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(54) IMPROVEMENTS RELATING TO BULK MATERIAL CONTAINERS

(71) We, FRANK NATTRASS, of "Fal-lows End", Brearton, Nr. Harrogate, in the County of York, and PETER JOHNSON NATTRASS, of "Tresco", Chain Lane, 5 Knaresborough, in the County of York, both British Subjects, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to container for bulk material, particularly for comminuted material.

15 The use of large bags for transporting bulk quantities of powdered or granular material is known and it is known for such bags to have an inner liner and to empty the bag through a tube forming part of the liner and passing through an opening in the base of the bag. In previous constructions it has not been possible to close the base of the bag completely and the object of the present invention is to provide a construction wherein the base of the bag is 25 completely sealed.

According to the present invention a bag for transporting bulk material comprises an outer bag member having a base section 30 with an opening therein and side walls, means secured to upper parts of said side walls by way of which said bag may be lifted, an inner liner within said outer bag member, said inner liner having a lower end terminating in a tubular section, a first tube 35 secured to said base section around the opening and projecting outwardly from said base section, a second tube secured to said base section, said first tube lying radially within said second tube and said tubular section 40 lying radially within said first tube, means releasably securing said tubular section within said first tube and means releasably closing said second tube with said tubular section and first tube retained wholly within said second tube by said releasable closing means.

In use the inner liner of such a bag is filled with material and the liner is then 50 closed at its upper end, retaining of the

tubular section of the lower end of the liner within the first tube and the protection of this within the second tube completely seals the base of the bag and so prevents contamination of the material within the bag. 55 When the bag is to be emptied the second tube is opened, the tubular section and surrounding first tube are pulled through the second tube, the first tube is opened and the tubular section is opened out and secured 60 around the entry tube to a receiving bin or other container. A closure means on the tubular section may then be released whereupon the material can flow into the container with little or no material being re-leased into the air. The outer bag member is re-useable, only the inner liner needing replacement although even this may be capable of limited re-use.

Preferably the upper end of the inner liner 70 is also of tubular form and extends beyond the upper end of the side walls of the outer bag member. After filling this gives sufficient free liner material to be folded over and tied off to form a waterproof closure 75 for the liner.

Conveniently a fabric skirt is secured to the upper edges of the side walls of the outer bag member to overlie the liner, the skirt having a central opening through which 80 part of the liner may pass. This is important as it ensures that the liner can be completely emptied of material merely by lifting the bag slightly while the lower end of the liner is secured to the container entry tube. 85

The invention will be better understood from the following description of a bag made in accordance therewith, read in conjunction with the accompanying drawings, 90 in which:—

Figure 1 is a schematic view of the bag in a position ready for filling;

Figure 2 shows a detail of the top section of the bag after filling; and

Figures 3 to 8 show different stages of 95 discharging the contents of the bag.

As shown in the Figures a bag comprises an outer bag member 1 having a base section 2 with an opening 3 therein and side walls 4. Four lifting loops such as 5 are 100

stitched to the upper parts of the side walls. Other means by way of which the bag may be lifted can be used, but loops are preferred, and the preferred method of securing these to the bag is as described in co-pending Application No. 15798/73 (Serial No. 1,431,581). To provide a single point lift the loops at two adjacent corners may be interlocked or otherwise joined together, and the loops at the other two adjacent corners may also be interlocked or joined. A cross strap is then secured around the two sets of joined loops to extend across the top of the bag and provide a lifting point engageable by a single lifting element.

Fitting within the outer bag member is an inner liner 6 which may conveniently be made of impervious plastics material. The upper end of the liner extends through a central opening formed in the skirt 7 which is an annular piece of fabric stitched to the upper ends of the side walls 4. Secured to one of the side walls 4 is a lid 8 which is formed with slots 9 through which the loops 5 may be passed.

After the bag is filled an upper tubular part 10 of the inner liner 6 is folded back upon itself in swan-neck form as shown in Figure 2 to give a waterproof closure to the liner. The folded part of the swan-neck closure lies within the skirt 7 and is tied off and secured to the skirt by a cord 11. The outer lid 8 is then fitted over the skirt to give additional protection. In its filled form the bag can be transported and stacked as desired.

At its lower end the bag has two short concentric tubes 12 and 13 stitched to the base of the bag around the opening 3. The tubes are conveniently made from the same fabric as the outer bag member. A tubular section 14 of the inner liner 6 is brought through the opening 3 and tied off with cords 15 and 16. The tubular section 14 projects through the inner tube 12 and is tied to the inner tube by a cord 17 extending around the inner tube. The inner tube 12 and tubular section 14 are then folded into the space within the outer tube 13 and the outer tube is tied with a cord 18 which thus seals off the base of the bag and encloses the vulnerable end of the inner liner.

When the contents of the bag are to be discharged the bag is lifted into position above an entry tube 19 to a receiving container 20 with the outer tube 13 above the entry tube 19. The cord 18 is untied and discarded and the end of the tubular section 14 of the inner liner is unfolded and pulled into the position shown in Figure 4. The end 21 of the section is cut off and the cord 17 loosened and discarded (Figure 5). The cord 15 on the tubular section 14 is thus exposed (Figure 6). The end of the tubular section 14 is fitted over the entry tube 19

and tied in position by a cord 22 (Figure 7). The cord 15 is now loosened and removed whereupon the contents of the bag will flow into the container 20. The fact that the section 14 is tied around the entry tube 19 prevents any of the material escaping into the atmosphere. If a slower rate of discharge from the bag is required the cord 15 may be merely loosened rather than completely removed.

With certain material it is possible that when the bag is almost discharged some small pockets of material may remain in the lower corners of the bag, as indicated at 23 in Figure 7, the amount of material left depending on the natural angle of repose of that material. If this happens this remaining quantity of material can be discharged by raising the bag through a further small distance. The tying of the upper end of the liner 6 to the skirt 7 and the anchorage of the lower end 14 of the liner to the entry tube 19 will mean that on raising the bag the liner is forced to take on a more elongated position as shown in Figure 8 so that all remaining material will pass into the container 20.

The invention provides a container for bulk material which is simple to handle, is re-useable, ensures good protection of the material and is capable of being completely emptied without discharging any material into the atmosphere.

The preferred material for the outer bag member is woven unpigmented polypropylene, which may be subject to degradation by ultraviolet light. To retard this degradation the bag may be fitted with a shroud for shielding the outer bag member from ultraviolet light.

WHAT WE CLAIM IS:—

1. A bag for transporting bulk material comprising an outer bag member having a base section with an opening therein and side walls, means secured to upper parts of said side walls by way of which said bag may be lifted, an inner liner within said outer bag member, said inner liner having a lower end terminating in a tubular section, a first tube secured to said base section around the opening and projecting outwardly from said base section, a second tube secured to said base section, said first tube lying radially within said second tube and said tubular section lying radially within said first tube, means releasably securing said tubular section within said first tube and means releasably closing said second tube with said tubular section and said first tube retained wholly within said second tube by said releasable closing means.

2. A bag according to claim 1 in which the upper end of the liner is also of tubular



stitched to the upper parts of the side walls. Other means by way of which the bag may be lifted can be used, but loops are preferred, and the preferred method of securing these to the bag is as described in co-pending Application No. 15798/73 (Serial No. 1,431,581). To provide a single point lift the loops at two adjacent corners may be interlocked or otherwise joined together, and the loops at the other two adjacent corners may also be interlocked or joined. A cross strap is then secured around the two sets of joined loops to extend across the top of the bag and provide a lifting point engageable by a single lifting element.

Fitting within the outer bag member is an inner liner 6 which may conveniently be made of impervious plastics material. The upper end of the liner extends through a central opening formed in the skirt 7 which is an annular piece of fabric stitched to the upper ends of the side walls 4. Secured to one of the side walls 4 is a lid 8 which is formed with slots 9 through which the loops 5 may be passed.

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When the contents of the bag are to be discharged the bag is lifted into position above an entry tube 19 to a receiving container 20 with the outer tube 13 above the entry tube 19. The cord 18 is untied and discarded and the end of the tubular section 14 of the inner liner is unfolded and pulled into the position shown in Figure 4. The end 21 of the section is cut off and the cord 17 loosened and discarded (Figure 5). The cord 15 on the tubular section 14 is thus exposed (Figure 6). The end of the tubular section 14 is fitted over the entry tube 19

and tied in position by a cord 22 (Figure 7). The cord 15 is now loosened and removed whereupon the contents of the bag will flow into the container 20. The fact that the section 14 is tied around the entry tube 19 prevents any of the material escaping into the atmosphere. If a slower rate of discharge from the bag is required the cord 15 may be merely loosened rather than completely removed.

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The invention provides a container for bulk material which is simple to handle, is re-useable, ensures good protection of the material and is capable of being completely emptied without discharging any material into the atmosphere.

The preferred material for the outer bag member is woven unpigmented polypropylene, which may be subject to degradation by ultraviolet light. To retard this degradation the bag may be fitted with a shroud for shielding the outer bag member from ultraviolet light.

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2. A bag according to claim 1 in which the upper end of the liner is also of tubular



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form and extends beyond the upper end of the side walls of the outer bag member.

3. A bag according to claim 1 or claim 2 in which a fabric skirt is secured to the upper edges of the side walls of the outer bag member to overlie the liner, the skirt having a central opening through which part of the liner may pass.

- 5 4. A bag for transporting bulk material
- 10 substantially as herein described with reference to the accompanying drawings.

URQUHART-DYKES & LORD,

11th Floor,
Tower House,
Merrion Way,
Leeds, LS2 8PB,
and

11th Floor,
St. Martin's House,
140 Tottenham Court Road,
London, W1P 0JN.
Chartered Patent Agents.

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