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DESCRIPTION WO2012038095A1

[0001]

¹³ Armored glass pane with edge reinforcement

[0002]

¹⁷ The present invention relates to an armored glass pane with an edge reinforcement according to the preamble of claim 1.

[0003]

²² A typical armored glass pane is z.

²³ B. described in EP 1 010 963 B1.

²⁴ This armored glass pane is designed as a laminated glass pane with several panes of glass and intermediate layers of plastic, e.g. B. polyurethane built. On the outer edge or perimeter of the known armored glass pane is a projection with an internal gradation. On the inside of the projection, an edge reinforcement running all around the edge is integrated as a composite part, which has a rectangular cross section and is arranged on the surface of the projection pointing into the interior of the vehicle. This edge reinforcement is designed as a welded or stamped frame and consists z. B. made of metal or stainless steel. The metal edge reinforcement is subject to relatively high temperature-dependent changes in length, which can even lead to cracking, chipping or other damage to the armored glass pane in the edge area.

[0004]

³⁶ The object of the present invention is therefore to specify an armored glass pane with an edge reinforcement that is designed to prevent damage to the armored glass pane due to

temperature changes.

[0005]

⁴² This object is achieved by the armored glass pane with edge reinforcement according to claim 1.

⁴⁴ Accordingly, the armored glass pane according to the invention for use in a motor vehicle is constructed with several panes and layers of glass, ceramic or plastic that are connected to one another in layers over a large area and with an edge reinforcement that extends on a circumference of the armored glass pane and has at least two reinforcement members, which for train the

⁴⁹ - -

[0006]

⁵³ Edge reinforcement are movable to each other or loosely in mutual engagement.

[0007]

⁵⁷ This loosely coupled structure of the edge reinforcement of the armored glass pane according to the invention has the decisive advantage that sufficient relative movement of adjacent reinforcement members is made possible, whereby unavoidable changes in dimensions and lengths due to temperature fluctuations can take place without damaging the pane structure.

⁶¹ Under a loose, mutual engagement is understood in the context of the invention that the reinforcing members are not fixed to each other, z.

⁶³ B. by screws or welding, but are movable relative to each other.

[0008]

⁶⁷ In addition, the invention contributes to simplifying the production or assembly of armored glass panes with edge reinforcement, since the frame parts or edge reinforcement parts are aligned by the mutual engagement of the reinforcement members during assembly and when the edge reinforcement is arranged on the armored glass during the manufacture of armored glass panes.

[0009]

⁷⁵ Preferably, the ends of two mutually adjacent reinforcement members of the edge reinforcement engage in one another in such a way that they are movable relative to one another and overlap.

⁷⁷ Because of the end-to-end engagement, a desired orientation and placement of the reinforcing members within the edge reinforcement can be achieved.

[0010]

⁸² In the case of the edge reinforcement of the armored glass pane of the invention, the end of one reinforcement member can be provided with a receptacle or multiple receptacles and the end of the other reinforcement member can be provided with a projection or multiple projections from adjacent reinforcement members.

⁸⁶ - - which (the) fits into the receptacle (s) .

⁸⁷ This receptacle/projection system can ensure sufficient overlapping of the reinforcement members and thus also achieve the desired strength and stability of the edge reinforcement in the event of fire or impact loads.

[0011]

⁹³ The receptacle or receptacles and, to match, the projection or projections of the reinforcing members can be conical.

⁹⁵ In this way, self-centering or alignment of the reinforcement members can be achieved when the reinforcement members of the edge reinforcement move relative to one another due to temperature changes.

[0012]

¹⁰¹ Preferably, the ends of two mutually adjacent reinforcing members of the edge reinforcement are mutually engaged in the manner of a tongue and groove system, the end of one reinforcing member being provided with one or more grooves and the end of the other, adjacent or subsequent reinforcing member being provided with a spring or several springs is provided, which fits (fits) into the groove(s).

[0013]

¹⁰⁹ The ends of two mutually adjacent reinforcing members of the edge reinforcement can also be plugged into one another or plugged together in the manner of a plug system, with the end of one reinforcing member being provided with one or more plug-in receptacles and the end of the other, adjacent or subsequent reinforcing member is provided with a plug-in member or several plug-in members, which fits or fits into the associated receptacle(s) as a projection or projections.

[0014]

¹¹⁸ A reinforcing member of the edge reinforcement can be provided at each of its ends with a projection or a spring

¹²⁰ - - be seen or a reinforcing member of the edge reinforcement can be provided at each of its ends with a respective seat or groove.

¹²² In another embodiment of the invention, a reinforcing member of the edge reinforcement may be provided with a projection or tongue at one end and a socket or groove at the other end.

¹²⁴ It is also possible that a reinforcing member of the edge reinforcement is provided with a projection or a tongue at one end and is formed as a dummy piece at the other end, or that a reinforcing member of the edge reinforcement of the invention is provided with a socket or a groove at one end and is formed at the other end as a dummy piece. However, a reinforcing member can also be provided with one or more projections and/or one or more receptacles at one end. The different configurations of the ends of the reinforcement members allow a great variety in the realization of edge reinforcements for armored glass panes.

[0015]

¹³⁴ The mating ends of two adjacent reinforcing members of the edge reinforcement may have facing exposed planar abutment surfaces extending parallel to a cross-sectional surface of the reinforcing members or edge reinforcement and abutting one another when the two adjacent reinforcing members are fully engaged.

[0016]

¹⁴¹ The edge reinforcement of the armored glass pane of the invention can have metal reinforcement members, in particular stainless steel, and/or a ceramic material, in particular A10N.

[0017]

¹⁴⁷ The edge reinforcement, or each reinforcing member of the edge reinforcement, may be substantially one-sided except at the coupling ends

¹⁴⁹ - - have a rectangular cross-section, an angular or L-shaped cross-section or a T-shaped cross-section.

[0018]

¹⁵⁴ The armored glass pane preferably has a step in the edge region with a projection formed by a part of a glass pane which protrudes over the other glass panes with the part and by at least part of the edge reinforcement.

¹⁵⁷ As a rule, the projection is intended to engage in the opening of a vehicle body and to hold or fasten the armored glass pane in the body.

[0019]

¹⁶² The edge reinforcement can completely or at least partially cover the inner surface of the projection of the armored glass pane in order to improve the ballistic and puncture-resistant

properties of the armored glass pane.

[0020]

¹⁶⁸ The edge reinforcement can be attached to an edge face or to a peripheral surface of the bulletproof glass pane and at least partially or completely cover the face or peripheral surface in order to prevent the bulletproof glass pane from splintering into the vehicle interior in the event of a shot or an impact from the outside.

[0021]

¹⁷⁵ The spring or protrusion of a reinforcing member may be conical, e.g.

¹⁷⁶ B. have a semi-circular or v-shaped outline or can also z.

¹⁷⁷ B. have parallel side surfaces that result in a U-shaped outline of the projection.

¹⁷⁸ The associated receptacle or groove then has the appropriate shape.

[0022]

¹⁸² Further advantageous developments of the present invention can be found in the dependent claims.

[0023]

¹⁸⁷ Further advantages, advantageous developments and uses of the invention are included in the following description

¹⁸⁹ - - spiellichen and preferred embodiments of the invention i refer to the drawings.

¹⁹⁰ Show it:

[0024]

¹⁹⁴ 1 shows a schematic sectional view of a bulletproof glass disc in a preferred embodiment of the invention, in which a multi-part edge reinforcement is integrated;

[0025]

¹⁹⁹ Fig. 2 is a schematic exploded side elevational view of an edge reinforcement which may be used in the embodiment of Fig. 1 and is constructed in three parts having three reinforcing members in a row;

[0026]

²⁰⁵ FIG. 3 shows an enlarged detail view of FIG. 2 according to a

[0027]

²⁰⁹ Section where two adjacent reinforcing members of the edge reinforcement of Figure 2 with a keyway system abut, the two reinforcing members shown only partially engaging;

[0028]

²¹⁴ Fig. 4 is an enlarged detail view of FIG. 2 according to the

[0029]

²¹⁸ Section of Fig. 3, wherein the two reinforcing members of the edge reinforcement shown are, however, fully engaged, in contrast to Fig. 3;

[0030]

²²³ FIG. 5 shows a schematic side view of a further edge reinforcement drawn out and dismantled in an armored glass pane with an outline that differs from the armored glass pane of FIG. 2;

[0031]

²²⁸ Figure 6 is a detached side view of a two piece

[0032]

²³² Edge reinforcement, again for a bulletproof glass pane with a different pane outline;

[0033]

²³⁶ Fig. 7 is a schematic sectional view of a bulletproof glass disk be a further embodiment of the invention, in de

²³⁸ e.g.

²³⁹ B. a three-piece edge reinforcement similar to that shown in Figure 2 may be incorporated;

[0034]

²⁴³ FIG. 8 shows a schematic view of an exemplary edge reinforcement of the armored glass pane of the invention from FIG. 7;

[0035]

248 Fig. 9 and Fig. 10 Associated views of a detail of

[0036]

252 edge reinforcement of Fig. 6, Fig. 10 being the view in the direction of arrow X in Fig. 9 and Fig.
9 being the view in the direction of arrow IX of Fig. 10; and

[0037]

257 Fig. 11 and Fig. 12 Associated views of a modification of

[0038]

261 Embodiment of Fig. 9 and Fig. 10, Fig. 12 showing the view in the direction of arrow XII in Fig.
11 and Fig. 11 showing the view in the direction of arrow XI of Fig. 12.

[0039]

266 1 shows a partial view of a preferred embodiment of the armored glass pane of the present
invention as a composite safety pane in cross section with a vehicle frame 14 indicated by a
dashed line.

269 The embodiment of the invention shown in FIG. 1 is explained in detail below with exemplary
reference to the use of the armored glass pane according to the invention as a retractable side
window of a motor vehicle.

[0040]

275 The armored glass pane according to the invention has the sandwich-like or laminated glass
panes 1.11, 3.11 and 5.11, with the inner glass pane 5.11 being arranged on the inside of the
vehicle, the outer glass pane 1.11 on the outside of the vehicle and the middle glass pane 3.11
being arranged between the outer glass pane 1.11 and the inner glass pane 5.11.

279 The outside and thus the side of the vehicle under fire is through the

280 Arrow A in FIG. 1, which points to the outer pane of glass 1.11.

281 A polyurethane layer 2.11 extends between the outer glass pane 1.11 and the middle glass
pane 3.11, forming a bond between the outer glass pane 1.11 and the middle glass pane 3.11.

283 The polyurethane layer 2.11 or

284 The polyurethane film has the same outline and area coverage as the outer glass pane 1.11.

285 Between the middle glass pane 3.11 and the inner glass pane 5.11 z.

286 B. another polyurethane layer 4.11 or a composite layer of polyvinyl butyral (PVB) is formed,
which in turn creates a strong bond between the middle glass pane 3.11 and the inner glass
pane 5.11.

289 The polyurethane layer 4.11 is congruent in terms of area to the abutting surface of the central

glass pane 3.11.

[0041]

- ²⁹⁴ The outer glass pane 1.11 protrudes over the other two glass panes 3.11 and 5.11 at the edge of the armored glass pane shown in a projection 8.11, whereby a gradation or
- ²⁹⁶ Level to the other glass panes 3 and 5 is formed out.
- ²⁹⁷ On the inward-facing surface 10.11 of the polyurethane layer 2.11 in the area of the projection 8.11, an edge reinforcement 6 is built in, which z.
- ²⁹⁹ B. can consist of a stainless steel, the armored glass pane frame-like at least partially encloses and forms a solid bond with the outer glass pane 1.11 by means of the polyurethane layer 2.11.

[0042]

- ³⁰⁵ The outer glass pane 1.11, the polyurethane layer 2.11 and the edge reinforcement 6 are flush with one another on an end face 9.11 of the armored glass pane or on the end face of the projection 8.11.
- ³⁰⁸ The edge reinforcement 6 has a rectangular cross section.
- ³⁰⁹ The projection 8.11, which is thus built up by the edge reinforcement 6, the outer glass pane 1.11 and the composite layer 2.11 lying in between, is held in a frame 14 of the motor vehicle, which is shown in FIG
- ³¹² __ 03 is indicated by dashed lines in cross section and runs in the roof area of the motor vehicle.
- ³¹⁴ In the position shown in FIG. 1, the armored glass pane engages in the frame 14 with the projection 8.11.
- ³¹⁶ The side window shown is thus raised and the window is closed.

[0043]

- ³²⁰ The inner glass pane 5.11 protrudes in the area of the gradation of the armored glass pane shown above the middle glass pane 3.11, creating a depression 12.11 or
- ³²² Groove or receptacle is formed in the area between the inner glass pane 5.11, the middle glass pane 3.11, which is flush with the polyurethane layer 4.11 at the end, and the continuous polyurethane layer 2.11.
- ³²⁵ The edge reinforcement 6 extends into the recess 12.11 and abuts approximately butt against the end face of the central glass pane 3.11.
- ³²⁷ Front side is the inner glass pane 5.11 with a seal 7.11, z. B. made of polyurethane, which also cavities 11.11 within the recess 12.11 between the adjacent surfaces of the edge reinforcement 6, the middle glass pane 3.11, the polyurethane layer 4.11 - or the bottom 13.11 of the recess 12.11 -, the inner glass pane 5.11 and the polyurethane layer 2.11 filled in or sealed within the indentation 12.11.

[0044]

- 335 1, the outer and middle glass panes 1.11, 3.11 are each 4 mm thick, the inner glass pane 5.11 is 8 mm thick, the polyurethane layers 2.11 and 4.11 are each 1 mm thick and the edge reinforcement is thick 6 steel about 2.5 mm.
- 338 On the inner surface of the inner glass pane 5.11, another layer sequence of polyurethane and polycarbonate can be applied over the entire surface in this order, the thickness of this additional polyurethane layer being about 1.9 mm and the thickness of the polycarbonate pane being about 2.5 mm. Shearing of the projection 8.11 at the transition area between the edge reinforcement 6 and the middle glass pane 3.11 is prevented by the overlapping design of the inner glass pane 5.11 with respect to the surface of the edge reinforcement 6 facing it.

[0045]

- 347 2 shows a preferred embodiment of the edge reinforcement 6 of the armored glass pane of the invention in the drawn out side view.
- 349 The edge reinforcement 6 is composed of a total of three juxtaposed parts or reinforcement members 2, 3 and 4 which are separated from one another for clarity but are aligned with one another as intended for installation in the armored glass pane of FIG. An associated outline 25 of the armored glass pane of FIG. 1 is drawn in dashed lines and schematically in FIG.

[0046]

- 356 The three reinforcing members 2, 3, 4 of the edge reinforcement 6 are strip-shaped and relatively elongated and each have the same substantially rectangular cross-section, if the cross-section is approximately z.
- 359 B. viewed at mid-length of the reinforcing members 2, 3, 4, as also shown in FIG. If the three shown reinforcement members 2, 3 and 4 are put together, the result is the three-sided, frame-shaped edge reinforcement 6 of the armored glass pane. The reinforcing members 2, 3 and 4 can be made, for example, by stamping out a stamped sheet metal.

[0047]

- 366 As can be seen in FIG. 2, the reinforcing member 2 of the edge reinforcement 6 is curved or kinked in accordance with the outline 25 of the armored glass pane and has two terminating ends 21 and 22.
- 369 A contour or Center line of the reinforcing member 2 follows z. B. the upper edge of the corresponding armored glass pane, in which the reinforcing member 2 - 1- T EP2011/004803 is integrated as a composite part of the composite armored glass pane of FIG.

[0048]

- ³⁷⁵ A spring 21.1 or a projection projects from one end 21 of the reinforcing member 2, the end 21 extending over a corner 27 of the edge reinforcement 6.
- ³⁷⁷ At the other end 22 of the reinforcing member 2 is a further spring 22.1 or protrusion protruding from the end 22 which in turn extends around a corner 26 of the edge reinforcement 6. The springs 21.1 and 22.1 each taper conically or each have side surfaces which extend parallel to one another.

[0049]

- ³⁸⁴ The elongate straight reinforcing member 3 of the edge reinforcement 6 is provided at one end 32 with a continuous groove 32.1 or socket into which the tongue 21.1 of the reinforcing member 2 fits or can engage.
- ³⁸⁷ When the reinforcement member 2 and the reinforcement member 3 are fully engaged with each other, as shown in Fig. 4, the spring 21.1 of the reinforcement member 2 engages in the groove 32.1 of the reinforcement member 3 and flat stop surfaces 21.2 of the end 21 of the reinforcement member 2 and flat stop surfaces or . Faces 32.2 of the end 32 of the reinforcing member 3 hit one another. The other end 31 of the reinforcement member 3 is designed as a blind piece or ends bluntly. The groove 32.1 is conically widened or has inner side surfaces extending parallel to one another and is an exact fit to the associated tongue 21.1 of the reinforcing member 2.

[0050]

- ³⁹⁸ The third reinforcing member 4 of the edge reinforcement 6 is also designed as a strip-shaped, elongated and straight part and has an end 42 which faces the end 22 of the reinforcing member 2 and a further end 41 which is designed as a dummy piece or closure.
- ⁴⁰¹ At the end 42, the reinforcing member 4 has a continuous groove 42.1 with adjacent ten stop surfaces 42.2. The groove 42.1 of the end 42 is conical or formed with plane-parallel inner side surfaces so that the tongue 22.1 on the end 22 of the reinforcing member 2 fits into the groove 42.1 of the reinforcing member 4 when the edge reinforcement 6 is assembled. When the tongue 22.1 is fully engaged in the groove 42.1, the planar abutment surfaces of the end 22 of the reinforcing member 2 and the abutting surfaces of the end 42 of the reinforcing member 4 abut against each other.

[0051]

- ⁴¹¹ A height of the tongue 21.1 and a corresponding depth of the groove 32.1, which are assigned to one another, are the same on the one hand and are matched to one another in such a way that the tongue 21.1 and the assigned groove 32.1 in the event of a relative movement between the reinforcing member 2 and the reinforcing member 3 at the ends 21 and 32 do not disengage.

416 This means that the tongue cannot move completely out of the groove, whereby it is achieved that an alignment of the reinforcing members 2 and 3 with each other is possible despite a relative movement due to e.g. B. a temperature change or mechanical stresses in the armored glass pane, in which the edge reinforcement 6 is integrated, can be maintained. For the sake of clarity, FIG. 3 shows a state in which the spring 21.1 of the reinforcement member 2 only partially engages in the associated groove 32.1 of the reinforcement member 3 of the edge reinforcement 6. In contrast, as mentioned, FIG. 4 shows a complete interlocking of tongue 21.1 and groove 32.1.

[0052]

427 When the spring 22.1 fully engages in the corresponding groove 42.1 of the reinforcement member 4, the flat contact surfaces hit one another, which can occur, for example, with a correspondingly high ambient temperature on the armored glass pane and a correspondingly large expansion of the edge reinforcement 6.

431 Through the spring groove system 22.1 and 42.1 of -13- P T/EP2011/004803

[0053]

435 Reinforcing members 2 and 4, a predetermined alignment of the two reinforcing members 2 and 4 can be maintained even when the two ends 22 and 42 move relative to one another, with the height of the tongue 22.1 and the depth of the groove 42.1 also being designed in this way at the ends 22 and 42 that the spring 22.1 can not come completely out of engagement with the groove 42.1 of the reinforcing member 4 if possible.

[0054]

443 Fig. 5 shows a schematic side view of an edge reinforcement 5.4 drawn out and dismantled for an armored glass pane of a further embodiment of the invention with a pane outline 55, which is again drawn in dashed lines and schematically in Fig. 5 and which differs from the outline 25 of the armored glass pane from 2 is.

[0055]

450 The three reinforcement members 5.1, 5.2 and 5.3 of the edge reinforcement 5.4 are in turn strip-shaped and relatively elongated and each have the same essentially rectangular cross-section, if the cross-section is approximately z.

453 B. viewed at mid-length of the reinforcing members.

454 If the three shown reinforcing members 5.1, 5.2 and 5.3 are put together and arranged in a row, the result is the three-sided, frame-shaped edge reinforcement 5.4 of the armored glass pane, which can have the cross section of FIG.

[0056]

- 460 The reinforcement member 5.2 of the edge reinforcement 5.4 is bow-shaped, slightly curved in accordance with the outline 55 of the armored glass pane and is otherwise constructed similarly to the reinforcement member 2 of FIG.
- 463 The reinforcement member 5.1 of the edge reinforcement 5.4 is straight and elongated, similar to the reinforcement member 3 of FIG.
- 465 The reinforcement member 5.3 of the edge reinforcement 5.4 is also straight and elongated, similar to the reinforcement member 3 of FIG. -14- EP2011/004803

[0057]

- 470 6 shows an example of a schematic side view of an edge reinforcement 6.3 drawn out and dismantled for an armored glass pane of yet another embodiment of the invention with a pane outline 65, which is again drawn in dashed lines and schematically in FIG the outline 25 of the armored glass pane of FIG. 2 or the outline 55 of the armored glass pane of FIG.

[0058]

- 477 The two reinforcement members 6.1 and 6.2 of the edge reinforcement 6.3 are in turn strip-shaped and relatively elongated and each have the same essentially rectangular cross-section if the cross-section is approximately z.
- 480 B. viewed at mid-length of the reinforcing members.
- 481 If the two shown reinforcing members 6.1 and 6.2 are put together, the result is the frame-like edge reinforcement 6.3 of the armored glass pane which is closed on all sides and which in turn can have the cross section shown in FIG.

[0059]

- 487 The reinforcing member 6.1 of the edge reinforcement 6.3 is essentially curved in a hook-like manner in accordance with the outline 65 of the armored glass pane.
- 489 A conical spring 6.12 protrudes from one end 6.11 of the reinforcement member 6.1, the end 6.11 extending over a corner of the edge reinforcement 6.3. At the other end 6.13 of the reinforcing member 6.1 there is a conical groove 6.14.

[0060]

- 495 The second reinforcement member 6.2 of the edge reinforcement 6.3 is essentially two-legged and designed in a V-shape corresponding to the outline 65 of the armored glass pane.
- 497 A conical spring 6.22 protrudes from one end 6.21 of the reinforcement member 6.2, the end 6.21 extending in a hook-shaped manner over a corner of the edge reinforcement 6.3. The tongue 6.22 of the reinforcing member 6.2 fits into the groove 6.14 of the reinforcing member

6.1. At the other end 6.23 of the reinforcing member 6.2 be there is a conical groove 6.23 into which the tongue 6.12 of the reinforcing member 6.1 fits.

[0061]

505 Fig. 7 shows a schematic sectional view of a bulletproof glass pane of a further exemplary embodiment of the invention, in which z.

507 B. as an edge reinforcement 7.1 an adapted edge reinforcement 6 similar to Fig. 2, an adapted edge reinforcement 5.4 similar to Fig. 5 or an adapted edge reinforcement 6.3 similar to Fig. 6 can be provided.

[0062]

513 The armored glass pane of FIG. 7 is constructed overall as a composite pane and has several panes of glass 10.7, 12.7 and 14.7 that are attached to one another over a large area and in layers.

516 The glass panes 10.7 and 12.7 are connected to one another by means of a PVB (polyvinyl butyral) layer 11.7 or a polyurethane film. The glass panes 12.7 and 14.7 are connected to one another by a PVB layer 13.7. The glass pane 10.7 on the bombardment side (cf. Arrow A pointing in the direction of fire in FIG. 7) is longer than the other panes of glass and protrudes beyond the end faces of the other panes of glass 12.7 and 14.7, which are flush with one another, in an outer edge region of the armored glass pane shown according to the invention. As a result, the glass pane 10.7 forms a projection 42 or a gradation 40 of the armored glass pane, the projection 42 engaging in a body frame or door frame 14 of a motor vehicle.

[0063]

527 In the gradation 40, ie on the front side above the glass panes 12.7 and 14.7, the edge reinforcement 7.1 is in the form of z.

529 B. a strip-shaped steel sheet attached with a rectangular cross-section, which extends along the entire stepped edge region of the armored glass pane shown within the gradation 40. The edge reinforcement 7.1 covers the front edge area (40.1) above the glass panes 12.7 and 14.7 fully or at least partially within step 40 inwardly adjacent to outer glass pane 10.7. The multi-part edge reinforcement 7.1 is a layer 30 of polyurethane with the glass pane 10 and a composite layer of z. B. polyurethane 15.7 connected to the end faces of the glass panes 12.7 and 14.7, which are flush with each other.

[0064]

539 On the inside of the glass pane 14.7 and the edge reinforcement 7.1 towards the passenger compartment, a composite layer made of polycarbonate can be attached to the armored glass pane of FIG. 7 over the entire surface.

542 In addition, the inside of the glass pane 10.7, i.e. the projection 42, and also the entire end face of the gradation 40, i.e. the edge end face of the edge reinforcement 7.1, can be coated with a polycarbonate layer or another passivation layer, also from several layers, e.g. B. a layer sequence of polyurethane and polycarbonate.

[0065]

549 FIG. 8 schematically shows an exemplary edge reinforcement 7.1 of the armored glass pane of the invention from FIG. 7 in the drawn out side view.

551 The edge reinforcement 7.1 is composed of a total of three parts or reinforcing members 2.8, 3.8 and 4.8 in series, separated for clarity but aligned with each other as provided in the armored glass pane of FIG. An associated outline 25.8 of the armored glass pane of FIG. 7 is drawn in dashed lines and schematically in FIG.

[0066]

558 The three reinforcement members 2.8, 3.8, 4.8 of the edge reinforcement 6 are strip-shaped and relatively elongated and each have the same substantially rectangular cross-section if you take the cross-section, for example, as z.

561 B. at mid-length of the reinforcing members 2.8, 3.8, 4.8 as also shown in FIG. If the three shown reinforcement members 2.8, 3.8 and 4.8 are put together and in mutual engagement, the result is the three-sided, frame-shaped edge reinforcement 7.1 of the armored glass pane.

[0067]

567 The reinforcement member 2.8 of the edge reinforcement 7.1, as can be seen in FIG. 8, is curved, kinked and bow-shaped in accordance with the outline 25.8 of the armored glass pane and has two terminating ends 21.8 and 22.8.

[0068]

573 A spring 21.18 or projection protrudes from the end 21.8 of the reinforcement member 2.8, the end 21.8 extending over a corner 27.8 of the edge reinforcement 7.1.

575 At the other end 22.8 of the reinforcing member 2.8 is a further spring 22.18 or projection protruding from the end 22.8 which in turn extends over a corner 26.8 of the edge reinforcement 7.1.

578 The springs 21.18 and 22.18 are z. B. each tapered.

[0069]

582 The elongate, straight reinforcing member 3.8 of the edge reinforcement 7.1 is provided at one end 32.8 with a continuous groove 32.18 or socket into which the tongue 21.18 of the

reinforcing member 2.8 fits or can engage.

585 If the reinforcement member 2.8 and the reinforcement member 3.8 are engaged with one another, the tongue 21.18 of the reinforcement member 2.8 engages in the groove 32.18 of the reinforcement member 3.8 according to a tongue/groove system pattern. The other end 31.8 of the reinforcement member 3.8 is designed as a blind piece or ends bluntly. The groove 32.18 is z. B. flared and fits into the spring 21.18 of the reinforcing member 2.8.

[0070]

593 The third reinforcement member 4.8 of the edge reinforcement 7.1 is also designed as a strip-shaped, elongated and straight part and has an end 42.8 that corresponds to the end of 22.8
595 Strengthening member 2.8 facing, and a further end 41.8 formed as a blank or termination. At the end 42.8 the reinforcing member 4.8 has a continuous, e.g. B. conical groove 42.18. The groove 42.18 of the end 42.8 is now again designed in such a way that the conical tongue 22.18 of the reinforcing member 2.8 fits into the groove 42.18 of the reinforcing member 4.8 when the edge reinforcement 7.1 is integrated in the laminated armored glass pane.

[0071]

603 In Fig. 9 and Fig. 10 associated views of a detail of the edge reinforcement 6.3 of Fig. 6 (or the edge reinforcements 5.4, 6 or 7.1) are shown for clarity, Fig. 10 showing the view in the direction of arrow X in Fig. 9 and FIG. 9 shows the view in the direction of arrow IX of FIG. 10. FIG.

607 More precisely, the continuous, conical spring 6.22 at the end 6.21 of the reinforcing member 6.2 is shown schematically in FIGS. 9 and 10, with the arrow A representing the direction of a shot striking the armored glass pane. The spring 6.22 is designed here as a single leg. The associated groove 6.14 of the reinforcing member 6.1 is adapted in terms of shape to this spring 6.22, ie z. B. continuously with a conically widened opening in such a way that the tongue 6.22 can engage and fit into the groove 6.14.

[0072]

616 In Fig. 11 and Fig. 12 a modification of the embodiment of Fig. 9 and Fig. 10 is shown, Fig. 12 being the view in the direction of arrow XII in Fig. 11 and Fig. 11 being the view in the direction of arrow XI of Fig. 12 represents.

619 More precisely, the modification in Fig. 11 and Fig. 12 has a continuous spring 6.221 at the end 6.21 of the reinforcing member 6.2. The spring 6.221 or the projection, however, is constructed here with two legs 6.222 and 6.223, which are arranged in a cross shape and at right angles to one another in order to obtain improved ballistic resistance of the edge reinforcement 6.2. The associated groove 6.14 of the reinforcing member 6.1 is in the modification -19- 011 004803 adapted in shape to this tongue 6.221, ie with two cross-shaped intersecting grooves which are adapted in shape to the tongue 6.221. Tongue and groove can also z. B. be conical.