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(54) IMPROVEMENTS RELATING TO BULK MATERIAL CONTAINERS

(71) We, FRANK NATTRASS, of "Fallows End", Brearton, Nr. Harrogate, in the County of York, and PETER JOHNSON NATTRASS, of "Tresco", Chain Lane, 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 containers for bulk material particularly for comminuted material and is a modification of the invention described and claimed in co-pending Application No. 15798/73 (Serial No. 1,431,581). That Specification claims a bag for transporting bulk material, having a top and four separate lifting loops disposed around the top, each loop having a bight and two spaced legs, and each leg being secured to the fabric of the bag by folding the fabric to a substantially S-shaped configuration around the leg and then back over itself and stitching through the three thicknesses of fabric and the leg.

In such a bag each leg of each loop is stitched to a total width of bag material which is three times the width of the loop material and as there are eight such legs the total width of bag fabric to which the lifting load is transmitted is twenty-four times the width of the loop material. By proper choice of materials it is possible to provide a bag that is no more expensive than existing bags and yet has a safety factor which is much greater than that of existing bags.

The present invention stems from the realisation that the fabric need not be folded around every leg and that one or more of the legs can be stitched to either exposed face of a substantially S-shaped section of folded fabric.

According to the present invention a bag for transporting bulk material has a top and four separate lifting loops disposed around the top, each loop having a bight and two spaced legs and each leg being secured to the fabric of the bag by folding a section of the fabric to a substantially S-shaped configuration along fold lines extending from the top towards the bottom of the bag to form three over-lying thicknesses of fabric, and stitching through the three thicknesses of fabric and the leg, at least one of the legs being placed on one of the exposed surfaces of the respective folded sections.

A bag made according to the present invention will have equivalent strength to one made according to the claims in the parent Application.

The conventional size of bags with which the invention is concerned is designed to carry one tonne of comminuted material. To support this weight it is desirable to use loop material which is at least 2 inches wide and to make the bag from material having a tensile strength of at least 50 kg. per linear inch. The lifting load will be transmitted to a total width of bag material of 48 inches and the maximum load supported will be 2.4 tonne, i.e. the bag will have a safety factor for a tonne load that is 2.4, i.e. similar to that of bags already in use.

However, the safety factor can readily be raised above this and it is desirable that this should be done. The proper way to lift or suspend bags according to the invention is to engage all four lifting loops to dispose them substantially vertical. However, it must be recognised that mishandling can occur and that a loaded bag may be engaged on one loop only; this leads to a requirement of a minimum safety factor of 4, and desirably somewhat above this. Accordingly the tensile strength of the bag material is preferably at least 83.3 kg per linear inch.

Obviously these minimum tensile strength figures will change if the width of the loop material is changed, and can be reduced if the material loop width is increased above 2 inches.

Conveniently the material of the bag is woven from a high tenacity synthetic fibre, for example polypropylene, polyethylene terephthalate, rayon, nylon and mixtures thereof. It may be possible to use a strong natural fibre, such as jute, but generally synthetic fibres are stronger and more resistant to deterioration. A particularly preferred material for the bag is 15×15 per sq. inch

woven polypropylene of 2000 denier, which is relatively cheap and possesses the required strength. Polypropylene has a tensile strength of 5 gms per denier and a single 2000 denier tape will thus support 10,000 gms. With a weave of 15 takes per inch width the tensile strength per inch is thus 150 kg, well above the preferred minimum figure of 83.3 kg. With 48 inches of material taking the load the maximum supported load will be 7.2 tonne, giving a safety factor for a tonne load of 7.2, significantly higher than that of conventional bags, even though the bag is no more expensive than conventional bags.

To maintain the safety factor given by the bag material it is obviously desirable to choose loop material giving the same safety factor. Thus, the absolute minimum breaking load of the loop material should be 600 kg, with the preferred minimum being 1000 kg. The material of each loop is preferably woven polyethylene terphthalate (e.g. "Terylene", Registered Trade Mark) of the type used for vehicle seat belts. A two inch width of this material has a breaking load of 1810 kg. so that four lifting loops will give a total load capacity of 7.24 tonne, i.e. a safety factor of 7.24 thus making such material particularly suitable for use with the woven polypropylene described above.

The gathering-in of the fabric at the upper part of the bag during the folding and stitching operations gives to the bag a characteristic shape having a broad bottom and a tapered top. This configuration both assists proper load distribution and provides inherent stability to the bag. In a preferred form of the invention the bag when filled with material has a shape resembling that of a wide-necked bottle with a broad base and a tapered top.

In order that the invention may be better understood a specific embodiment of a bag made in accordance therewith will now be described in more detail, with reference to the accompanying drawings in which:—

Figure 1 is a schematic perspective view of a bag; and

Figure 2 is a cross-section on the line II—II of Figure 1 through a loop stitched to the bag.

The bag is formed with a body 1 having a substantially square base, the preferred fabric for the body and base being polypropylene of 2000 denier, woven at 15×15 per sq. inch, i.e. with 15 warp tapes and 15 weft tapes to the inch. Towards the top of the body the fabric is gathered-in, and four lifting loops 2 to 5 are secured to the fabric. Each loop (e.g. loop 2) comprises a bight 6 and two spaced legs 7 and 8. Each leg is secured to the fabric of the bag body by folding sections of the fabric to substantially S-shaped configurations along fold lines extending from the top towards the bottom of the bag so forming three overlying thicknesses of fabric in each section. The leg is placed on the outer exposed surface of the folded section as shown in Figure 2 and secured by stitching through the three thicknesses of fabric and the leg. Alternatively, the legs may be placed on the inner exposed surfaces of the folded sections of fabric so that the legs will lie inside rather than outside the bag. Some of the legs may lie between adjacent thicknesses of folded fabric as described in co-pending Application No. 15798/73, Serial No. 1,431,581.

The material used for the loops is preferably woven "Terylene" webbing as used for vehicle seat belts. With webbing two inches wide it will be seen that a six inch width of bag fabric is stitched to each leg and the total width of bag fabric available to take the transmitted load from the loops is 48".

The bag includes a cover 13 stitched to the bag fabric around the mouth at the upper end thereof, and the cover has a draw-string 14 surrounding a central opening.

The bag shown may be lined with a detachable or fixed liner, which may for example be of polythene, to prevent migration of fine particles of powder through the fabric of the bag wall.

Once the bag as shown has been filled, and the draw-string of the cover tied, the bag may then be lifted by the loops. A number of bags may be stacked one on top of another, with the bottom of one bag lying on the cover of another. The squat profile of the bag when filled resembles that of a wide-necked bottle with a broad base and a tapered top which leads to good stability, and the loaded bag carries well by suspension from either a crane of a fork lift truck. A bag designed to carry one tonne of powdered material would have a base approximately 35" square and a height of approximately 50". If made from the preferred materials described the bag will have a safety factor of 7.2.

As described the bag is not reusable after the bottom has been cut to release the material. A reusable bag may be made howtver by cutting a hole (which may be round or square) in the base, hemming the cut edges to prevent tearing of the material and laying a sheet of heavy gauge polyethylene or other sheeting over the hole and surrounding part of the base of the bag, as described and claimed in our co-pending application no. 14058/74, Serial No. 1,431,582. Material can then be loaded into the bag and, providing the ratio of total base area to area of the hole in the base is above a certain minimum (readily determined empirically), the pressure of the material on the floor of the bag surrounding the hole maintains suffi-

cient tension in the sheeting to prevent it from being pushed out of the hole. To empty the bag the sheeting is cut, and a new piece of sheeting is put in the bag before reuse.

In a further modification the bag may be formed with a drawstring closure at the base, although this is more expensive. However, it does have the added advantage of giving a degree of control over the flow from the container.

WHAT WE CLAIM IS:—

1. A bag for transporting bulk material, the bag having a top and four separate lifting loops disposed around the top, each loop having a bight and two spaced legs and each leg being secured to the fabric of the bag by folding a section of the fabric to a substantially S-shaped configuration along fold lines extending from the top towards the bottom of the bag to form three overlying thicknesses of fabric, and stitching through the three thicknesses of fabric and the leg, at least one of the legs being placed on one of the exposed surfaces of the respective folded sections.

2. A bag according to claim 1 in which the material of each loop is at least 2 inches wide and the material of the bag has a tensile strength of at least 50 kg. per linear inch.

3. A bag according to claim 2 in which the material of the bag has a tensile strength of at least 83.3 kg. per linear inch.

4. A bag according to claim 2 in which the material of the bag has a tensile strength of about 150 kg. per linear inch.

5. A bag according to any one of the preceding claims in which the material of the bag is woven from a high tenacity synthetic fabre.

6. A bag according to claim 5 in which the material of the bag is 15×15 per sq. inch woven polypropylene of 2000 denier.

7. A bag according to any one of the preceding claims in which the material of each loop has a breaking load of at least 600 kg.

8. A bag according to claim 7 in which the material of each loop has a breaking load of at least 1000 kg.

9. A bag according to claim 7 in which the material of each loop has a breaking load of about 1810 kg.

10. A bag according to any one of the preceding claims in which the material of each loop is woven polyethylene terephthalate.

11. A bag according to any one of the preceding claims in which the top of the bag is provided with a cover stitched to the fabric of the bag, the cover having a central opening which may be closed by a drawstring.

12. A bag according to any one of the preceding claims and which, when filled with comminuted material, has a shape resembling that of a wide-necked bottle, with a broad base and a tapered top.

13. A bag for transporting bulk material, substantially as herein described and as illustrated in the accompanying drawings.

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