

(19)



Europäisches Patentamt

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Office européen des brevets



(11)

EP 0 751 093 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.01.1997 Bulletin 1997/01

(51) Int. Cl.⁶: **B66F 1/00**

(21) Application number: **96109864.7**

(22) Date of filing: **19.06.1996**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

(30) Priority: **20.06.1995 GB 9512467**

(71) Applicant: **Poulson, Brian William
Bury St. Edmunds, Suffolk IP30 0JE (GB)**

(72) Inventor: **Poulson, Brian William
Bury St. Edmunds, Suffolk IP30 0JE (GB)**

(74) Representative: **Dummett, Thomas Ian Peter
Dummett Copp & Co.
25 The Square
Martlesham Heath, Ipswich, Suffolk IP5 7SL
(GB)**

(54) Lifting device particularly for bulk bags

(57) The present invention relates to a device for lifting a selectable number of bags containing a fluent material by means of the engagement of a lifting tine with a lifting loop carried by the bag, characterised in that the device comprises:

- a. a first generally upright frame member incorporating means by which the frame can be engaged at or adjacent its lower edge by a lifting mechanism for movement in a generally vertical plane, said first frame carrying a plurality of generally transversely disposed mounting points located at or adjacent its upper edge, each of said mounting points being adapted to locate and support a projecting lifting tine member adapted to engage the lifting loop of a bag;
- b. a second frame member extending transversely of said first frame member and carrying support members adapted to engage the laterally outward faces of a bag or bags carried by said lifting tine member and thereby stabilise said bags against lateral movement with respect to said first frame during lifting of said bags, the lateral spacing between said support members being adjustable to accommodate the transverse width of the said one or more bags carried by said lifting member(s); and
- c. one or more lifting tine members engaged with one or more of said mounting points whereby the device can be adjusted to lift one or more bags by selection of the mounting point(s) or the lateral spacing between the mounting point(s) with which the lifting tine(s) are engaged.

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Description

BACKGROUND TO THE INVENTION:

Fertilizers and other fluent material, for example powdered synthetic resins, chalk and the like, are often transported from one site to another in bags. Recently, it has been proposed to pack such materials in bags which have a capacity of from 500 to 1500 Kgs or more. Such large bags are handled by a fork lift or other mechanical handling machines, for example a front end loader on a tractor. The bags can be lifted by their base, for example by sliding the tines of a fork lift truck under the outer edges of the base of the bag. However, this carries the risk that the tines may tear the material of the base of the bag and result in loss of the contents of the bag as it is lifted. Where the bag and its contents are to be stored outside, as often happens with large bags of fertilizer, any tear or puncture in the bag wall will destroy its weather resistant properties and may result in water damage to the bag contents.

As an alternative, the bag is lifted by means of one or more lifting loops attached to the side walls of the bag. Preferably, the loop(s) extend above the top of the bag to provide upstanding lifting loop(s) into which the tine of a fork lift truck can be engaged. Whilst this reduces the risk of damage to the base of the bag, it may result in a comparatively high lifted structure. As a result, it may not be possible to lift the bag sufficiently to clear loading or truck platforms in low headroom locations. Furthermore, in view of the different sizes and weights of bags which are now available, several different lifting mechanisms have hitherto been required to accommodate different bags, adding to the cost and complexity of handling big bags.

We have now devised a form of lifting frame for use with big bags having upstanding lifting loops which reduces the above problems.

SUMMARY OF THE INVENTION:

Accordingly, the present invention provides a device for lifting a selectable number of bags containing a fluent material by means of the engagement of a lifting tine with a lifting loop carried by the bag, characterised in that the device comprises:

- a. a first generally upright frame member incorporating means by which the frame can be engaged at or adjacent its lower edge by a lifting mechanism for movement in a generally vertical plane, said first frame carrying a plurality of generally transversely disposed mounting points located at or adjacent its upper edge, each of said mounting points being adapted to locate and support a projecting lifting tine member adapted to engage the lifting loop of a bag;
- b. a second frame member extending transversely of said first frame member and carrying support

members adapted to engage the laterally outward faces of a bag or bags carried by said lifting tine member and thereby stabilise said bags against lateral movement with respect to said first frame during lifting of said bags, the lateral spacing between said support members being adjustable to accommodate the transverse width of the said one or more bags carried by said lifting member(s); and

c. one or more lifting tine members engaged with one or more of said mounting points whereby the device can be adjusted to lift one or more bags by selection of the mounting point(s) or the lateral spacing between the mounting point(s) with which the lifting tine(s) are engaged.

The term at or adjacent in respect of the location of the means by which the first frame is engaged by the lifting means is used herein to denote that the lifting means engages the frame within the bottom half of the first frame so that the lifting means can raise the frame substantially to the full lifting height of the lifting means. Preferably, the frame is secured to the lifting means by way of a lug or lugs located substantially at the basal edge of the frame, for example by means of pins passing through trunnions or the like carried by the base member of the frame. In order to provide stability to the connection between the lifting mechanism and the frame, it is preferred to provide a second point of engagement between the two at a point approximately a quarter to halfway up the height of the frame, for example by way of hooks carried by the frame which engage a cross bar or the like carried by the lifting means. Other forms of attachment of the frame to the lifting means may be required with different forms of lifting mechanism and can readily be devised for each case. As a generality, it is preferred that at the lowest position of the lifting means, the frame rests upon the ground, thus maximising the height to which the lifting device can lift the frame whilst enabling the bags lifted by the device of the invention to be lowered to the ground for disengagement of the lifting tines from the lifting tines of the bag.

The invention can be applied to a wide range of sizes and shapes of bags containing a wide range of fluent solid materials, for example resin powders or granules. However, the invention is of especial application in the lifting of bags containing from 500 to 2000 Kgs of fertilizer which have a generally cylindrical or squared cross-section. Such bags are typically made from a polypropylene fibre woven outer bag with one or more PVC or polyethylene sheet inner liners. The bags also carry one or more lifting loops by which they are lifted. The loops can be affixed to the side walls of the bag or can extend around the base of the bag. Typically, there will be a lifting loop to each of two opposed side faces of the bag and the two loops may cross above the top of the bag to provide a single lifting point at the cross-over where both loops can be engaged by a single lifting tine. If desired four individual loops, one for each side face can be used and the loops collected together manually

for engagement with the lifting tine. Such bags are commercially available and may be used as such in the invention. For convenience, the invention will be described hereinafter in terms of a bag having a pair of crossed lifting loops as commonly used in the bulk supply of fertilizers.

The first frame member of the device of the invention is typically a square or rectangular shaped steel box girder or similar frame. Along the upper edge of the frame are located the mounting points for the projecting lifting tines which are to engage the lifting loop(s) of the bag. The mounting points can be in the form of sockets or the like into which the base portion of the lifting tines engage or can be in the form of the weld joint by which the lifting tine is permanently secured to the frame member. The engagement can be a screw, push, bayonet or any other suitable fit so that the tine can be secured in the mounting point or can be removably mounted for positional adjustment as described below. The mounting points can be located away from the upper edge of the frame within the top quarter of the height of the frame, but this will reduce the height to which the lifting tines can be raised and may limit the locations at which the device can be used. It is therefore preferred that the mounting points be located upon the upper transverse member forming the frame structure. The mounting points are to receive the lifting tines so that the latter project forwardly of the plane of the frame member, with the means by which the frame is mounted on the lifting means being located on the rearward face of the frame. Preferably, the vertical separation between the mounting points for the lifting tines and the means by which the frame is mounted on the lifting means is as great as is feasible.

As stated above, the lateral spacing between the lifting tines is preferably adjustable so that the device can accommodate different sized bags. Thus, the first frame member can be formed in two or more telescopic portions so that the frame can be expanded or contracted laterally to provide the desired lateral spacing between the lifting tines to ensure that adjacent bags rest against one another when lifted. However, it is preferred from a cost and simplicity of construction point of view to make the frame member rigid, eg. as a welded rectangular frame, and to provide a number of substantially evenly spaced apart forward facing mounting points along the top member of the frame. By selecting the mounting point into which a lifting tine is engaged, the operator can provide two spaced apart tines, three closely spaced tines or a single central tine to lift two 1000Kg bags, three 500Kg bags or one 2000Kg bag respectively. By mounting the lifting tines so that they can be demounted and inserted in other mounting points, it is thus possible to manufacture a frame which can accommodate a range of numbers and sizes of bags within a standard sized frame and with the minimum number of lifting tines.

The lifting tines can be simple round, squared or other cross-section elongate members, optionally hav-

ing a basal mount for engagement with the mounting points. Preferably, the tines are of a round cross section and taper or have a tapered tip to assist engagement with the lifting loop of the bag. Typically, the tines will be from 10 to 25% longer than the radius of the bag they are to lift. If desired, the tip of the tines may be curved upwards to reduce the risk of the loop sliding off the tine during use. If desired the mounting point can mount the tine at an angle of from 5 to 15° to the horizontal so that the lifting loops are biased towards the first frame member.

The first frame member may be provided with other features to assist in the operation of the device of the invention. For example, the first frame member may be expansible and contractible vertically, for example by forming it as two telescopic top and bottom portions moveable with respect to one another by means of one or more hydraulic rams. The frame can be collapsed vertically so as to present a small height for insertion through the open side of a curtain side wall truck for removal of bags from the platform of the truck. The frame can then be expanded to assist raising of the bag to a greater height once free from the truck, for example in a store or the like.

The first frame extends in a generally vertical sense and has a second transverse frame member attached to it which is to carry the members for providing lateral support to the bags. The second frame can be a simple rigid welded steel box girder frame or similar which is rigidly welded or otherwise secured to the first frame. However, if desired, the lateral adjustment of the spacing between the support members can be achieved by forming the second frame as a laterally expansible and contractible frame operating under the influence of an hydraulic ram or the like and/or by forming the first frame as a laterally expansible and contractible frame which carries the portions of the second frame carrying the support members with it. However, again for simplicity and cost reasons, it is preferred to form the second frame member as a substantially rigid fixed dimension frame having the support members adjustably secured to it and to bolt, weld or otherwise secure the second frame member to the first frame member.

The second frame carries the support members on it in a manner which allows the lateral space between the support members to be adjusted to accommodate the number of bags which are suspended from the lifting tines of the first frame member. Typically, the support members will engage the laterally outward face of the bag or bags suspended from the lifting tines, for example using two support members with the bags suspended between them in side to side touching relationship. However, intermediate support members can be provided between adjacent bags of desired. However, we have found that this is not usually necessary and that a pair of support members acting on the outward faces of the bag or row of bags will give adequate lateral support. For convenience, the invention will be described hereinafter in terms of the use of two

support members.

The support members can take a wide range of sizes and shapes, but it is preferred to round or chamfer that face bearing against the walls of the bags so as to minimise the risk of puncture of the bag wall. Typically, the support member comprises a vertical wall extending for 15 to 75 cms along the side wall of the bag and formed with an angled or curved face in contact with the wall of the bag. The support member may have a rubber or other soft surface to reduce the risk of puncturing the wall of the bag and to minimise sliding of the bag past the support member. The support member extends forwardly of the second frame member by any suitable distance, typically from 15 to 50 cms. If desired, the support member can comprise two or more arc shaped members carried by a vertical spacer, which is in turn carried by the second frame member.

The support member is slidably mounted upon the second frame member, for example by means of guide rails or channels on the forward face of the second frame member. The position on the support member can thus be selected according to the number and size of the bags suspended from the lifting tines of the first frame. Once selected, the relative position of the support member upon the second frame can be fixed, for example by a clamping bolt or other releasable locking mechanism. Alternatively, the support member can be moved with respect to the second frame by means of one or more hydraulic rams which lock the support member in the desired position.

Whilst the second frame member has been described above in terms of a separate frame to the first frame, it will be appreciated that the second frame member can take the form of one or more transverse rails carried by the first frame intermediate the top and bottom of the first frame member and which serve to support the support members. However, the use of a second frame which provides two transverse rails to support the support members is preferred since this will reduce the risk of the support members twisting, which could occur when a single rail is used.

The device of the invention can readily and cheaply be made from steel box girders or the like to provide a simple and rigid framework and associated members which is rugged and easy to use. As stated above, the device can be used to lift a wide range of sizes and shapes of bags containing a wide range of materials. Due to the demountable nature of the lifting tines and the adjustability of the lateral positions of the support members, a single device can simply and easily be modified to handle different number and sizes of bags without the need for additional components or skilled labour. The device of the invention thus readily lends itself to use on farms in the handling of fertilizer bags.

DESCRIPTION OF THE DRAWINGS:

The invention will now be described by way of illustration only with respect to a preferred form thereof as

shown in the accompanying drawings in which Figure 1 is a diagrammatic perspective view of the device and Figure 2 is a side elevation of the device of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

The device comprises a generally upright rectangular shaped frame 1 made from horizontal and vertical box girder steel sections welded together. The top section of the frame carries on its front face a series of forwardly projecting tubular sockets 2 into which tubular or solid steel lifting tines 3 are detachably mounted. Thus, the sockets and the ends of the tines 3 can have screw threads or inter-engaging bayonet mountings. Alternatively, the tine can be secured in position by a cross pin or bolt passing through the walls of the socket and the tine. As shown, there can be five sockets uniformly positioned across the width of the frame with one at the centre point and two symmetrically to each side. However, other numbers of sockets can be present having regard to the size and weight of the bags to be lifted. The use of five sockets is especially preferred since this can be used to accommodate 500, 1000 and 2000 Kg bags as described above.

The frame 1 also carries on its rear face means by which the frame 1 can be connected to a lifting mechanism. Preferably, the lifting mechanism is a fork lift truck or the front end loader of a tractor. The connection means can take any suitable form, but is mounted as close to the bottom edge of frame 1 as is practical so that the maximum lift from the lifting mechanism can be achieved and so that the bags suspended from the lifting tines 3 can be lowered onto the ground. The connection means shown in Figure 2 comprises a hook member which hooks over a cross bar on the fork lift rise and fall mechanism and a pair of lugs which can be connected by a clevis pin or the like to lock the frame 1 onto the rise and fall mechanism.

Attached to the base portion of frame 1 is a transverse second frame member 4, which comprises two parallel transverse rails and upright end members to form a rectangular frame. Slidably mounted on the transverse rails are two metal cheek pieces 5 which have a triangular shape or could have the face opposed to the bags suspended from tines 3 as a curved face. If desired, that face can have rounded corners and/or a rubber or other soft surface to reduce the risk of snagging of the bag wall on member 5 and sliding of the bag upon member 5. The position of member 5 upon the transverse rails can be adjusted by means of a releasable locking mechanism, for example a clamping bolt or the like (not shown).

As indicated above, the device is dimensioned to accommodate up to three 1000 Kg bags, with the lifting tines 3 in the position shown in Figure 1, in which case members 5 will be located at or adjacent the end of the transverse rails of frame 4. However, by removing the two outer tines 3 and bringing members 5 laterally inwardly towards one another, the device can be

adapted to lift a single 2000 Kg bag. In this case, the laterally outward ends of the first and second frame members may extend beyond the width of the single bag and present a hazard during use. It may therefore be desirable to form the laterally outward ends of the frames as demountable portions or telescopic portions so that the excessive width of the frames can be reduced to that of the bag.

The device is made from steel components and can be sized to suit the intended use of the device. Since several different permutations of sizes and number of bag to be lifted can be accommodated in a single device, the user need only purchase a single standard device which can be readily altered on site to accommodate different loads.

Claims

1. A device for lifting a selectable number of bags containing a fluent material by means of the engagement of a lifting tine with a lifting loop carried by the bag, characterised in that the device comprises:

- a. a first generally upright frame member incorporating means by which the frame can be engaged at or adjacent its lower edge by a lifting mechanism for movement in a generally vertical plane, said first frame carrying a plurality of generally transversely disposed mounting points located at or adjacent its upper edge, each of said mounting points being adapted to locate and support a projecting lifting tine member adapted to engage the lifting loop of a bag;

- b. a second frame member extending transversely of said first frame member and carrying support members adapted to engage the laterally outward faces of a bag or bags carried by said lifting tine member and thereby stabilise said bags against lateral movement with respect to said first frame during lifting of said bags, the lateral spacing between said support members being adjustable to accommodate the transverse width of the said one or more bags carried by said lifting member(s); and

- c. one or more lifting tine members engaged with one or more of said mounting points whereby the device can be adjusted to lift one or more bags by selection of the mounting point(s) or the lateral spacing between the mounting point(s) with which the lifting tine(s) are engaged.

2. A device as claimed in claim 1, characterised in that the lifting tines are removably mounted in said mounting points.

3. A device as claimed in either of claims 1 or 2, characterised in that there are five mounting points

located substantially symmetrically upon the first frame member.

4. A device as claimed in any one of the preceding claims, characterised in that the second frame member comprises two transverse substantially parallel rails mounted upon the first frame member and carrying at least two vertically extending support members secured to at least one of said rails by a releasable locking mechanism.

5. A device as claimed in claim 1, characterised in that the first and/or second frame members are telescopically extensible or contractible.

6. A device as claimed in any one of the preceding claims, characterised in that the lifting tines are at least in part inclined upwardly.

7. A fork lift truck or other lifting mechanism carrying a device as claimed in any one of claims 1 to 6.

8. A mechanism as claimed in claim 7, characterised in that a bag or bags are suspended from a lifting tine or tines of the device and the support members engage the side wall of the bag or bags.

9. A mechanism as claimed in claim 8, characterised in that at least two bags are suspended in side by side relationship and the support members engage the laterally outward faces of each of the bags.

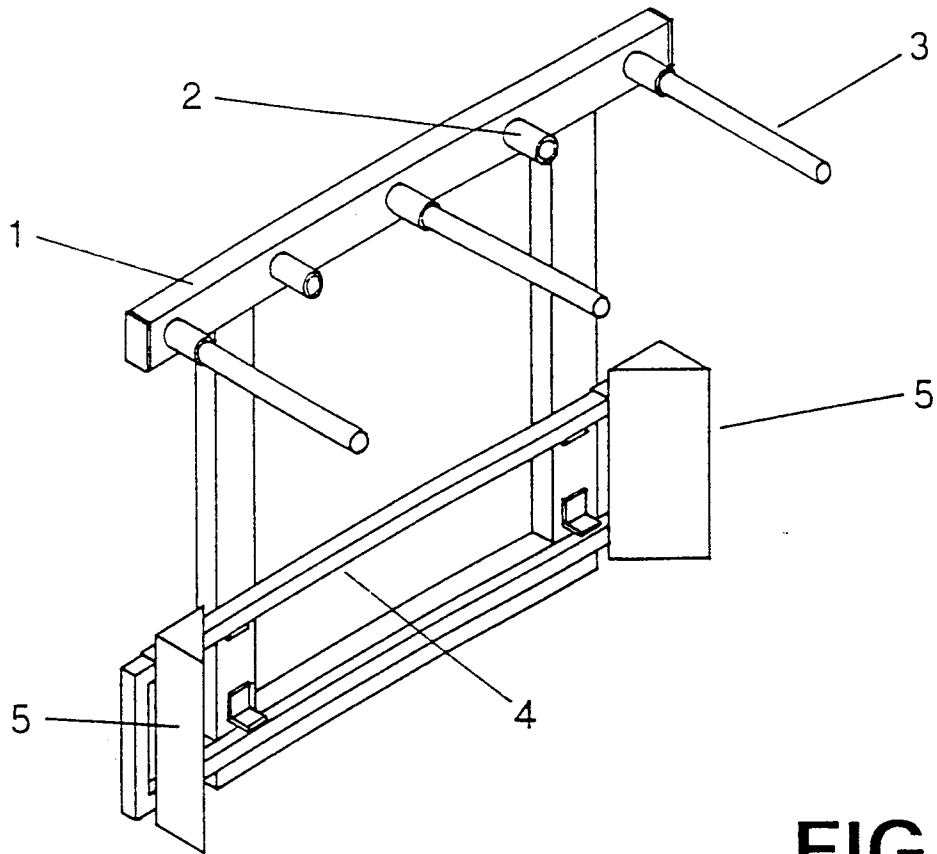


FIG 1

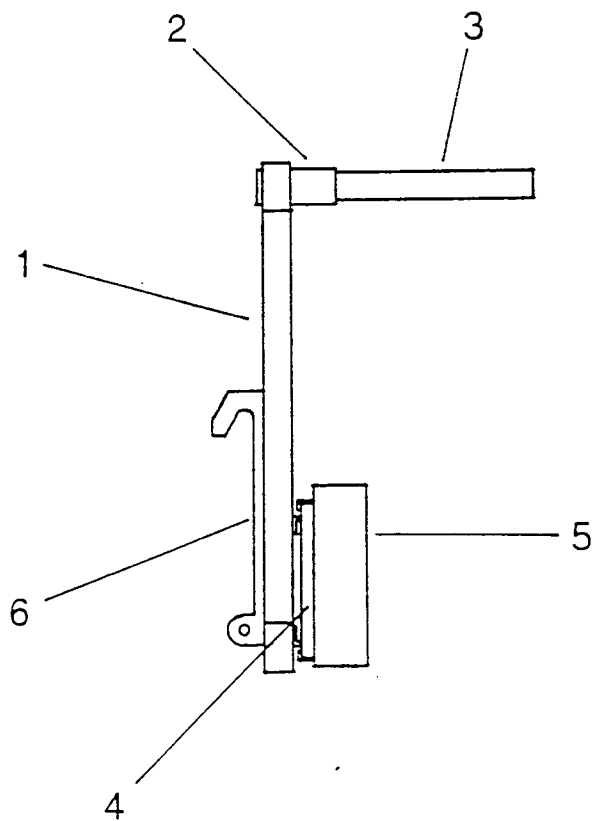


FIG 2