

^{for}
Method ~~of~~ packing small objects and package for small objects

The invention relates to a method as indicated in the preamble of Claim 1 and to a packing in which this method is implemented.

5 In processes for technical mass production, manufactured objects require packings which on the one hand, for example, protect breakable parts, but which on the other hand are also suitable to ensure that the packed objects can readily be taken therefrom by machine or by hand in always the same position, more particularly if, for example, the packed objects are to be subjected to further
10 manufacturing steps. Moreover, more and more packings are required which each join comparatively small numbers of small objects to form a set in order that machine conversion can be effected more rapidly in a further processing step to which the packed objects (for example, semi-manufactured products) are to be subjected.

15 DE-GM 69 04 519 discloses a padding for a packing for breakable or shock- or impact-sensitive articles, in which a light foil of synthetic material is shaped by deep drawing, cavities not required for the small objects to be packed are filled more particularly with foamable synthetic materials, and the system consisting of the
20 foil shaped by deep-drawing and of the filling is sealed with a smooth plate of another material, such as cardboard, paper, corrugated board, wood or synthetic material, by gluing, welding, adhesion or pressing, so that a compact padding body is obtained. The manufacture of this packing requires several laborious manufacturing steps and special tools, which considerably increase the cost for the packing of small objects, whose
25 price is sharply calculated. A further disadvantage more particularly for mass production of small objects of widely differing shapes, is that a large number of different prepared packings, previously manufactured in accordance with the shapes of

objects to be packed, must be constantly kept in stock.

DE-UM 16 97 030 discloses a packing for bottles, glasses and other breakable articles, which consists of a foamed synthetic material, for example polystyrene having substantially closed pores, and which is shaped in moulds by
5 injection, compression or an expanding agent, at least part of its outer surface having a denser structure as compared with the foam structure. This denser structure may be formed, for example, through the action of heat and densification. The aforementioned disadvantages are also inherent in these packing bodies, i.e. that they must be previously manufactured by means of tools, which are to be made separately and which
10 must correspond to the shape of the objects to be packed, and that it is necessary to keep widely differing packing bodies in stock, which is very expensive.

A multilayer packing is disclosed in GB-PS 838 659 in which objects are held on an adhesive layer provided on a synthetic resin backing or in recesses provided in said backing, in which latter case another adhesive layer made of an
15 elastic, non-setting adhesive is provided below the recesses.

This packing also has the disadvantage that, as far as the embodiment with the recesses is concerned, it is to be previously manufactured with tools which are to be made separately and which must correspond to the objects to be packed, and that in general a comparatively complicated manufacturing procedure is to be followed for it
20 in which a plurality of process steps is required, *i.e.* provision of an elastic adhesive layer on a backing plate, provision of an elastic foam layer, provision of a further elastic adhesive layer, and covering of this adhesive layer with a removable protective foil. If the objects to be packed are held only by means of the adhesive layer provided on the foam layer, a safe transport of particularly fragile objects is not guaranteed
25 because no depressions are present which hold the objects in position with clamping fit.

The invention has for its object to simplify the method mentioned in the opening paragraph of packing small objects of widely differing shapes in such a
30 manner that the packing is manufactured directly during the packing process in the shape corresponding to the objects to be packed and without the use of additional tools.

According to the invention, this object is achieved in that at least one

small object to be packed is pressed so far into the carrier layer, which is heated to a temperature in the range of 70 to 180°C, that the small object is firmly held in a compartment formed by thermal deformation of the carrier layer and corresponding to the shape of the small object, and in that an area of the carrier layer immediately adjoining the base plate remains substantially undeformed.

According to advantageous further embodiments of the invention, several small objects are simultaneously pressed into the carrier layer, the distance between several adjacent small objects can be adjusted so that an area of undeformed material of the carrier layer is maintained between the small objects each time.

A packing for small objects for the implementation of the method according to the invention, comprising a non-deformable base plate and an elastic carrier layer, is characterized in that the carrier layer is indetachably fixed to the base plate and to a smooth surface layer, both the carrier layer and the surface layer consisting of thermoplastically deformable material.

The use of a foamed thermoplastic material for the carrier layer affords the particular advantage that the foamed material can be permanently deformed after being heated so that small objects to be packed, when they are pressed into this carrier layer, form permanently deformed areas (compartments or nests) in the carrier layer, which correspond as accurately as possible to the shape of the small objects to be packed and consequently hold the objects with clamping fit. An individual compartment or nest is formed for each individual small object to be packed, so that even deviations in size of the objects within the tolerance range are compensated for. The formation of nests or compartments in this manner can be realized considerably more economically and more rapidly than if, for example, shapes in a carrier material for receiving small objects were to be formed mechanically, for example, by cutting or punching; a considerable number of tools and an expensive keeping in stock of packings for differently shaped small objects to be packed are required for shaping cavities very accurately to size in this manner; moreover, such a method is also much more time-consuming, which involves disadvantages for an efficient mass production.

By means of the method according to the invention, packings accurate to size can be formed directly at the location of manufacture of the small objects to be packed, the shaping of the packing being attained by the small objects to be packed

themselves and not by a separate tool. A further major advantage for an efficient mass production is that it becomes considerably simpler for packing material to be kept in stock because only a single kind of basic packing in the form of a packing body having a multilayer construction need be kept ready for small objects to be packed of widely differing kinds and shapes, which packing body is formed into its required shape for receiving the small objects only at the location of manufacture of the small objects to be packed. A further advantage of the method according to the invention is that small quantities of small objects can be packed as sets and that a large number of small objects can be combined by stacking a number of such sets, for example in a cardboard box. The exposed upper sides of the small objects pressed into the carrier layer are then covered with the base plate of a further packing with small components. For the transport of the whole stack, the small objects of the uppermost packing body are protected by a suitable protecting cover.

If corrugated board is used for the rigid base plate of the packing body and, for example, polyethene foam is used for the carrier layer, the further advantage is obtained that the packing body can be readily subdivided by cutting. A further advantage is that on a single packing body not only several different small components, which are to be processed or machined together in a further processing step, can be sorted and packed, but that also different numbers of small objects can be combined and packed rapidly and simply so as to form a set.

By way of example of an embodiment, a method of packing magnetic U-shaped cores of a ceramic ferrite is described. The method according to the invention is obviously also suitable for small objects of a widely differing kinds, for example, glass bottles for medicines, or metal parts whose sensitive surfaces have to be protected during transport.

In the drawings:

Fig. 1 shows a basic packing in the form of a packing body having a multilayer construction in sectional view,

Figs. 2 and 3 show a packing with U-shaped magnetic cores inserted into it in longitudinal section and in cross-section.

Fig. 1 shows in sectional view a packing body 1 comprising a base plate 3, for example of mono- or multicorrugated board, having a thickness of 3 to 5 mm, and a carrier layer 5, for example of cross-linked polyethene foam having a density of 0.025 to 0.3 g/cm³, a softening range of 70 to 180°C and a thickness of $\approx$ 10 mm, and provided with a smooth surface layer 7. The smooth surface layer 7 may be formed in known manner, for example by surface densification through the action of heat or, for example, by adhesion or welding of a layer or the like. In the embodiment described, a polyethene foil having a thickness of 50 μ m is used to form a smooth surface layer 7. A smooth surface layer 7 may be formed, for example, in known manner by surface densification through the action of heat.

Figs. 2 and 3 show in longitudinal and cross-sectional view the packing body 1 and small objects 9 pressed so as to fit therein, in this case magnetic U-shaped cores of a ceramic ferrite.

The method of packing the small objects 9 involves that the packing body 1 and more particularly the carrier layer 5 with the surface layer 7 is heated to a temperature of $\approx$ 160°C and the small objects 9, in this case U-shaped cores having a length of 35 mm, a width of 12,5 mm and a height of 21 mm are pressed at a pressure of 1500 N into a surface with an area of 320 X 214 mm² (dimension of the packing body 1) to such a depth that each object 9 is firmly held in a compartment 11 formed by thermal deformation of the carrier layer 5 and of the surface layer 7 and corresponding to the shape of the small object 9, while an area 13 immediately adjoining the rigid base plate 3 is maintained substantially without any deformation and areas 15 of the carrier layer 5 located between the individual small objects 9 are maintained without any deformation. Each small object 9 thus forms an individual compartment 11 accurate in shape and position, the foamed thermoplastic material of the carrier layer 5 being densified by the action of heat at the areas into which the small objects 9 are pressed. At the areas 13 and 15, a residual elasticity is maintained in the material of the carrier layer 5, the lateral restoring forces of the material of the carrier layer 5 acting at the areas 15 so that the inserted small objects 9 are held under tension in their compartments 11, which guarantees a safe seat of the small objects 9

during a transport operation. The smooth surface layer 7 constitutes a boundary layer between the small objects 9 and the carrier layer 5; it improves the sliding properties of the surface of the carrier layer 5 and thus renders it easier to take the small objects 9 from the composite plate 1.

**CLAIMS**

1. A method of packing small objects with the use of a packing body having a multilayer construction, which comprises a non-deformable base plate and an elastic thermoplastically deformable carrier layer fixedly connected to the base plate, characterized in that at least one small object (9) to be packed is pressed so far into the carrier layer (5), which is heated to a temperature in the range of 70 to 180°C, that the small object is firmly held in a compartment (11) formed by thermal deformation of the carrier layer and corresponding to the shape of the small object, and in that an area (13) of the carrier layer immediately adjoining the base plate remains substantially undeformed.
2. A method as claimed in Claim 1, characterized in that several small objects (9) are pressed simultaneously into the carrier layer (5).
3. A method as claimed in Claim 2, characterized in that the distance between several adjacent small objects is so adjusted that an area of undeformed material (15) of the carrier layer is maintained between the small objects each time.
4. A method as claimed in at least one of Claims 1 to 3, characterized in that a base plate (3) of corrugated board is used.
5. A method as claimed in at least one of Claims 1 to 4, characterized in that a packing body is used whose carrier layer (5) consists of foamed thermoplastic material.
6. A method as claimed in Claim 5, characterized in that cross-linked polyethene foam is used as the foamed thermoplastic material.
7. Use of the packing manufactured by the method claimed in Claims 1 to 6, which packing serves for packing in particular breakable small objects and especially such objects which are to be subjected to further technical manufacturing processes.
8. A packing for small objects for the implementation of the method as claimed in at least one of the Claims 1 to 6, comprising a non-deformable base plate and an elastic carrier layer, characterized in that the carrier layer (5) is indetachably fixed to the base plate (3) and to a smooth surface layer (7), both the carrier layer and the surface layer being made of thermoplastically deformable material.
9. A packing body as claimed in Claim 8, characterized in that the carrier layer (5) consists of a foamed material, more particularly of cross-linked polyethene foam.



PHD 86.101 EP

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10. A packing body as claimed in Claims 8 and 9, characterized in that the surface layer (7) is formed from a polyethene foil.

11. A packing body as claimed in Claims 8 to 10, characterized in that the base plate (3) consists of corrugated board.