PARCELS COMPRISING AT LEAST TWO STACKS OF UNITS OF GOODS; MEANS, METHOD AND APPARATUS FOR FORMING SAID PARCELS

The present invention relates to a parcel of at least on pair of stacks of units of goods surrounded by a self-clamping sling. The invention also comprises a prefabricated sling for forming such parcels. The invention further comprises a method of forming such parcels comprising a self-clamping load sling and an apparatus for performing said method.

Transport and storage of units of goods or bags are to a great extent performed by stacking these on pallets which usually are covered and protected/secured by foliar plastic sheet. This is a rather expensive procedure, mainly because of the cost of the pallets, including the cost of reusing, refurbishing, repairing and transporting the pallets.

It is known in the art proposals for overcoming these problems by using slings instead of pallets. From WO 88/06554 there is known a process and machine for making up a parcel of bags from adjacent stacks of bags and two straps forming a closed loop, which encircle the stacks of bags, transversally with respect to the bags, the lower part of the straps extending upwards between the piles of bags to form a central suspension loop for lifting the parcel. The application of a pair of straps complicates the handling of such parcels because it requires two suspension loops to be hooked onto lifting devices like hooks or truck forks. The stability of such parcels is questionable and the narrow width of the straps will for many types of goods damage the bags during handling. The openings in the

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straps through which the suspension loops protrude are complicated, and it requires strict control to secure that the strap ends are kept together during handling.

A similar arrangement for handling stacks of bags is described in GB patent specification No. 1.409.243. Also in this case two sets of loop-formed straps surround the bags, but the common suspension loop for lifting the parcel of bags is threaded through a ring to which the strap ends are secured. This arrangement is even more complicated than that described above. The disadvantages with regard to stability and possible damage to the bags are similar to those described in WO 88/06544.

The objective of the invention was to arrive at a safe and economic way of handling units of goods or bags that would not require pallets and which did not have the disadvantages related to known sling devices for handling bags.

Another objective was to develop a method and apparatus for placing the bags in a lifting and storage device that met the requirements with regard to safety and stability for parcels of stacks of bags to be handled by commonly applied lifting devices.

A further objective was to obtain an improve the sling device itself by a more efficient way of forming the sling.

When the inventors started looking for new ways of avoiding application of pallets for transporting/storing bags, the concept of self-clamping slings seemed promising in spite of the disadvantages and shortcomings of the known solutions within this concept. It was therefore decided to try to develop improved sling type lifting devices for bags. The problems related to application of narrow straps were first investigated. Substitution of such straps with a wide belt or cloth, for instance having a width being ubstantially equal to the length of the bags, was then

proposed. However, such a solution seemed to result in several new problems. First of all was the problem of joining the ends of such a belt to a joint that would be strong enough to meet the requirements with regard to lifting strength through the lifetime of the belt, i.e. through several lifting operations. Another problem was to gather together a wide belt to form a suspension loop for lifting the stacks of bags. Then there had to be made an opening in the belt for the lifting loop without reducing the lifting strength of the looped belt. The latter problem proved to be very simple to solve by simply slitting an opening in said belt in the area just above the two self-clamping stacks of bags.

To make a strong joint for the belt ends required selection of the right material for the belt and the proper way of forming the joint. Said belt could be made from any cloth material having the required strength. Such material could be polypropylene, polyethylene, jute etc. and even paper. Sewing, application of various types of glue, hot melt etc. were considered. The belt ends could also be joined by means of a clamping device consisting of a she- and he-member. In this way, the belt ends are folded around the respective he- and she-members until they are locked together. Weldable materials can also be joined by welding. The final solution to this problem would also have to incorporate a solution taking into consideration the method of forming the looped belt with bags stacked therein. Accordingly, a new method and device for placing the bags in such a looped belt had to be developed. In order to arrive at an economically acceptable solution, it was decided that the problem of designing a device for stacking bags into the belt had to be developed simultaneously with solving the problems of obtaining a secure and permanent joint between the belt ends.

The method of forming parcels of self-clamping load sling of stacks of units of goods or bags according to the invention, comprises that a sling in the form of a belt having a width substantially equal to the transverse width of said stacks, is formed into a closed loop comprising a suspension loop for lifting the parcel. A predefined length of said belt is first formed from a belt supply, and then at least

two stacks of units of goods are placed on the belt such that the belt surrounds said stacks and extends upwards between the stacks to form a central suspension loop. An opening is provided in the belt for pulling said loop through and then forming the loop and thus the lifting means or eye. The two ends of the belt are joined together to form a closed loop of the belt.

A modification according to the invention of this method is shown in figures 7-11. The main features of this method relates to formation of the central suspension loop and placement of a sleeve around said loop.

A special way of forming the sling was developed. This implied treating the belt material, at least those parts which should be joined together by irradation or corona discharge. The adherance of the glue or hotmelt to the belt material was then substantially strengthen.This solution to the problem proved to give belt joints that could endure the strain the parcels were exposed to during lifting. The joints were strong enough even during lifting at relatively high temperatures. It was further found that when a sleeve was applied around the suspension loop, the sleeve material could be made from corona treated base material and glue or hotmelt could be applied for joining the material to a sleeve. Similar material, such as woven polypropylene fabic, is usually applied for for instance making flexible intermediate bulk containers and in stead of using seems for joining the various parts of the material, it can be treated with corona discharge and glue and hotmelt can be applied to the joints.

An alternative method of forming said parcels of units of goods comprises that a predefined length of a belt having a width substantially equal to the width of said stacks of units of goods is formed into a closed loop by placing the belt over four rods (16a-d) being transverse to the belt, forming the central suspension loop and then placing the belt around another set of four rods (17a-d) and joining the two belt ends into a closed sling. An opening in the upper part of the belt is provided for pulling the suspension loop through and gathering the loop o form a lifting

eye. The units of goods are stacked into the belt subsequent to formation of the closed sling.

The apparatus for forming a parcel of at least two stacks of units of goods surrounded by a sling comprises a supply of loop material, in the form of a belt or cloth which during production of the parcel of stacks will pass over two pair of rods spaced apart. Each such set of rods has a vertically displaceable rod placed in between said rods for providing, together with a vertically movable plate with two rods secured thereto, the predefined length of the belt. The outer end of the belt is fastened in a clamping device during the whole stacking operation.

At the end of said operation, the clamping device can, be moved horizontally above the stack of bags in order to place the outer end of the belt in position for being joined to the other end of the belt. The apparatus further comprises a device for supplying units of goods to be stacked in the sling. Any suitable device for placing the units or bags on the belt and subsequently on the previous bag can be applied. The device also comprises at least two roll assemblies on which the predefined belt rests during the stacking operation. These roll assemblies can be moved vertically.

The parcel according to the invention comprises at least one pair of stacks of units of goods surrounded by a loop-formed sling comprising a central suspension loop extending upwards between said stacks of units of goods. The sling is in the form of a closed loop of a belt having a width substantially equal to the transverse width of said stacks and the central loop is gathered together to form a lifting eye, which optionally can be reinforced by a sleeve of suitable material. The belt ends overlap, preferably across their total width, and are permanently secured together by sewing, gluing, hot melt etc.

A corresponding parcel can be made by simply placing a pre-defined length of a belt over eight rods and joining the two ends of the belt on top of the stacks of units of goods or bags. The bags can be loaded into the belt manually.

The invention and its special features are further explained and shown in connection with the figures and the description thereof.

Fig. 1 shows the first step in the production of a parcel of two stacks of units of goods surrounded by a self-clamping sling.

Fig. 2 shows formation of the predefined length of the sling.

Fig. 3 shows the production step at which the .first units of goods have been stacked on to the belt forming the sling.

Fig. 4 shows the. production step when the last units of goods have been stacked on the sling.

Fig. 5 shows the last step in the production comprising joining the two ends of the belt to form the sling.

Fig. 6 shows an arrangement for applying a belt-formed sling to be filled manually with bags.

Fig. 7 shows the alternative method of pulling out a predetermined length of the belt material.

Fig. 8 shows the placement of the first stack of parcels in the belt

Fig. 9 shows formation of the suspension loop.

Fig. 10 shows two stacks of stacks placed inside the belt.

Fig. 11 shows the two stacks of parcels surounded by the belt just before the belt ends are joined together.

Figs. 12-14 show a device for pleating part of the suspension loop and forming a sleeve around said pleated part.

In Figure 1 there is shown a supply 1 for the continuous belt 2 to be formed into the load sling. The belt 2 passes over two transverse rods 4, spaced apart with a rod 5 above and in between, a vertical movable plate 8 with rods 8b and 8a and a transverse pair of rods 6, spaced apart with a rod 7 above and in between the rods 6. The end of the belt 2 is fastened in a clamping device 3. Below the belt 2 are two vertically movable roll assemblies 10a,b. Above the belt 2 are transverse rods 9 which can be removed during the process. Above the rods 9 there are three partition walls 11 between which units of goods shall be stacked. A loading device 12 for supply of units of goods to be stacked is shown. The device 12 can be any suitable device for supplying the units of goods to the apparatus for forming stacks of such units surrounded by a sling formed from the belt 2. A knife 18 is placed immediately below the belt 2 adjacent to the belt supply 1. At the very beginning of the sling forming operation the knife 18 is raised vertically to make a central slit in the belt 2.

In the lower left corner of Figures 1-5 the belt 2 is shown viewed at an angle with respect to the successive unit operations.

Figure 2 shows the belt 2 stretched out to its pre-defined length. This is attained by moving the rod 5 downwards, the plate 8 and the rod 7 and simultaneously placing the roll assemblies 10a,b in their starting position for stacking of units of goods, whereby the belt 2 is stretched out to its pre-defined length. The belt parts

resting on the respective roll assemblies 10a and 10b, and being locked in these positions, will form the bottom parts of the sling for the respective stacks of bags 13. The belt supply 1 is then locked until the production of the parcel of stacks of bags is concluded. The form of the thus pre-defined belt 2 is shown more clearly in the lower left corner of Figure 2. Units of goods or bags 13 are then loaded successively between the partition walls 11 and down on the rods 9 and subsequently onto the preceding bag 13.

Figure 3 shows a further step in the production of parcels of stacks of bags. The rods 9 have now been removed and the bags rest on the belt 2 on the roll assemblies 10a,b. The plate 8 is moved upwards bringing with it by means of the rod 8b the section of the belt 2 being between roll assemblies 10a and 10b.

Figure 4 shows the process step at which stacking of bags is finalized. The belt 2 now surrounds both sides and the bottom of the two stacks of bags 13. A loop 14 of the belt 2 is formed between the two stacks and is held in position by the rod 8b. This part of the belt 2 is pressed together in the transverse direction and glue might be sprayed into the folds in order to keep the loop 14 more easily in its desired form. The roll assemblies 10a,b have been moved downwards to a lower position than shown in Figures 2 and 3, and the belt 2 is stretched out around the two stacks of bags.

Figure 5 shows the last step of the process of forming a parcel of self-clamping load slings. When the stacking of bags is finalized the clamping device 3 is moved to the left over the top of the stacks with one end of the belt 2 and joined with the other end which has been cut away from the continuous supply of belt. During this step of the process a slit-formed opening has been provided in the belt allowing the upper part of the loop 14 to be positioned above the belt 2. Prior to positioning the upper part of the loop 14 above the belt 2, the loop 14 has been gathered together, transversely, to form a lifting eye 15 at the end of the loop 14. The two ends of the belt 2 are joined by glue, hot melt, sewing or any other

suitable joining method. If glue is applied, a plate may be placed on top of the stack A immediately beneath the joint area, and glue can be supplied between the two belt ends where a roll could then press them together to form a permanent joint.

The units of goods or bags can be stacked into the belt in various patterns depending on the size of the units of goods. The type of goods which can be handled according to the invention, can be bags, boxes, etc. and any types of goods which can be loaded and stacked into a sling-formed belt. The main proviso is that the width of the belt is about the same as the width of the stacks of units of goods.

When one parcel of units of goods has been loaded as described above, the whole process can be restarted. The production time for a parcel of bags using the apparatus according to the invention will be 1-3 minutes depending on the size of the parcels and the units of goods.

Figure 6 shows a special arrangement for manual stacking of bags into a belt-formed sling 2. Eight rods 16a-d and 17 a-d, being transverse to the belt 2, define the two stacks of bags 13. The belt 2 can be placed over rods 16a -d and passed 16a for forming the suspension loop 14 and then down past 17b and further around rods 17c,d,a and b around stack B and across stack A to be joined with the other end of the belt 2. A central slit or opening for the suspension loop can be provided in the upper area of the belt 2 in the area between the two stacks A and B. The bags 13 can be loaded manually inside the belt either before or after the two belt ends are joined.

A preformed belt can also be made and supported by an assembly of eight rods after which the bags can be loaded manually into the belt having a central suspension lifting loop as described above. Additional support can be provided by a base plate or a base plate assembly.

Such a prefabricated belt can have a pleated part encircled by a sleeve or at least one rope or strap to keep the pleats permanently together. The belt can be made from materials as described above and be in the form of a ready made loop or from a piece of material being joined as described above.

Figure 7 shows how the belt 2 is secured to a rod 18 and running up to the belt supply 1 before the first stack of parcels 13 are placed onto the respective roll assemblies 10a and 10b. In fig 8 it is shown that the belt 2 is placed on top of the roll assemblies 10a and 10b and the first stack B of parcels 13 is placed on 10b and its rigth side is covered by the belt 2. As shown on figure 9 the belt 2 is pressed upward along stack B by a rod 23 placed between the assemblies 10a and 10b. This is how the central suspension loop 15 is formed and it is pressed and folded together or pleated and then surrounded by a sleeve 22 as shown on the small figure to the rigth of stack B. (figure 9). The stack A can then be placed on the assembly 10a and the belt 2 is placed along stack A by moving the rod 18 upward.The suspension loop is then hoisted up and secured in a clamping device 22 and the rod 23 can be released and moved back to its initial position between the assemblies 10a and 10b. As further shown on figue 10 the rod 19 is pressed to the rigth placing the cut off end of the belt 2 on top of stack B. On figure 11 the first stage of joining the belt ends together is shown. Glue or hot melt is supplied to the top layer of the belt by a device 21 whereupon the rod 18 is moved to the rigth placing the other end of the belt on top of the belt end previously covered with glue and the two belt ends are pressed together forming a strong joint. The parcel of stacks A and B surounded by the belt compricing the central suspension loop 15 is then ready for being transported out of the apparatus and a new parcel of stacks can be made. The stacks A and B can be surrounded by plastic sheet or film, for instance by conventional shrink wrapping, prior to being placed on the roll assemblies 10a,b.

Figure 12-14 shows how the belt 2 can be pleated and a sleeve 22 can be secured around the pleated loop 15 according to the invention. Pleating and placement of a sleeve 22 around the central part of the pleated part will be performed prior to the operation shown in figure 9. Rods 18 and 23 will be at the same height, placing the belt 2 in a horizontal position during pleating. The belt 2 is first placed between two sets of guiding bars 24 as shown on figure 12. The bars 24 are kept at a predefined distance by end pieces 25 a,b and said distance defines the heigth of the pleats 27 (figure 13). Each set of bars 24 are consists of two parts, one on each side of the belt 2 and will be moved out of the belt area when pleating and placement of the sleeve 22 are completed. On the bars 24 there are pieces 26a,b which can be moved along the bars 24 and when piece 26a are moved towards piece 26b the belt 2 is pleated and the central pleated part 27 is ready for encirclement by a sleeve 22. This is further shown on figure 14 where the sleeve material from a supply 28 therefore extends into a curved or buckled device 33. On figure 14 there are shown pressure cylinders 31 and 32 for horizontal movement of the bars 24 and the pleating pieces 26a,b respectively. The device 33 is secured to piece 26b and has a width being substanially the same as that of the pleated part 27. Glue or hotmelt is supplied to the sleeve material which is cut by a knife or similar device 34 to pre-defined length before the pleating process starts. When the pleating process is finalized, the device 33 will be immediately below the pleated part 27 (figure 13). The device 33 will then be pressed around part 27 and this part will thereby be encircled by the sleeve 22.

Example 1

This examples shows the preferred way of joining the two belt ends by glue or adhesive. The example further comprises tests performed for evaluating the strength of such joints.

A test piece of polypropylene cloth being treatded with irradation (corona) had a width of 100mm and the overlapp area for the two cloth ends were about 15cm. A thermosetting adhesive, for instance polyurethane, was applied to one of the cloth ends in 4mm stripes across the cloth, 4-6 were applied. The temperature of the adhesive was above its melting point. During the test the adhesive was supplied at 180°C. The distances between the stripes were 30mm. Immidiately after application of the adhesive the other cloth part was placed on top of the other and they were pressed together for about 10sec. Then the joint was exposed to a tension test at 60°C and at a tension rate of 200mm/min. Several tests were performed until rupture. All samples ruptured in the cloth, the adhesive stripes did not yield or rupture. Various termosetting adhesives were tested and they all passed the tensile strength test giving a safety factor of 7:1., i.e. parcels weighing 1600kg can be exposed to a tension of at least 11200kg without rupture of the joint or cloth. If the cloth fabric was not corona treated glued joints glued together as described above did not pass the test. Based on these tests a supension belt having a width of 100cm and being corona treated could be safely joined by thermosetting adhesive. The belt ends could be overlapping in an area of 5-10cm and 2-6 stripes of adhesive would be sufficient.

By the present invention the inventors have succeded in developing parcels of stacks of units that can be surrounded by a suspension loop giving safe and economic handling of such parcels. An apparatus essential for the economy of such a concept has also been developed and the preferred way of forming and joining the applied belt together has proved to be determening for commercializing the concept.

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Claims

1. Parcel comprising at least one pair of stacks (A,B) of units of goods surrounded by a self-clamping load sling comprising a central suspension loop (14) extending upwards between said stacks (A,B) of units of goods (13),
characterized in that
the sling is in the form of a closed loop of a belt (2) having a width substantially equal to the transverse width of said stacks (A,B) and that the central loop (14) is gathered together to form a lifting eye (15) and extending through a central opening in the upper part of the belt (2), and that the belt ends overlap and are secured permanently together by sewing, gluing, hot melt etc.

2. Means for forming a parcel according to claim 1.
characterized in that
the self-clamping load sling constitutes a prefabricated loop formed belt (2) comprising a pleated part whose central part is surrounded by a sleeve, with at least one rope or strap to keep the pleats permanently together.

3. Method of forming parcels of self-clamping load sling of at least two stacks (A,B) of units of goods or bags (13),
characterized in that
a sling in the form of a belt (2) having a width substantially equal to the transverse width of said stacks (A,B) is formed into a closed loop comprising a suspension loop (14) for lifting the parcel by first forming a predefined length of said belt (2) from a belt supply (1) and then place onto the belt (2) units of goods to form stacks (A,B), such that the belt surrounds said stacks (A,B) and extends upwards between the stacks (A,B) to form a central suspension loop (14) and that an opening is

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provided in the belt (2) for pulling said loop (14) through and forming the loop into a lifting eye (15) and that the two ends of the belt (2) are joined together to form a closed loop of the belt (2).

4. Method according to claim 3 for forming parcels of self-clamping load sling of stacks (A,B) of units of goods (13),
c h a r a c t e r i z e d i n t h a t
the predefined length of the belt (2) is formed by pulling the belt (2) over a pair of rods (4), being spaced apart and having a vertically movable rod (5) placed in between, and over a rod (8b) fastened to a vertically movable plate (8) and then above a second pair of rods (6) having a vertically movable rod (7) in between, and that the end of the belt (2) is then fastened in a clamping device (3), whereupon the rods (5) and (7) are moved downwards against the belt (2) and the plate (8) is moved downwards such that the rod (8a) presses the belt (2) downwards while roll assemblies (10a,10b) are moved up against the belt (2) until the belt (2) rests thereupon and that the belt supply (1) is locked as the predefined length of the belt (2) has been pulled out.

5. Method according to claim 3,
c h a r a c t e r i z e d i n t h a t
the predefined length of the belt (2) is formed by pulling the belt (2) from the belt supply (1) and on to a rod (18) initially positioned at the roll assembly (10a), whereupon a first stack(B) is placed in the belt (2) and upon the roll assembly (10b) and then the suspension loop (15) is formed by moving upward a rod (23) placed between the roll assemblies (10a,b), and that the second stack (A) then is be placed on the belt (2) and the assembly (10a), the stacks (A,B) are then completely surrounded by the belt (2) as the rods (18) and (19) are moved over the top parts of the said stacks.



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6. Method according to claim 3,
characterized in that
glue or hot melt is applied to at last one of the end parts of the belt (2) which have been treated with corona dicharge and that the two belt ends then are pressed together.

7. Method according to claim 3,
characterized in that
during formation of the suspension loop (15) the belt (2) is pressed together, pleated and surrounded by a sleeve (22).

8. Method according to claim 3,
characterized in that
the sleeve (22) is formed around the pleated part (27) of the loop 15 of the belt (2) by means of a curved device (33), having sleeve material containing glue or adhesive placed thereon and being mounted on a pleating device (26,b), and pressing said device (33) around the pleated part (27) to secure the sleeve (22) onto the suspension loop (15).

9. Method according to claim 3 for forming parcels of self-clamping load sling of stacks (A,B) of units of goods or bags (13),
characterized in that
a belt (2) having a width substantially equal to the transverse width of said stacks (A,B) is formed into a closed loop by placing the belt (2) over rods (16a-d), being transverse to the belt (2), forming the central suspension loop (14) and placing the belt (2) around rods (17a-d) and joining the two ends of the belt (2) into a closed sling, and that an opening is provided in the belt (2) for pulling the suspension loop (14) through and that the suspension loop (14) is gathered together to form a lifting eye (15) and that units of goods (13) are stacked into the sling subsequent to formation of the closed sling.

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10. Method of forming parcels of self-clamping load sling of stacks (A,B) of units of goods (13),

characterized in that

a preformed sling made from a belt (2) having a width substantially equal to the width of the stacks (A,B) and comprising an opening for a central suspension loop (14), is placed on rods (16a-d) spaced apart from rods (17a-d) such that the suspension loop (14) is placed between said two sets of rods (16a-d) and rods (17a-d), and that said sets of rods are transverse to the belt (2), and that a lifting eye (15) is formed from the upper part of the loop (14) and that units of goods (13) are then loaded into the sling to form stacks (A,B).

11. Apparatus for forming a parcel of at least two stacks (A,B) of units of goods (13) surrounded by a sling in the form of a closed loop comprising a central suspension loop for lifting the parcel,

characterized in that

between a supply for loop material (1) and a clamping device (3) for fastening the outer end of belt (2), to be formed into a load sling, there are arranged two sets of rods (4) and (6), each of which having vertically movable rods (5) and (7) placed in between, and that at least two vertically movable roll assemblies (10a and 10b) are placed between the two pairs of rods (4) and (6) at such distance that a plate (8) with rods (a,b) can be moved vertically in between the roll assemblies (10a and 10b), and that the apparatus further comprises means (12) for supply of the units of goods (13).

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12. Apparatus according to claim 11,
characterized in that
the apparatus comprises a set of rods (9) positioned above the roll assemblies (10a,b) and between partition walls (11) between which the units of goods (13) will be placed during stacking and that the rods (9) can be removed from the apparatus during the stacking process.

13. Apparatus according to claim 11,
characterized in that
the apparatus comprises a vertically movable rod (23) placed between roll assemblies (10a,b), for forming the suspension loop (15), and a clamping device (20) for holding the suspension loop (15).

14. Apparatus according to claim 11,
characterized in that
the apparatus comprises two sets of guiding bars (24) having mounted thereon pieces (26a,b) horizontally movable against each other for pleating the belt (2) and where the bars (24) are spaced apart at a distance corresponding to the height of the formed pleats (27), and that a device (33) for forming the sleeve (22) around the suspension loop (15) is secured to the pleating device (26b).

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