



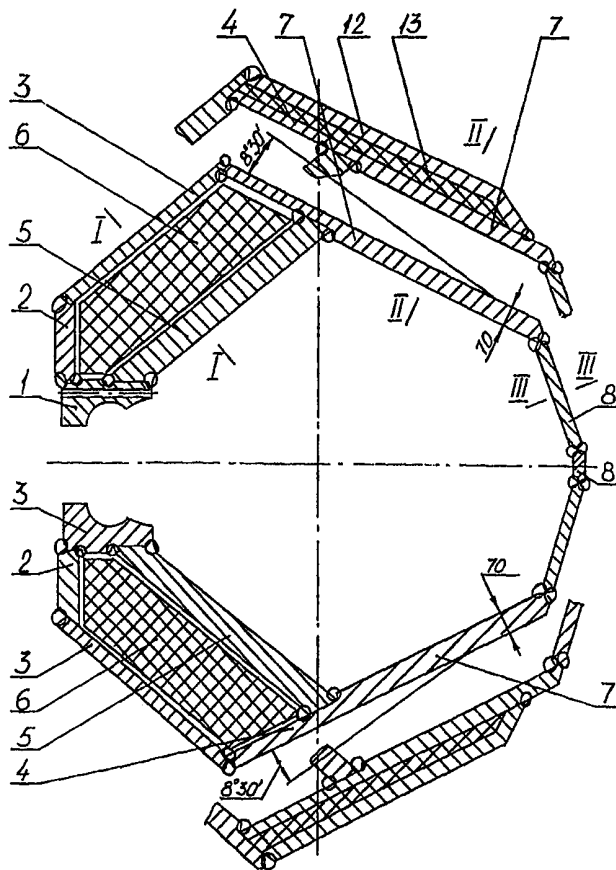
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<p>(21) International Application Number: PCT/IB97/01336 (22) International Filing Date: 24 October 1997 (24.10.97) (71) Applicants (for all designated States except US): SCIENTIFIC RESEARCH INSTITUTE OF STEEL (NII STALI) [RU/RU]; 81-A Dubninskaya Street, Moscow, 127411 (RU). URAL DESIGN BUREAU OF TRANSPORT ENGINEERING (UKBTM) [RU/RU]; 3 Michurin Street, Nischnij Tagil, 622051 (RU). RUSPA AG [CH/CH]; Pestalozzistrasse 2, CH-8200 Schaffhausen (CH). (72) Inventors; and (75) Inventors/Applicants (for US only): VASILEV, Vyacheslav [RU/RU]; Room 65, Ssari 13, Nischnij Tagil, 622052 (RU). KONDRATEV, Ury [RU/RU]; Room 45, Ssari 107, Nischnij Tagil, 622046 (RU). MOLODNYAKOV, Nikolay [RU/RU]; Room 7, Ilitcha 35, Nischnij Tagil, 622051 (RU). POTKIN, Vladimir [RU/RU]; Room 23, Okuneva 1, Nischnij Tagil, 622051 (RU). TUMASOV, Viktor [RU/RU]; Room 125, Junosti 43, Nischnij Tagil, 622018 (RU). ANIKINA, Lidia [RU/RU]; Room 235, Turistskaja 24-2, Moscow, 123480 (RU). GRIGORJAN, Valery [RU/RU]; Room 58, Valdajskij pr 12, Moscow, 125445 (RU). MIKHAILOV, Eugenij [RU/RU]; Room 29, Klotchkova 2, Moscow, 121374 (RU). ROTOTAEV, Dmitry [RU/RU]; Room 112, Flotskaja 74, Moscow,</p>		<p>125411 (RU). TEREKHIN, Igor [RU/RU]; Room 20, 3-ja Sokolnitcheskaja 1, Moscow, 107014 (RU). KHAB-BIKHOZHIN, Khabib [RU/RU]; Room 11, Rogatchevskij per. 7, Moscow, 127474 (RU). ANDRONOV, Vladislav [RU/RU]; Room 33, Pervomajskaja 19, Nischnij Tagil, 622001 (RU). SHOMPOLOV, Ury [RU/RU]; Cholkina 10, Nischnij Tagil, 622018 (RU). KUZNETSOV, Anatoly [RU/RU]; Room 41, Ordschonikidsse 13, Nischnij Tagil, 622051 (RU). (74) Agent: SCHAAD, BALASS, MENZL & PARTNER AG; Dufourstrasse 101, CH-8034 Zürich (CH). (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>

(54) Title: TURRET WITH COMBINED LAMINATED ARMOURING

(57) Abstract

The invention relates to armoured vehicles and can be used for increasing protection level of turrets of tanks and other mobile and stationary objects. The turret is characterised by that its embrasure is made as a single monolith component, and armoured walls (2, 3, 4, 5), space covers (9), the roof (10) and the bottom sheet (11) are separate components made of rolled steel armour which are manufactured in such a way that when they are assembled and welded into a turret the main metal of the joining components fully or partially covers component butts and weld joints from the direction of ballistic attack, besides, each armour wall of the turret (2, 3, 4, 5) has a support on the roof and the bottom sheet. Separate welded assemblies of the turret made of rolled armour sheets can be manufactured as single units, and turret sides can be made double-barrier with filling of the inter-barrier spaces with special fillings. This turret has practically the same ballistic resistance and survivability against ballistic threat for components made of rolled armour and the zones of welded joints, and by ballistic resistance it is superior to the cast turret.



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TURRET WITH COMBINED LAMINATED ARMOURING

The invention relates to the field of armoured vehicles and can be used for increasing protection level of tank turrets or other mobile and fixed objects.

There is a well-known cast turret with combined laminated armouring consisting in the front sector of an embrasure, upper front, front, side and back walls with spaces between them for protective fillers, featuring also side and rear walls and upper space covers, the roof and the bottom sheet made of rolled stock and welded to the turret casting ("Main Battle Tanks" edited by B.S.Safonov and V.I.Murakhovsky, Arsenal-Press Publishing House, 1993, Moscow, pp.59-60, 72).

Such turret design featured rather high structural strength and survivability when hit by projectiles and on condition that armour thicknesses were properly selected and effective protective fillers were used it was able to provide the prescribed level of ballistic resistance.

However, continuous growth of penetration capability of antiarmor weapons versus weight and dimensions limits existing for tanks as combat vehicles makes the protection designers to provide the needed level of ballistic resistance of modern tanks by way of simultaneous application of a complex of different methods and techniques of protection reinforcement, among which the main are the following: increase of

dynamic strength of armour materials used, development of new and improvement of existing structural patterns of armoured units and protective fillers used in them, application of additional dynamic protective devices, optimisation of the whole complex of protective measures with regard to power of antitank weapons at prescribed weight and dimensions limits.

As tank turrets are concerned, one of significant reserves of increase of their ballistic resistance or reduction of the weight of the turret steel base while retaining the existing ballistic protection level is increase of resistance of the steel armour used for turrets. Presently the turret base is manufactured of medium-hardness cast armour which is essentially (10-15%) inferior in ballistic resistance to medium hardness rolled homogeneous armour (RHA). Developments aimed at improvement of dynamic strength characteristics of cast armour steels in order to increase ballistic resistance have been much less successive than those for RHA. Thus, for the same weight the turret made of RHA can have higher ballistic resistance than the turret made of cast armour and besides, if RHA is used further improvement of ballistic resistance is possible.

The additional advantage of the turret made of rolled stock is the possibility to provide higher precision of manufacture because in the process of manufacturing the cast armour base of the turret the required casting quality and precision of the casting as to its dimensions and mass can hardly be achieved, and additional labour-consuming and non-mechanised operations are needed for removal of casting defects, adjustment of dimensions and mass of the casting including adjustment of spaces for fillers.

Realization of the structural advantages of the turret made of rolled stock as compared to cast turret is possible only if its ballistic resistance and survivability in the places of rolled armour elements joints meets the

general requirements to ballistic resistance and survivability of the turret as a whole.

The present invention is based on the task to design a turret with increased ballistic resistance by way of making it cast of rolled armour. This task has been solved due to the fact that the turret with combined laminated armouring consisting in the front sector of embrasure, upper front, front, lateral and back armour walls with spaces between them for protective fillers, consisting also of side and rear walls, covers of spaces, the roof and the bottom sheet, has an embrasure made as a single monolith component, and armour walls, covers of spaces, the roof and the bottom sheet are separate component parts made of rolled armour which are designed in such a way that when they are assembled and welded into the turret the main metal of the joining components fully or partially cover component butts and welded joints from the side of ballistic threat; besides, each armour wall of the turret has a support on the roof and the bottom sheet directly or via intermediate components.

It is advisable to manufacture separate welded joints consisting of rolled sheets of the same thickness as a single component. It is possible to weld additional side plates of rolled armour on the side armour walls of the turret and to fill the spaces formed between the armoured walls and the welded-on side plates with antiradiation materials.

Such design of the proposed turret provides high resistance to projectiles and high precision of manufacture.

The invention is illustrated by the following drawings:

- Fig.1 - the horizontal cross-section of the turret;
- Fig.2 - vertical radial cross-sections of the turret;
- Fig.3 and Fig.4 - variant of manufacturing of the upper front wall and rear wall accordingly of single bended parts.

The proposed turret consists of an embrasure 1 (Fig.1), upper front 2 (Fig.1,3), front 3 (Fig.1,2,3), lateral 4 (Fig.1), back 5 (Fig.1,2) armour walls, spaces with protective fillers 6 (Fig.1,2), side 7 (Fig.1) and rear 8 (Fig.1,4) armour walls, space covers 9 (Fig.1,2), the roof 10 (Fig.1,2) and the bottom sheet 11 (Fig.1,2).

In order to provide increased structural strength, ballistic resistance and survivability of the welded turret under attack of projectiles in the horizontal cross-sections upper front 2 (Fig.1,3) and back 5 (Fig.1,2) armour walls have a support of embrasure 1 (Fig.1), front armour walls 3 (1,2,3) have a support on upper front 2 (Fig.1,3) and lateral 4 (Fig.1) armour walls, lateral 4 (Fig.1) and side 7 (Fig.1) armour walls being made as single components supported by back armour walls 5 (Fig.1,2). In vertical radial cross-section upper front 2 (Fig.1,3), front 3 (Fig.1,2,3) and lateral 4 (Fig.1) armour walls via space covers are supported by back armour walls 5 (Fig.1,2), which in their turn are supported by the roof 10 (Fig.1,2) and special projections on the bottom sheet 11 (Fig.1,2) which is the base of the welded turret.

Installation of additional side plates of rolled armour 12 (Fig.1) on lateral 4 (Fig.1) and side 7 (Fig.1) armour walls and filling the spaces between the armour walls and side plates with protective materials 13 (Fig.1) is possible. Covering of weld joints by the main metal of joining components and mutual support of components promote reduction of impact load transmitted directly through weld joints and provide practically uniform resistance and survivability of the turret under effect of ballistic threat both against the components made of rolled armour and against zones of weld joints.

Thus the proposed design of the turret provides higher ballistic resistance, structural strength and survivability under projectile attack and can be used for tanks and other mobile and stationary armoured objects.

CLAIMS

1. The turret with combined laminated armouring consisting in the front sector of the embrasure (1), upper front (2), front (3), lateral (4) and back (5) armoured walls with spaces between them for protective fillers (6), side and rear (8) walls, space covers (19), the roof (10) and the bottom sheet (11), characterised in that the embrasure (1) is made as a single monolith part, and armoured walls (2,3,4,5), space covers (9), the roof (10) and the bottom sheet (11) are separate component parts made of rolled steel armour which are designed with possibility of full or partial covering of component butts or weld joints by main metal of joining components from the side of expected attack when assembled and welded into the turret, and each armour wall (2,3,4,5) of the turret has a support on the roof (10) and the bottom sheet (11) directly or via intermediate components.
2. The turret according to Claim 1, characterised in that its separate welded assemblies consisting of rolled sheets of the same thickness are made as single components.
3. The turret according to Claim 1, 2 characterised in that on its side (7) and lateral (4) armour walls additional side plates of rolled armour are welded, and spaces between the armoured walls and side plates are filled with protective materials.

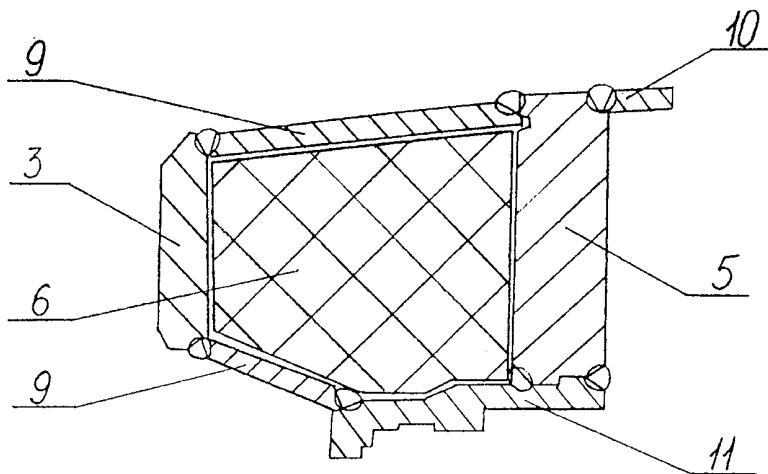


FIG. 2

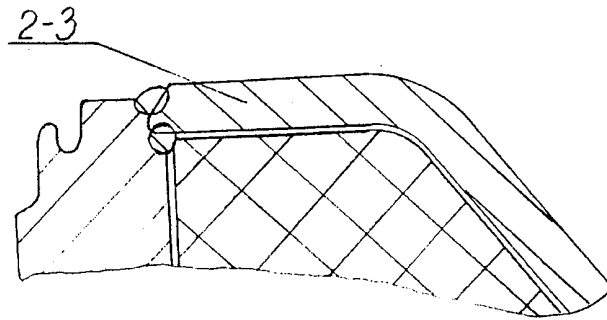


FIG. 3

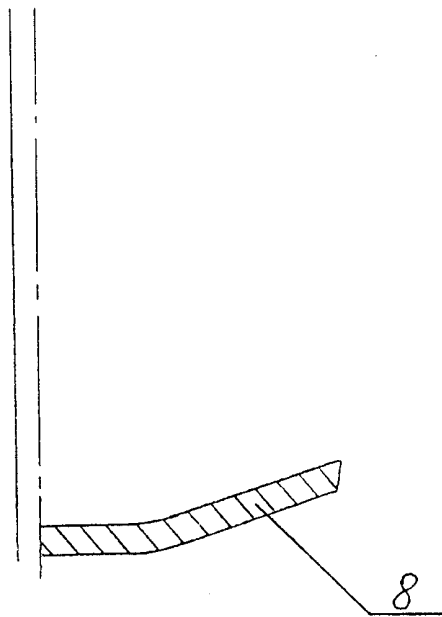


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 97/01336

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F41H7/04

According to international Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F41H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 412 122 A (BÖHM ET AL.) 25 October 1983 see column 8, line 56 - column 9, line 6; figures 57,68	1-3
A	DE 78 01 915 U (THYSSEN INDUSTRIE AG MASCHINENBAU) 28 November 1979 see page 11, line 5 - line 17; figures 5-8	1-3
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A	DE 79 08 157 U (THYSSEN INDUSTRIE AG MASCHINENBAU) 28 November 1979	
A	EP 0 520 854 A (CREUSOT-LOIRE INDUSTRIE) 30 December 1992	

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
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Information on patent family members

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