly of claim 1, wherein the material container impactors provide from about 1,000 to about 25,000 lbs. of force.
3. The material container discharge assembly of claim 1, wherein the material container impactors provide about 16,000 lbs. of force.
4. The material container discharge assembly of claim 1, wherein each conditioning frame is curved.

5. The material container discharge assembly of claim 4, wherein the conditioning frames are from about seven to about 12 square feet.

6. The material container discharge assembly of claim 5, wherein the material container impactors further comprise at least one pneumatic cylinder.

7. The material container discharge assembly of claim 6, wherein the material container impactors comprise two or more pneumatic cylinders.

8. The material container discharge assembly of claim 5, wherein the material container impactors further comprise at least one hydraulic cylinder.

9. The material container discharge assembly of claim 8, wherein the material container impactors comprise two or more hydraulic cylinders.

10. The material container discharge assembly of claim 1 further comprising a discharge receiving gate engaged to the main frame assembly comprising a material container receiving aperture and first, second, and third moveable plates, wherein the first and third plates are movable between an open and closed position and further define a second plate receiving area for receiving the opposed second plate when the second plate and the first and third plates are in the closed position.

11. The material container discharge assembly of claim 10, wherein the spout access chamber is substantially circular and spaced below the material container receiving aperture and around a material receiving spout.

12. The material container discharge assembly of claim 11, wherein the spout access chamber comprises at least two access doors on substantially opposite sides of the chamber that operate to create a substantially air tight seal when closed.

13. The material container discharge assembly of claim 1 further comprising a hoist moveably engaged with the main frame assembly and a material container transport component engaged to the hoist and adapted to engage the material container.

14. The material container discharge assembly of claim 13, wherein the material transport component comprises a central portion, a plurality of container support members extending outwardly from the central portion and wherein the container support members each comprise:

- a first portion, wherein each of the first portions are in substantially the same horizontal plane;
- a second portion, upwardly extending from the first portion; and
- a third portion, wherein each of the third portions are in substantially the same plane, which is substantially parallel to the plane defined by the first portions.

15. The material container discharge assembly of claim 14, wherein the second portions extend upwardly from the first portions at about a ninety degree angle.

16. The material container discharge assembly of claim 15, wherein the third portions of the container support members comprise at least one outwardly extending substantially L-shaped bag loop retention member.

17. The material container discharge assembly of claim 16, wherein the third portions of the container support members each further comprise an inwardly extending substantially L-shaped bag loop retention member.

18. The material container discharge assembly of claim 14 further comprising a basket engaged with the material transfer component.

19. The material container discharge assembly of claim 18, wherein the basket is integrated with the container support members.

20. A method for conditioning a material container comprising the steps of:

providing a material container discharge assembly that comprises a main frame assembly, a spout access chamber engaged with the main frame assembly, at least two independently moveable material container impactors comprising a conditioning frame and engaged with the main frame assembly and further providing a material container;

positioning the material container within the main frame assembly and above the spout access chamber;

actuating the conditioning frame of at least one of the material container impactors in a direction towards the material container; and

applying force from the conditioning frames to opposite sides of the material container.

21. The method of claim 20, wherein the material container is positioned within the main frame assembly using a hoist.

22. The method of claim 21, wherein at least two of the independently moveable material container impactors apply force to opposite sides of the material container at substantially the same time.

23. The method of claim 20, wherein at least two of the independently moveable material container impactors apply force to opposite sides of the material container at substantially the same time.

24. The method of claim 23, wherein the conditioning frames of the material container impactors each apply from about 1,000 lbs. of force to about 16,000 lbs. of force to the material container.

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