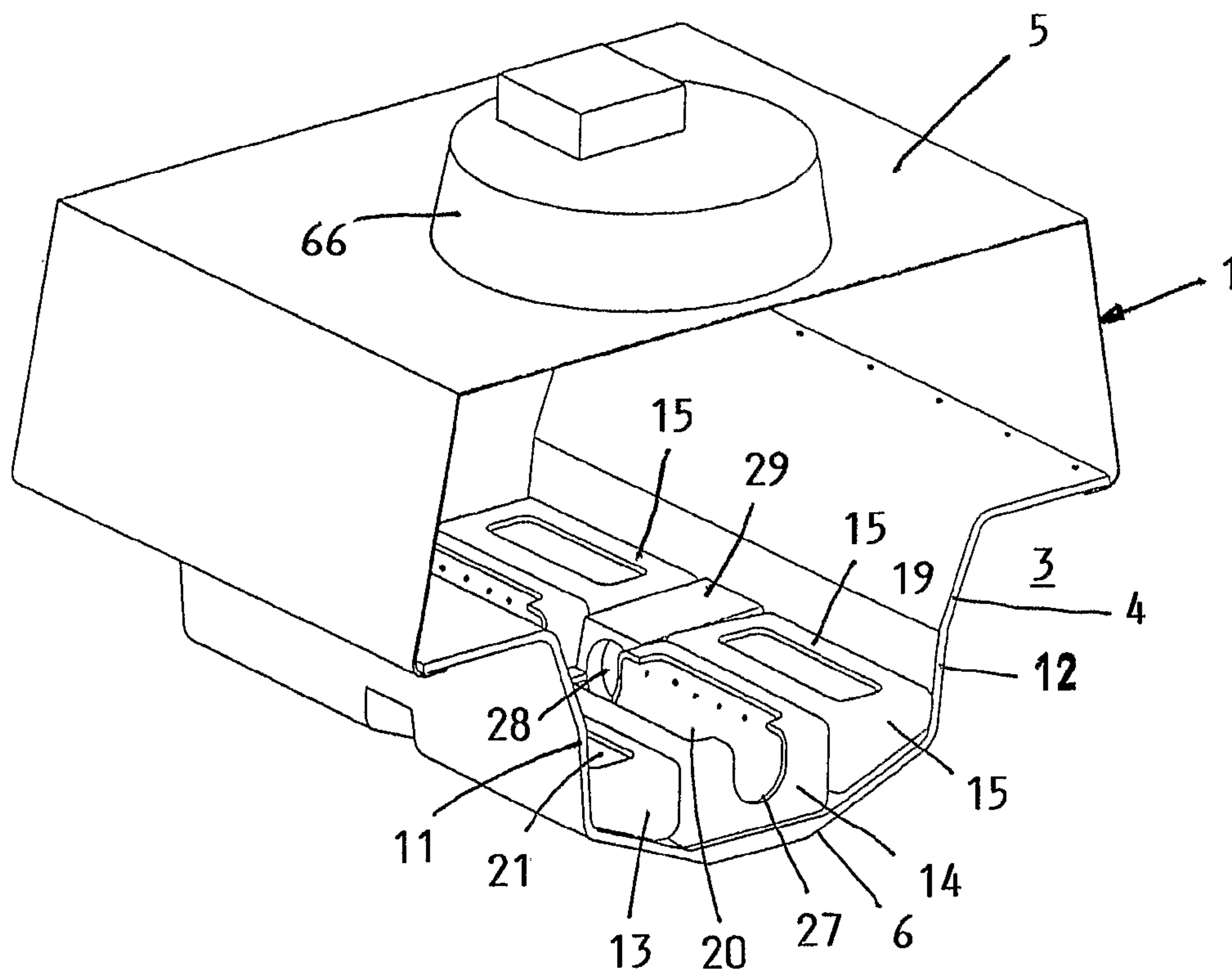




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(72) Inventeurs/Inventors:
GREUTER, ADOLF, CH;
LIST, HANS-JOERG, DE
(73) Propriétaire/Owner:
GENERAL DYNAMICS EUROPEAN LAND SYSTEMS-
MOWAG GMBH, CH
(74) Agent: BORDEN LADNER GERVAIS LLP

(54) Titre : VEHICULE BLINDE
(54) Title: ARMORED VEHICLE



(57) Abrégé/Abstract:

The armored vehicle (1), showing a bottom and a top shell (4, 5) has a reinforced floor structure for protection against mines, in that the floor area (6) of the subshell (4) is connected rigidly with an inner floor plate (7) via bracing elements (13, 14, 15) having longitudinal and transverse walls, which are also connected with the side walls (11, 12) of the subshell (4) along their borders (9, 10). The minimum height of the stiff bracing elements (13, 14, 15) corresponds to distance provided for the arrangement of a drive shaft between the inner floor plate (7) and the floor area (6).



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(71) Applicant: MOWAG GMBH [Stateless/CH]; Untersee-
strasse 65, CH-8289 Kreuzlingen (CH).

(74) Agent: QUEHL, Horst; Ringstrasse 7, CH-8274
Taegerwilen (CH).

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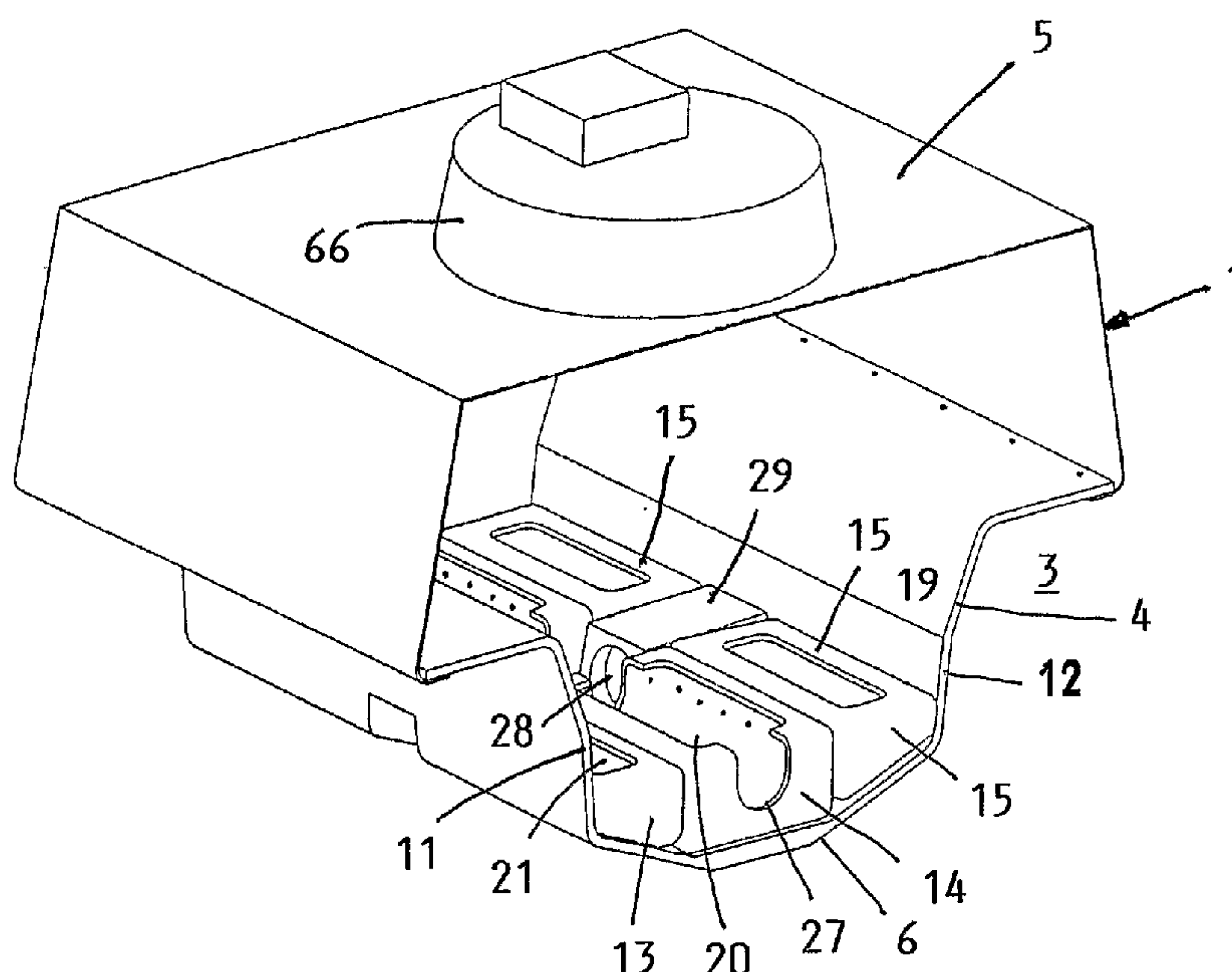
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(54) Title: ARMORED VEHICLE



(57) Abstract: The armored vehicle (1), showing a bottom and a top shell (4, 5) has a reinforced floor structure for protection against mines, in that the floor area (6) of the subshell (4) is connected rigidly with an inner floor plate (7) via bracing elements (13, 14, 15) having longitudinal and transverse walls, which are also connected with the side walls (11, 12) of the subshell (4) along their borders (9, 10). The minimum height of the stiff bracing elements (13, 14, 15) corresponds to distance provided for the arrangement of a drive shaft between the inner floor plate (7) and the floor area (6).

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Armored vehicle

The invention relates to an armored vehicle with a pan-shaped subshell including wheel area walls on the side and a top shell connected to this enclosing the occupants' area, whereby an inner floor plate is fixed with distance above the floor area of the subshell.

5

From DE-A-19605230 and DE-A-19740103 it is known to fix a shield below the floor of the vehicle to protect against the effect of mines. However, such a shield does not suffice against mines with a high explosive force, such as the ones corresponding to a quantity of explosives equivalent to more than 6 kg of TNT.

10

The damping provided as per the DE-A-19605230 based regulation cannot prevent, due to its inadequate flexural strength, that the accelerations appearing due to the pressure of the explosion of the mines deform the floor area of the vehicle, which then penetrates into the inside of the vehicle to such extent that the survival chance for the occupants become very low.

15

The mounting of a plate reinforced by formed ribs as suggested by DE-A-19740103 leads only to an additive, inadequate improvement of the flexural strength of the protective design, since only the plate showing the ribs is reinforced, together with the risk that the free cross- sectional ends of the ribs act like a chipper knife on the adjacent counter punch under the effect of the blast force of a mine. Added to this is that the metallic construction of this shield, under the effect of the hollow charge penetrating the plating, leads to a fragmentation cone that spreads relatively broadly in the inside area, so that in all probability the occupants will be affected. By an external attachment of a shield below the floor of the vehicle, there is a greater proximity to the mine with a correspondingly higher load caused by the explosion force of the mine and also a lowering of the ground clearance of the vehicle, together with a considerable rise in the weight of the vehicle.

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It is believed that embodiments of the present invention may provide improved protection for the type of vehicles mentioned above against the effect of the mines, while avoiding the principal disadvantages mentioned above in the known designs. Accordingly, the reinforcements serving as protection against the mines are to be integrated in the vehicle design such that for a relatively low increase in weight and for none or negligible reduction of the ground clearance of the vehicle, bare minimum

deformations to the inside of the vehicle from the effect of the mine explosion and accordingly the structural deformation occurring in the vehicle as a result of the mine effect is made non-fatal for the occupants.

5 According to one aspect, there is provided an armored vehicle comprising:

a pan-shaped subshell provided with a floor area and side walls extending from opposite sides of the floor area;

a top shell connected to the pan-shaped subshell to thereby form an enclosed occupants' area;

10 an inner floor plate fixed a distance above the floor area of the subshell, wherein the inner floor plate comprises border flanges running parallel to the side walls of the subshell, and through which the inner floor panel is connected in shear-resistant manner to the sub-shell; and,

one or more bracing elements rigidly connecting the inner floor plate with the floor area of the subshell, in a manner so that the inner floor plate with the floor area of the sub-shell forms a bending resistant floor structure, integrated in the vehicle, the structure having in one cross-section a configuration of a transverse beam wherein the inner floor panel forms an upper flange and the floor area forms a lower flange of the transverse beam.

20

According to another aspect, there is provided an armored vehicle comprising:

a pan-shaped subshell including side walls and a floor area,

a top shell connected to the subshell to define an occupants' area, and

an inner floor plate secured at a distance above the floor area of the subshell,

25 wherein the inner floor plate comprises:

borders running parallel to the side walls of the subshell, the borders being connected to the side walls so as to be shear-resistant, and

a plurality of bracing elements rigidly connecting the inner floor plate with the floor area of the subshell, so that the inner floor plate and the floor area of the subshell form a bend-resistant floor structure, integrated in the vehicle.

30

Embodiments of the invention will be described by way of example only with reference to the accompanying drawings in which:

35 Fig.1 A perspective view of the longitudinal section of a vehicle as per an embodiment the invention,

Fig.2 The longitudinal section as per Fig.1 before the integration of the inner floor plate of the vehicle,

- 5 Fig.3 A perspective view of an embodiment of the subshell of a vehicle as per the invention,

Fig.4 A cross-section of the subshell shown in Figure 3, reinforced by hollow bracing elements, and

10

Fig.5 A representation according to Fig.4 with filled bracing elements.

- The schematic representation of vehicle 1, shown as an example, with the help of which an embodiment of the invention will be described in more detail. The vehicle 1 has the cross-sectional form clearly shown in Fig.1 and 2, with a subshell 4 forming sidewise wheel clearances 2, 3 and a top shelf 5 rigidly fixed to this by means of screws, or rivets, Both the wheel clearances 2, 3 together can have four, six, eight or more individually driven wheels or also several drive or guiding wheels of a crawler.

- 20 The top shell 5 is designed according to the purpose of use of the vehicle, for instance, an observation or a gun tower 66. To protect it against the projectiles, the top shell 5 can be made from ferrous or non-ferrous metals and can have retrofitted armor plates, not shown here, customized for the purpose of use.

- 25 The subshell 4 is preferably designed from a fibre-reinforced, tough plastic material and has a very high wall thickness at least in the lowermost and the middle portion of its pan-shaped floor area 6, depending upon the type of the shield. However, the subshell 4 can also be designed from the same material as that of the top shell 5, such as ferrous or non-ferrous metals.

30

- Over the floor area 6 the vehicle 1 has an accessible inner floor plate 7, which are quite far from the foot rests meant for the occupants. The foot rests are not shown here. As a result of the thus created floor area 8, a drive shaft (not shown here) extends in the longitudinal direction of the vehicle, several gear shafts, torsion springs, supply strands running transverse to this, so that owing to their space requirements there is a minimum distance between the floor area 6 and the inner floor plate 7.

35

For implementing a bending resistant floor structure with a high load bearing capacity, the inner floor plate 7 is connected at its borders via one-piece border flanges 9, 10 with the upward aligned side walls 11, 12 of the subshell 4 and also across the longitudinal
5 direction of the vehicle via parallel and consecutive bracing elements 13, 14, 15 with the floor area 6 of the subshell 4.

An additional rigidity contributing to the stiffness of this floor structure is also provided for, between the bracing elements 13, 14, 15. The border flanges 9, 10 connect to the
10 inner floor plate 7 on one or both the sides, so that their flanges have an L- or T-shaped cross-section.

The connections mentioned are preferably detachable e.g. designed through studs not shown here, so that the vehicle components enclosed by the bracing elements 13, 14,
15 15 are accessible. Instead of a bolted connection, at least in the sub-areas of surface contacts, an adhesive or a rivet connection can also be provided.

Such a floor structure made of shear-resistant plates, connected to one another with the mentioned minimum distance, forms a cross-sectional profile with a high capacity for
20 carrying loads, in which according to the laws of statics, owing to the load expected from below as a result of the effect of the mines, the floor area 6 is comparable with the upper flange and the inner floor plate 7 with the lower flange of a transverse beam. As a result, the floor structure can absorb very high forces and distribute these over the entire vehicle, than when the individual stiffness of the floor area 6 of the subshell 4 and of the
25 inner floor plate 7 would only add up in case of bending or buckling loads.

The embodiments given here show three bracing elements 13, 14, 15 arranged across the direction of the vehicle, which form hollow spaces 16, 17, 18 as shown in Fig.4 and which shows openings 19, 20, 21 on the top as shown in Fig.2, through which the bolt
30 connections 22 can be established.

In accordance with the embodiment given in Fig.5, the bracing elements 23, 24, 25 comprise of hollow bodies also adjusted to the contour of the cross-section of the floor structure, which, however, are filled, aiming for an additional reinforcement and/or
35 increasing the protection, for instance, against projectile-forming mines. Metal or plastic foam is suitable for such a filling.

For bringing in a drive shaft of the vehicle, not shown here, the middle bracing element 14 or 24 has a recess 26, 27, u-shaped in its cross-section, open on the top or closed only by the inner floor plate 7. Further, box-shaped bracing elements 29, open below,
5 are provided in the longitudinal direction of the vehicle 1 between similar bracing elements 13 and 15, which are narrow and which form a lead-through channel 28 for a gear shaft not shown here, which are screwed or riveted to the adjacent bracing elements 13 or 15 respectively.

10 The embodiment shown in Fig.3 shows bracing elements 30, 31, 32, closed on all sides, reinforced, for instance, through metal foam and glued to one another, before fixed on to the inner floor plate 7.

It shall be understood that in the scope of the described invention there are numerous
15 additional embodiments, which have one common advantage that they lead to a highly effective protective design against the mines, integrated in the vehicle, with relatively low increase in weight and low change in the ground clearance of the vehicle.

In order to further distribute the explosion forces acting on the stiff floor structure,
20 designed as per the invention, from it to the entire vehicle, support elements can be provided on the side walls 11, 12 of the subshell 4 in a way not shown here, which establish a connection till the roof 33 of the top shell 5, as is known from the DE-A-10144208 of the applicant.

CLAIMS:

1. An armored vehicle comprising:
 - a pan-shaped subshell provided with a floor area and side walls extending from opposite sides of the floor area;
 - 5 a top shell connected to the pan-shaped subshell to thereby form an enclosed occupants' area;
 - an inner floor plate fixed a distance above the floor area of the subshell, wherein the inner floor plate comprises border flanges running parallel to the side walls of the subshell, and through which the inner floor panel is connected in shear-resistant manner
 - 10 to the sub-shell; and,
 - one or more bracing elements rigidly connecting the inner floor plate with the floor area of the subshell, in a manner so that the inner floor plate with the floor area of the subshell forms a bending resistant floor structure, integrated in the vehicle, the structure having in one cross-section a configuration of a transverse beam wherein the
 - 15 inner floor panel forms an upper flange and the floor area forms a lower flange of the transverse beam.
2. The vehicle as per claim 1, wherein the bracing elements are hollow bodies, whose outer surfaces are connected in a shear-resistant manner with an inner surface
- 20 of the subshell, and with a lower side of the inner floor plate.
3. The vehicle according to claim 1 or 2 wherein in longitudinal and transverse directions, mutually adjacent bracing elements are connected with one another so as to be shear-resistant along their parallel running surfaces.
- 25 4. The vehicle according to any one of claims 1 to 3 wherein the bracing elements are connected with one another, and with the inner floor plate and the subshell, by rivets or bolts.
- 30 5. The vehicle according to any one of claims 1 to 4 wherein at least some of the bracing elements have a recess for accommodating functional components of the vehicle.
- 35 6. The vehicle according to any one of claims 1 to 5 wherein at least one of the bracing elements is reinforced by a filler material.

7. The vehicle according to any one of claims 1 to 6 wherein the floor area of the subshell forms a shield.
8. The vehicle according to any one of claims 1 to 7 wherein the subshell, the inner floor plate and the bracing elements are made from a fibre-reinforced plastics material.
9. The vehicle according to any one of claims 1 to 8 wherein the bracing elements have a minimum height corresponding to a distance required to accommodate a drive shaft of the vehicle between the inner floor plate and the floor area.
10. An armored vehicle comprising:
a pan-shaped subshell including side walls and a floor area,
a top shell connected to the subshell to define an occupants' area, and
an inner floor plate secured at a distance above the floor area of the subshell,
wherein the inner floor plate comprises:
borders running parallel to the side walls of the subshell, the borders being connected to the side walls so as to be shear-resistant, and
a plurality of bracing elements rigidly connecting the inner floor plate with the floor area of the subshell, so that the inner floor plate and the floor area of the subshell form a bend-resistant floor structure, integrated in the vehicle.
11. The armored vehicle according to claim 10, wherein the bracing elements are hollow bodies having first outer surfaces connected to an inner surface of the subshell at a first end, and second outer surfaces connected to a lower side of the inner floor plate at a second end.
12. The armored vehicle according to claim 11, wherein adjacent bracing elements are connected to one another in longitudinal and transverse directions so as to be shear-resistant along respective parallel running surfaces.
13. The armored vehicle according to claim 11, wherein the bracing elements are connected to one another and the inner floor plate and the subshell through rivets or bolts.
14. The armored vehicle according to claim 10, wherein at least some of the bracing elements have a recess for components of the vehicle.

15. The armored vehicle according to claim 10, wherein the bracing elements are reinforced by a filler material.
- 5 16. The armored vehicle according to claim 10, wherein the floor area of the subshell has a greater thickness.
17. The armored vehicle according to claim 10, wherein the subshell, the floor plate and the bracing elements are made of fiber-reinforced plastic.
- 10 18. The armored vehicle according to claim 10, wherein the bracing elements are dimensioned to accommodate a drive shaft between the inner floor plate and the floor area.
- 15 19. The armored vehicle according to claim 11, wherein the bracing elements adjacent to one another in the longitudinal and the transverse direction are connected so as to be shear-resistant with one another along respective parallel running outer surfaces.

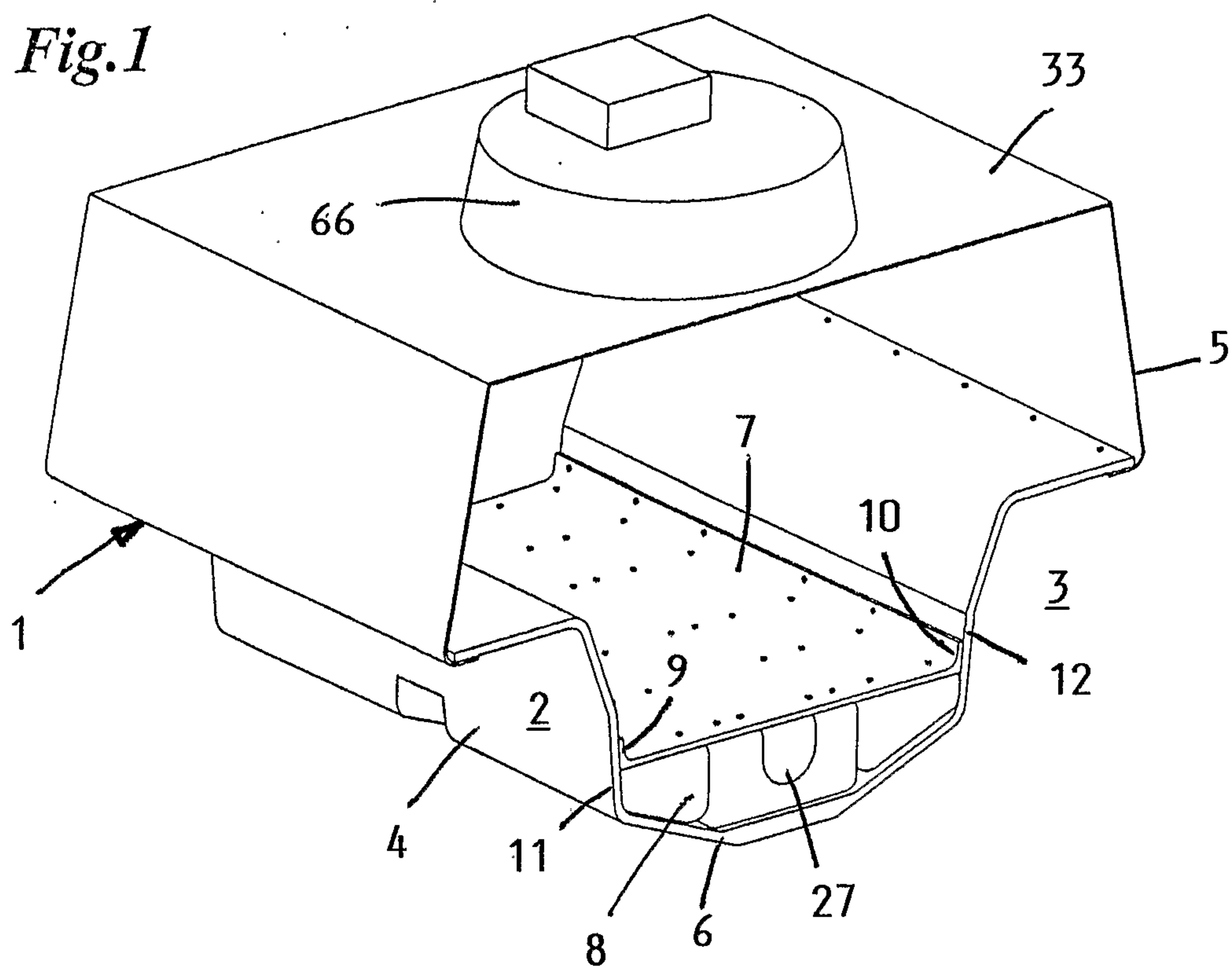
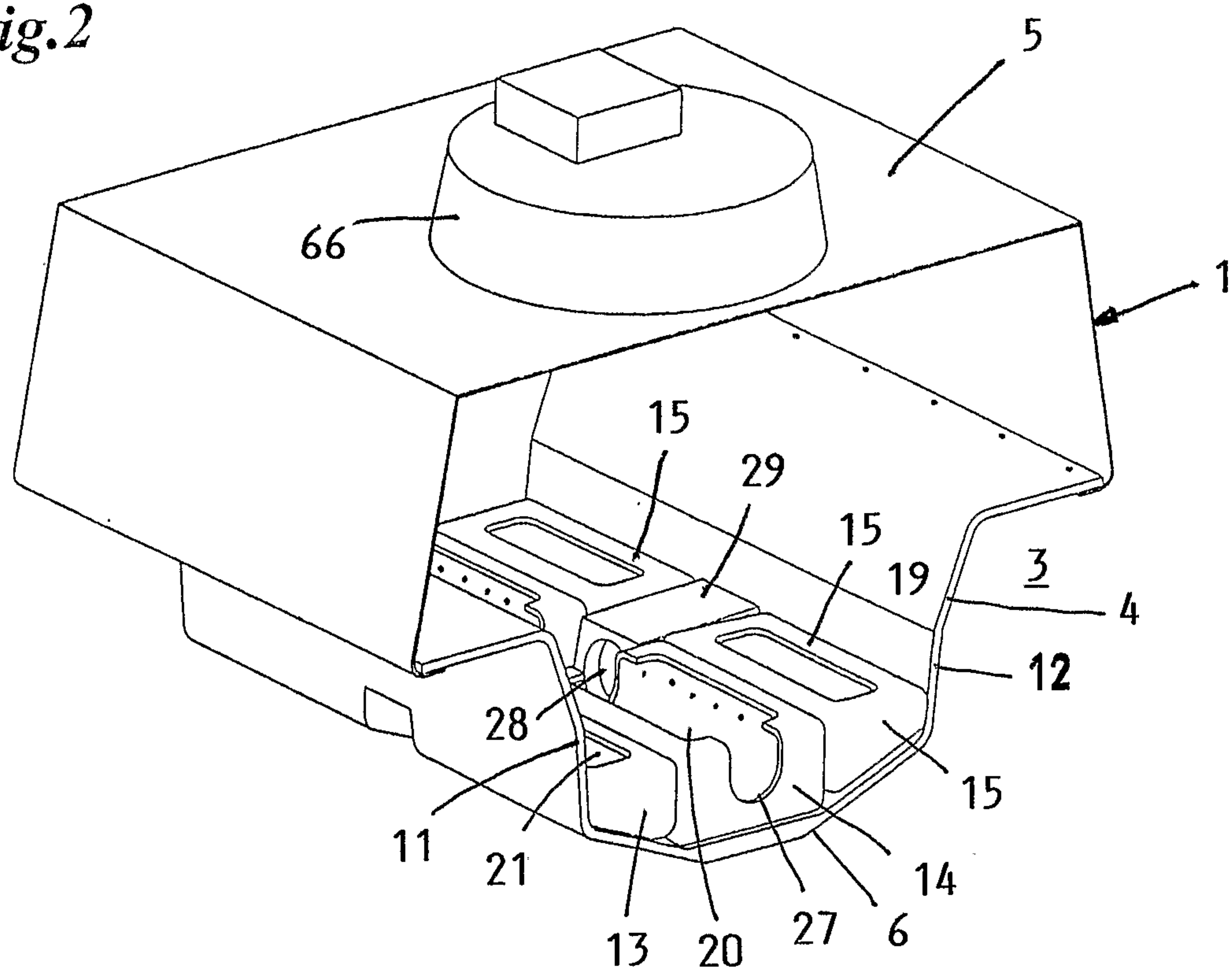
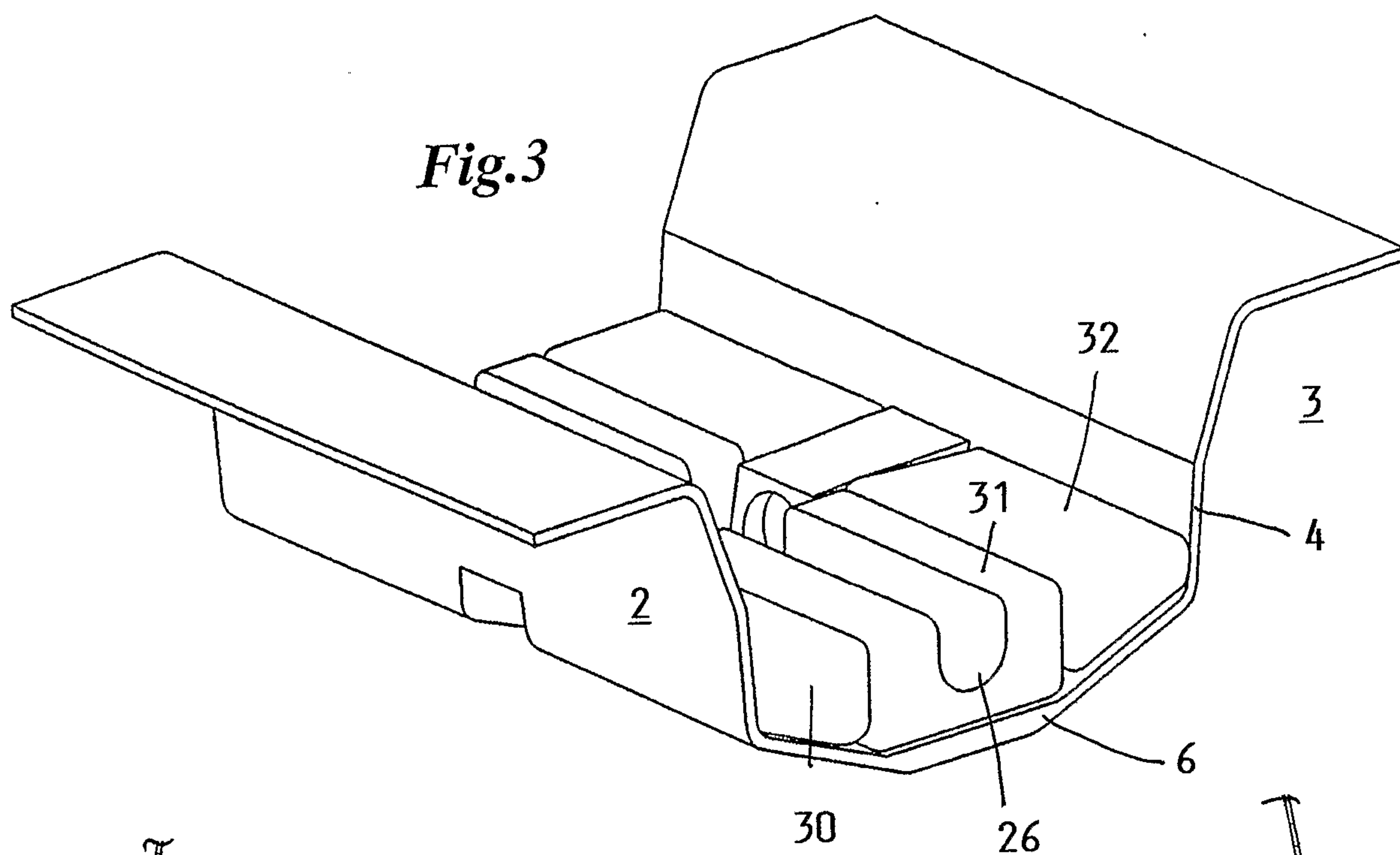
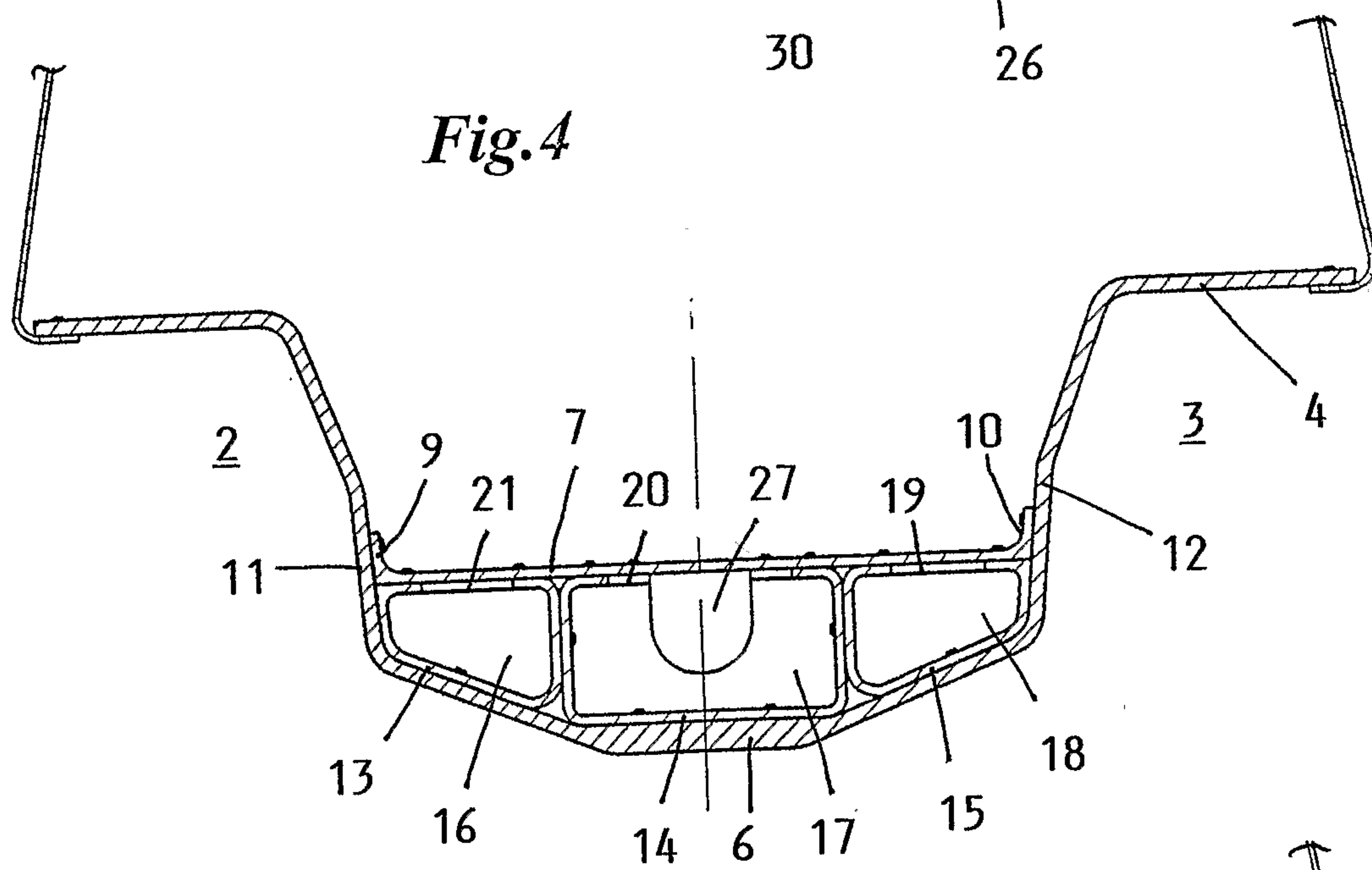
Fig.1*Fig.2*

Fig.3*Fig.4**Fig.5*