SHEET PACKAGING APPARATUS

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ABSTRACT

A first aspect of the invention concerns a corner packaging device (14) which can be used in the packaging of a polygonal pack (10) of stacked glass sheets. The device includes two identical packaging members (12) each having a facing element (16) to lie against an outer surface of the pack at a corner and a pair of transverse flanges (22) meeting one another at a corner (24) of the facing element so as in use to lie against adjacent edges of the pack. There is a projection (28) lying generally in the plane of each flange and extending beyond the inner edge (26) of the flange and a recess (30) extending into the flange from that inner edge. With this arrangement, the packaging members can be arranged with their facing elements lying against opposite surfaces of the pack, with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack to be received slidably within the recess of the other flange over a range of different pack thicknesses. Each flange also carries a projecting sling attachment formation (44) beneath which a lifting sling (46) can be engaged for the purposes of lifting the pack at an upright attitude when the devices embrace the corners of the pack and are anchored in position by straps (40, 42) encircling the devices and the pack to hold the pack together. Other aspects of the invention relate to a packaging system incorporating such devices (14) and the individual packaging members (12).
SHEET PACKAGING APPARATUS

BACKGROUND TO THE INVENTION

[0001] This invention relates to sheet packaging apparatus.

[0002] In one application, the apparatus of the invention is specifically designed for use in the packaging of glass sheets arranged in a stack. For many years, packs of stacked glass sheets were packaged in timber frames, but in more recent times this type of packaging has been rejected in view of environmental considerations.

[0003] One packaging system which could be used in place of conventional timber packaging systems is described in ZA 2000/0564. This system makes use of moulded plastic corner packaging elements arranged to embrace the corners of the pack. However, while this proposal can be used to good effect in the packaging of a pack of glass sheets of known and constant thickness, it lacks the versatility to be used with packs of different thickness.

[0004] Another proposal is the so-called U-pack system described in U.S. Pat. No. 6,478,354. This proposal makes use of corner members which embrace opposite sides of the corners of the pack and has the versatility to deal with packs of varying thickness by virtue of connecting members which interconnect the corner members. Although versatile, this proposal has the disadvantage that the packaging of each corner of the pack requires three separate components. Furthermore, it is necessary to cut the connecting members to exactly the right length if the resulting assembly is to embrace the corner of the pack in a suitably snug manner. In practice, it has been found that it is difficult to cut the connecting members sufficiently accurately.

SUMMARY OF THE INVENTION

[0005] According to the invention there is provided a corner packaging device for embracing a corner of a polygonal pack of stacked glass sheets, the device comprising:

[0006] two identical packaging members each having a facing element to lie against an outer surface of the pack at a corner thereof and a pair of flanges meeting one another at a corner of the facing element and extending transverse to the facing element so as in use to lie against adjacent edges of the pack, each flange being generally planar and having an edge remote from the facing element,

[0007] a projection lying generally in the plane of each flange and extending beyond the inner edge of the flange and a corresponding recess extending into the flange from the inner edge, whereby the packaging members can be arranged with their facing elements lying against opposite surfaces of the pack and with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack to be received slidably within the recess of the other flange over a range of different pack thicknesses, and

[0008] a sling attachment formation, projecting transversely from the plane of each flange, beneath which a lifting sling can be engaged for the purposes of lifting the pack at an upright attitude when corner packaging devices embrace the corners of the pack and are anchored in position by straps encircling the devices and the pack to hold the pack together.

[0009] In the preferred embodiment the device also includes foot formations, on which the pack can stand edgewise, projecting transversely from the plane of each flange.

[0010] Further according to the invention there is provided a packaging system for a polygonal pack of glass sheets arranged in a stack, the system comprising, for each corner of the pack, a device as summarized above, and straps passing around the devices and encircling the pack to hold the glass sheets together.

[0011] Still further according to the invention there is provided an individual packaging member for use in the packaging device and system.

[0012] Other features of the invention are described below and set forth in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

[0014] FIG. 1 shows a perspective view of a glass sheet packaging system according to this invention;

[0015] FIG. 2 shows a side elevation of the system seen in FIG. 1;

[0016] FIG. 3 shows a plan view of the system seen in FIG. 1;

[0017] FIG. 4 shows an end view of the system seen in FIG. 1;

[0018] FIG. 5 shows an interior side view of one packaging member of a corner packaging device according to the invention;

[0019] FIG. 6 shows an exterior side view of the same packaging member;

[0020] FIG. 7 shows a perspective view of the same packaging member;

[0021] FIG. 8 shows how two identical packaging members are mated with one to embrace a corner;

[0022] FIG. 9 shows a modified glass sheet packaging system according to the invention;

[0023] FIG. 10 shows a perspective view of an edge protector used in the packaging system of FIG. 9;

[0024] FIG. 11 shows a perspective view of a corner pad which can be used in the packaging system of the invention; and

[0025] FIG. 12 illustrates the use of the corner pad of FIG. 11.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0026] As described hereunder the invention is concerned with the packaging of a stack of glass sheets arranged in a polygonal, in this case rectangular, pack 10.
Reference is made firstly to FIGS. 5, 6 and 7 which illustrate a single packaging member 12 of a corner packaging device 14, one such corner packaging device 14 being provided for each corner of the pack 10. The packaging member 12 is moulded in one piece of a suitably robust plastics material and includes a generally triangular facing element 16 having a ribbed inner surface 18 and a flat outer surface 20. The member 12 also includes a pair of generally planar flanges 22 which meet one another at a corner 24 of the facing element and which extend transversely to the facing element.

As shown in FIG. 8, each flange has an inner edge 26. Extending beyond this edge, in the plane of the flange, is a projection 28. Spaced from the projection 28 is a recess 30 which extends into the flange from the inner edge 26. The overall width and depth of the recess 30 are slightly greater than the overall width of the projection 28 and the distance by which it projects from the edge 26.

It will be understood that the shape of packaging member 12 is such that it can be positioned with the inner surface 18 of the facing element 16 against the surface of the pack 10 at a corner of the pack and with the flanges 22 extending along the side edges of the pack in the corner region.

FIG. 8 shows how two of the packaging members 12 can be arranged in opposition to one another with the projections 28 aligned with the recesses 30. It will furthermore be understood that with the members 12 aligned in this way, they can be moved towards one another for the projections 28 to enter and slide into the recesses 30. In practice, a pair of members 12 are brought together in this way to form the packaging devices 14 at each corner of the pack 10, as shown in FIGS. 1 to 4.

With the packaging devices 14 embracing the corners of the pack 10, as shown in FIGS. 1 to 4, straps 40 and 42 are arranged to pass over and around the devices, encircling the pack, and are appropriately tensioned to hold the stich of glass sheets together in the pack. Any suitable form of strap, such as conventional steel packaging straps, may be used for this purpose.

Prior to placement and tensioning of the straps, the packaging members 12 of each packaging device 14 are capable of moving towards or apart from one another as required to accommodate the thickness of the pack 10.

It will be understood that over a range of pack thicknesses, the projections 28 will always be at least partially received in opposed recesses 30. Thus it will be understood that within this range of thicknesses of the flanges, together with the projections 28, will always form a bridge between the opposing packaging members 12, and will accordingly extend over even those glass sheets located centrally in the pack 10. This is considered to be an important advantage of the illustrated embodiment, in that even the central glass sheets are prevented, in the assembled package, from slipping laterally out of the stack.

Projecting transversely from the plane of each flange 22 is a sling attachment formation 44 shaped as illustrated. During transportation and handling, the pack 10 will generally be at an upright attitude as seen in FIGS. 1 and 2. The pack in this orientation can be lifted, by means of suitable lifting apparatus such as an overhead crane or winch, via slings 46 hooked beneath the formations 44 as indicated in broken outline in FIG. 2.

In addition to the sling attachment formations 44, foot formations 48 also project from the general plane of each flange 22. As will be apparent from FIG. 2, the pack 10 can stand upright on the foot formations 48 on a flat surface 50. In practice, the sling attachment formations may project the same distance from the flanges 22 as the foot formations, and are therefore also able to act as feet on which the pack can stand at an upright orientation. The ability of the pack to stand on both the sling and foot formations will enhance the stability of the pack when arranged on edge.

Because the packaging members 12, and hence the packaging devices 14, are identical to one another, sling attachment formations and foot formations are present at all four corners and along each edge of the pack. It is accordingly possible for the pack 10 to stand on an end edge as opposed to a side edge as illustrated in FIG. 2.

It will be noted that the sling and foot formations 44, 48 are spaced apart from one another on each flange of the packaging member to provide a secure landing zone for the straps 42. It will be understood that with the straps 42 are unable to slip laterally out of the landing zone once they are properly tensioned.

It will also be noted from FIG. 5 that the sling and foot formations are hollow but are reinforced internally by webs. In this way, the overall mass of plastic material used in the moulding of a packing member 12 can be reduced.

In the packaging system illustrated in FIGS. 1 to 4, the glass sheets are held together at their corners only. During transportation and handling at an upright orientation, this could conceivably give rise to a tendency for the outer sheets in the pack to bow outwardly, leading to the possibility of cracking of those sheets. To avoid this, the invention proposes a slightly modified packaging system as illustrated in FIG. 9. Here, a moulded plastics edge protector 52, illustrated in FIG. 10, is arranged to embrace each of the four edges of the pack, at positions midway between the corners. Further strips 54 are then arranged to pass over the edge protectors, encircling the stack, to provide restraint to at the centre of the pack, thereby preventing outward bowing of the outer glass sheets in the central area.

Although shown as a U-shaped moulding in FIG. 10, the edge protectors could be provided by straight strips, having the same cross-section but being sufficiently flexible to be bent around and embrace the edge of the pack at the required positions.

The ribbed internal surfaces of the facing elements 16 will in certain circumstances promote a good grip on the corner surfaces of the pack 10. However it is recognised that the plastic material of which the packaging members 12 are made will generally be relatively hard and rigid. This gives rise to the possibility of cracking of the glass sheets if the packaging members are pressed too hard against the glass. For this reason it is considered desirable at least in some cases to provide each packaging device 14 with relatively resilient padding between the packaging members and the glass itself. FIG. 11 shows a corner pad for this purpose.

The corner pad 60 seen in FIG. 11 is made of a low density polyethylene with a degree of resilience and includes
side panels 62 and edge panels 64 defining an open corner 66. The clear spacing between the side panels 62 is selected to be slightly greater than the maximum expected thickness of the pack 10 of stacked glass sheets. This allows a pad 60 to be fitted over each corner of the pack as illustrated in Fig. 12, with the corner of the pack projecting through the opening 66, whereby a corner packaging device 14 as described above can be assembled over the pad. For ease of illustration, Fig. 12 shows only one packaging member 12 of the packaging device in position. The resilience of the pad is such that it can deform as necessary when the device 14 is assembled and the straps 40 and 42 are tensioned, for instance by crumpling up on itself, if the pack 10 should have a thickness less than the clear spacing between the side panels 62. Once installed the pad acts as a cushion to prevent direct contact between the packaging member 12 and the glass sheets and accordingly to reduce the potential damage to the glass sheets by those members.

1-16. (canceled)

17. A corner packaging device for embracing a corner of a polygonal pack of stacked glass sheets, the device comprising:

- two identical packaging members each molded in one piece of a relatively rigid plastics material and each having a facing element which can lie parallel to an outer surface of the pack at a corner thereof and a pair of flanges meeting one another at a corner of the facing element and extending transverse to the facing element so as in use to extend parallel to adjacent edges of the pack, each flange being generally planar and having an edge remote from the facing element,

- a projection lying generally in the plane of each flange and projecting beyond an inner edge of the flange and a recess extending into the flange from the inner edge, the width and depth of the recess being greater than the width of the projection and the distance by which the projection projects beyond the inner edge of the flange, whereby the packaging members can be arranged with their facing elements lying parallel to opposite surfaces of the pack and with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack to be received within the recess of the other flange over a range of different pack thicknesses, and

- a sling attachment formation, projecting transversely from each flange, beneath which a lifting sling can be engaged for the purposes of lifting the pack at an upright attitude when the corner packaging device is anchored in a position embracing the corner of the pack.

18. A packaging device according to claim 17 and comprising a foot formation, on which the pack can stand edgewise, projecting transversely from each flange.

19. A packaging device according to claim 18 wherein the sling attachment formation and the foot formation on each flange are spaced apart from one another to provide a landing zone to receive a strap used to encircle the pack and a pair of packaging devices embracing adjacent corners of the pack.

20. A packaging device according to claim 19 wherein the sling attachment formation and the foot formation project the same distance from the flange on which they are provided.

21. A packaging device according to claim 20 wherein the sling and foot formations are hollow and are reinforced internally.

22. A packaging device according to claim 17 comprising a pad for location between the packaging members and the corner of the pack.

23. A packaging device according to claim 22 wherein the pad is shaped to embrace a corner of the pack with side and edge panels arranged to extend, at the corner of the pack, over the sides and edges respectively of the pack.

24. A packaging device according to claim 23 wherein internal surfaces of the facing panels of the packaging members are ribbed.

25. A packaging device according to claim 17 wherein the projection and recess have tapered shapes.

26. A packaging system for a polygonal pack of glass sheets arranged in a stack, the system comprising, for each corner of the pack, a corner packaging device for embracing a corner of the pack, the device comprising:

- two identical packaging members each molded in one piece of a relatively rigid plastics material and each having a facing element to lie against which can lie parallel to an outer surface of the pack at a corner thereof and a pair of flanges meeting one another at a corner of the facing element and extending transverse to the facing element so as in use to extend parallel to adjacent edges of the pack, each flange being generally planar and having an edge remote from the facing element,

- a projection lying generally in the plane of each flange and projecting beyond an inner edge of the flange and a recess extending into the flange from the inner edge, the width and depth of the recess being greater than the width of the projection and the distance by which the projection projects beyond the inner edge of the flange, whereby the packaging members can be arranged with their facing elements lying parallel to opposite surfaces of the pack and with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack to be received within the recess of the other flange over a range of different pack thicknesses, and

- a sling attachment formation, projecting transversely from each flange, beneath which a lifting sling can be engaged for the purposes of lifting the pack at an upright attitude when the corner packaging device is anchored in a position embracing the corner of the pack;

and straps which can be arranged to pass around the devices and encircle the pack to hold the glass sheets together.

27. A packaging system according to claim 26 which includes edge protectors for embracing edges of the pack between the corners thereof, and further straps passing around the edge protectors and encircling the pack.

28. A packaging system according to claim 27 wherein each edge protector has the cross-section of a shallow channel.
29. A packaging member for use in a corner packaging device for embracing a corner of a polygonal pack of stacked glass sheets, the packaging member being molded in one piece of a rigid plastics material and comprising:

- a facing element which can lie parallel to an outer surface of the pack at a corner thereof and a pair of flanges meeting one another at a corner of the facing element and extending transverse to the facing element so as in use to extend parallel to adjacent edges of the pack, each flange being generally planar and having an edge remote from the facing element,

- a projection lying generally in the plane of each flange and projecting beyond an inner edge of the flange and a recess extending into the flange from the inner edge, the width and depth of the recess being greater than the width of the projection and the distance by which the projection projects beyond the inner edge of the flange, whereby opposing, identical packaging members can be arranged with their facing elements lying parallel to opposite surfaces of the pack and with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack to be received within the recess of the other flange over a range of different pack thicknesses, and

- a sling attachment formation, projecting transversely from each flange, beneath which a lifting sling can be engaged for the purposes of lifting the pack at an upright attitude when the packaging member is anchored in a position embracing a corner of the pack.

30. A packaging member according to claim 29 comprising a foot formation, on which the pack can stand edgewise, projecting transversely from each flange.

31. A packaging member according to claim 27 wherein the sling attachment formation and the foot formation on each flange are spaced apart from one another to provide a landing zone to receive a strap used to encircle the pack and a pair of packaging devices embracing adjacent corners of the pack.

32. A packaging member according to claim 31 wherein the sling attachment formation and the foot formation project the same distance from the flange on which they are provided.

33. A packaging member according to claim 32 wherein the sling and foot formations are hollow and are reinforced internally.

34. A packaging member according to claim 29 wherein the projection and recess have tapered shapes.

35. A package of rectangular glass sheets, the glass sheets being stacked alongside one another in a rectangular pack, the package including:

- a corner packaging device at each corner of the pack, the corner packaging device comprising:

  - two opposing, identical packaging members each molded in one piece of a relatively rigid plastics material and each having a facing element lying parallel to an outer surface of the pack at the corner and a pair of flanges meeting one another at a corner of the facing element and extending transverse to the facing element so as extend parallel to adjacent edges of the pack, each flange being generally planar and having an edge remote from the facing element,

- a projection lying generally in the plane of each flange and projecting beyond an inner edge of the flange and a recess extending into the flange from the inner edge, the width and depth of the recess being greater than the width of the projection and the distance by which the projection projects beyond the inner edge of the flange, whereby the packaging members are arranged with their facing elements lying parallel to opposite surfaces of the pack and with their flanges extending towards one another and with the projection of one flange extending over an edge of the pack and into the recess of the other flange, and

- a sling attachment formation, projecting transversely from each flange, beneath which a lifting sling can be engaged for the purposes of lifting the pack at an upright attitude,

and

- straps encircling the pack and the packaging devices to hold the pack together.

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