

The invention relates to transparent plastics panes with embedded monofilar plastics fibres adapted to reduce fracturing or prevent the fragments falling out if the
5 plastics pane is broken. Plastics panes of this kind are particularly suitable as noise barriers.

Noise barriers of this kind are known from EP 0 407 852 A2 ([^]= US-A 5 040 352). Plastics panes of this known kind are
10 excellent at preventing loose fragments from being formed and falling out. Strips, ornaments or shapes can also be embedded in the panes, so as to protect birds.

Austrian patent specification 263 298 discloses a
15 translucent structural panel in which a partly metal-coated fabric is embedded by casting. The fabric reinforces the structural panel, but cannot prevent individual fragments from forming in the event of breakage, since owing to the high strength of the plastics of which the structural panel
20 is made, the thread breaks at the same time as the panel. In addition, the fine lights in the fabric prevent the structural panel from being transparent, so that the panels are suitable only as lighting elements and not as window-panes. Also, metal-coated fabric can cause reflexes
25 or reflections which spoil the appearance and also may appear to be transparent from one side without being so.

DE-U-84 35 283 discloses transparent structural panels comprising external cables which trap and secure any parts
30 which are produced by a fracture. The fragments in question are relatively large and can break into other, free fragments which are still relatively large. Conventional strips or the like can be added to these known panels as protection for birds.

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The "Schweizer Ingenieur und Architekt", No. 13, (1988), pages 379 and 380 discloses sound-insulating panes which disintegrate into loose fragments in the event of breakage. To protect birds, vertical strips, e.g. 5 mm wide, can be

etched on the panes. This additional complexity is expensive, increases the risk of dirtying the pane and is unsightly.

5 Since it is expensive to embed bird-protecting elements in the plastics panes, which are cast in one piece or are laminated by being made up of individual cast plates, in practice bird-protecting symbols or elements are stuck on to the outside of the plastics panes. However, the
10 externally-stuck bird-protecting elements are subject to weathering and prevent the panes from being cleaned. They have the further disadvantage of spoiling the appearance of the panes, and the advantage of transparency is largely lost. If individual silhouettes of birds of prey are stuck
15 on to the panes, they do not disturb the environment, but a few silhouettes of birds of prey are more for appearance than a protection for birds.

The aim of the invention, therefore, is to obtain a
20 plastics pane of the initially-described kind which protects birds without disturbing the environment. The object is to retain the appearance of a transparent plastics pane without the need for complicated or expensive procedures.

25 To this end, in the case of a transparent plastics pane of the initially-described kind, the inner plastics fibres are high-contrast, the plastics used for manufacturing the threads has a transmission ratio of 0 - 65%, the threads
30 have a thickness in the range from 1 mm to 5 mm, the distance between the threads is at most 100 mm and the surface density of the threads is between 2.5 and 25%.

The contrast of plastics threads is measured to DIN 5033
35 (colorimetry) and 5036 (radiometric and photometric properties of materials). Preferably the material or the actual plastics thread has a transmission ratio of 0 to

30%, more particularly 0 to 10%. A transmission ratio of about 0% is particularly advantageous. To obtain contrast also, the plastics thread must stand out from the background, e.g. by having a different colour. Metal-coated threads are unsuitable for this purpose if for example they reflect the sky in front of the pane against the sky behind the pane or give undesired reflexes or reflections, e.g. of the sun. It is advantageous to use dark threads, particularly black threads. Owing to the high-contrast threads, flying birds can recognise the transparent wall as an obstacle while there is still time and they are a few metres away, and can fly round the plastics wall.

In particularly advantageous embodiments the plastics threads are 1 mm to 5 mm thick. More particularly the thickness range from 1.8 to 3.0 mm, preferably 2.0 to 2.5 mm, has been found particularly advantageous with regard to the required properties, i.e. easy insertion into the plastics pane, sufficient strength in the event of a fracture, sufficient protection of birds and no substantial impairment of the overall transparency of the pane.

Usually the threads in the pane extend horizontally, since the panes are clamped at the side; in that case the cohesion in the event of a fracture is particularly advantageous. Usually the threads are laid parallel to one another. If desired or necessary, two layers of threads can be incorporated in the pane and will then preferably extend in two directions, an angle of 90° between threads of different layers being particularly advantageous. From the outside, this embodiment looks like a gauze fabric.

Usually the distance between neighbouring threads is made not greater than 100 mm, since above this distance there is a marked decrease in the protection of birds or the prevention of fragments. Preferably the distance between

threads is up to 50 mm, particularly when the threads are horizontal, since birds appear to recognise horizontal obstacles less easily than vertical obstacles.

- 5 The surface density of the high-contrast threads, i.e. the percentage of the surface of the entire plastics pane which is covered by the threads, is usually from 2.5 to 25%. Preferably, particularly in the case of horizontal threads, the surface density is at least 5%, particularly
- 10 advantageously 6 to 10%. In the case of vertical threads, the surface density can be slightly less, so that in this case the advantageous range is from 5 to 8%. Below this surface density, the bird-protecting effect is rapidly
- 15 at a greater distance and spoil the appearance, i.e. the advantageous transparency of the plastics pane is largely wasted.

Typical pane thicknesses are 4 to 40 mm, preferably 12 to

20 25 mm. The panes are usually manufactured in sizes of 1.5 m x 1 m to 2 m x 3 m. Larger or smaller sizes are possible for special uses.

The panes are usually substantially transparent, preferably

25 colourless or slightly tinted, e.g. smoky brown. Colourless transparent plastics panes usually have a transmission ratio of at least 70%. A ratio of 90 to 95% is advantageous. Tinted embodiments usually have a

30 transmission ratio of 45 to 75%, usually between 50 and 60%. The absorption of the threads and of the tinted pane is cumulative, so that the threads are additionally recognisable as high-contrast elements.

The invention will be explained in detail with reference to

35 a drawing of an embodiment. The drawing shows a transparent plastics pane 1 according to the invention, in partial view. The pane is of acrylic glass (PMMA), with a

thickness of 20 mm. The internal plastics threads 2 are monofilar and made of black-dyed polyamide. The transmission ratio of polyamide is substantially 0. The pane material is transparent and has a light transmission of 92%. The polyamide fibres 2 have a diameter of 2.0 mm and are disposed at an average spacing of 30 mm, corresponding to a surface density of plastic fibres of 6.7%.

- 10 In a field test, a pane of the aforementioned kind measuring 2 m x 2 m was manufactured together with an equal-sized pane with non-dyed (i.e. transparent) polyamide fibres of similar size and similar surface density, and a pane on which conventional bird-protecting strips were
- 15 stuck. The black-dyed threads were clearly visible to a normal-sighted person at a distance of 6 m, but did not spoil the appearance. The black-dyed polyamide threads were still visible at a distance of 10 m, but were not noticeable to a passing observer. At a distance of 20 m
- 20 the black polyamide threads could be seen only with difficulty, and there was practically no visible difference on the plastics pane with transparent polyamide thread. By comparison, the conventional transparent panes with bird protection were noticeable at a distance of 20 m, whether
- 25 with strips or with a pattern of squares. The conventional stuck panes looked considerably worse than the pane according to the invention, and the view through the pane was greatly impeded.
- 30 The pane according to the invention had the additional advantage of being less expensive to make than conventional panes with bird protection, and was easier to clean with water, owing to the smooth surface.

CLAIMS

1. A transparent plastics pane comprising internal plastics threads which substantially hold together any fragments produced in the event of a fracture, characterised in that the threads are high-contrast, the plastics used for manufacturing the threads has a transmission ratio of 0 - 65%, the threads have a thickness in the range from 1 mm to 5 mm, the distance between the threads is at most 100 mm and the surface density of the threads is between 2.5 and 25%.
2. A plastics pane according to claim 1, characterised in that the threads are dyed black.
3. A plastics pane according to claim 1 or 2, characterised in that the threads are monofilar.
4. A plastics pane according to claim 1, 2 or 3, characterised in that the thickness of the threads is in the range from 1.8 mm to 2.5 mm.
5. A plastics pane according to one of the preceding claims, characterised in that the threads extend horizontally.
6. A plastics pane according to claim 5, characterised in that the distance between threads is not more than 50 mm.
7. A plastics pane according to claim 6 characterised in that the surface density of the threads is between 5 and 25%.
8. A plastics pane according to one of claims 1 to 4, characterised in that the threads extend vertically.



9. A plastics pane according to claim 8 characterised in that the surface density of the threads is between 2.5 and 20%.
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10. A plastics pane according to one of the preceding claims, characterised in that the thickness of the pane is from 4 to 40 mm.
- 10 11. A plastics pane according to claim 10, characterised in that the thickness is in the range from 12 to 25 mm.
12. Use of the plastics pane according to one of the preceding claims as a noise barrier.
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