

[54] **PACKAGING COMPRESSIBLE MATERIAL**

[72] Inventor: **Johnnie B. Hunt**, Stuttgart, Ark.

[73] Assignee: **J. B. Hunt Company**, Stuttgart, Ark.

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[58] Field of Search.....53/24, 124 R, 124 D; 100/42, 100/232; 141/12, 71

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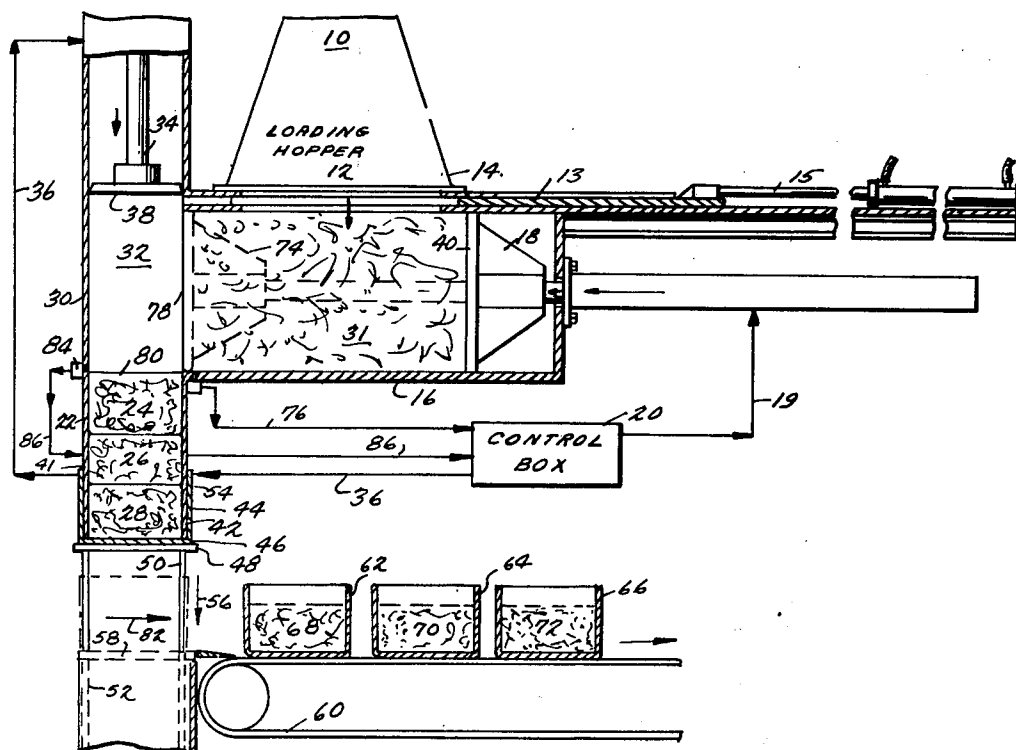
Primary Examiner—Travis S. McGehee

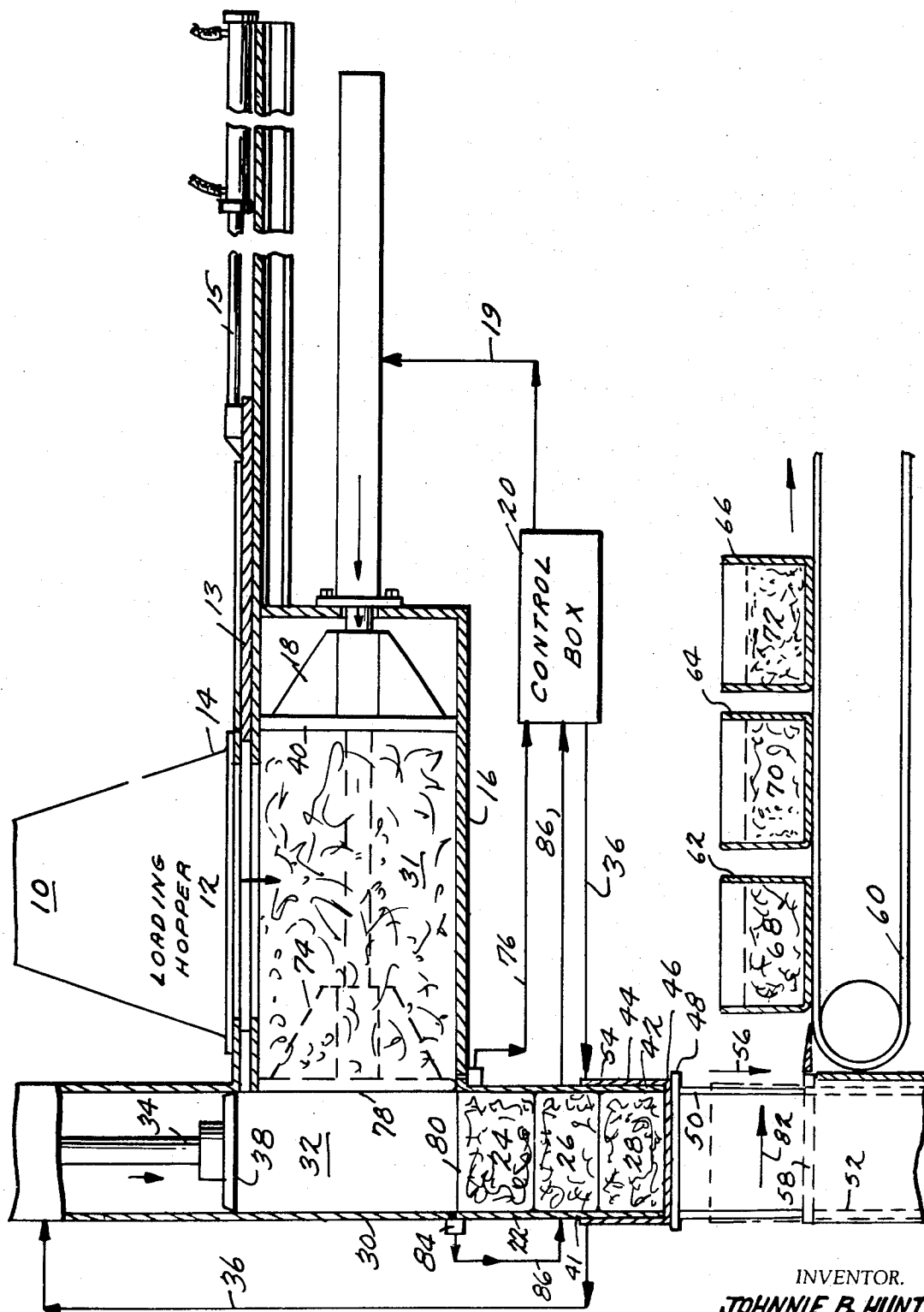
Attorney—Everett A. Johnson

[57] **ABSTRACT**

Apparatus and method are disclosed by which a compressible and expandable material such as rice hulls may be packaged. The apparatus includes hydraulic press means for successively compressing and packing increments of compressed rice hulls into a container or bag without releasing expanding pressure therein which would otherwise rupture the bag or container in the packing operation.

11 Claims, 1 Drawing Figure





INVENTOR.
JOHNNIE B. HUNT

Edward A. Johnson
ATTORNEY

PACKAGING COMPRESSIBLE MATERIAL

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Ser. No. 24,052, filed Mar. 24, 1970, now abandoned, and which in turn is a division of my pending application Ser. No. 592,403, filed Nov. 7, 1966, now U.S. Pat. No. 3,501,890 and entitled Method and Apparatus for Packaging Compressible Material.

This invention generally relates to an apparatus and a method by which compressible material may be packaged. Specifically, the invention consists of apparatus and a method in which material, such as rice hulls, can be compressed and while under compression may be received within a packing container or receptacle. This apparatus performs all these functions automatically without any human manipulation being involved therewith.

There has been a major problem in the industry of packing compressed material into receiving receptacles, having a thin composite side construction such as paper bags, because during the packing operation the tendency of the material to expand rips open the receiving receptacle in which it is placed. This shortcoming with previous apparatus and methods created a large waste of material or a need for very heavy and expensive containers. To overcome this shortcoming the subject invention presents a solution for this particular problem and effectively presents an apparatus and a method by which compressed materials may be packaged into a thin side construction receiving receptacle without the danger of ripping the receptacle.

The invention is particularly concerned with the packaging of materials which are solids but nevertheless, due to the material exhibiting considerable void space and due to the inherent resiliency of the material, it may be greatly compressed but it tends to return to its expanded or uncompressed state with considerable force. The material, as the term is used herein, refers to a material which can be compressed from its normal state, but due to its characteristics has a tendency to expand after it has been compressed.

This description will proceed with rice hulls as an example of a material which may be highly compressed and packaged in paper bags while so compressed. However, no limitation to rice hull handling is necessary or intended.

Previous apparatus used a filling chute at the end of which the paper bag was loosely placed and the compressed fibrous material was ram forced thereinto. A paper receiving receptacle at this instance had a tendency to rip upon the expansion of the compressed fibrous material. This particular shortcoming in the previous apparatus has been effectively overcome by the subject invention by placing the receiving paper receptacle with its closed bottom end in an adjacent relationship with the end of the filling chute thereby allowing the paper bag to embrace or encircle the filling chute. The paper receptacle is supported by a platform which is hydraulically lifted and controlled and which is further responsive to the weight of the filled paper receptacle. The hydraulic support means can be of any well known construction. After the paper receptacle has been filled the platform recedes to a lower position and a conveyor means transports the filled container to a sealing station and other further processing.

The primary object of the invention then is to overcome the previous ripping effects which were encountered in the packaging of compressed material into a receiving receptacle, having thin composite construction.

Another object of the invention is to provide an automatic method of filling these receiving receptacles with compressed material without any manipulation by a human operator.

A still further object of the invention is to provide a method whose efficacy overcomes the problems previously encountered when paper receiving receptacles were being filled.

These and other objects and advantages of the invention will become apparent during the course of the following description.

The accompanying drawing forms part of this application and refers to a particular contemplated embodiment which is used to carry out the invention. The figure displaying the apparatus is a cutaway view of a vertical side of the subject apparatus.

Referring specifically to the drawing accompanying the application, the invention is now described with its composite elements and functional operation. Generally, the apparatus consists of a loading chamber or a surge hopper 10 which holds the loose fibrous material 12. The loading chamber 10 having a flare out bottom 14, is located perpendicularly above a horizontally disposed ramming chamber 16. This ramming chamber 16 has a rectangular shape and its dimensions can be of any convenient size. Within the ramming chamber is placed a horizontal packing ram 18 which is hydraulically actuated when it receives a proper command signal 19 from a control box 20, as is explained hereinafter. A horizontally disposed sealing slide 13 controls the amount of material which is deposited within the horizontally disposed ramming chamber 16. The sealing slide 13 is controlled by a small hydraulic ram 15, but a suitably disposed cam shaft arrangement would suffice to control its operative movement. This sealing slide 13 also is a composite part of the ramming chamber 16, since it forms the upper section of the chamber 16. At the end of this horizontally disposed ramming chamber 16 is a vertically disposed filling chamber 22 which is so located at the terminal end of the ramming chamber 16 so as to receive the horizontally and vertically compressed charge or core of rice hulls, as specifically shown by numerals 24, 26, and 28. The vertically disposed filling chamber 22 is located at a right angle relationship with and immediately below the horizontal ramming chamber 16. End wall 30 is common to both the horizontal ramming chamber 16 and the vertical filling chamber 22. At the terminal end section 32 of the horizontal ramming chamber 16 is located a vertical packing ram 34 which is also pneumatically operated upon the reception of a command signal from control box 20, as explained hereinafter. The vertical packing ram 34 has a rectangular cross-sectional packing face 38 which is of smaller dimensions than the rectangular cross-sectional packing face 40 of the horizontal packing ram 18. At the terminal open end 42 of the vertically disposed filling chamber 22 is located a paper receptacle 44 which receives the compressed rice hull core.

The bottom closed end 46 of this receiving paper receptacle 44 is placed in close adjacent contacting

relationship to the vertical filling chamber 22 so that the bottom closed end 46 of the paper receptacle 44 operably contacts the open terminal end 42 of the vertical filling chamber 22. The paper receptacle 44 is supported by a platform 48 which is pneumatically operated by a hydraulic mechanism 50 and 52. The platform 48 pressed the bottom closed end 46 of the paper receptacle 44 firmly against the open terminal end 42 of the vertical filling chamber 22. The support platform means 48 is pneumatically controlled and it is appropriately raised and made operative at the time when the paper receptacle 44 is to receive the compressed rice hull charge or core 28. The hydraulically controlled support platform 48 is responsive to the weight of the core 28 within the paper receptacle 44, that is, it supports the empty paper receptacle 44 firmly against the terminal open end 42 of the vertical filling chamber 22, but when the paper receptacle 44 receives the compressed charge of rice hulls it is forced downwardly so that the free terminal open end 54 of the paper receptacle 44 is free from the sides of the vertical filling chamber 22.

This downward movement of the filled paper receptacle is characterized by the dashed line configuration, specifically emphasized by arrow 56, which represents the direction of the moving support platform 48, after the paper receptacle 44 has received its fill of compressed rice hull charges such as shown by 28'. When the support platform 48 has reached its final position noted in the drawing by dashed line configuration at 58, the filled paper receptacle 44 is moved on to a conveyor belt 60, by suitable mechanical apparatus (not shown). The conveyor belt 60 transports the previously filled but open paper receptacles 62, 64 and 66 to the final packaging apparatus (not shown) which seals the upper open end of the paper receptacles 62, 64 and 66 having the compressed rice hull charges 68, 70 and 72 therein for final operative distribution. The receiving paper receptacle 44 can be placed at the terminal end of the vertical filling chamber 22 by any suitable mechanical apparatus (not shown) which assures that the bottom closed end 46 of the receiving paper receptacle 44 fits tightly but slidably over the composite sides of the vertical filling chamber 22, so that the receiving paper receptacle 44 can receive the bottom charge 28 therein, as another charge of rice hulls is being compressed vertically in section 32 of horizontal chamber 16.

It has been found that the previous mechanical apparatuses which were used to package compressed fibrous material into a paper receptacle such as 44 caused the receiving paper receptacle 44 to split open when the compressed material was received therein. The particular improvement which is defined by the subject invention is that the paper receptacle 44 is tightly but slidably fitted over the lower section 41 of the vertical filling chamber 22 having its terminal closed end 46 on an operative receiving relationship with the open terminal end 42 of the vertical filling chamber 22. This particular operative relationship allows for the bottom material charge 28, located at the open terminal end 42, to be forced into the receiving paper receptacle 44 as the other compressed charge is being formed thereabove in section 32 of horizontal chamber 16. As this uppermost charge is being formed,

it forces the bottom charge 28 downward towards the bottom closed end 46 of the receiving paper receptacle 44 thereby forcing the paper receptacle 44 to receive the bottom charge 28 in such a manner that when the charge 28 is received by the paper receptacle 44 the composite sides of this paper receptacle 44 withstand expansion pressure of the compressed fibrous material charge 28. It is believed that this phenomenon is premised on the fact that as the compressed charge 28 moves into the receiving paper receptacle 44 the composite sides thereof present a continuity of the vertical filling chamber 22 thereby mitigating for the over-expansion of the compressed material charge 28. This over-expansion caused the receiving paper receptacles to split open as it was receiving the compressed charge of material.

The method of operating the apparatus is now described and is essentially as follows. A predetermined amount or charge of rice hulls or other fibrous compressible material is placed within the horizontally disposed ramming chamber 16, this predetermined amount is calculated by the timing of the sealing slide ram 13. The amount of the charge of material 12 deposited within the ramming chamber 16 is predetermined so that when it has been horizontally and vertically compressed the compressed charge fills the paper material receptacle 44. The material charge 12 is deposited into the ramming chamber 16 through the horizontally disposed sealing slide 13. This sealing slide 13 is actuated by a hydraulically operated ram 15 which is smaller in dimension and in ramming power than the other rams 18 and 34 which are used to compress the charge of fibrous material. The predetermined amount of rice hulls 12 is allowed to fall into section 31 of horizontal ramming chamber 16 by the opening of the sealing slide 13. When the predetermined amount of rice hulls has been placed into section 31 of the ramming chamber 16, the sealing slide 13 and the horizontal power ram 18 are simultaneously energized, however, the smaller sealing slide 13 has a higher velocity than the horizontal packing ram 18, thereby sealing the ramming chamber 16 for the power compression packing operation. The horizontal packing ram 18 is operated under high pressure so that it can horizontally compress the rice hulls with its power stroke within ramming chamber 16. When the horizontal packing ram 18 reaches the end of its stroke as shown by the dashed line configuration 74, a response element such as an interlock mechanism (not shown) is energized and a signal 76 is transmitted to a control box, which in turn transmits a control signal 36 to begin the operation of the vertically disposed packing ram 34. The horizontal packing ram, however, does not return to its initial starting position, it remains in the position as shown by the dashed line configuration 74. The front face 78 of the horizontal ram 74 effectively defines a vertical wall for the vertical ramming by the vertically disposed ram 34.

The material has now been horizontally compressed by the horizontal packing ram 18 and it is found within the chamber section 32 of the ramming chamber 16. The bottom of this chamber section 32 is further defined by upper surface 80 of the previously compressed charge 24, which has remained within the vertical filling chamber 22. There are shown three com-

pressed charges 24, 26 and 28 of rice hulls within the vertical filling chamber 22. These compressed charges 24, 26 and 28 present a bottom support for the vertical compression of the charge now under compression through the vertical ram 34. The last of these charges 28 is forced out of the terminal open end 42 of the vertical filling chamber 22 by the vertical ramming stroke of the vertical packing ram 34.

While the vertical packing ram 34 is compressing the charge of rice hulls found in the ramming chamber section 32, the last charge 28 is forced to become enclosed by the paper receptacle 44 which is encircling the terminal open end 42 of the vertical filling chute 22. By this process the last charge 28 of compressed rice hulls within the vertical filling chamber 22 is forced into the receiving paper receptacle 44. The weight of the charge 28 forces the support platform 48 to recede downwardly and at its final position as shown by numeral 58 the open free end 54 of the paper receptacle 44 is no longer encumbered by the vertical filling chamber 22 and the paper receptacle can be moved by suitable means (not shown) to the conveyor belt 60 in the direction shown by arrow 82.

The vertical filling chamber 22 is defined by a rectangular cross-section. The sides thereof are tapered or flared outwardly so that the cross-section of the terminal open end 42 is larger than the upper rectangular cross-section. This outward taper is required to ease the exit of the last charge 28 from the vertical filling chamber 22. For best results it has been found that for rice hulls the terminal open end 42 of the vertical filling chamber 22 should have cross-sectional dimensions of 12 inches $\times$ 15 inches with a $\frac{1}{2}$ inch taper every 60 inches of the length of the vertical filling chamber 22.

When the vertical power ram 34 has completed its downward stroke the charge within section 32 of ramming chamber 16 is now a compressed charge similar to the previously compressed charges 24, 26 and 28 in the vertical filling chamber 16. The last compressed charge has, however, displaced the top charge 24, so that charge 24 is not in the position of charge 26 and charge 26 is in the last position within the vertical filling chamber 22, and charge 28 has been packaged into the paper receptacle 44. The vertical ram 34 is now ready to be returned to its steady state position. At the end of its power stroke the vertical ram 34 activates a control element 84 which transmits a signal 86 to the control box 20 which generates a signal to the return controls of the vertical power ram 34 and the horizontal power ram 18 so that they are returned simultaneously to their respective steady state positions.

The electrical control system for the operation is shown in box form as numeral 20. No specific electrical elements are shown since any type of control mechanism which can operate the hydraulic rams 18 and 34 and generate control signals therefore can be used. The steady state position obtained upon the return stroke is conveniently obtained by a return mechanism which is not shown since they are well known in the art. The hydraulic power rams 18 and 34 can be constructed with rearward protectors connected to their front plates so that when the power thrust of the rams 18 and 34 is being placed upon the charge last formed any loose material remaining in the ramming chamber 16 will not tend to accumulate behind the ram

face plate. The rearward protectors do not in any way effect the efficient operation of the apparatus. They merely maintain the ramming elements in a clean condition while they are operating.

The particular material used in the operative description of this apparatus, that is rice hulls which are compressible, should not be taken as limitative but merely as exemplary. The particular dimensions noted herein should also be taken as exemplary of the apparatus. It is readily ascertainable that a person of ordinary skill in the art would note that cylindrical or other configurations of the ramming and filling chambers 16 and 22 could be constructed without departing from the essence of this invention. Furthermore, the particular vertical and horizontal configuration of the apparatus could be changed without departing from the essence of the invention.

The invention has been described in detail in connection with one particular embodiment thereof. It will be understood that other embodiments which include other configurations in the construction and arrangement of the various parts of the apparatus may be made without departing from the spirit of the invention or exceeding scope as set forth in the appended claims.

What is claimed is:

1. A method for filling a receptacle having an open top and a closed bottom comprising the steps of telescoping the receptacle about an elongated loading chamber having an open end, the closed bottom of said receptacle being disposed across said open end; successively compressing distinct masses of material, sequentially accumulating a plurality of such compressed masses of material within said loading chamber in tiered array; supporting said plurality of masses within said chamber by lateral expansion forces thereof acting on the walls of the loading chamber; and periodically displacing a mass of material through the open end of said chamber into said receptacle while the bottom end thereof moves away from said open end of the loading chamber and while another compressed mass is introduced into said loading chamber.

2. A method as in claim 1 wherein each mass of material is expansible and is partially decompressed as it moves toward the open end of said loading chamber and before being placed within the telescoped receptacle.

3. A method as in claim 1 wherein said material is rice hulls, and wherein said accumulated masses are step-wise displaced from the loading chamber by a similar mass compressed in a direction transverse to the longitudinal axis of said loading chamber, and wherein said receptacle is a paper bag.

4. A method for filling a receptacle with compressible material comprising the steps of placing the receptacle about a confined loading zone having a lower open end with the closed bottom end of said receptacle abutting the lower end of said zone, successively compressing a series of masses of material, accumulating a plurality of compressed masses of material within said loading zone, and periodically transferring another compressed mass of material from said series into said zone and concurrently discharging a mass of material from the lower open end of said loading zone into said receptacle while the closed bottom end thereof and the discharging mass progressively move away from the open lower end of said loading zone.

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5. A method as in claim 4 wherein each compressed mass is partially expanded in moving through said loading zone prior to being displaced through said open end of the loading zone into said receptacle.

6. A method as in claim 5 wherein the retreating receptacle is restrained by a uniform opposing force which is less than the rupture strength of the walls of the receptacle but sufficient to prevent uncontrolled expansion of the mass discharging from the loading zone.

7. A method as in claim 4 wherein the progressive withdrawal of the receptacle from the loading zone is controllably restrained to assure that the mass moves as a plug with the receptacle.

8. A method for filling a receptacle having an open top and a closed bottom comprising the steps of telescoping the receptacle about an elongated loading zone having an open discharge end, the closed bottom of said receptacle being disposed across said discharge end; successively compressing a series of distinct masses of material; sequentially accumulating a plurality of such compressed masses of material within said loading zone; restraining said plurality of masses within

said loading zone by lateral expansion forces thereof acting on the walls of the loading zone; and periodically displacing a mass of material through the discharge end of said zone into said receptacle while the bottom thereof moves progressively from said discharge end of the loading zone and while another compressed mass is concurrently introduced into said loading zone.

9. A method as in claim 8 wherein each compressed mass of material is expansible and is partially decompressed as it moves through the loading zone and before being placed within the receptacle.

10. A method as in claim 9 wherein the progressive withdrawal of the receptacle from the loading zone is controllably restrained to prevent turbulent expansion of the stabilized mass discharging from the loading zone into the retreating receptacle.

11. A method as in claim 8 wherein said material is rice hulls, and wherein said accumulated masses are step-wise displaced from the loading zone by a similar mass compressed in a direction transverse to the longitudinal axis of the loading zone, and wherein said receptacle is a paper bag.

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