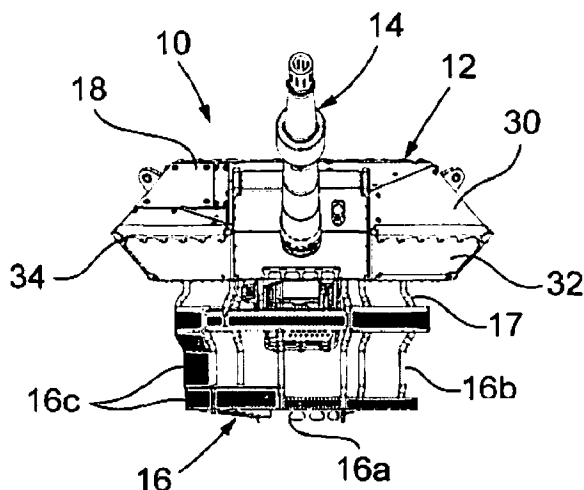




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(72) Inventeurs/Inventors:  
ARRIGHI, PAOLO, IT;  
MORONI, LORENZO, IT  
(73) Propriétaire/Owner:  
OTO MELARA SPA, IT  
(74) Agent: ROBIC

(54) Titre : STRUCTURE DE TOURELLE, EN PARTICULIER POUR UN VEHICULE DE COMBAT  
(54) Title: TURRET STRUCTURE, IN PARTICULAR FOR A FIGHTING VEHICLE



(57) Abrégé/Abstract:

The invention relates to a turret for a fighting vehicle. The turret comprises a casing comprising: a firearm, an upper half-shell at least partially widening towards the bottom of the casing, a lower half-shell at least partially widening towards the top of the casing, a supporting element mounted at the edge border, the supporting element matching and covering the area where the upper and lower armored panels are adjacent to one another, and a base fixing element matching and covering the bottom of the lower half-shell and the bottom surface of the lower armored panel. The supporting element is adapted to provide support stability of the upper and lower armored panels and the supporting element or the base fixing element is affixed to the casing by through organs extending through the lower panel.

## **ABSTRACT**

The invention relates to a turret for a fighting vehicle. The turret comprises a casing comprising: a firearm, an upper half-shell at least partially widening towards the bottom of the casing, a lower half-shell at least partially widening towards the top of the casing, a supporting element mounted at the edge border, the supporting element matching and covering the area where the upper and lower armored panels are adjacent to one another, and a base fixing element matching and covering the bottom of the lower half-shell and the bottom surface of the lower armored panel. The supporting element is adapted to provide support stability of the upper and lower armored panels and the supporting element or the base fixing element is affixed to the casing by through organs extending through the lower panel.

## TURRET STRUCTURE, IN PARTICULAR FOR A FIGHTING VEHICLE

### Field

The present invention relates to a turret, in particular for  
5 a fighting vehicle.

### Background

In the technical field turrets are known, i.e. systems that  
are generally adapted for supporting a firearm and are able to  
10 protect the men on board or the mechanism that allows the  
projectile associated with the firearm to be shot, allowing at  
the same time the firearm to be aimed and to shoot in different  
directions.

Turrets are typically designed to be installed not only on  
15 buildings or fixed structures, but also on mobile structures,  
such as military aircraft, fighting vehicles, etc.

For example, EP Application 0122187 discloses a turret for  
an armored vehicle comprising a saddle mounted on the vehicle  
via a ring race allowing its rotation around a vertical axis and  
20 an oscillating body mounted on the saddle via trunnions so as to  
be able to oscillate around a horizontal axis, the saddle being  
made up of a baseplate and front, rear and side walls and  
covered by the oscillating body, wherein the baseplate of the  
saddle is located approximately in the plane of the ring race,  
25 the front and rear walls of the saddle are made up of sections  
of cylindrical surfaces the axes of which coincide with the axes  
of the trunnions and delimit with the side walls in the plane of  
the baseplate a polygon circumscribed about the circular opening  
of the baseplate bordered by the ring race, and the oscillating  
30 body has, seen from the side, the shape of two trapezes joined  
by their long bases, its side walls consisting of inclined  
panels assembled to form protruding edge dihedrons.

Though, turrets manufactured according to the prior art suffer from some drawbacks.

### **Summary**

5       An object of the present invention is to provide a turret, which is able to solve the drawbacks of the prior art and which, at the same time, can be produced in a simple and economic fashion. In particular, an object of the present invention is to provide a turret provided with an improved casing, which is  
10 adapted for ensuring a particularly effective ballistic protection.

According to a broad aspect, the present invention relates to a turret for a fighting vehicle, the turret comprising a hollow casing defining a bottom, a top, first and second sides,  
15 a front, an outside and an edge border, the casing comprising: a firearm; an upper half-shell at least partially widening towards the bottom of the casing; a lower half-shell at least partially widening towards the top of the casing, the upper half-shell and the lower half-shell meeting and widening in the edge border of  
20 the casing, wherein, proximate the edge border and on the outside of the casing, the upper half-shell comprises an upper armored panel and the lower half-shell comprises a lower armored panel, the upper and lower armored panels being adjacent and peripherally in contact with one another, the lower half-shell  
25 defining a bottom and the lower armored panel defining a bottom surface; a fixing element mounted at the edge border of the casing, the fixing element matching and covering a region where the upper and lower armored panels are adjacent to one another; and a base fixing element matching and covering the bottom of  
30 the lower half-shell and the bottom surface of the lower armored panel; a connecting upright connecting the fixing element and the base fixing element, the connecting upright at least

partially overlapping the fixing element, the base fixing element and the lower panel; wherein the fixing element is adapted to provide support stability of the upper and lower armored panels; and wherein the fixing element or the base  
5 fixing element is affixed to the casing by through organs extending through the lower armored panel.

### **Brief description of the drawings**

Further features and advantages of the present invention  
10 will be best understood upon perusal of the following detailed description, which is provided by way of example and is not limiting, with reference, in particular, to the accompanying drawings, wherein:

- figures from 1 to 3 are bidimensional views, in particular a  
15 lateral elevation view, a front elevation view, and a plan view from above, respectively, of a turret for vehicles manufactured according to an explanatory embodiment of the present invention;
- figures 4 and 5 are bidimensional views, in particular a front elevation view and a lateral elevation view, respectively,  
20 of a front portion or shell of the turret shown in the previous figures;
- figures from 6 to 8 are enlarged views, in partial cutaway drawings, of manufacturing details shown in figure 4 and highlighted therein with the closed curves VI, VII and VIII;
- 25 - figure 9 is a perspective view of a rear portion or tail of the turret shown in figures from 1 to 3;
- figures 10 and 11 are bidimensional views, in particular a front elevation view and a lateral elevation view, respectively, of the rear portion or tail shown in figure 9; and
- 30 - figure 12 is an enlarged view, in partial cutaway drawing, of manufacturing details shown in figure 10 and highlighted therein with the closed curve XII.

**Detailed description of embodiments**

Variants, examples and preferred embodiments of the invention are described hereinbelow. With reference to the accompanying drawings, number 10 indicates, as a whole, a  
5 turret, in particular for a fighting vehicle, manufactured according to an explanatory embodiment of the present invention.

In particular, turret 10 is designed to be mounted on top of a fighting vehicle, for example on a tank (not shown). More in detail, turret 10 is mounted so as to rotate relative to the  
10 fighting vehicle, so that it is able to rotate around a substantially vertical axis, moving on a substantially horizontal plane.

Though, in further embodiments, turret 10 can be mounted not only on a fighting vehicle, but also on buildings and fixed  
15 structures, as well as on mobile structures, for example military aircraft.

Turret 10 has a hollow casing 12, which is provided with a firearm, such as a cannon 14. In the embodiment shown, cannon 14 projects towards the outside of hollow casing 12 and is  
20 supported by the latter during its rotation around a substantially horizontal axis

As described more in detail below, hollow casing 12 is provided, on the outside, with an armor, which is designed to protect the hollow casing itself from the impact and the  
25 explosion of the ammunitions coming from enemy weapons.

In particular, hollow casing 12 has a substantially box-like shape and, in the embodiment shown, it comprises a plurality of sheet metal pieces, which are assembled with one another as described more in detail below. In particular, the sheet metal  
30 pieces are coated with a plurality of armor panels.

Furthermore, turret 10 comprises a basket 16, only partially visible in figures 1 and 2, which extends through a bottom opening (not numbered) provided on the lower side of hollow casing 12 and is adapted to house the crew of the vehicle on which the turret is mounted.

In particular, turret 10 is fitted to the fighting vehicle in correspondence to the bottom of casing 12, typically by interposing a rotation support (e.g. bearings) between the structure of the vehicle and the bottom of casing 12.

In the embodiment shown, basket 16 comprises a base 16a and a plurality of uprights 16b, which preferably have a tubular shape and join the base to hollow casing 12. In particular, ballistic grids or plates 16c are transversely mounted between segments of the uprights 16b and are adapted to provide a protection for the compartment defined by basket 16.

Optionally, the uprights 16b, by bending or curving outwards, form a cove 17, which is arranged close to their top, so as to increase the volume enclosed in basket 16 close to hollow casing 12. In this way, one can advantageously increase the usable space in the region at the boundary between the inside of hollow body 12 and casing 16, which typically is a critical area, since it is suited to house the seats (not visible) on which the operators making up the crew of the turret seat.

Hollow casing 12 comprises:

- a front portion or shell 18, on which firearm 14 is mounted and which defines a front cavity 20 (see figure 4); and
- a rear portion or tail 22, which houses at least one between a projectile magazine and a (motor-driven or

manual) mechanism to load the projectiles (not shown) into the breech of said firearm 14 and which defines a rear cavity 24.

Front portion or shell 18 and rear portion or tail 22 are distinct from one another and are mutually mechanically assembled so that aforesaid cavities 20, 24 at least partially communicate with one another.

The presence of a front portion or shell 18 and of a rear portion or tail 22, which are separate from one another and subsequently assembled, has different advantages. For example, an advantage lies on the fact that the manufacturing processes of casing 12 can be separated, so that front portion or shell 18 is processed in a separate and independent manner relative to rear portion or tail 22. In particular, this allows operators to use smaller machines for the processing of the two portions 18, 22 compared to the machine that would otherwise be necessary for a casing substantially consisting of a one-piece shell, for example manufactured by welding the sheet metal pieces making it up. Furthermore, the assembly and the preparation of front portion or shell 18 (with the firearm) and of rear portion or tail 22 (with at least one between the the projectile magazine and the projectile loading mechanism) can take place in parallel, in order to then join the portions at the end of the relative assembling processes, thus remarkably reducing the overall manufacturing time.

The fact that, once assembled, cavities 20, 24 communicate with one another allows the projectiles stored in the magazine and/or introduced into the loading mechanism arranged in rear portion or tail 22 to be transferred to the breech of firearm 14 arranged in front

portion or shell 18, preferably with the control and aid of the operators of the crew accommodated in basket 16.

Preferably, front portion or shell 18 and rear portion or tail 22 are mounted in a mutually removable manner, for example they can be connected to a plurality of screws designed to be removed when the two portion 18, 22 have to be disassembled. For example, this circumstance can be due to the need for maintenance or replacement of one of the two portions 18, 22. The possibility to disassemble the portions 18, 22 makes it easier for them to be moved and more quickly repaired or replaced, since they are separate from one another.

In the embodiment show, front portion or shell 18 and rear portion or tail 22 have a rear face 26 and a front face 28, respectively, which substantially match one another, are mutually juxtaposed and abutting, and are mechanically coupled to one another. Preferably, this coupling takes place by means of a removable connection between faces 26, 28 (for example, by means of screws that can be removed in case of need).

Preferably, rear face 26 and front face 28 are substantially flat and, in particular, are arranged on a substantially vertical plane.

In particular, rear face 26 and front face 28 have at least one rear window 27 and one front window 29, respectively, which match one another and are suited to overlap one another.

In the embodiment shown, front portion or shell 18 has the bottom opening and basket 16 is fitted thereto.

Furthermore, the bottom of front portion or shell 18 is suited to be mounted so as to rotate on top of the fixed or mobile structure on which turret 10 is suited to be

installed, in this case a fighting vehicle. In particular, the assembly is performed by interposing a suitable rotation support between the structure and the bottom of the front portion or shell 18 (around the region in which basket 16 is mounted), for example bearings.

Preferably, casing 12 has an upper half-shell 30 at least partially widening towards the bottom of said casing 12 (hence, tapered towards the top), and a lower half-shell 32 at least partially widening towards the top of casing 12 (hence, tapered towards the bottom). Upper half-shell 30 and lower half-shell 32 meeting, widening, in at least one edge border 34 of casing 12. Thanks to these features, upper half-shell 30 and lower half-shell 32 obtained in this way have, on the one hand, a scarce radar perceivability (so-called "stealth effect") and, on the other hand, the ballistic ability of bouncing incident projectiles towards the outside.

Preferably, the aforesaid half-shells 30, 32 define, by widening and meeting, at least one lateral edge border 34a, which is laterally arranged on casing 12, in particular on front portion or shell 18. In the embodiment shown, half-shells 30, 32 define a pair of lateral edge borders 34a, which are arranged on opposite sides of the casing, in particular on front portion or shell 18. For example, this couple of lateral edge borders 34a are substantially parallel to one another.

Preferably, the aforesaid half-shells 30, 32 define, by widening, at least one front edge border 34b, which is frontally arranged on casing 12, in particular on front portion or shell 18. In the embodiment shown, half-shells 30, 32 define a pair of front edge borders 34b, in particular on front portion or shell 18. For example, these

front edge borders 34b frontally converge relative to casing 12, in particular relative to front portion or shell 18.

In particular edge borders 34 are arranged in correspondence to at least part of the perimeter of casing 12 (and, in particular, of front portion or shell 18) and, more in particular, in correspondence to the lateral profiles or lateral sides that join in a part of the front profile that is frontally tapered to house firearm 14.

As a person skilled in the art clearly understands, even though in the embodiment shown edge borders 34 are carried only by front part or shell 18, in possible variants of the invention they can also be applied to rear portion or tail 22.

With reference, in particular, to the figures from 6 to 8, the structure of edge borders 34 can also permit an improved fitting of an armor onto casing 12, in particular in correspondence to half-shells 30, 32.

As shown in the figures from 6 to 8, upper half-shell 30 and lower half-shell 32 are joined in correspondence to each edge border 34 by means of at least one upper inclined sheet metal piece 36 and one lower inclined sheet metal piece 38, respectively. For example, upper inclined sheet metal piece 36 and lower inclined sheet metal piece 38 can be welded to one another in correspondence to edge border 34.

In particular, in each region where an edge border 34 is provided, upper half-shell 30 and lower half-shell 32 have, on the outside, an upper armored panel 40 and a lower armored panel 42, in the embodiment shown arranged above inclined sheet metal pieces 36, 38. Panels 40, 42 are adjacent and peripherally in contact with one another, in

particular in correspondence to edge border 34.

In the embodiment shown, in correspondence to each edge border 34, casing 12 comprises, furthermore, a fixing element 46, which matches and covers the area where panels 40, 42 are adjacent to one another. More in detail, fixing element 46 is oblong (for example, extends along the entire length of adjacent panels 40, 42 in correspondence to edge border 34) and has a concavity facing the area where panels 40, 42 are adjacent to and in contact with one another. In particular, fixing element 46 has a substantially V-shaped section.

Preferably, fixing element 46 is constrained to said casing 12 (lower half-shell 30) by means of through members 47, for example by means of a plurality of screws, which extend through lower panel 42 and, in particular, are aligned under edge border 34. This constraint is able to allow fixing element 46 to ensure the stability of the support of adjacent panels 40, 42. In fact, in the embodiment shown, the invention avoids, for this reason, a coupling of fixing element 46 to casing 12 (upper half-shell 32) by means of members extending through upper panel 40.

This situation has the significant advantage of offering the possibility to reduce the number of points in which panels 40, 42 are perforated, since, in this way, weakening areas of the panels are created in an undesired manner. Furthermore, the preferred decision of perforating the sole lower panel 42 for the fitting of the fixing element is advantageous due to the fact that the potentially weakened areas of the armor of casing 12 are arranged in a position that is difficult to reach for a projectile that is aimed at turret 10.

In the embodiment shown, through members 47 extend through lower panel 42 and lower sheet metal piece 38, which are arranged one on top of the other, to obtain the fitting of fixing element 46.

Preferably, base fixing elements 48 are also provided, which are similar to fixing elements 46 described above with reference to the area where edge border 34 is provided. Base fixing elements 48 are interposed between lower armored panel 42 and the bottom of lower half-shell 32. In the case shown in figure 7, through members 47, which allow each base fixing element 48 to be coupled to casing 12, extend through the bottom of lower half-shell 32, in particular without passing through lower armored plate 42. On the contrary, in the case shown in figure 8, through members 47 extend through lower armored plate 42, in a transverse direction.

Furthermore, fixing uprights 50 are optionally provided, in particular of the plate-like type, each one of them being suited to connect fixing element 46 to base fixing element 48 associated with the same lower panel 42. Preferably, each one of them is also suited to connect pairs of mutually adjacent fixing elements 46 and/or pairs of mutually adjacent base fixing elements 48, thus also constraining to one another, in particular, the adjacent lower panels 42.

In this way, in particular, fixing uprights 50 overlap the areas in which lower panels 42 are adjacent to one another, so as to avoid empty spaces in the armor built by panels 40, 42.

Preferably, each fixing upright 50, at the same axial end 52, connects to adjacent fixing elements 46, for example, by being passed through by the same through

members that extend through fixing elements 46 and lower armored panel 42. In this way, in order to fit fixing uprights 50, operators do not need to drill further holes through lower armored panel 42, besides the ones that are already needed for the installation of fixing elements 46. The same also applies to opposite axial end 54 of fixing upright 50, with the difference that it connects base fixing elements 48 that are adjacent to one another.

In the embodiment shown, each fixing element 50 has ends 52, 54, that are wider than the rest of the upright, in particular creating the shape of a "dog bone".

Figure 12 shows a detail of rear portion or tail 22 of casing 12. Preferably, rear portion or tail 22 is manufactured with a plurality of sheet metal pieces, which are cold-assembled with one another, for example screwed to one another, in particular without performing hot-assembling procedures, such as welding procedures. The mechanical connection between adjacent areas of the sheet metal pieces fixed together is performed by means of ballistic interlocking means, generically indicated with 56, which are known for casings manufactured by means of welding. This reduces manufacturing costs and times and makes repairs easier to be performed.

In the embodiment shown, front portion or shell 18 is manufactured by welding a plurality of sheet metal pieces 36, 38, on which armored panels (40, 42) are mechanically heat-free mounted, in particular by means of the use of screws (preferably, in accordance with the solution described above).

Naturally, the principle of the present invention being set forth, the embodiments and the implementation details can be widely changed with respect to what

described above and shown in the drawings as a mere way of non-limiting example, without in this way going beyond the scope of protection provided by the accompanying claims.

/GV

**CLAIMS**

1. A turret for a fighting vehicle, the turret comprising a hollow casing defining a bottom, a top, first and second sides,  
5 a front, an outside and an edge border, the casing comprising:

a firearm;

an upper half-shell at least partially widening towards the bottom of the casing;

10 a lower half-shell at least partially widening towards the top of the casing, the upper half-shell and the lower half-shell meeting and widening in the edge border of the casing, wherein, proximate the edge border and on the outside of the casing, the upper half-shell comprises an upper armored panel and the lower half-shell comprises a lower armored panel, the upper and lower  
15 armored panels being adjacent and peripherally in contact with one another, the lower half-shell defining a bottom and the lower armored panel defining a bottom surface;

a fixing element mounted at the edge border of the casing, the fixing element matching and covering a region where the  
20 upper and lower armored panels are adjacent to one another; and

a base fixing element matching and covering the bottom of the lower half-shell and the bottom surface of the lower armored panel;

25 a connecting upright connecting the fixing element and the base fixing element, the connecting upright at least partially overlapping the fixing element, the base fixing element and the lower panel;

wherein the fixing element is adapted to provide support stability of the upper and lower armored panels; and

30 wherein the fixing element or the base fixing element is affixed to the casing by through organs extending through the lower armored panel.

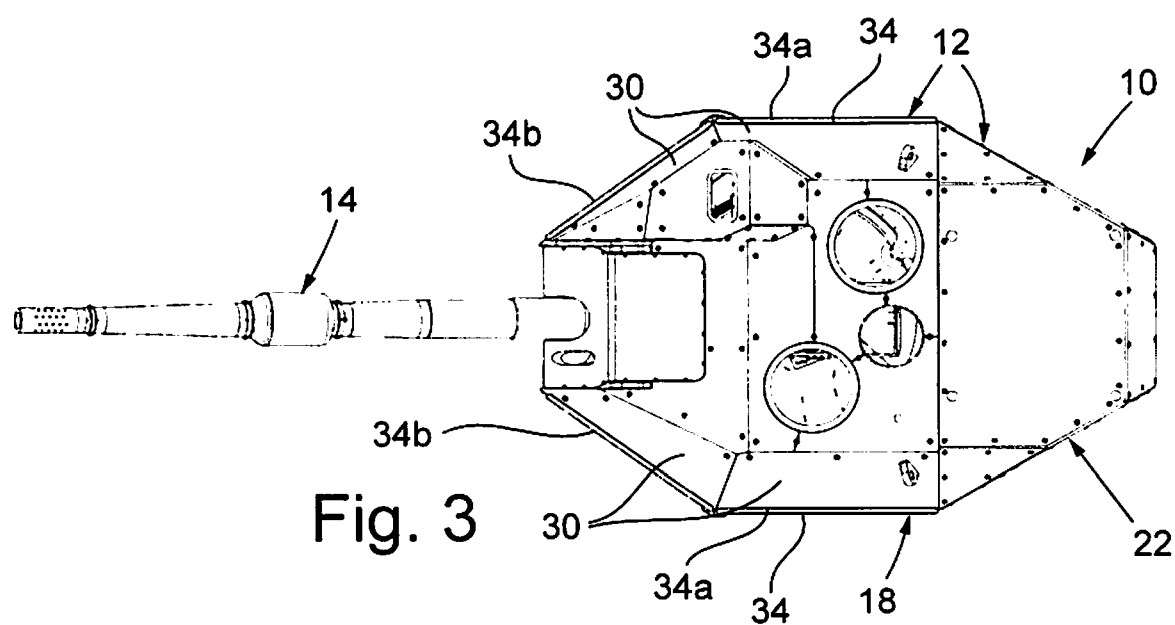
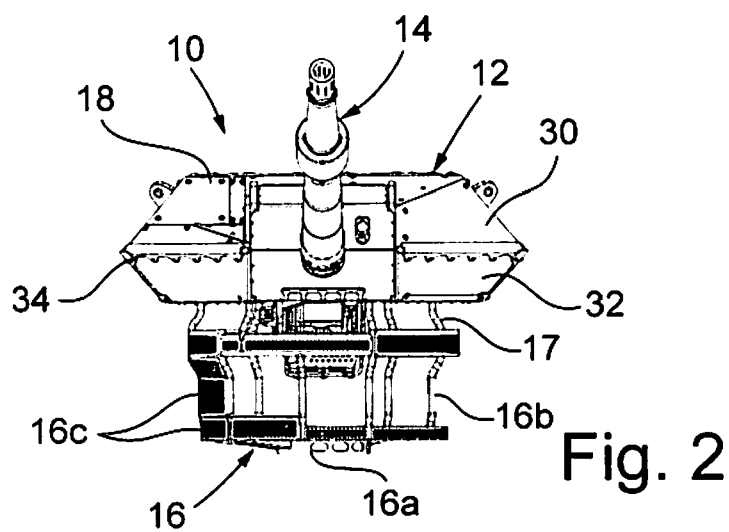
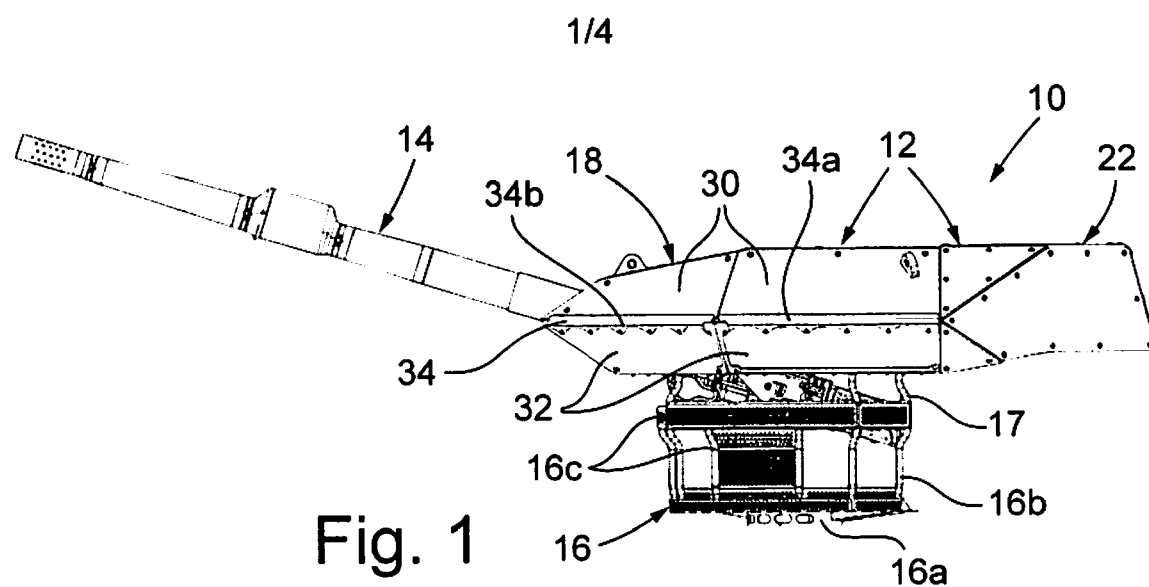
2. The turret according to claim 1, wherein the upper and lower half-shells define first and second lateral edge borders on the first and second sides of the casing at a meeting region.

5

3. The turret according to claim 2, wherein the upper and lower half-shells define a front edge border on the front of the casing at the meeting region.

10 4. The turret according to claim 3, wherein the edge border comprises the first and second lateral edge borders and the front edge border.

15 5. The turret according to any one of claims 1 to 4, wherein the connecting upright overlaps and connects a pair of mutually adjacent fixing elements or a pair of mutually adjacent base fixing elements.



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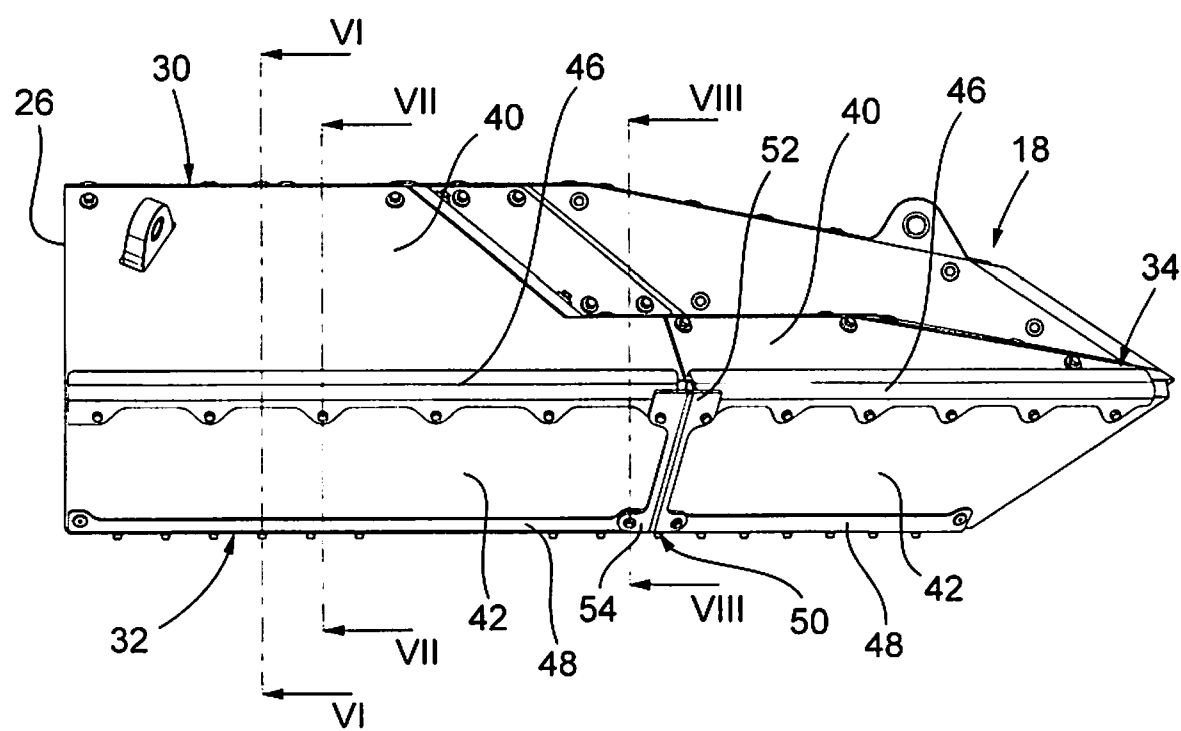
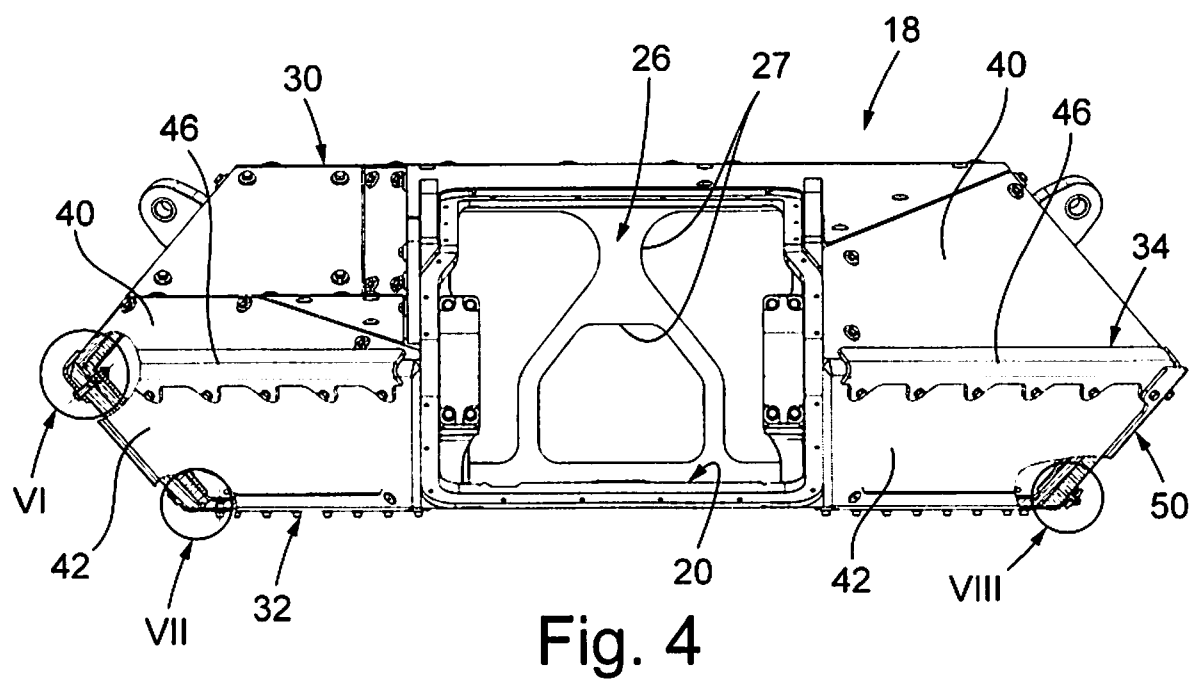
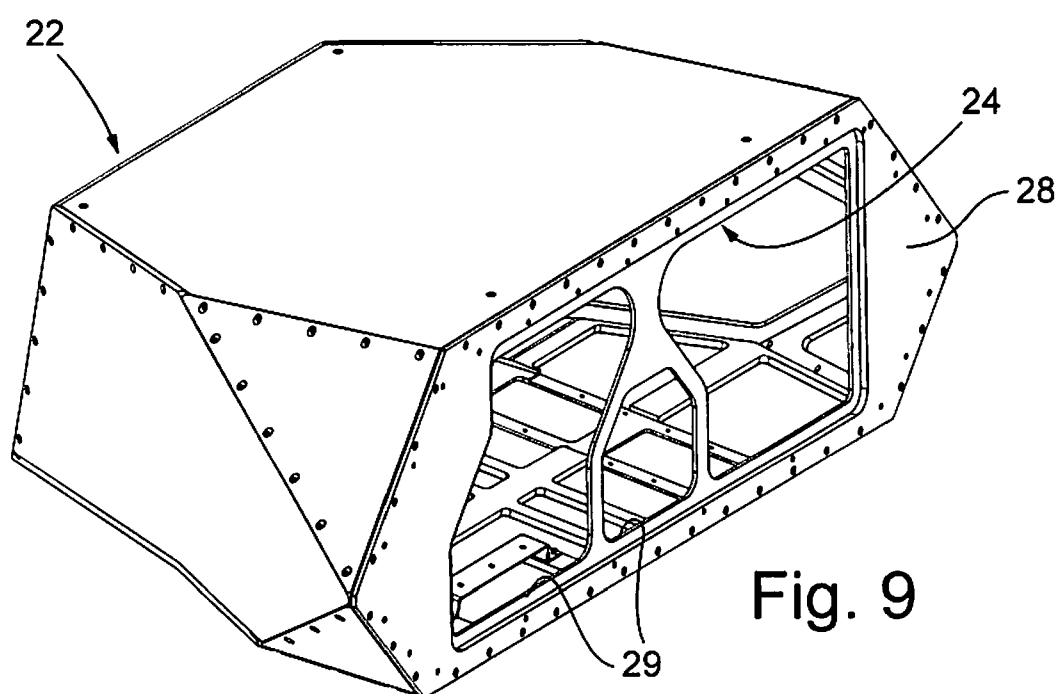
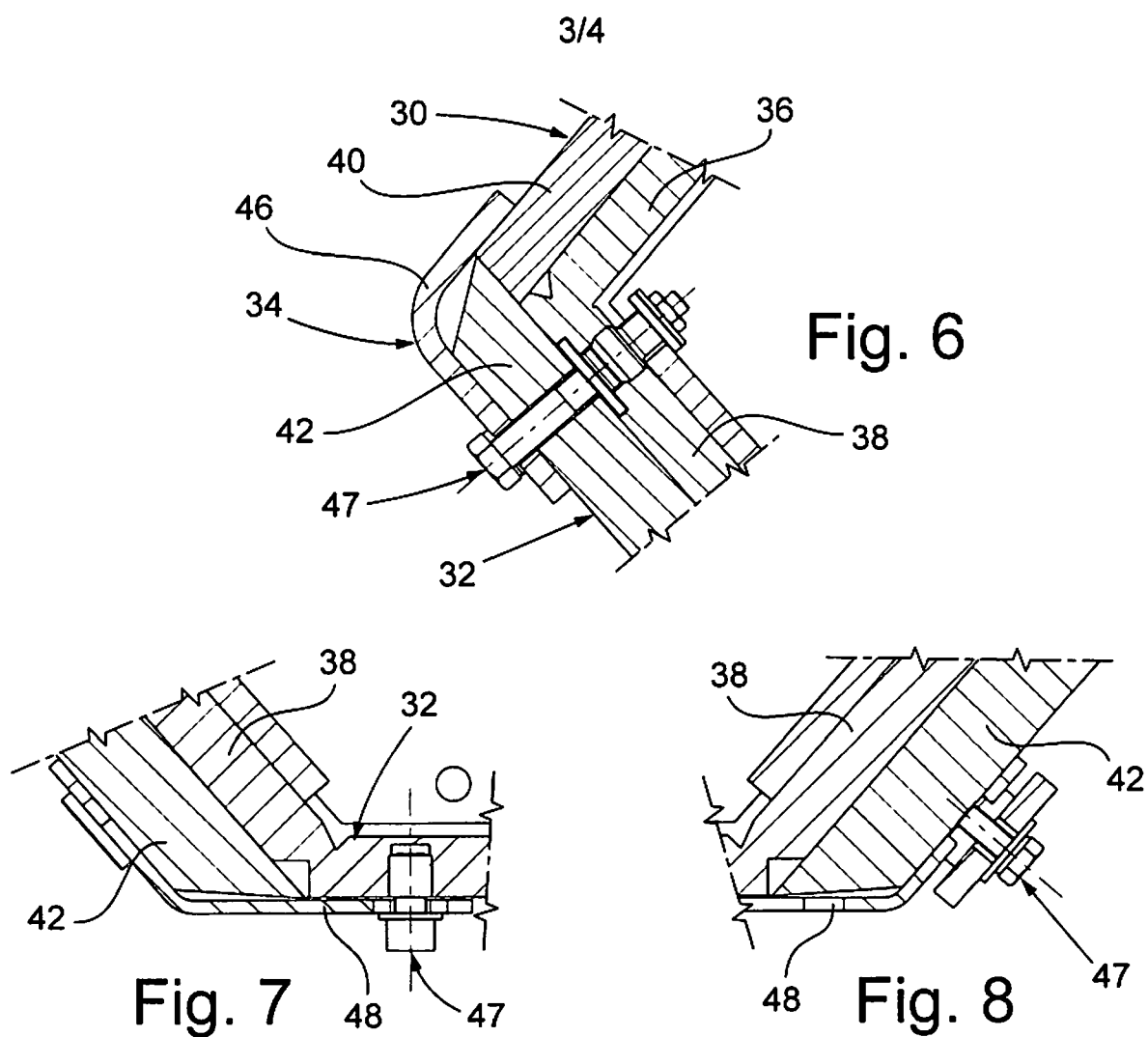


Fig. 5



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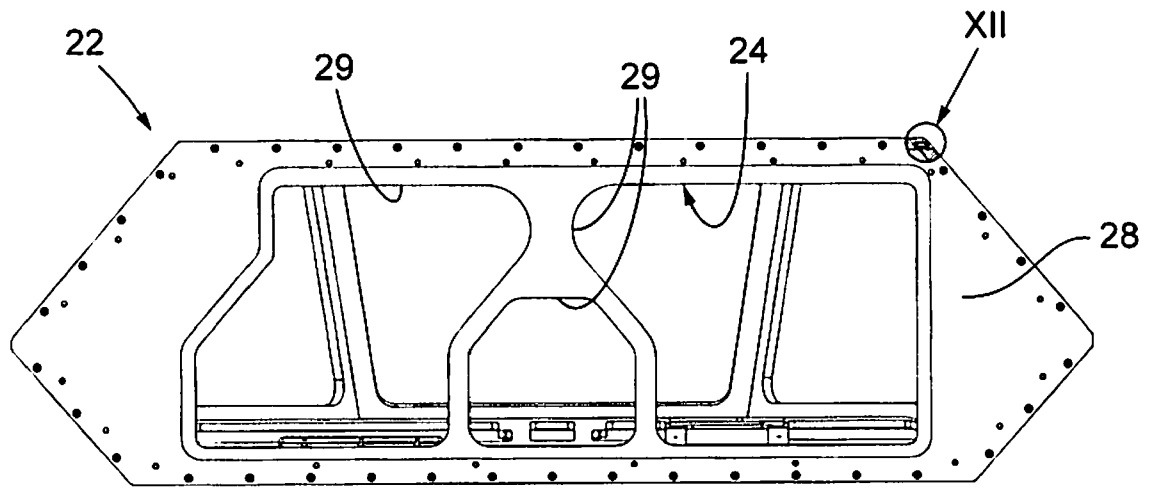


Fig. 10

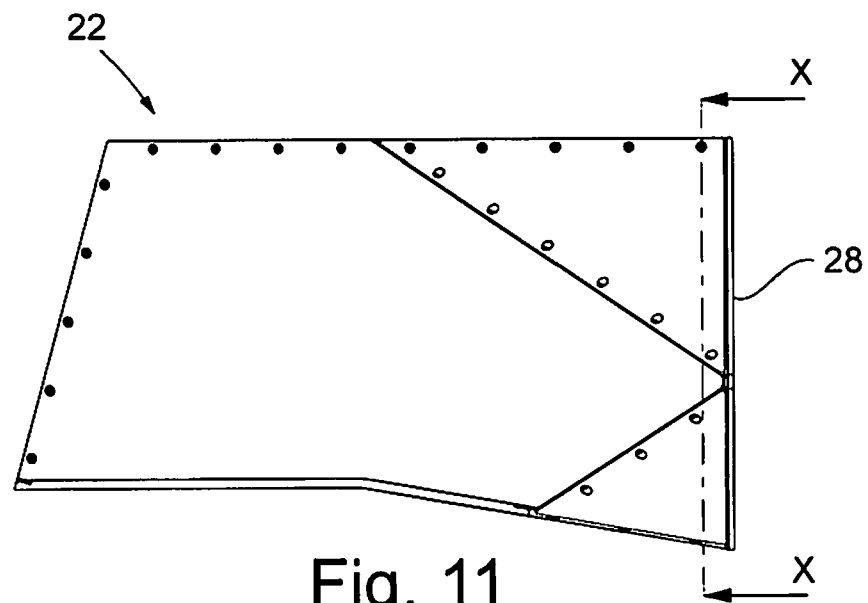


Fig. 11

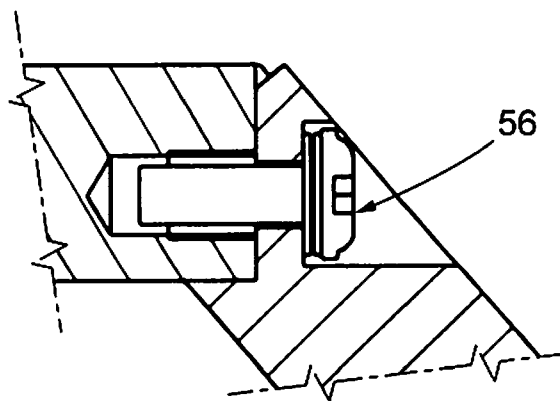


Fig. 12

