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(54) PACKAGING FOR ARTICLES

(71) We, FRANK & HEIDECHE G.m.b.H., a German Body Corporate, trading as ROLLEI-WERKE FRANK & HEIDECHE, of 196 Salzdahlumerstrasse, Braunschweig, Germany, 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:—

The invention relates to a packing of foamed polystyrene (Styropor — Registered Trade Mark), having a six-sided packing body consisting of two shell halves, internally enclosing the packed goods in a close fitting manner and externally formed with smooth surfaces.

Multi-part symmetrical and asymmetrical packings of foamed polystyrene (Styropor) which enclose packed goods either as shell halves or as a one piece surrounding structure are known.

In packings of foamed polystyrene (Styropor) a force impact-absorbing effect inherent in the material is increased by the fact that these packings for conveying goods enclosed in a close fitting manner have ribs of various forms and orientations on the outer and/or inner sides. The theory adopted here is that the energy absorbed by the packing when dropped on the ground or upon impact with some other object firstly acts upon the protruding ribs and a part of the energy is dissipated by the deformation or destruction of these ribs. Moreover the destruction of a part of the tiny bubbles foamed in the Styropor participates in the energy absorption. In this specification forces applied to the packing body due to the packing body falling onto a surface or due to some other object striking the packing body will hereinafter be referred to as impact forces.

Since the apparently soft Styropor with its enclosed bubbles fundamentally represents a quite rigid and strong synthetic plastics mass, with conventional or even optimally ribbed packing success is achieved only with great difficulty in preserving the goods to be protected adequately against

external forces, if only by reason of the specific properties of the material. This problem is the more difficult to solve, the lower is the inherent weight of the conveyed goods, since small or light parts when dropped often do not develop the force necessary for the deformation or destruction of the Styropor material. If such goods with relatively low inherent weight, such as optical precision engineering products, for example cameras, are also particularly sensitive to impact forces applied thereto, Styropor packings known hitherto do not offer adequate protection against transport damage.

According to the invention there is provided a packing of foamed polystyrene having a six-sided packing body consisting of two shell halves which together define an internal cavity for enclosing an article in a close fitting manner and which are each provided with smooth surfaces externally, wherein the packing body has noses protruding from the corners of its body surfaces. Thus a packing is provided in which impact forces on the packing body firstly can attack only the extremely small area of at least one individual nose. The energy liberated in the impact is in this case reduced by successively occurring rapid damped resilience of the nose increasing deformation of the nose until bursting of individual bubbles within the foamed packing, and breaking in of the entire nose.

According to one embodiment of the invention it is expedient that the shell halves are symmetrically assembled in their external shaping. Thus in the case of an impact force favourable distribution of the impact and pressure forces to the two shell halves is achieved and the configuration of the tools for the externally symmetrical shell halves is substantially simplified.

An expedient embodiment of the invention is achieved in that a plane of separation of the shell halves, defined by interengaging faces of the shell halves, which plane is generally rectangular extend parallel with the largest surface of each shell half.

Thus in the packing of usually parallelepipedic packed goods, convenient short manual operations are rendered possible and favourable conditions of centres of gravity are achieved in the enclosing of the packing for example within an outer carton.

A further advantageous development of the invention consists in that those edges of the packing body which extend from the noses towards the plane of separation of the shell halves, have cut-out portions tapering towards the plane of separation. With the shaping of these cut-out portions it is possible to influence the spring movement of the noses which yield for the purpose of force absorption in the case of an impact force.

In a further embodiment of the invention each pair of adjacent cut-out portions are made to subtend an acute or an obtuse angle with respect to each other, according to choice. In this way the spring movement of such a cut nose can be adapted to the size and weight of the packed goods to be transported. Acute-angled cut-out portions increase the spring movement while obtuse-angled cut-out portions increase the stability of a nose to a great extent and thus permit optimum adaptation of the damping effect of the noses formed by different cut-out portions to the weight and also to the impact sensitivity of the goods to be transported.

A further advantageous embodiment of the invention is that the wall thicknesses of the packing body are relatively thin in comparison with the size of the enclosed goods. Thus it is ensured that in the case of simultaneous occurrence of falling to the ground and other impact forces upon two or more noses of one shell half, a large part of the occurring impact accelerations is absorbed as a result of springing of the entire packing body.

According to a further development of the invention the edges of the largest surfaces extend in directions generally parallel with the plane of separation of the shell halves and extend to the noses in smoothly curved lines. Such curving of the edges and smooth-surfaced shaping of the shell halves has two essential advantages. Firstly the absence of sharp-edged steps or surface transitions in the region of the noses avoids pre-marked fracture positions which can lead to premature breakage, also smooth-surfaced outer and inner walls require the simplest tool shaping.

Finally, in a further improvement of the invention the two shell halves of the polystyrene packing body are enclosed by an outer carton which abuts only on the noses of the packing body. In such an assembly the impact forces acting upon the packing body are reduced by deformation of the

outer carton before they reach the polystyrene packing body. Moreover such an assembly provides the smooth outer faces necessary for stacking and despatch.

Therefore there may be provided a packing of foamed polystyrene (Styropor) of the initially described kind which provides adequate protection for highly delicate products with especially small dimensions and low weight and which moreover can be produced with the use of the simplest tool forms.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 shows a perspective view of a packing body;

Figure 2 shows a perspective cross-sectional view through the packing body;

Figure 3 is a lateral elevational view of the packing body illustrating springing movement of the body when it strikes the ground upon being dropped; and

Figure 4 is a partial lateral elevational view of the packing body with an article inserted therein, in which the springing action of the packing body is symbolically represented.

Referring now more particularly to Figure 1, there is shown an assembled packing body 1 formed from two shell halves 2, 3. The shell halves 2, 3 having complementary engaging surfaces on one another at a separation plane 4 therebetween, together form a six-sided cubic or parallelepipedic body core. The body surfaces meeting at the eight corners of the body are however formed into noses 5 protruding from the body core. The pointedly shaped noses 5 are slightly flattened and rounded at their end most remote from the body. Cut-out surfaces 7 of isosceles triangle form are provided in the edges 6 of the packing body extending perpendicularly of the separation plane 4, each triangular surface 7 point with two apices 8 to the separation line 4, that is, the cut out portion defined between surfaces 7 tapers from the edge 6 towards the separation plane 4. In order to achieve a largely uniform distribution of any impact forces to all parts of the packing body, the shell halves 2, 3 receiving the packed goods are made largely symmetrical in their external dimensions. In this way, as Figure 3 shows, approximately uniform wall thicknesses of relatively slight dimensions in relation to the size of the packed article, are produced around the internal space cell 9 adapted in shape to be substantially complimentary to the packed goods. Projections 11 and recesses 12 in the walls 10 of the shell halves 2, 3, necessary for the individual imitation of the shape of the conveyed goods, are

largely compensated or uniformly distributed as regards material over the entire surface of the walls. Thus all the properties of the Styropor shaped in this way, necessary for the protection of the packed goods, such as strength, yieldability, deformability, etc., are balanced over the entire packing body 1.

A simple outer carton 15 produced for example from micro-corrugated pasteboard is so designed in its clear internal dimensions that all eight noses 5 abut the outer carton in the corners of the inner walls of the outer carton. The packed goods 13 held in a close fitting manner in the shell halves 2, 3 on the one hand and the noses 5 abutting the outer carton 15 on the other hand hold the shell halves fast in their position so that they cannot be separated laterally. Furthermore the outer carton prevents opening of the shell halves during transport and provides the smooth rectangular outer surfaces necessary for stackability.

If in one example an individual nose is struck fully upon the package falling to the ground, that is the packet has fallen on one corner, then in succession firstly the corner of the outer carton 15 and then the point of the nose 5 yield. The material deformation of the Styropor in the nose 5 proceeds by upsetting, with a decreasing quantity of energy, in proportion to the increasing material cross-section of the nose. That is to say the impact force acting in the direction towards the packed goods decreases in the same proportion as the material resistance increases by deformation.

Figure 3 shows two further possibilities of assumed examples of impact forces. A formation of the packing body 1 adapted according to choice to the mass weight and impact sensitivity of the goods may be seen in the following example:—

If an impact force from the direction E strikes simultaneously upon two mutually opposite noses 5, 5¹ on one vertical body edge 6, the noses 5, 5¹ spring towards one another. This is effected by the angular cut-away portion A defined between noses 5, 5¹. In Figure 3 the springing together of the noses is indicated in chain lines by the angle A¹. Here again firstly the deformation of the nose points and then the spring movement of the noses to reduce the triangular cut-out portion A takes place as the resistance of the yielding material of the body rises.

The adaptation in each case to goods having different masses in this example is possible due to the fact that the cut-out surfaces 7 can be made at increasingly obtuse angles to one another towards the separation line, as shown by the cut-out portion B in Figure 4. With a more obtuse-angled cut-out portion B the actual nose 5 becomes

more acutely-angled. In the course of energy dissipation after initial deformation the nose moves substantially earlier than if, with the acutely-angled cut-out portion A in Figure 3, a greater and thus stiffer material mass were situated beneath the nose. Then also it is clearly indicated in Figure 4 that an article 13 inserted into the internal space cell 9, in the present case a camera, is effectively suspended on eight imaginary springs, if one imagines the dynamic movement lines extending from the nose points 5 to the nearest corners in each case of the article 13 as tension springs 14 indicated in chain lines.

In a last example it is assumed that an impact force on the packing body from the direction C, due to the body falling on the ground, causes the body to strike simultaneously on two or more noses 5. Here the entire impact force is firstly divided up according to the part of the impact force acting on each nose. The noses successively yield resiliently and finally effect a short springing movement of the entire body core, which however remains rigid in the internal space cell, as indicated in Figure 3 by the chain lines. Here the impact force dissipated by steps is opposed by the stepped increase of the material resistance, especially its resilience properties. The necessary springing of the body core, and the outwardly directed spreading apart of the noses 5 following upon the already exploited inherent spring action of the nose points 5, 5¹ (Figure 3) take place by reason of the thin-walled formation of the packing body. A modification of wall thickness 10 according to choice in each case renders possible a deliberate adaptation of the mass weight of the goods 13 to the degree of the requisite force absorption, related to the g-values predetermined by the disturbance sensitivity of the goods. By the term g-values there is understood the acceleration which the body experiences relative to the force of gravity. Due to the symmetry of the two shell halves the production of a simple tool merely imitating the curved outer surfaces suffices for both halves. Then the internal space in each shell half is shaped according to the forms of the goods to be conveyed with an insert cavity formed possibly different for each shell half.

In order to avoid premature material breakages in the packing body, which should occur only at a stage in time after the deformation and spring movement due to excessively large impact forces, all the body surfaces extending to the noses 5 are curved smoothly and made without sharp-edged transition points.

A packing of foamed polystyrene (Styropor) formed in accordance with the invention permits the reduction of relatively high

impact force accelerations which can reach values up to 300 g. to values which still lie lower than 80 g. in relation to the residual acceleration which still acts upon the goods to be protected. Thus optical precision engineering products such as cameras etc., can withstand major cumbersome transportation without damage.

The packing body consisting of two smooth shell halves 2, 3 advantageously permits adaptation of the internal space cell 9 of the shell halves 2, 3, with the same external shaping, to the physical properties of the packed article in each case, in that simplified tool inserts for shaping the internal space can easily and cheaply be replaced.

WHAT WE CLAIM IS:—

1. A packing of foamed polystyrene having a six-sided packing body consisting of two shell halves which together define an internal cavity for enclosing an article in a close fitting manner and which are each provided with smooth surfaces externally, wherein the packing body has noses protruding from the corners of its body surfaces.
2. A packing as claimed in claim 1, wherein the shell halves are made symmetrical in their external shaping.
3. A packing as claimed in claim 1 or 2, wherein a separation plane of the shell halves, which plane is generally rectangular, extends parallel with the largest surface of each shell half.
4. A packing as claimed in claim 3,

wherein the edges of the largest surfaces extend in directions generally parallel to the separation plane of the shell halves, extend to the noses in smoothly curved lines.

5. A packing as claimed in claim 3 or 4, wherein each of those edges of the packing body which extend from the noses towards the separation plane have cut-out portions tapering towards the separation plane.

6. A packing as claimed in claim 5, wherein each pair of adjacent cut-out portions are of acute-angled formation with respect to each other.

7. A packing as claimed in Claim 5, wherein each pair of adjacent cut-out portions are of obtuse-angled formation with respect to each other.

8. A packing as claimed in one of the preceding Claims, wherein wall thicknesses of the packing body are thin in relation to the size of an article to be packed therein.

9. A packing as claimed in one of the preceding Claims, wherein an outer carton enclosing the two shell halves abuts only the noses of the packing body.

10. A packing substantially as hereinbefore described with reference to the accompanying drawings.

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