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(71) Applicant: **STAMICARBON B.V.**
Mijnweg 1
NL-6167 AC Geleen(NL)

(72) Inventor: **O'Kennedy, Philip Augustine**
Marymount
New Ross Co. Wexford(IE)

(74) Representative: **Hoogstraten, Willem Cornelis Roeland et al**
OCTROOIBUREAU DSM Postbus 9
NL-6160 MA Geleen(NL)

(54) **Apparatus for stacking filled intermediate bulk containers and stack of filled intermediate bulk containers.**

(57) An apparatus for stacking two or more Intermediate Bulk Containers (IBCs) which apparatus comprises means for sequentially placing the IBCs into a moulding means to form a stack of IBCs; and means for removing the thus formed stack from the moulding means. Means is provided for vibrating the IBCs within the moulding means.

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APPARATUS FOR STACKING FILLED INTERMEDIATE BULK CONTAINERS AND STACK OF FILLED INTERMEDIATE BULK CONTAINERS

This invention relates to an apparatus for stacking filled or partly filled intermediate bulk containers (hereinafter referred to as IBCs).

IBCs are generally in the form of bags or sacks made from a woven fabric such as polypropylene tapes made up to form a tubular body looped on top for tying purposes, cut hexagonally and stitched on to the bottom to give the bag/sack a generally circular shape. The container is generally provided with an inner liner of polyethylene film to give protection to the contents against the ingress of moisture and/or other potential contamination. In this connection it is opportune to mention that IBCs have particular use for the storage of and the transportion of powdery, granular or prill like materials such as chemicals, including fertilizers for farm use -contents particularly susceptible to damage from moisture.

Such IBC's are generally provided with lifting straps or slings or otherwise attached to the container or formed integrally therewith. When lifting by such means, the contents of the IBC are compressed and this compression tends to give the IBC a convex top which does not lend itself to stability when one IBC is stored above one or more other IBCs. In practice, it has been found that stacking such IBCs gives rise to an unstable stack with obvious consequential safety hazards for any person obliged to handle/work with the stacked IBCs.

It is an object of the present invention to overcome these problems.

The invention therefore provides an apparatus for stacking two or more filled or partly filled IBCs which apparatus comprises means for sequentially placing the IBCs into a moulding means to form a stack of IBCs; and means for removing the thus formed stack from the moulding means.

Preferably, means is provided for vibrating the first and subsequent IBCs within the moulding means.

Preferably the moulding means is of tubular construction and the placing means is adapted to lower each IBC into the moulding means the axis of which is substantially perpendicular to the ground.

Preferably, the removing means includes a conveying means located beneath the moulding means on which rests the first placed IBC and the moulding means includes an openable part in the form of a door to enable the conveying means to move the stack in a substantially horizontal direction through the door and out of the moulding means.

Preferably a pallet is interposed between the first IBC and the conveying means so that the thus formed stack is supported by the pallet.

Preferably means is provided to enable a controlling means to detect when each IBC of the stack is placed in the moulding means.

Preferably, the stack comprises three IBCs.

Preferably, the placing means is a carousel apparatus which comprises a ground engaging support for a carousel; means for rotating the carousel; at least two hoisting means suspended from the carousel each having a respective hook device thereon which hoisting means are located substantially equidistant from each other; means for independently raising and lowering each hook device so that in operation each hoisting means is adapted to elevate in a sequential fashion from an IBC loading station a respective IBC whereupon the carousel is rotatable to a position to enable said hoisting means to lower said IBC into the moulding means.

Preferably the carousel apparatus comprises at least three hoisting means one of which comprises a weight device for lowering on top of the stack of IBCs within the moulding means so as to compress the stack within the moulding means.

Preferably, the carousel apparatus comprises four hoisting means one of which includes said weight.

Preferably, means is provided for sequentially feeding the IBCs to the loading station.

Preferably, the loading station includes a vibrating means for each IBC prior to being elevated by the hoisting means.

Preferably, each hook device comprises a plate member having means on one face thereof for hingedly engaging with the cable of a respective hoisting means the other face of which plate member pivotally supports a hook member; and biasing means for urging the hook member out of engagement with a load attachable thereto when the weight of the load is not being supported by the hoisting means.

This invention also relates to a stack of filled or partly filled intermediate bulk containers.

In such cases where the IBCs are provided with lifting straps it is also known that between the filling of an IBC with contents i.e. fertilizer and its reaching the end user namely the farmer, the lifting straps will have been used on several occasions possibly causing damage to them.

The present invention is directed not only towards overcoming these problems but also towards providing for better stacking and distribution of the end product.

The invention therefore provides a stack of filled or partly filled intermediate bulk containers - (IBCs) which comprises two or more IBCs and an outer removable wrap adapted, in use, for accommodating the stack, the outer wrap being in the form of a bag the mouth of which is placed over the top of the stack and pulled towards the base of the stack to contain the stack within the bag. Preferably, the outer wrap is both waterproof and reusable.

This invention also relates to flexible intermediate bulk containers.

In such cases where the IBCs are provided with lifting straps it is also known that between the filling of an IBC with contents i.e. fertilizer and its reaching the end user namely the farmer, the lifting straps will have been used on perhaps six to eight occasions. The manner of use of the lifting straps is not always regrettably in accordance with recommended practice and damage to the lifting straps does occur. Accordingly, when the IBC reaches the farmer the lifting straps are often damaged and dangerous to use giving rise to a further safety hazard.

It has been proposed to overcome this type of problem by not providing lifting straps and placing the IBCs on special pallets using a forklift truck. This is fine in itself provided that all the users have fork lift trucks to handle the IBCs -a position which generally does not always apply in a farmyard or small factory.

In the use of the IBCs for storage -while inner liners are provided -storage outdoors is not generally feasible and accordingly valuable indoor storage space must be used.

The present invention is directed towards overcoming the aforesaid problems by providing for storage and/or transportation of powdery, granular or the like materials, an outer wrap adapted for releasable closure and adapted in use to accommodate in a stacked formation a plurality of IBCs each with an inner bag to hold the contained materials and each with lifting straps, the outer wrap not having lifting straps and shaped at its base for standing on a pallet. Preferably the outer wrap is both waterproof and reusable.

The invention will be understood in greater detail from the following description of preferred embodiments thereof given by way of example only and with reference to the accompanying drawings in which

Fig. 1 is a perspective view of an apparatus according to the invention viewed generally from above;

Fig. 2 is the apparatus of Fig. 1 of the drawings viewed generally from below;

Fig. 3 is a plan view of the apparatus of Fig. 1 of the drawings;

Fig. 4 is an elevation of the apparatus of Fig. 1 of the drawings viewed in the direction of the arrow IV of Fig. 3 of the drawings;

Fig. 5 is an elevation of the apparatus of Fig. 1 of the drawings viewed in the direction of the arrow V of Fig. 3 of the drawings;

Figs. 6 -18 are detailed views of parts of the apparatus of Fig. 1 of the drawings;

Fig. 19 is a perspective view of a filled or partly filled IBC;

Fig. 20 is a perspective view of three IBCs stacked on a pallet; and

Fig. 21 is a perspective view of the stack of IBCs shown in Fig. 2 of the drawings having an outer wrap thereon which combination is in accordance with the present invention.

Referring now to the drawings, there is shown, in particular in Figs. 1 -5 of the drawings, an apparatus 10 according to the invention for stacking intermediate bulk containers (IBCs). The apparatus 10 essentially comprises means, generally shown as 11, for sequentially placing IBCs 12 into a moulding means 13 to form a stack 14 of IBCs, and means 17 for removing the thus formed stack 14 from the moulding means 13.

The placing means 11 comprises a carousel apparatus 30 mounted on a support 20. The support 20 comprises four legs 21, 22, 23 and 24 which together with struts 25 support a substantially rectangular frame 26 and a beam 27. Part of the frame 26 and the beam 27 support a substantially circular track 28.

The carousel apparatus 30 is of generally cruciform shape having arms 31, 32, 33 and 34 the ends of which have rotatably attached thereto a respective wheel 35, 36, 37 and 38. The wheels 35 - 38 are adapted for moving along the track 28. The carousel apparatus 30 is, in addition to the support offered by way of the track 28, also rotatably supported by a ground engaging support 15. Mounted on the support 15 is an electric motor 16 and an associated gear box (now shown) having a wheel (not shown) for meshing with teeth 39 located centrally of the carousel apparatus 30. The electric motor 16 serves to rotate the carousel apparatus 30 in the direction of arrows 18 (Fig. 3).

Mounted on each arm 31 -34 is a respective electric motor 41, 42, 43 and 44 the purpose of which will be explained below. Electric cables (not shown) for supplying the motors 16, 41 -44 are attached to the support 15. Suitable connections for enabling said cables to supply those components mounted on the carousel apparatus 30 are housed in a housing 45.

Each of the motors 41-44 supports a respective cable one of which 51 is shown in the drawings - (see in particular Figs. 9 and 10 and 14-18 of the drawings).

Three of the cables including the cable 51 terminate in a ring supporting member 52 having a ring 53 attached thereto. The fourth cable associated with the motor 44 supports a wheel 54 having a tyre 55 containing weights (not showns). Attached to each ring 53 is a respective hook device 60.

The hook device 60 comprises a plate member 61 having on one face 63 thereof a ring 62 adapted for engaging with the ring 53. The plate member 61 is rotatable relative to the ring 62. Projecting in a wing-like fashion from the plate member 61 are three cage engaging members 64, 65 and 66 the purpose of which will be explained below. On the other or lower face 67 of the plate member 61 is a handle 68 which projects in a plane parallel to the plane of the plate member 61. Centrally mounted on the lower face 67 is a first pair of lugs 69 having a hook 70 pivotally attached thereto. Also mounted on the lower face 67 is a second pair of lugs 71. Mounted on the hook 70 is a third pair of lugs 72. Connecting the lugs 71 and 72 is a spring 73. The spring 73 serves to bias the hook 70 into a disengaging position as shown in Figures 15-17 of the drawings. The handle 68 not only serves as a grip for an operator 74 but also is weighted such that when the hook device 60 is suspended without engaging with the IBC 12, the plate member 61 is in a substantially horizontal condition and consequently, the hook 70 will be in the disengaging position. To engage the hook 70 in the loop of the IBC 12, the operator 74 grasps the handle 68 (see Figure 17) so as to engage the hook 70 in the loop of the IBC 12. The handle 68 is held while the cable 51 is raised until the hoist 51 supports the weight of the IBC 12. As the weight of the IBC 12 is taken by the cable 51, the handle 68 is released whereupon the plate 61 assumes the horizontal condition, the hook 70 is in the engaging position - (Figures 14 and 18) and the spring 73 is stretched.

When the hoist 51 is lowered so that the weight of the IBC 12 is removed therefrom, the spring 73 serves to automatically pull the hook 70 into the disengaged position, thereby releasing the loop of the IBC 12 from hook 70. Thus, when releasing an IBC, the operator 74 is not required.

Attached to each arm 31-34 is a respective cage device 81, 82, 83 and 84. One of the cage devices 83 is shown in detail in Figs. 8-10 of the drawings and it will be appreciated that the other cage devices 81, 82 and 84 have similar features. The cage device 83 comprises a plate 85 having a hole 86 therein. The hole 86 enables the hoist 51 to pass therethrough. Fixedly attached to the plate 85 is a cage member 87. The cage member 87 comprises four outwardly curved metal legs 88 which support a metal ring 89. The plate 85 has four holes therein for slidably engaging with respective bolts 90. The bolts 90 are fixed fast to the arm 33. Sandwiched between each bolt 90 and the arm 33 is a respective spring 91 which serves to urge the plate 85 and consequently the cage member 87 downwardly as shown in Fig. 10 of the drawings.

Also mounted on the arm 33 (and similarly on the other arms 31, 32 and 34 is a pair of micro switches 92, 93. Each of the micro switches is of the type having a respective arm 94, 95. Each arm 94, 95 rests on the upper face of the plate 85. When the plate 85 is shown in the upward condition as seen in Fig. 9 of the drawings, the micro switches 92, 93 are activated due to the plate 85 pushing against the arms 94, 95 and placing them in an upward condition.

When the plate 85 is in the condition shown in Fig. 10 of the drawings, the micro switches 92, 93 are deactivated due to the absence of the pressure from the plate 85 enabling the arms 94, 95 to be in a downward condition. The activation of the micro switches 92, 93 provides a signal which is monitored by a central control system, preferably a microprocessor (not shown) the purpose of which will be explained below.

The upward condition of the plate 85 (Figures 8 and 9 of the drawings) is effected when the hoist 51 has elevated the plate member 61 to a sufficient height so that the cage engaging members 64, 65 and 66 engage with the plate 85 thereby pushing the latter against the springs 91 and consequently actuating the microswitches 92 and 93. Actuation of the microswitches 92, 93 serves to cut off the power to the electric motor 43 (or the motor 41, 42 or 44 as the case may be) thereby automatically halting the elevation of the cable 51. If the IBC 12 being elevated by the cable 51 is sufficiently bulky, it will engage with the metal ring 89 and consequently push the plate 85 upwardly and achieve the same result. (For reasons of clarity, in Figure 9 of the drawings the plate 85 is shown in the upward condition even though the cable 51 is shown in a lowered condition. See Figure 8 for a view of the plate member 61 engaging with the plate 83. Again, for reasons for clarity, the microswitches 92 and 93 are omitted from Figure 8 of the drawings).

The drawings of the cage member 87 is to prevent the IBC 12 from swinging during rotation of the carousel apparatus 30.

With particular reference to Figs. 11-13 of the drawings, the moulding means 13 essentially comprises a tubular shaped housing 100 having a substantially semi-circular wall 101 and a pair of doors 102, 103 which, when closed, essentially provide the other semi-circular wall of the housing 100. The

housing 100 is open at both ends and the wall 101 and the doors 102, 103 each have a respective outwardly flared part 104, 105 and 106 at the mouth 107 of the housing 100. The doors 102, 103 may be opened and closed by rams 108 (Fig. 11). A sensing device 109, 110 enables the microprocessor to determine whether or not the doors 102, 103 are open or closed.

The wall 101 and the doors 102, 103 have reinforcing components 111 thereon and the rams 108 and the wall 101 are supported by a frame 112 (Fig. 13). The wall 101 has three holes 113, 114 and 115 therein. In register with each hole 113, 114 and 115 and mounted on one of the reinforcing components 111 is a respective sensor 116, 117 and 118 the purpose of which will be explained below.

The internal diameter of the housing 100 when closed should be such as to provide a close but not too tight a fit for IBCs 12 placed therein. Essentially, the diameter of the housing 100 should be equal to or slightly less than the diameter of the base of the IBC 12. Having regard to the nature of the contents of the IBCs 12, the IBCs are shaped by the housing 100.

Located beneath the housing 100 and essentially providing a base on which the stack 14 rests is a pallet 120. The pallet 120 is fed to its location beneath the housing 100 by a conveyor system 121 from a magazine 122 housing a stock of pallets. Part of the conveyor system 121 has a vibrating portion 123 which portion is located directly beneath the housing 100. Thus, the portion 123 is capable of vibrating the pallet 120 located beneath the housing 100 and consequently is capable of vibrating IBCs 12 within the moulding means 13 or the stack 14 within the moulding means 13. Conveyor systems having vibrating portions therein are well known and will not be described here.

Attached to each arm 31-34 is a respective plate three of which 131, 132 and 133 are shown - (Figs. 6-10 of the drawings). Each of said plates bears a respective letter A-D which serve to visually identify each arm 31-34. It will be noted from Figs. 6 and 7 of the drawings that the plate 131 labelled 'A' is positioned nearer the end of the arm 31 when compared with the position of the plate 132 labelled 'B' of the arm 32 and the other plates labelled 'C' and 'D'. Thus, the distances between the circular track 28 and the plates labelled 'B', 'C' and 'D' respectively are substantially equal and the distance between the circular track 28 and the plate 131 labelled 'A' is comparatively less. The reason for this will be explained below.

With particular reference to Figs. 6, 7 and 8 of the drawings, there is shown a sensor 150 mounted on the inner wall of the circular track 28. The sensor 150 is located directly above the loading station 143.

On that part of the circular track 28 just short of a point directly above the moulding means 13 is a sensor 151. The sensor 151 is visually highlighted by a white band 152. The purpose of the sensors 150 and 151 will be explained below.

A conveyor system 140 serves to bring the filled or partly filled IBCs 12 containing fertilizer prills/granules sequentially from a filling station (not shown) in the direction of the arrow 141. The conveyor system 140 incorporates a vibrating portion 142 similar to the vibrating portion 123 which portion 142 serves to vibrate each IBC 12 to enable trapped air between the granules to escape prior to the IBC 12 being tied by the operator 74 and subsequently elevated by the cable 51.

Following vibration, the conveyor system 140 moves each IBC 12 to a loading station 143.

The apparatus 10 operates as follows. It will be noted that the arms 31-34 are located 90¤ apart relative to each other. The arm 31 supports the plate 131 having the letter 'A' thereon; the arm 32 supports the plate 132 having the letter 'B' thereon; and the arm 33 supports the plate 113 having the letter 'C' thereon. The other arm 34 has a similar plate (see above) having the letter 'D' thereon.

The starting position of the carousel apparatus 30 for creating the stack 14 is that with the plate 131 labelled 'A' opposite the sensor 150 (see Fig. 6). In other words, the arm 31 is directly over the loading station 143. The sensor 150 is capable of outputting a signal controlled by the microprocessor which signal is reflected back to the sensor 150 by the plate 131. The reflected signal is monitored by the microprocessor which now has the information that the arm 31 is above the loading station 143. The signal is reflected back to the sensor 150 having regard to the relative nearness of the plate 133 to the circular track 28. The other plates labelled 'B', 'C' and 'D' fail to reflect back the signal outputted by the sensor 150. Consequently, the microprocessor can determine the orientation of the plate 'A' relative to a datum point or sensor 150.

Under the control of the microprocessor, the conveyor system 140 will have fed (say) the first IBC 12 to the vibrating portion 142 whereupon the contents of the IBC 12 are vibrated and subsequently moved to the loading station 143. The microprocessor activates the motor 41 to lower the associated cable 51 to an appropriate level to enable the operator 74 to manually engage the hook 70 with the loop of the IBC 12 in the manner described above. The operator 74 now operates a control panel (not shown) at the loading station 143 which control panel signals the microprocessor to

raise the cable 51. Operator intervention is not required except for tying the IBC 12 following vibration; manually engaging the hook 70; and signalling the microprocessor to raise the cable 51.

When the plate 91 has been raised against the bias of the springs 91 (see above) by the action of either the IBC 12 pushing against the metal ring 89 or the action of the cage engaging members 64-66 engaging with the plate 91, the microswitches 92, 93 are engaging so as to cut off the power to the motor 43. The microprocessor now operates the motor 16 so as to rotate the carousel apparatus 30 through 90¤ in the direction of the arrows 18 (Fig. 3) thereby bringing the plate 131 labelled 'A' above the moulding means 13 and plate 132 labelled 'B' above the loading station 143. During rotation of the carousel apparatus 30, the plate 131 labelled 'A' passes the sensor 151. The passing of the plate 131 relative to the sensor 151 is detected by the microprocessor which reduces the electrical power to the motor 16 and finally cutts power to the motor 16 to enable the carousel apparatus 30 to come to a halt gently with the plate 131 above the moulding means 13.

The motor 41 is now actuated so as to lower the hoist 51 thereby lowering the IBC 12 into the moulding means 13 the doors 102, 103 of which are closed. In the meantime, the conveyor system 121 has fed a pallet 120 from the magazine 122 to beneath the forming means 13. Thus the hoist 51 lowers the IBC 12 onto the pallet 120 and the hook 70 automatically disengages from the loop of the IBC 12 in the manner described above. The presence of the IBC 12 (hereinafter referred to as the first IBC) is detected by the sensor 116 which signals the microprocessor which actuates the vibrating portion 123 for a predetermined period. Simultaneously with the operation of the motor 41 to lower the cable 51, the motor 42 is actuated by the microprocessor so as to enable the operator 74 to attach the hook 70 of the cable cable 51 associated with the motor 42 to a second IBC 12.
The presence of the plate 132 labelled 'B' is not detected by the sensor 150 as the distance between the second plate and the circular track 28 is too great.

When the operator 74 operates the control panel, the cable cable 51 associated with the motor 42 is raised and the cycle of events described above with respect to the arm 31 is repeated. Simultaneously with the actuation of the motor 42, the motor 41 is actuated so as to raise the hoist 51 associated therewith to clear the moulding means 13. When the cable 51 associated with the motor 42 lowers the second IBC 12 into the moulding apparatus 13, the presence of the second IBC 12 is detected by the sensor 117 which enables the microprocessor to actuate the vibrating portion 123 for a predetermined period.

A third IBC 12 is loaded into the moulding means 13 by the cable 51 associated with the motor 43 in a fashion similar to the loading of the second IBC 12, the presence of the third IBC 12 being detected by the sensor 118. A stack 14 of IBCs has now been formed in the moulding means 13.

It will be appreciated that during the lowering of the third IBC 12 into the forming means 13, the cable cable 51 associated with the motor 44, now directly above the loading station 143, is not lowered as this cable has the wheel 54 attached thereto.

Following the release of the third IBC 12 in the moulding means 13, the cable cable 51 associated with the motor 43 is elevated and the carousel apparatus 30 is rotated through 90¤ so as to bring the wheel 54 directly above the forming means 13. The wheel 54 is lowered into the forming means the weight of which compresse the top of the stack 14. Simultaneously, the vibrating portion 123 is actuated for a predetermined period. Simultaneously with the lowering of the wheel 54, the cable 51 associated with the motor 41 (plate 131 labelled 'A') which has now returned to be directly above the loading station 143 is also lowered. A first IBC 12 of a second stack 14 is attached to the hook 70 and the cable 51 associated with the motor 41 is elevated simultaneously with the elevation of the hoist 51 associated with the motor 44.

Under the control of the microprocessor, the doors 102, 103 are opened; and the removing means 17 is actuated by the microprocessor so that the pallet 120 having the stack 14 thereon is removed from the moulding means 13 to a location still inside the wall 160 of a building in which the apparatus 10 is housed.
Simultaneously, a second pallet 120 is fed to the moulding means 13 and the entire cycle of events described above is now repeated to form a second and subsequent stacks 14 of IBCs 12.

If desired, an outer wrap (not shown) may be placed over the stack 14 prior to its removal through the opening 161 in the wall 160 to a loading bay (not shown). At the loading bay, a fork lift truck (not shown) may be used to immediately place the pallet 120 and stack 14 onto an awaiting lorry (not shown) or into storage as required.

The apparatus 10 according to the invention thus provides for the secure stacking of IBCs 12 at a relatively rapid, easy and convenient rate.

If the apparatus 10 is not in use, the conveyor system 140 can be used to convey articles, including unstacked IBCs through an opening 162 in a wall 163 of the building (arrow 164) leading to a second loading bay (not shown).

Referring now to Figures 19-21, there is shown an IBC 12 woven from polypropylene tape and made up to form a tubular body with a lifting loop 221. The IBC 12 has an inner liner or bag of polyethylene film. The IBC 12 is filled or partly filled in the manner described above with fertilizer in the form of prills/granules. The IBC 12 is then vibrated to enable trapped air between the granules to escape and the inner bag sealed/tied. The vibrating of the IBC allows the material in the IBC to assume a good position in the IBC for stacking purpose.

Referring in particular to Fig. 20, three IBCs 12, having been individually vibrated, are stacked as shown and mounted on a pallet 223. The bottom and intermediate IBC has the lifting loop 221 pressed down onto the tubular portion of the IBC due to the weight of the material in the IBC above.

Referring to Fig. 21 of the drawings the three IBCs are shown contained within an outer wrap 224 which embraces the stack 14. The outer wrap 224 is in the form of a bag the mouth of which is placed over the top of the stack 14 and pulled towards the base 225 of the stack 14. Accordingly, the base 225 of the wrap 224 is upermost.
The use of the outer wrap 224 which is of a waterproof material, i.e. heavy gauge P.V.C., serves first to prevent ingress of moisture and/or other contaminations to the stack 14 and second acts to enhance the stability of the stack 14. The use of the outer wrap 224 allows the stack 14 on the pallet 223 to be stored outside.

Claims

1. An apparatus for stacking two or more filled or partly filled Intermediate Bulk Containers (IBCs) which apparatus comprises means for sequentially placing the IBCs into a moulding means to form a stack of IBCs; and means for removing the thus formed stack from the moulding means.

2. An apparatus as claimed in claim 1 wherein means is provided for vibrating the first and subsequent IBCs within the moulding means.

3. An apparatus as claimed in claim 1 or claim 2 wherein the moulding means is of tubular construction and the placing means is adapted to lower each IBC into the moulding means the axis of which is substantially perpendicular to the ground.

4. An apparatus as claimed in any of claims 1-3, wherein the removing means includes a conveying means located beneath the moulding means on which rests the first placed IBC and the moulding means includes an openable part in the form of a door to enable the conveying means to move the stack in an substantially horizontal direction through the door and out of the moulding means.

5. An apparatus as claimed in claim 4 wherein means is provided for interposing a pallet between the first IBC and the conveying means so that the thus formed stack is supported by the pallet.

6. An apparatus as claimed in any of claims 1-5 wherein the placing means for rotating the carousel; at least two hoisting means suspended from the carousel each having a respective hook device thereon which hoisting means are located substantially equidistant from each other; means for independently raising and lowering each hook device so that in operation each hoisting means is adapted to elevate in a sequential fashion from an IBC loading station a respective IBC whereupon the carousel is rotatable to a position to enable said hoisting means to lower said IBC into the moulding means.

7. An apparatus as claimed in claim 6 wherein the carousel apparatus comprises at least three hoisting means one of which comprises a weight device for lowering on top of the stack of IBCs within the moulding means so as to compress the stack within the moulding means.

8. An apparatus as claimed in any of claims 6 or 7, wherein each hook device comprises a plate member having means on one face thereof for hingedly engaging with the cable of a respective hoisting means the other face of which plate member pivotally supports a hook member; and biasing means for urging the hook member out of engagement with a load attachable thereto when the weight of the load is not being supported by the hoisting means.

9. A stack of filled or partly filled intermediate bulk containers (IBCs) which comprises two or more IBCs and an outer removable wrap adapted, in use, for accomodating the stack, the outer wrap being in the form of a bag the mouth of which is placed over the top of the stack and pulled towards the base of the stack to contain the stack within the bag.

10. An outer wrap adapted for releasable closure and adapted in use to accommodate in stacked formation a plurality of intermediate bulk containers each with an inner bag to hold the contained material and each with lifting straps, the outer wrap not having lifting straps and shaped at its base for standing on a pallet.

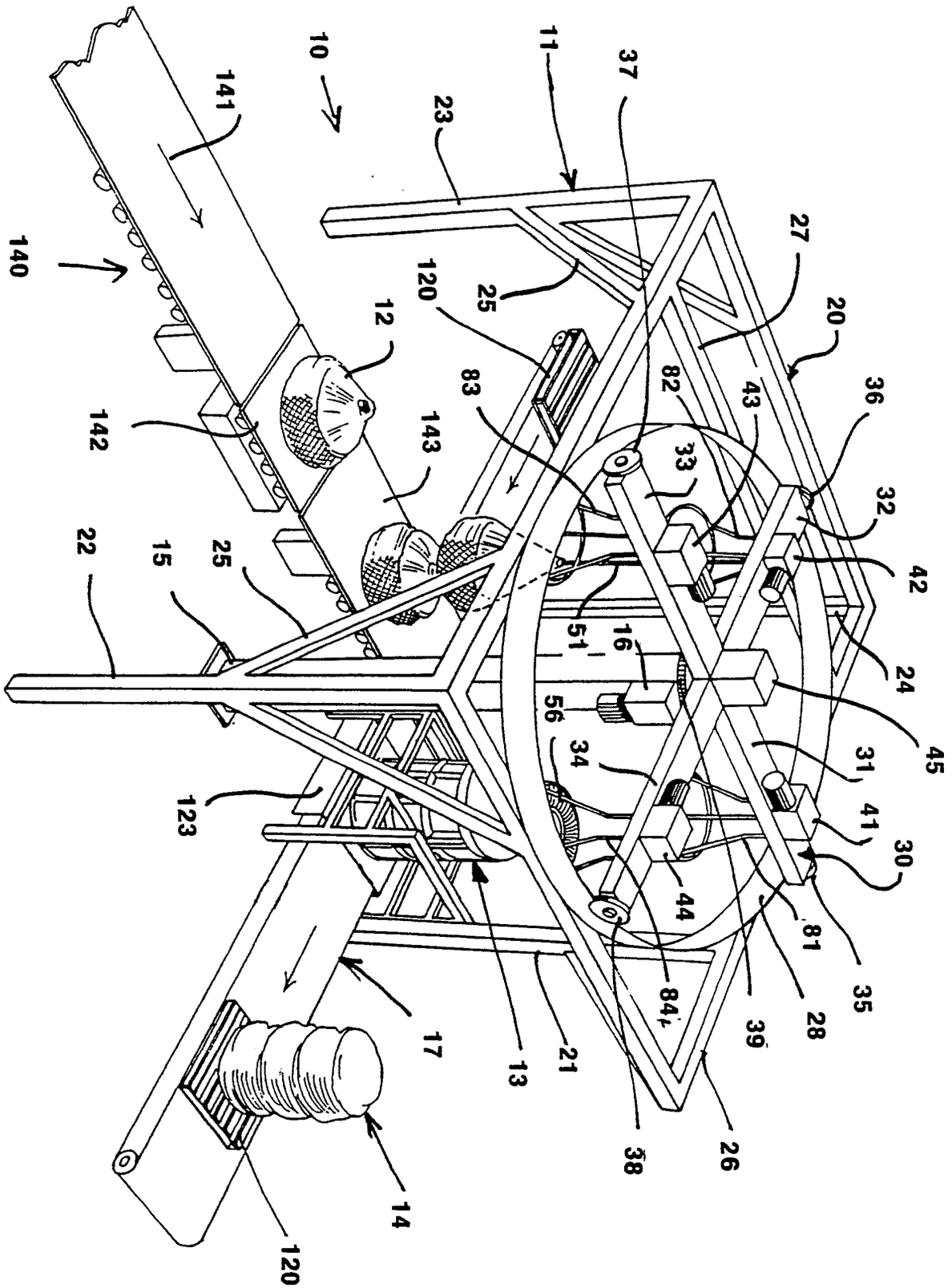
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Fig. 1

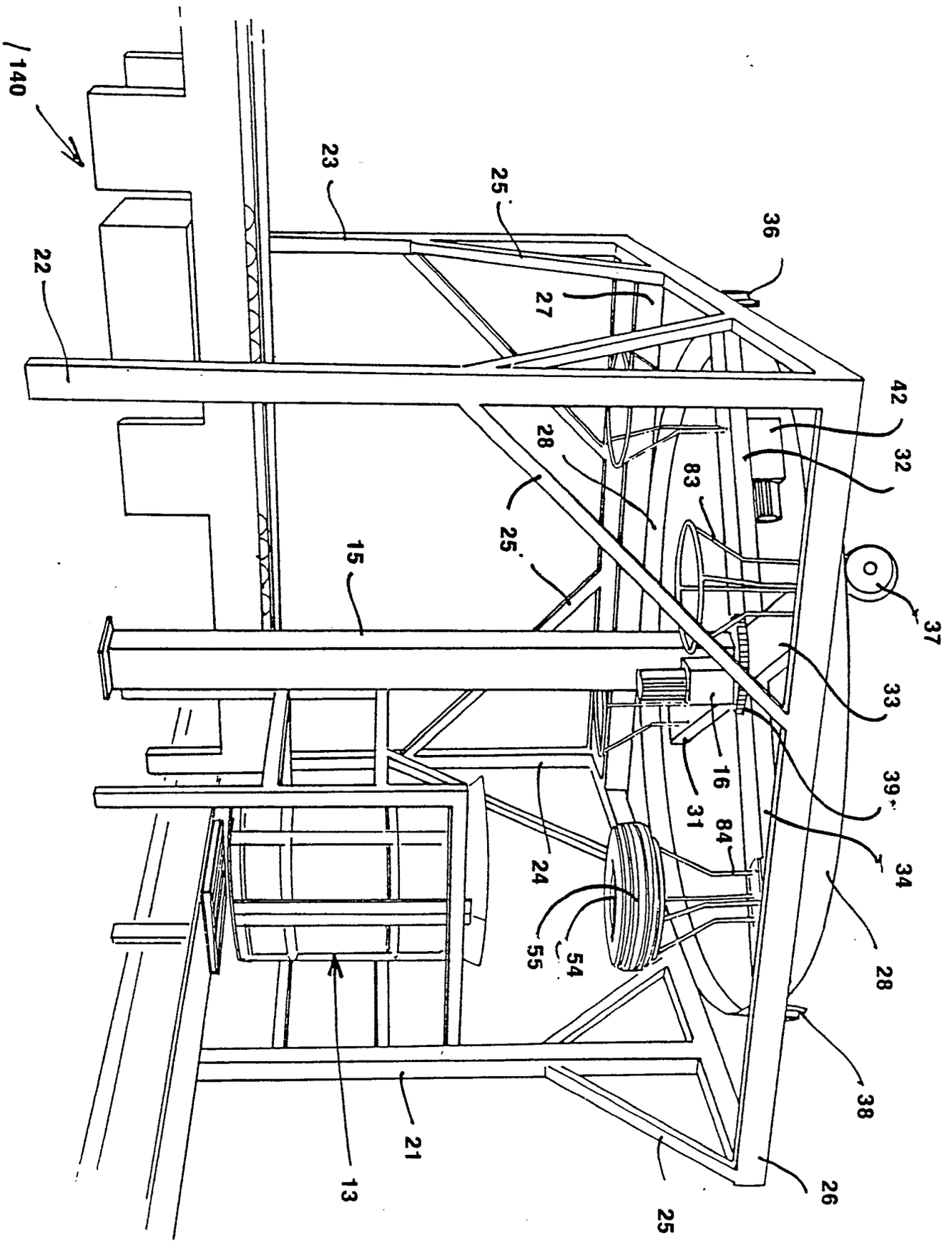
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Fig. 2

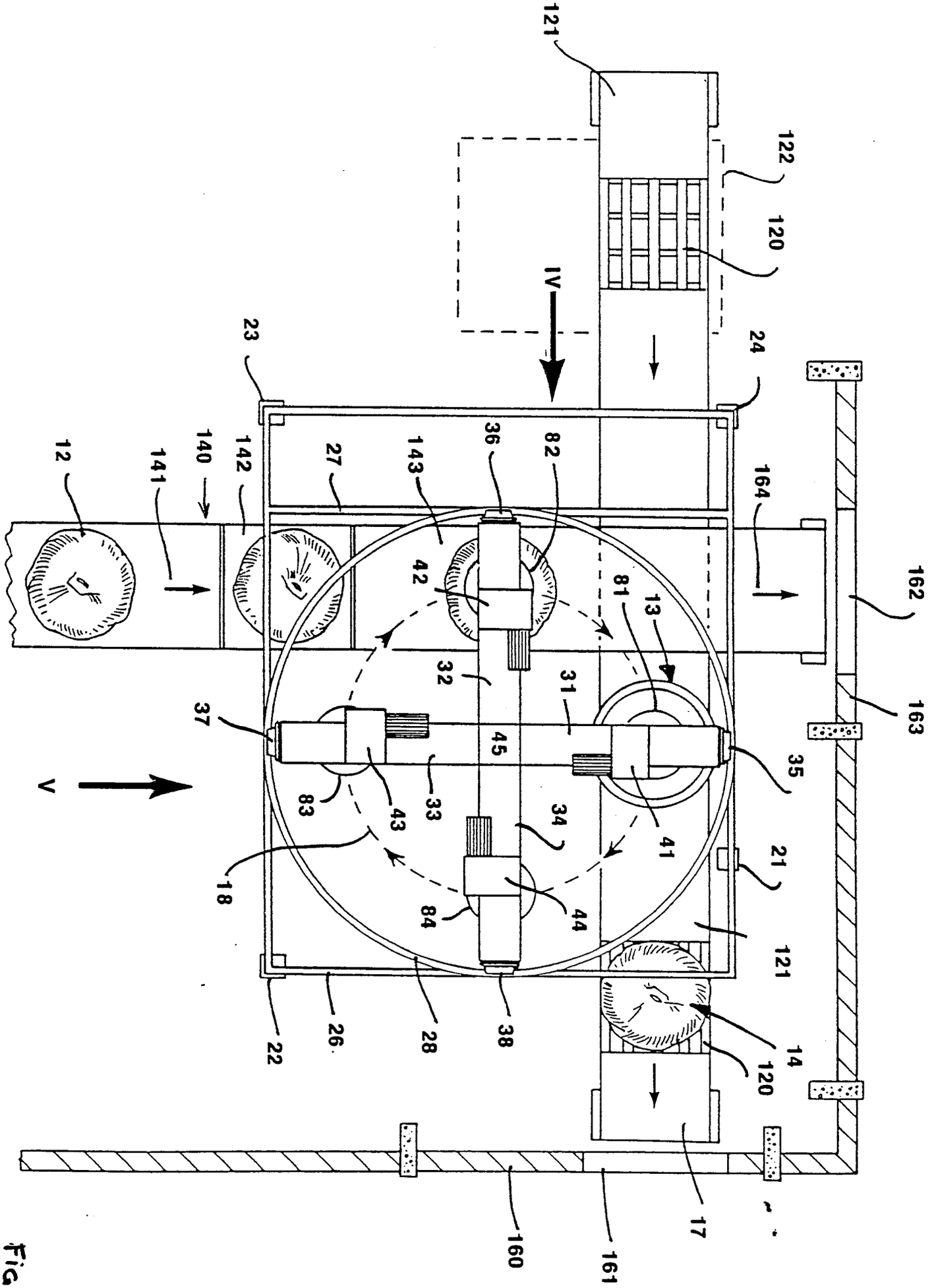
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Fig 3

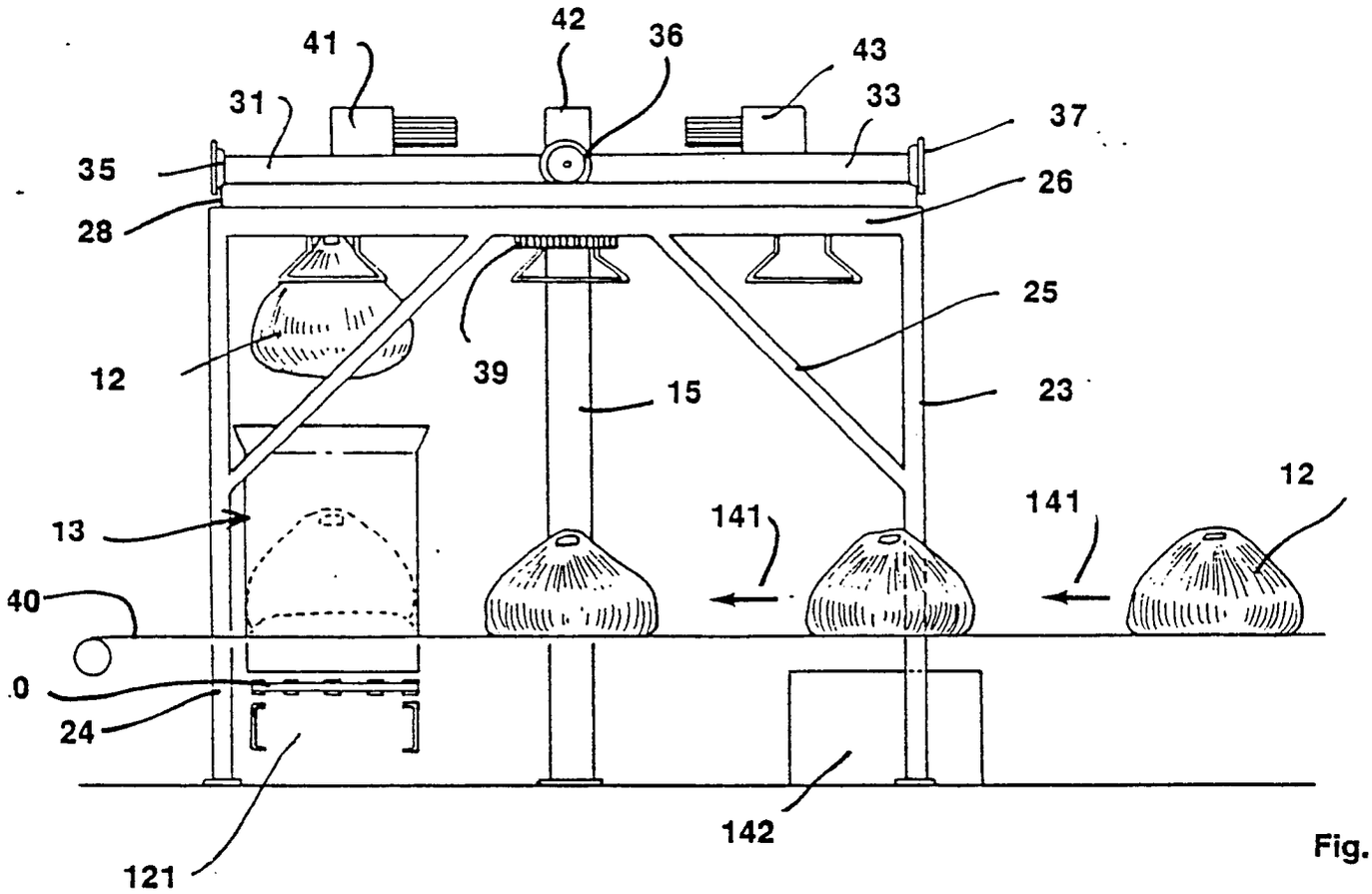
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Fig. 4

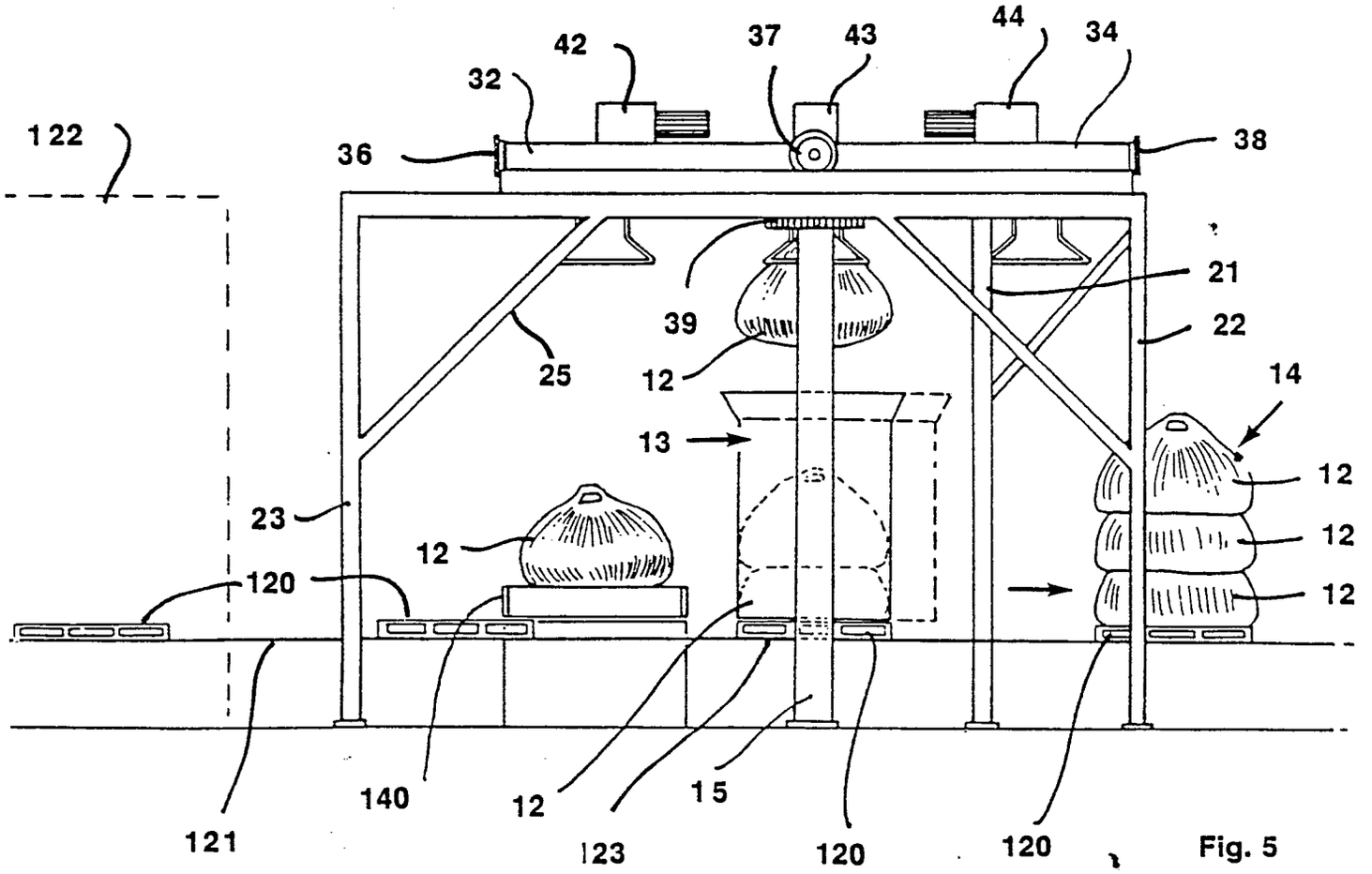
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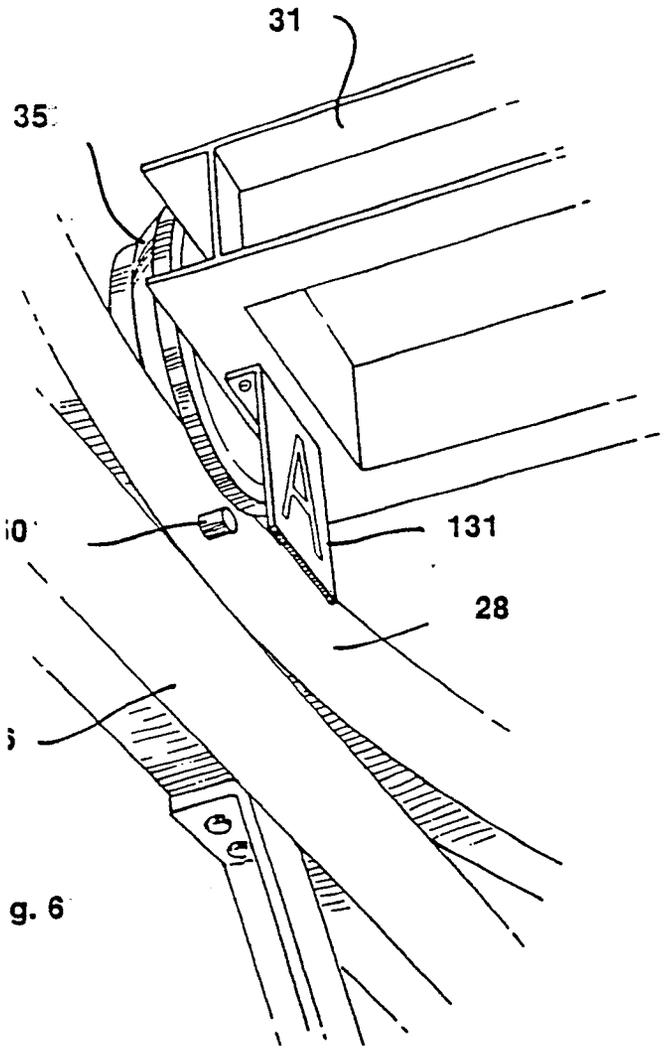
Fig. 5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g. 6

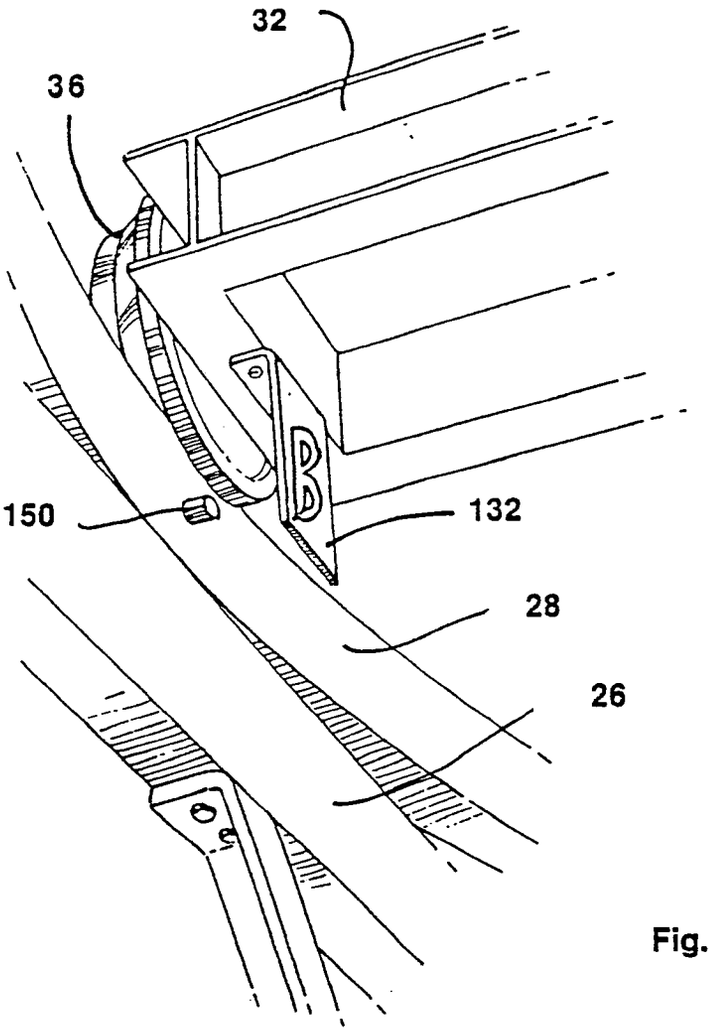
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Fig. 7

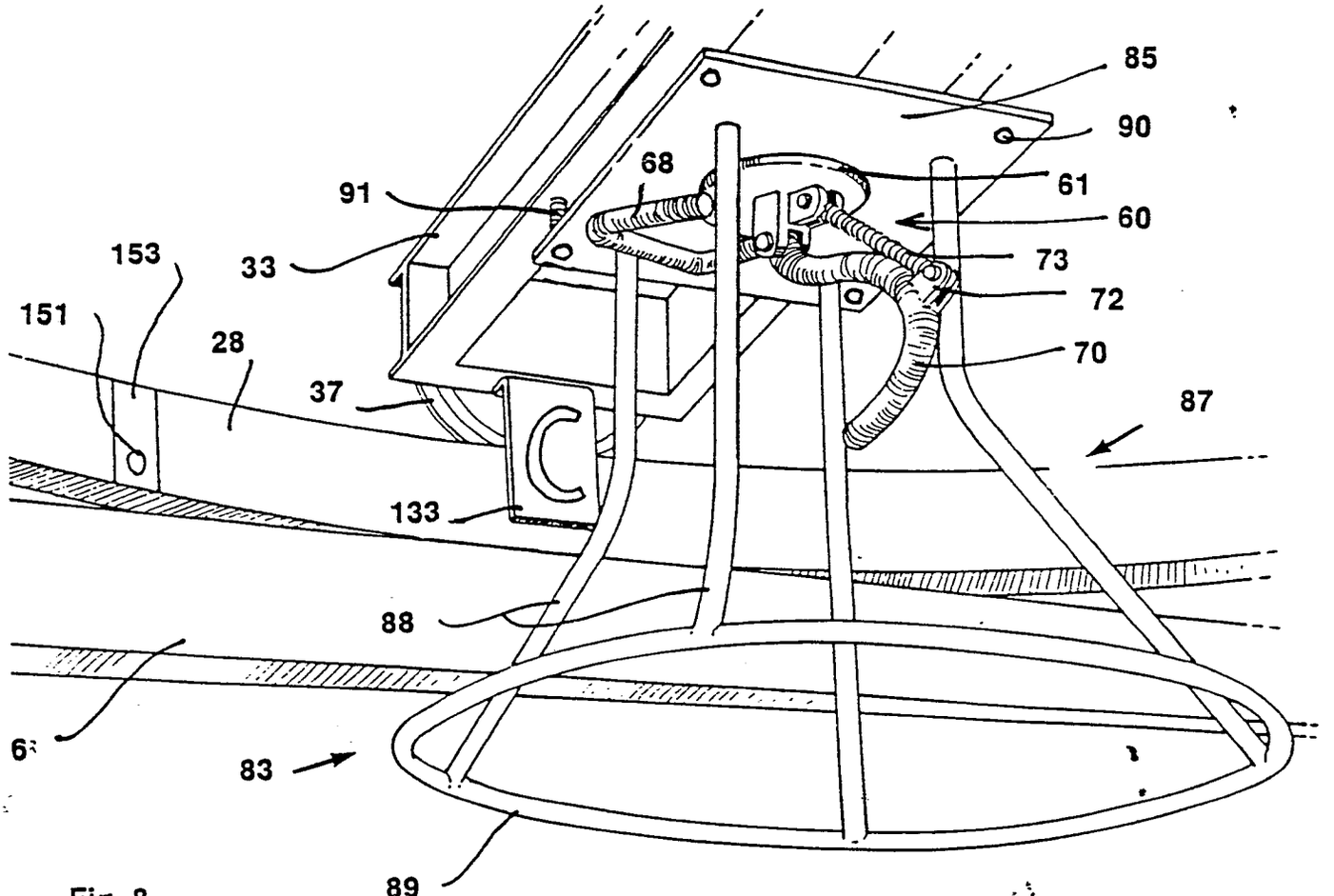
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Fig. 8

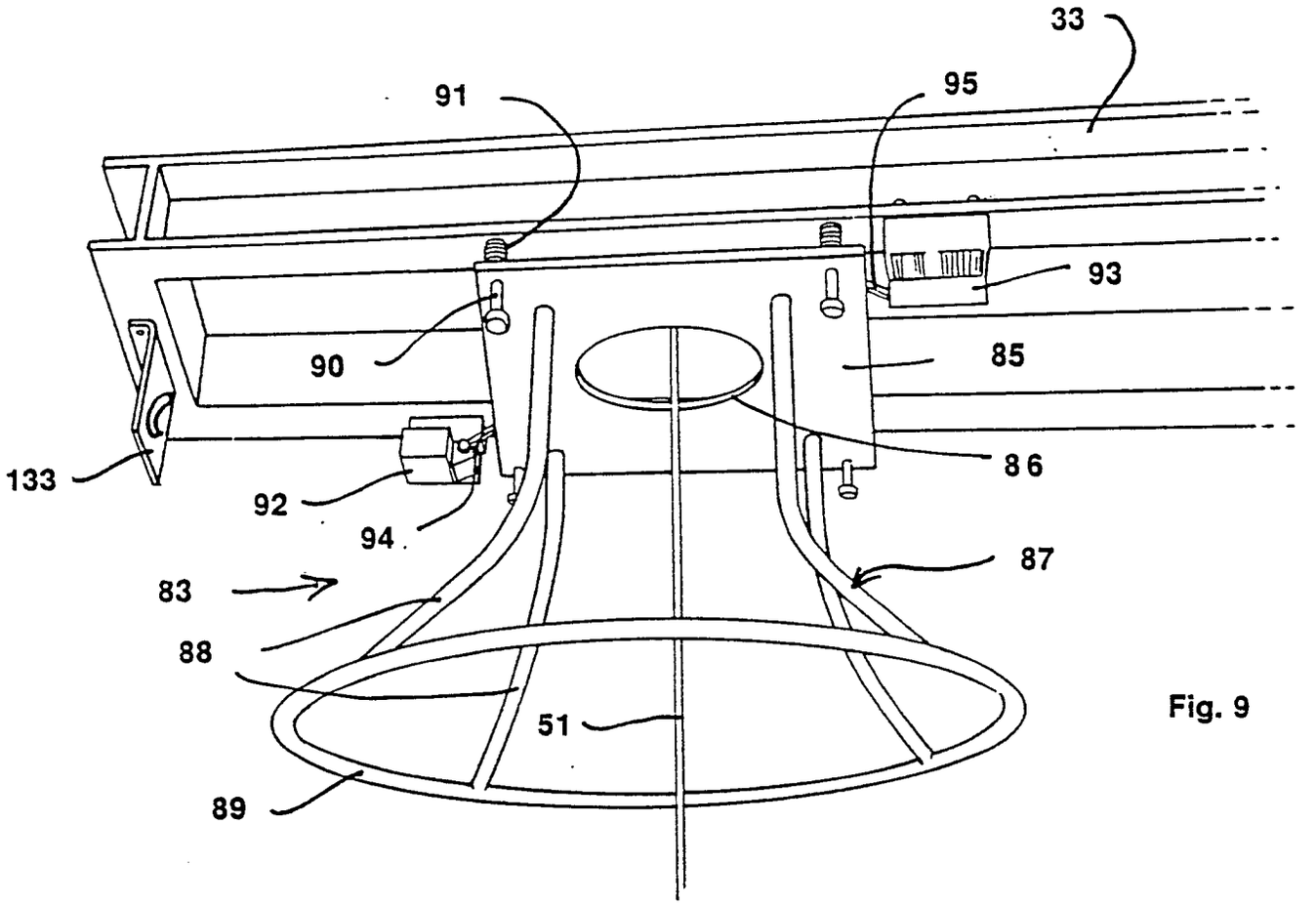
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Fig. 9

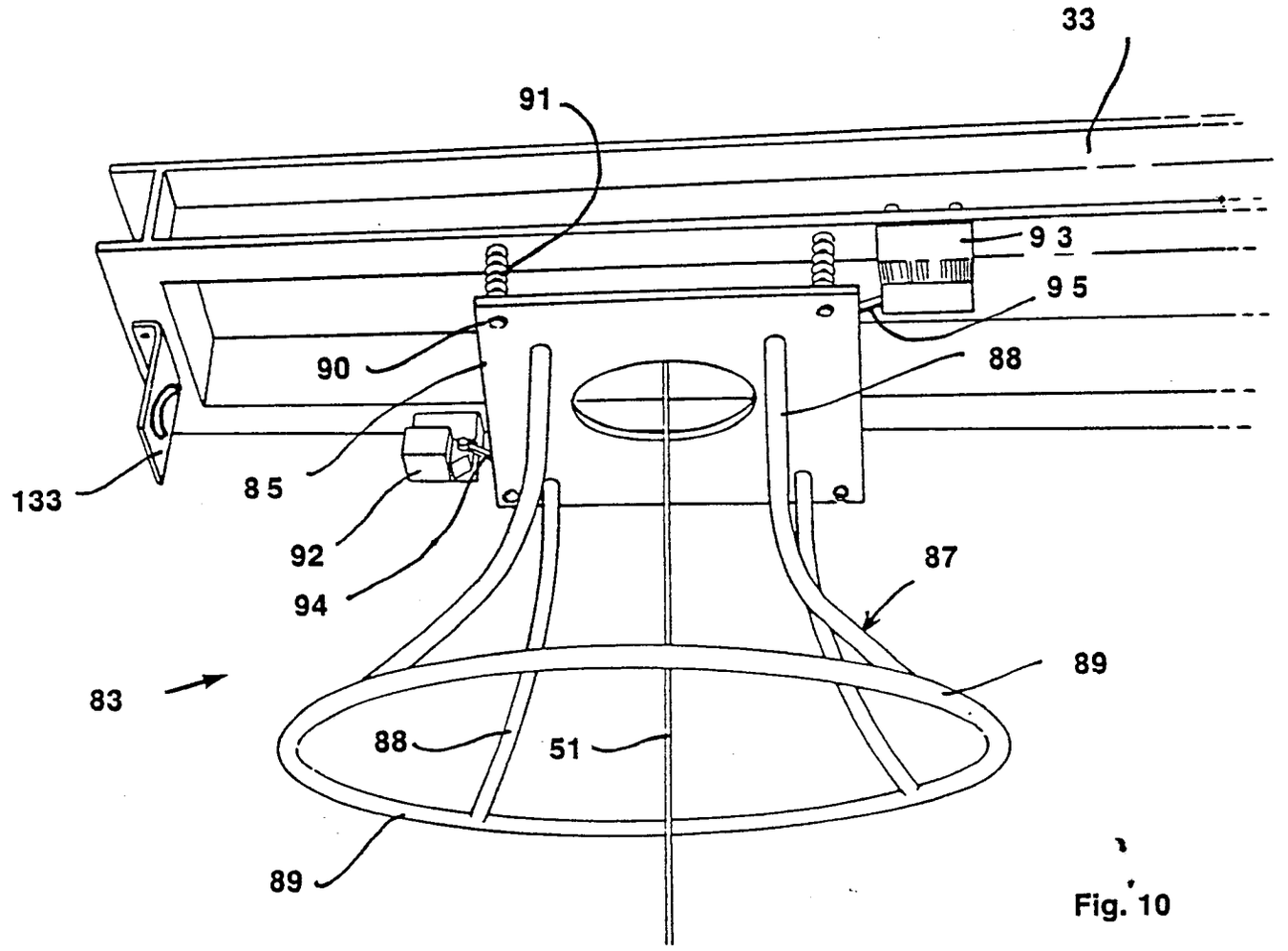
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Fig. 10

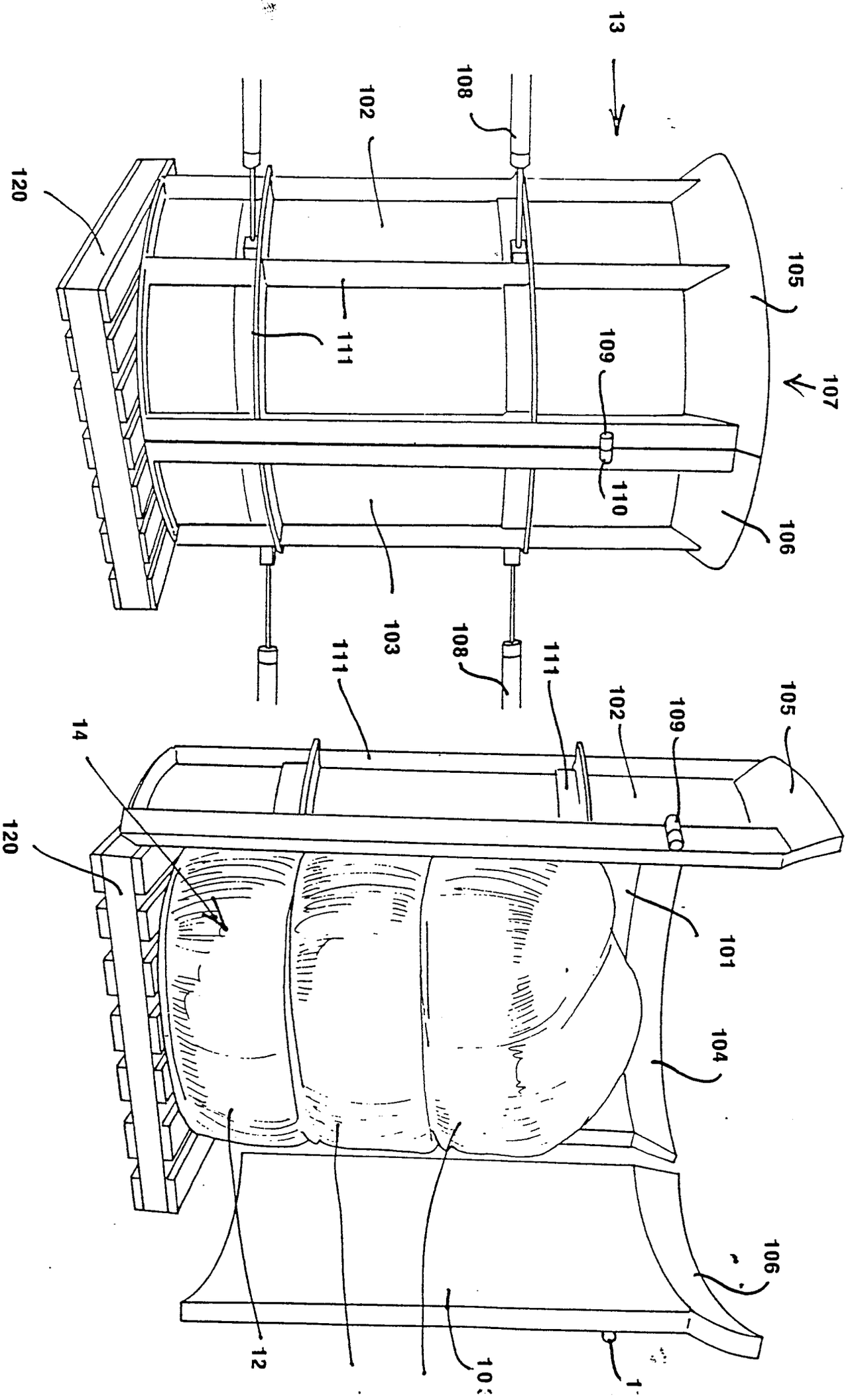
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Fig. 11

Fig. 12

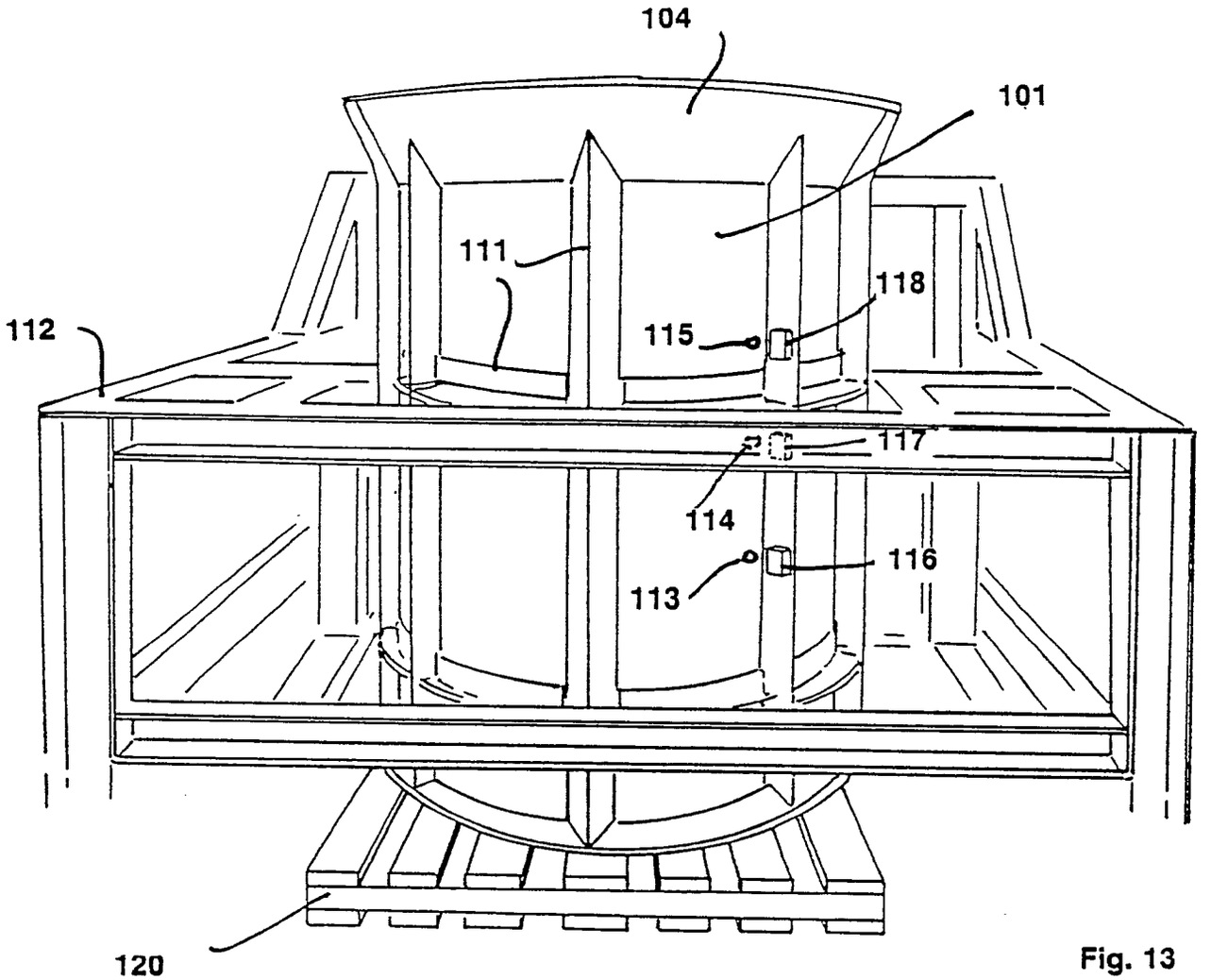
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Fig. 13

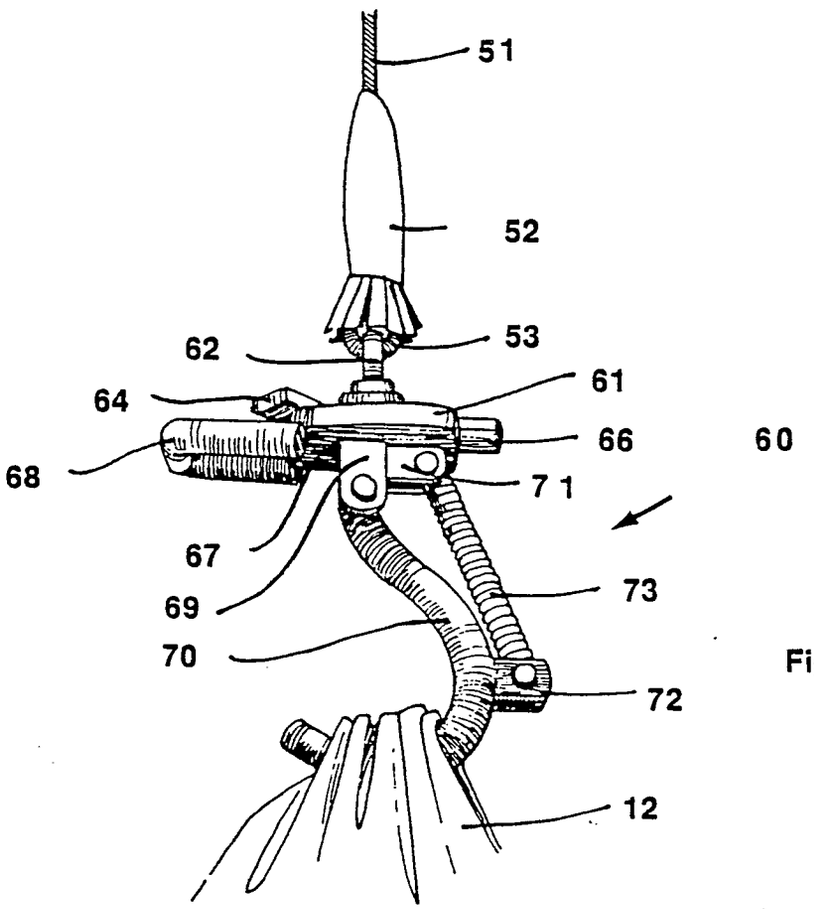
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Fig. 14

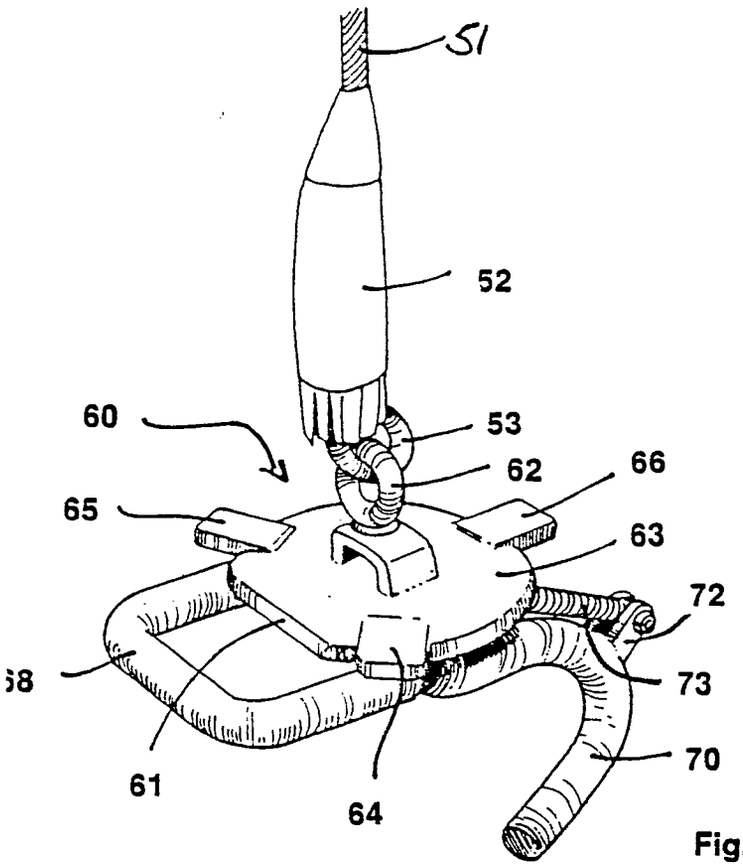

Fig. 15

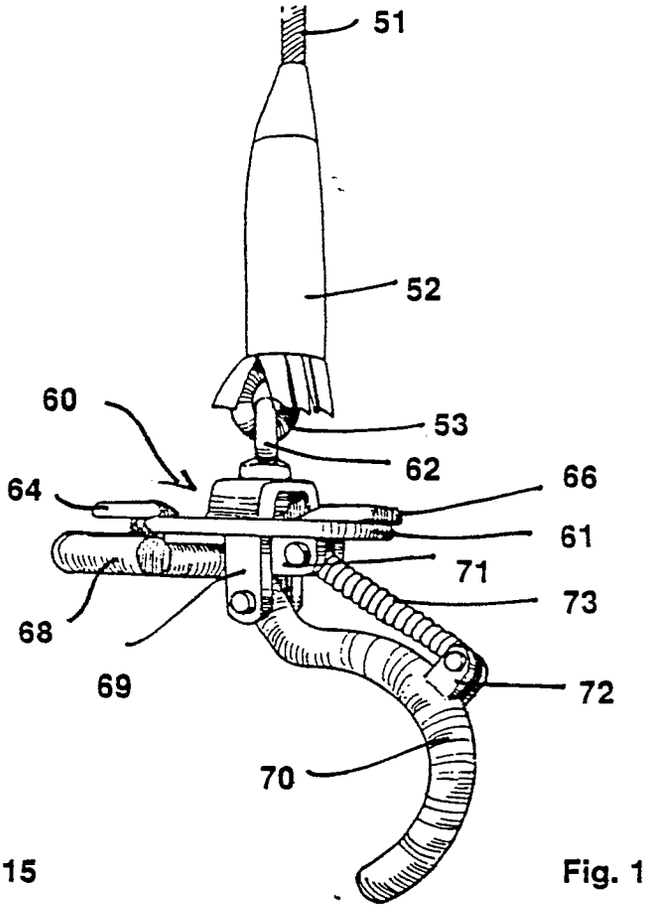

Fig. 16

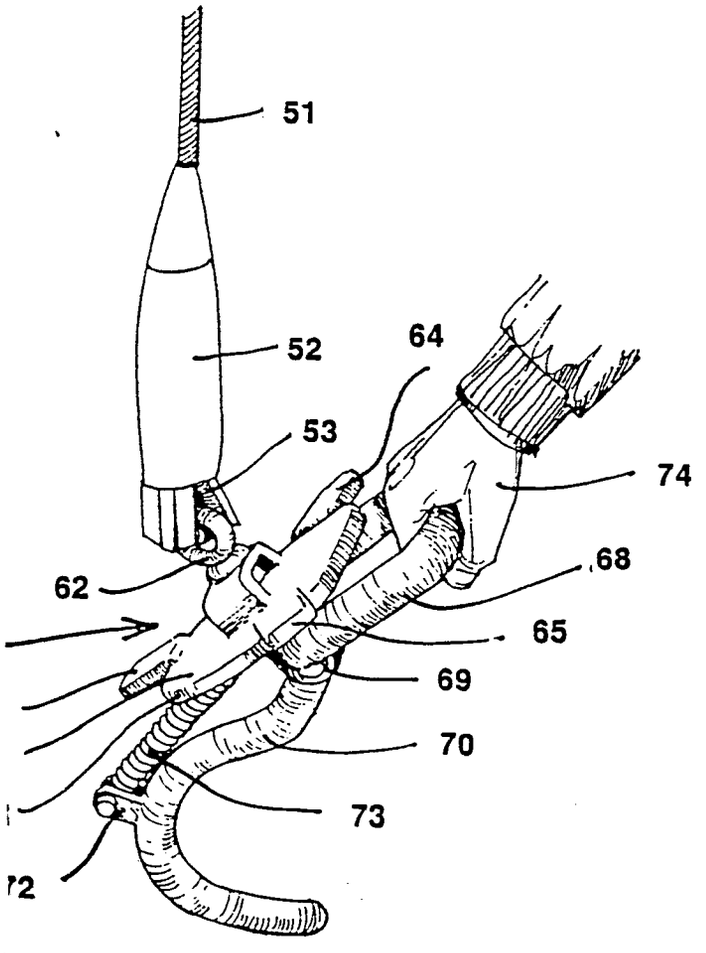

Fig. 17

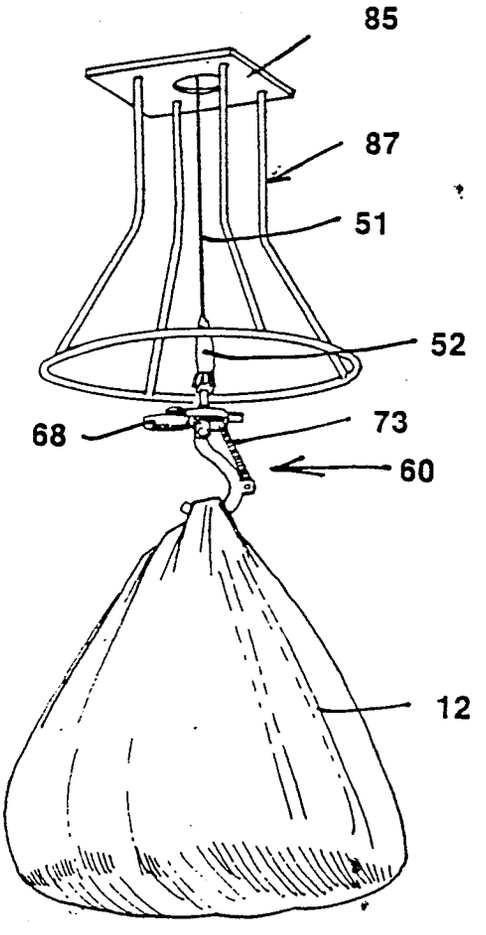

Fig. 18

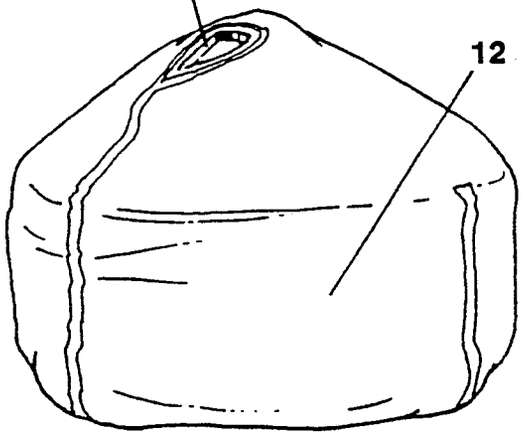

Fig. 19

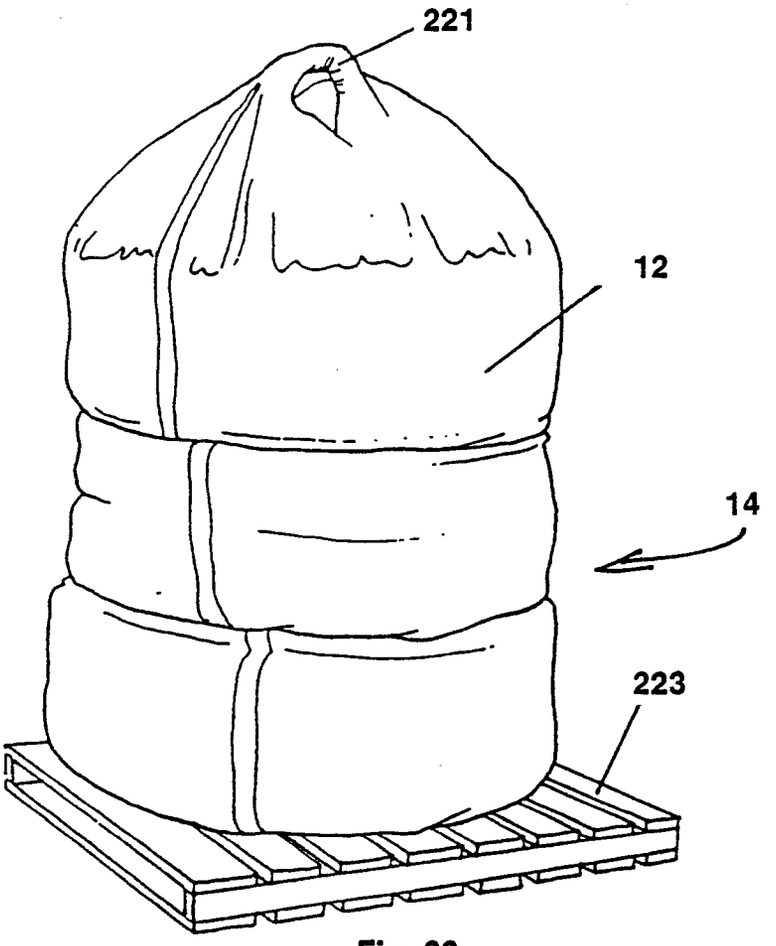

Fig. 20

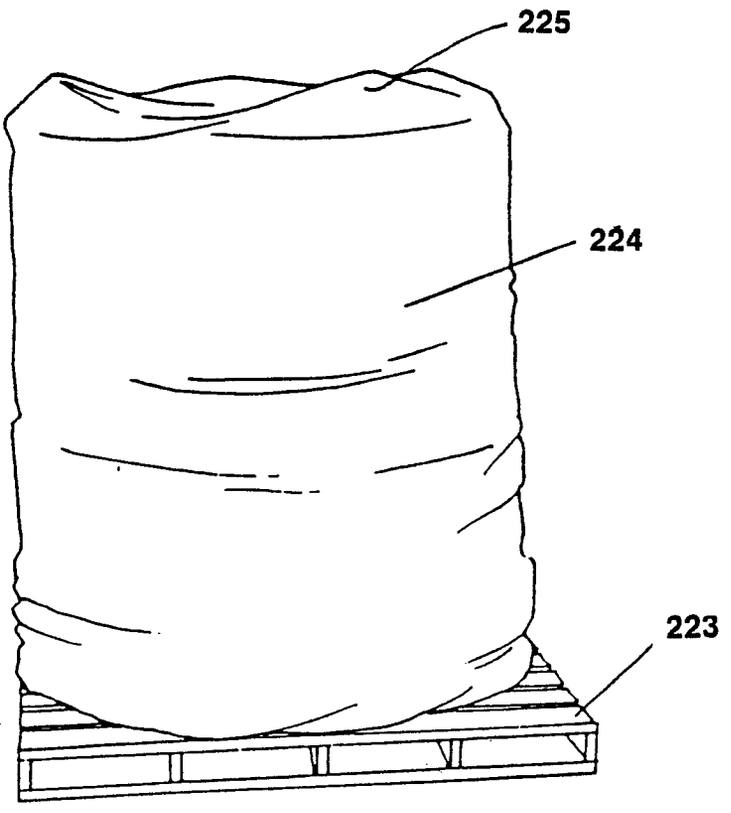

Fig. 21

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 20 2374

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 407 878 (VSESOJUZNY) * Claim 1; figures 1,2,7 *	1,2,5	B 65 B 61/24 B 65 G 57/00 B 65 D 88/16 B 65 D 19/44
A	US-A-4 034 846 (BURGIS) * Column 2, line 60 - column 3, line 5; figure 1 *	1,4	B 65 D 90/06
A	US-A-2 373 162 (BRECHTEL) * Whole document *	1-8	
X	DE-A-2 625 461 (CORDES) * Claims 1-8; page 14 - page 15, line 1; figures 1-3 *	9,10	
X	GB-A-1 544 631 (FISONS) * Whole document; figure 5 *	9,10	
A	US-A-4 499 599 (POLETT) * Abstract; figure 3 *	9,10	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 B
B 65 G
B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28-04-1987	WERNER D.M.

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