

The present invention relates to packing containers, in particular for the storage and transport of silicon discs, which are produced from a thermoplastic material suitable for injection molding.

Already known are different types of transport containers for silicon discs of which each has special features for the protection of the product. In general, each transporting container consists of a cassette for receipt of silicon discs and a two-part box (main box and cover). Main box and cover are firmly connected with one another on closure so that the cassette is clamped rigidly and the silicon discs are secured in predetermined arrangement. In this way, breaks or micromovements of the silicon discs are avoided whereby the plastics could be rubbed away and the silicon, in particular on closing of the box, could be contaminated.

It has now been established *inter alia* that with these known containers, a uniform and effective washing of the two box parts before the insertion of the product cannot be carried out without problem on account of the great depth of the seats for the discs, with this depth also influencing the drying of the seats disadvantageously. In addition it has been established that, with the known arrangements, the lodging of the inner cassette and the silicon discs located therein is not sufficiently rigid so that movements of discs in closed containers are always still possible. Therefore, there existed the object of avoiding the disadvantages of the known packing containers.

Starting from this object, the present invention proposes a solution therefor which is indicated in the characterising part of claim 1. Preferred embodiments are indicated in the sub-claims.

From the document DE-A-3330720 there is known a container for the storage and transport of silicon discs, consisting of three parts, namely a lower box half, an upper box half, which are releasably connected form-fittingly with one another for the formation of the outer protective box and arranged in this box are cassettes which are distributed between the lower and upper box halves, compliment one another and cooperate with one another in order to close the box halves and to interlock with one another, means in the inner base part of the lower and upper box halves which prevent the displacement of the cassettes in any direction and auxiliary means provided only on the upper box half which serve for the jamming-in of the cassettes and for

the securing of the silicon discs.

According to the present invention, the shape of the feet of the cassettes is essential and particularly important.

The two skirts of the cassettes are so arranged that each end thereof has a rib bent outwardly at right angles which together with the skirts engages within a profile element provided in the base of the box. This profile element has a length which corresponds to the distance between the two skirts of the cassette - that distance which is between the two parts of the skirts bent outwardly at right angles. Accordingly, a more secure insertion of the cassette on the base part of the container is guaranteed.

The indicated transverse rib should not under any circumstances encompass the entire length of the profile piece; it is sufficient that the skirting bent outwardly corresponds to half the width of the base profile element.

The distance between the two skirts of the cassette should be so chosen that the outer edge of these skirts reaches the inner edge of the long profile piece of the box base. This also represents an important feature of the present invention which is not present in the known containers for silicon discs.

With the now known solutions, the cassette is secured to the container base via struts which are arranged on the side walls of the container and engage directly the outer wall of the cassette.

A further known feature in the securing of the cassette in the base part consists in that there are provided in the skirts notches in which corresponding projections of the base part of the container engage.

The securing of the upper part of the cassette in the box cover is carried out according to the invention with the aid of holding ribs. Such ribs are known *per se* from Figure 1 of DE-A-3330720. From this specification it can be seen that these skirts extend only perpendicularly from the container cover into the interior of the container until they can laterally come into contact with the edges of the silicon discs. An essential feature of the ribs according to the present invention is to be seen in that they are bent outwardly and indeed so that only the end of the bent out part touches the edge of the silicon discs. At the contact point, these ribs, similarly to the known ribs, have a notch which forms a seat for the edge of the silicon

disc.

5 The angled formation of the ribs has various advantages. The main advantage is that on closing the container the silicon discs press the ends of the ribs upwardly so that the contact point between the ribs and the silicon discs remains firm and a relative movement is avoided. With the ribs according to the state of the art, in contrast, on closing of the container the ribs are pressed outwardly; however they slide along and contaminate the edges of the silicon discs these with the resulting worn away plastics.

15 The height of the cassette containing the silicon discs corresponds precisely to the distance (in the closed container) between the base of the lower part of the box and the profiled elements of the upper part thereof (cover).

20 A further constructional feature for a better securing of the silicon discs in the cassette consists, according to the invention, in a trouble-free rounding off of the lower cassette part in which the silicon discs are arranged. With the cassettes of the known containers, there isn't any complete rounding off but only a partial rounding or an angular rounding off consisting of a plurality in broken straight lines.

30 The constructional features of the two box parts of the container have proved in practice to be very advantageous. In the first place, they allow the production of the base and cover parts in the same form so that these two parts can easily be inserted one within the other. In fact they differ from one another only through the addition of the holding ribs on the cover part, with this addition being carried out with the aid of a displaceable carriage in the press tool.

40 The lower edge of one each of these parts has, on the half-way periphery a projection whose height corresponds to the height of a corresponding cut out which extends on the lower surround half. Therefore the result is achieved that the projection of a base or cover part always enters into engagement exactly with the border of the other part so that when the container is closed an uninterrupted and equal height matching together of the upper and lower container parts is always guaranteed.

50 Seen in the transverse direction, the edge projection is adjustable outwardly with respect to the edge recess whereby - it may be in the transverse direction, it may be in the longitudinal direction - very precise matching together is achieved.

Each box part has on its one side a locking hook elastically bent outwardly and on the other side a gripping tooth for the elastic hook of the other part. Interfering hook and gripping tooth are accordingly the individual parts of a snap closure.

This closure arrangement has, as a consequence such a construction that each base and cover part has a positive closure part on one side and a negative closure part on the other side which come into engagement with the corresponding closure parts of the other part and accordingly form the closure.

Further details and advantages of the present invention can be perceived quite clearly from the following description with reference to the accompanying drawings in which a preferred embodiment is illustrated by way of example.

In the drawings

Figure 1 shows a plan view of the container according to the present invention;

Figure 2 shows a similar but partially broken away view of the container according to the invention;

Figure 3 shows a partially broken away elevation of the longer container side;

Figure 4 shows a section along the line A-A of Figure 3;

Figure 5 shows a section of the upper cover part of the container along the line B-B of Figure 2;

Figure 6 shows an elevation of the shorter side of the cover part of the container;

Figure 7 shows a section of the shortest side of the cover part of the container according to Figure 6 along the line C-C of Figure 5;

Figure 8 shows an elevation of a cassette with only partially shown recesses for the receipt of the silicon discs;

Figure 9 shows a plan view of a cassette for receipt of the silicon discs;

Figure 10 shows a section of a cassette according to Figure 9 along the line D-D.

As can be seen from the drawings, the container

has a two-part box and a cassette for the silicon discs. As has already been mentioned, the two box parts, that is the base part and the cover part - have the same construction and the same depth back (with the exception of the rib arrangement) and can accordingly be manufactured in a single pressing mould.

A first constructional feature of the two box parts relates to the means for the closure thereof. The means consists of a special formation of the peripheral edges and the parts of snap closure provided on the shorter sides of each box part.

As is shown in Figure 3, the longer lateral edge of each box half is sub-divided into two halves; in the first half the edge on one side is displaced to one side and in the second half it is displaced to the same extent on the other side of the middle lines Z-Z. In practice this side edge has a projection on one half and on the other edge half has a recess 11, which have the same height with reference to the line Z-Z. Moreover as can be seen from Figures 4 and 5, a displacement is also provided in the transverse direction so that, after engagement of the two box halves, for one half, the upper part enters the lower part and, for the other half, the lower part enters the upper part.

With reference to Figure 5, it can be seen that each box part has a hook bendably outwardly whose end has a projection 13. On the other side, each box part has a seat 14 with a tooth 15. The closure parts 12, 13 on the one hand and 14 and 15 on the other hand complement each other constructionally so that when the two box halves are coupled together (Figures 3 and 4) not only is a trouble free coupling together thereof and a precise matching to one another of the longer and shorter edges obtained but also reciprocal engagement with one another and locking of the hook arrangement 12, 13 of one box half with the hook arrangement 14, 15 of the other box half is obtained.

On the base of each box part, there are provided two profile elements 16, 17 and 18, 19 which extend lengthwise and parallel to one another and have a parallelepipedic form and extend inwardly. These profiled pieces are provided for the jamming-in of the cassettes as is described in the following.

The cover part of the box, or the upper box half, differs from the base part of the box only through the provision of two rib arrangements 20, 21 which are assembled separately along the two profiled elements 16 and 17 in the pressing mould. Such arrangements

consist of a plurality of comb-like ribs which are elastically deformable and whose lower ends 22 and 23 are bent inwardly at right angles, as can be seen better in Figures 4, 5, 6 and 7. The lower surface of each horizontal end segment 22, 23 has a small notch in which the edge of a silicon disc engages.

With reference to Figures 8 to 10, now the cassette receiving the silicon discs are described in detail. Generally considered, this cassette has the same construction as cassettes known according to the state of the art and consist of two longitudinal walls 24, 25 and are connected by two transverse walls 26, 27 and have a set of ribs which form a set of recesses (in general 25) for receipt of the silicon discs. It is to be noted that the lower part of the two longitudinal positions 24 and 25 has a uniform circular form corresponding to the radius of the silicon discs.

To be seen as essential distinguishing features of the cassettes according to the invention, are the transverse ribs 30 which are arranged on the base of the cassettes and are secured to the skirts 31 in the vicinity of four edges. As can be seen in particular from Figure 2, the ribs 30 and the profile elements of the lower box parts come into engagement with one another in order to centre the cassette and to avoid any displacement in the transverse and longitudinal direction.

A preferred constructional form of the cassette consists in one of the two transverse walls (wall 27 of Figure 8) having the form of a web which is reinforced by the profile skirts 33. This profile skirt is preferably interrupted in the middle. The web 27 is connected directly with the side walls 24 and 25; it can be arranged both at the level of the central point of the silicon discs inserted in the cassette and also deeper.

As can be seen in Figure 4, the cassette is secured to the box not only by the cooperation of the feet 31 and the ribs 30 of the cassette with the profile elements 18 and 19 but also by the cooperation of the upper box half and the rib arrangements 20 and 21 which engage the upper or lateral edges of the silicon discs which are arranged in the transverse ribs 28 and 29 of the cassette.

The deformable ribs 20, 21 serve for the jamming in of the silicon discs. The distance between respective two ribs corresponds exactly to the separation of respective two transverse ribs 28 and 29. The ribs 20 and 21 are so arranged in the cover that

lie just above the bulges between the transverse ribs. As can be seen in Figure 4, the individual deformable ribs, and in particular their horizontal segments 22, 23, jam-in the silicon discs by means of a uniformly distributed pressure action in contrast to the known ribs which exert a localised and consequently greater pressure and accordingly are more dangerous for the silicon discs. It should be mentioned moreover that the jamming-in effect takes place without there being sliding between the disc edges and the ribs since the ribs are jammed by the cassette edge and are deformed only at their horizontal segment surrounding the edge of each silicon disc.

The rounded out formation of the recesses receiving the discs permits a uniformly distributed contacting with the edges of the discs whereby punctiform pressures and rotational displacements of the discs are avoided and it is achieved in addition that the discs align along their axes and indeed as a result, that the surrounding seat amply neutralises possible displacements from the linear arrangement of the discs, with these displacements arising as a result of a possible supporting of the discs on their primary surfaces.

A further known structural feature of the box according to the invention consists in that on the base part and on the cover part there are provided external feet; two feet 32 are shown for each edge, which feet are arranged in geometrically displaced "tongue-and-groove-like" positions at right angles in order to make possible the stacking of several boxes without danger of an undesired sliding off one another.

In the indicated Figures, a preferred constructional form of the invention is described. It is however self-evident that various modifications and variants from the constructional details can be considered on the part of a person skilled in the art without diverging from the framework of the invention.



Claims:

1. Container for the storage and transport of
5 silicon discs, consisting of three pieces, namely a
lower box half, an upper box half or lid, which are
releasably connected with one another form fittingly to
form the external protective box and cassettes arranged
10 in this box which have a plurality of seats for receipt
and storage of a plurality of silicon discs, and, in
addition, means (12, 13, 14, 15), which are distributed
between the upper and lower box halves, are
complementary to one another and cooperate with one
15 another in order to lock together and close the two box
halves, as well as profile elements (18, 19, 16, 17) in
the internal base part of the lower and upper box
halves which engage with skirting at the base of the
cassette so as to prevent displacement thereof in any
20 direction, characterised by rib arrangements (20, 21),
provided only on the upper box half which serve for the
locking of the cassette and for the holding steady of
the silicon discs and which are secured at their upper
part to the two profile elements (16, 17), with the
25 ends (22, 23) of the individual ribs being bent at
right angles towards the interior of the box.

2. Container for the storage and transport of
silicon discs according to Claim 1, characterised in
that the said two box halves are completely identical
30 to one another except for the additional arrangement of
the said rib arrangements (20, 21) for jamming in the
cassette and for holding steady the silicon discs.

3. Container according to Claim 1, characterised
35 in that the bent out ends (22, 23) of the said ribs are
equipped with a lower notch which engages with the
discs.

4. Container according to Claim 3, characterised
40 in that the ribs are elastically deformable.

5. Cassette for the storage and transport of
silicon discs in containers according to Claim 1,
consisting of two longitudinal walls which are
45 connected by two transverse walls and which have
projecting transverse ribs for formation of channels
for the receipt of silicon discs, characterised in that
there are provided on the base of the cassette ribs
(30) which are secured to skirting (31) near the four
50 borders of the cassette and engage the profile elements
(18, 19) of the lower container part.

6. Cassette according to Claim 5, characterised
in that one of the transverse walls is formed as flange



(27) on which a profile skirt (33) is arranged.

5 7. Cassette according to Claim 6, characterised in that the profile skirt (33) is interrupted in the middle.

10 8. Cassette for the storage and transport of silicon discs according to Claims 1 to 5, characterised in that the said seats for receipt of the silicon discs in the cassette have a lower part curved in the shape of a circle, as a result of which a better distributed contact between the seats and the discs is achieved and a better alignment thereof is achieved.

15 9. Container according to Claims 1 and 5, characterised in that the distance between the outer edges of the skirting (31) corresponds to the distance between the internal edges of the two profile elements (18, 19) provided in the lower box half.

20 10. Container according to Claims 1 and 5, characterised in that the distance between the internal edges of the two ribs (30) at the one side of the cassette corresponds to the length of the profile
25 elements (18, 19) provided in the lower box half.