RUSSIAN FEDERATION

FEDERAL SERVICE
ON INTELLECTUAL PROPERTY

(nineteen) EN(eleven) 2 502 643(13)C9

(51) IPC
B64D 7/00 (2006.01)
B64D 27/16 (2006.01)
B64D 33/02 (2006.01)
B64D 45/00 (2006.01)
B64D 39/04 (2006.01)
B64C 1/36 (2006.01)

(12)REVISED DESCRIPTION OF THE INVENTION TO THE PATENT

Note: the bibliography reflects the state when reprinted

(21)(22) Application:**2011154437, 12/30/2011**

(24) Starting date of the patent term:
30.12.2011

Priority(s):
(22) Application date:**30.12.2011**

(43) Date of publication of the application:**07/10/2013**Bull.No.**nineteen**

(45) Published:**27.12.2013**

(15) Correction information:
Correction Version #1 (W1 C2)

(48) Correction published:
08/30/2019 Bull. No. 25

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(56) List of documents cited in the search report:**US 5683061 A, 04.11.1997. JP 1285494 A, 11/16/1989. US 7159818 B2, 01/09/2007. KREIZMER L.P. etc. Dictionary radio amateur, Moscow Leningrad, Energiya, 1966, p. 38, 692. US 4282909 A1, 11.08.1981. RU 2010123678 A, 12/20/2011. RU 2054022 C1, February 10, 1996. RU 2045798 C1, 10.10.1995. RU 2260230 C1, 10.09.2005. GB 2366913 A, 03/20/2002.**

(54)MULTIFUNCTIONAL AIRCRAFT WITH REDUCED RADAR VISIBILITY

(57) Abstract:
Invention applies to areas aircraft industry. The multifunctional aircraft contains a fuselage (1), wing panels (2), all-moving vertical tail consoles (4), all-moving horizontal tail consoles (3), cockpit canopy (5), horizontal edges of engine air intakes (6), fine-mesh nets, shielding intake devices and air ejection (7), lateral inclined edges of engine air intakes (8), device (9) reducing the effective scattering surface (ESR) of the power plant and the flap (10) of the in-flight refueling bay. The optical sensors are made with the possibility of turning in the idle state with the back side, with the radar-absorbing coating deposited on it, in the direction of the irradiating radars. The antenna compartments are closed with shielding diaphragms. The antenna planes are deflected from the vertical plane. Unit designs were used as antennas

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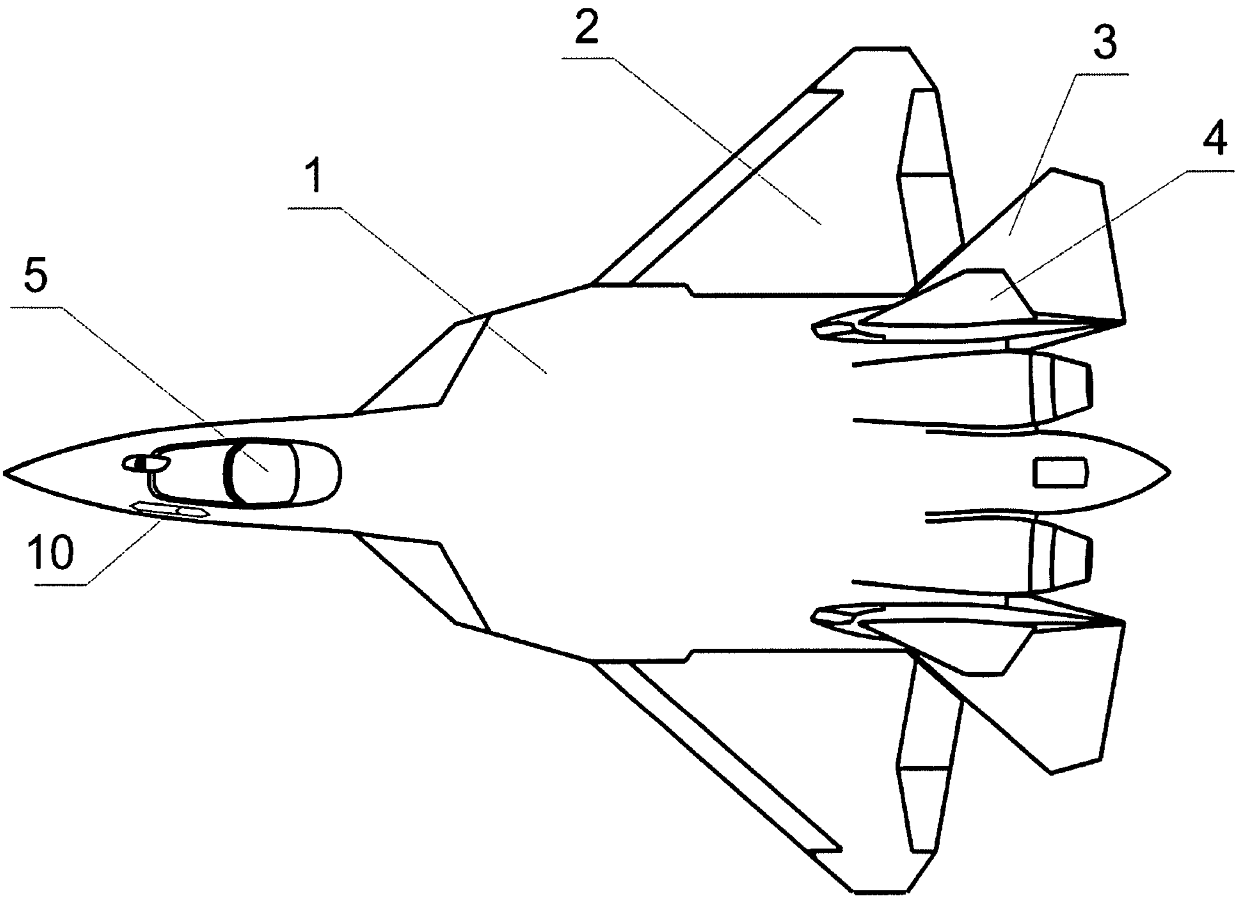
glider. The antenna-feeder system is made on the basis of low-reflective antennas in the radar wavelength range. The invention is aimed at reducing the value of radar signature. 5 ill.



Фиг. 1

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FEDERAL SERVICE
FOR INTELLECTUAL PROPERTY

(nineteen) EN(eleven) 2 502 643(13)C9

(51) Int. Cl.
B64D 7/00 (2006.01)
B64D 27/16 (2006.01)
B64D 33/02 (2006.01)
B64D 45/00 (2006.01)
B64D 39/04 (2006.01)
B64C 1/36 (2006.01)

(12)ABSTRACT OF INVENTION

Note: Bibliography reflects the latest situation

(21)(22) Application:**2011154437, 12/30/2011**

(24) Effective date for property rights:
30.12.2011

priority:
(22) Date of filing:**30.12.2011**

(43) Application published:**07/10/2013**Bull. No.**nineteen**

(45) Date of publication:**27.12.2013**

(15) Correction information:
Corrected version no1 (W1 C2)

(48) Corrigendum issued on:
08/30/2019 Bull. No. 25

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(54)MULTIFUNCTIONAL AIRCRAFT OF DECRASED RADAR SIGNATURE

(57) Abstract:

FIELD: transport.

SUBSTANCE: invention relates to aircraft engineering. Proposed aircraft comprises fuselage 1, outer wings 2, wings of all-moving vertical empennage 4, wings of all-moving horizontal empennage 3, cockpit canopy 5, horizontal edges of engine nacelles 6, closemeshed screen to shield air intake and discharge devices 7, lateral inclined edges of engine air intakes, device 9 to decrease engine absolute cross-section and flaps 10 of in-flight refueling rod compartment. optical transducers can turn in nonworking state by rear sides with radio absorption coating applied hereon in direction of illumination radars. Antenna compartments are closed by shielding membranes. Plates of antennas are deflected from vertical plane. Airframe structural elements are used as antennas. Antenna feeder system is built around low-radiation antennas in radar range of wavelengths.

EFFECT: decreased radar signature. 5 dwgs

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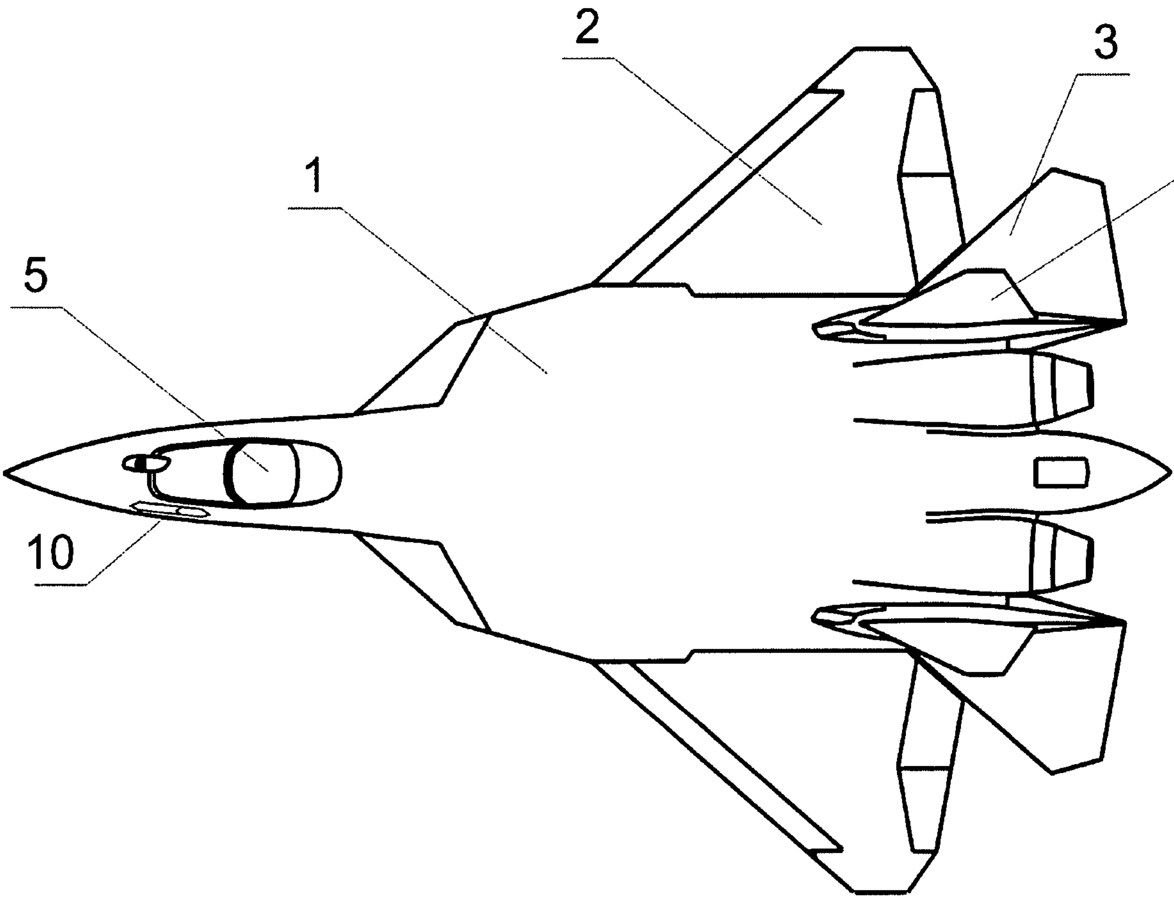

Фиг. 1

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The invention relates to the field of aircraft engineering, in particular to tactical aircraft, providing detection and destruction of air, surface and ground targets.

A well-known multifunctional aircraft (Fomin A.V. "Su-27. History of a fighter", Moscow, "RA Intervestnik", 1999, p. passive countermeasures, surveillance and aiming means (radar sighting system, optoelectronic aiming system), control and registration system of parameters, communication system between aircraft and with control points, flight and navigation system, countermeasures system, control system for weapons of destruction and passive countermeasures , providing navigation, piloting in manual and automatic control modes, built-in system control, inter-aircraft navigation and exchange of tactical information in the group, guidance from command and control centers,radar survey of airspace and the underlying surface, airspace location, detection and tracking of ground and air targets, target designation of weapons, setting active radar jamming, the use of uncorrectable weapons, as well as aviation weapons (ASP) with passive thermal, passive and active radar heads homing on ground, air and surface targets, the use of passive countermeasures.passive and active radar homing for ground, air and surface targets, the use of passive countermeasures.passive and active radar homing for ground, air and surface targets, the use of passive countermeasures.

As disadvantages of the known technical solution, it should be noted the high value of the effective scattering surface (ESR), which determines the characteristics of the detection of an aircraft by enemy radar equipment. For the famous aircraft EPR value is about 10-15m^2(here we consider the average value for the selected angle).

The technical result, to which the invention is directed, is in reducing the value of the radar visibility of the aircraft to an average value of the order of 0.1-1 m^2.

The invention is illustrated by drawings, where figure 1 shows an aircraft integral aerodynamic layout - top view; figure 2 - aircraft integral aerodynamic layout - bottom view; figure 3 - aircraft integral aerodynamic layout - front view; figure 4 - section A-A figure 2.; figure 5 - section B-B figure 2.

On the presented drawings, positions are indicated: 1 - fuselage,
2 - wing consoles,
3 - consoles of the all-moving horizontal tail (TsPGO), 4 - consoles of the all-moving vertical tail (TsPVO), 5 - cockpit canopy,

6 - horizontal edges of the engine air intakes, 7 - fine-mesh nets covering air emissions, 8 - lateral inclined edges of the engine air intakes, 9 - a device that reduces the EPR of the power plant,

10 - flaps of the in-flight refueling boom compartment. The aircraft onboard equipment complex includes: general aircraft equipment; indication system and controls; a set of means of destruction, active and passive countermeasures; observation and sighting means (radar sighting system, optical-electronic sighting system);

a system for monitoring and recording parameters, a communication system between aircraft and with control points; flight and navigation system; a system of countermeasures; a control system for means of destruction and passive countermeasures, providing navigation, piloting in manual and automatic control modes; built-in system control; inter-aircraft navigation and exchange of tactical information in a group, guidance from command and control centers, radar survey of airspace and the underlying surface, detection and tracking of air and ground targets, setting active radar jamming, uncorrectable weapons of destruction; as well as aviation weapons with passive thermal, passive and active radar homing heads for air, ground surface targets,

The EPR of the aircraft consists of the EPR of its following components: airframe; power plant; optical and antenna systems of the onboard equipment complex; outboard and retractable equipment in flight.

The value of the RCS of the airframe and the power plant is determined by three factors:

- the shape of the theoretical contours and the layout of the airframe, including air intake and air channel;

- design of airframe units, technological and operational joints skins, flaps, hatches and joints between the movable and fixed parts of the aircraft airframe;

- use of radio-absorbing and shielding materials and coatings. The shape of the theoretical contours and the layout of the airframe made it possible to reduce the amount of energy reflected by EM waves in individual angles by redistributing the maxima of the backscattering diagram to the minimum number of directions and to the least dangerous sectors.

constructive measures

Cleaning the ASP inside the airframe made it possible to reduce the overall RCS by eliminating the reflection of electromagnetic waves from the irradiating radars from the ASP and their triggers.

The implementation of the air intake channel S-shaped in combination with radio absorbing coatings (RPC) provides a reduction in RCS in the axial directions. In other sectors of the front hemisphere (FPS) - due to the screening of the input guide vane (VNA) of the engine, from the elements of which the electromagnetic (EM) waves of the irradiating radar are mainly reflected, which is a significant share (up to 60%) in the RCS of the airframe - engine system in the PPS. The application of RPP on the walls of the air intake channel (AI) makes it possible to reduce the magnitude of the EM signals reflected from the VNA and re-reflected onto the channel walls, thereby the overall level of the RCS of the air intake in the ABL decreases.

The device 9 in the air intake channel to reduce the EPR of the engine in the front hemisphere can be installed in a channel of any shape in front of the VNA, but it is mainly installed in "straight" channels. The device 9 acts as a screen that partially covers the VNA in the paraxial directions from the ingress of EM waves. In addition to shielding, the device 9 divides the air intake channel in front of the AHA into a number of separate cavities formed by cylindrical (or concentric or non-concentric) or flat surfaces, while the flat surfaces can be parallel or intersecting. Each cavity has a smaller cross-sectional area than the air intake channel in this zone. Such segmentation with simultaneous coating of the walls of the RPP segments makes it possible to reduce the value

The EM signals reflected from the VNA and re-reflected onto the walls of the cavities of the device 9, thereby reducing the overall level of EPR of the VZ in the PPS.

Bringing the sweep angles of the leading and trailing edges of the bearing surfaces, air intakes, hatch doors to two or three directions other than the axial one, makes it possible to ensure that the global maxima of the backscatter diagram (BSR) are reduced to these directions. Such a DOR causes a decrease in the overall level of ESR in PPP.

The inclination of the sides of the fuselage 1 in the cross section, the inclination of the vertical aerodynamic surfaces (vertical tail 4, side edges 8 VZ) to one direction in the cross section makes it possible to reduce the EPR in the lateral hemisphere (BPS) due to the re-reflection of the EM wave incident on the inclined surface of the airframe, in direction other than the direction of the irradiating radar.

Screening of air intake and exhaust devices with structural elements, as well as fine meshes, makes it possible to reduce or eliminate the RCS component from airframe "inhomogeneities" (such as a hole, slot, sinus) due to the fact that the linear size of the mesh cell covering the inhomogeneity is less than ¼ of the length of the EM waves that irradiate the aircraft. In such a situation, the fine mesh acts as a screen for the EM wave, which reduces the component of these inhomogeneities in the EPR.

Closing the in-flight refueling boom compartment with flap 10 excludes the niche and boom components from the overall EPR of the aircraft.

The use of all-moving vertical tail 4 allows to reduce the total area of the AO and, as a result, to reduce the level of the signal reflected from the AO, which, in turn, reduces the RCS value in the BPS.

The use of conductive sealants makes it possible to ensure electrical conductivity between individual structural and technological elements of the airframe, which, in turn, makes it possible to exclude the “inhomogeneities” component in the EPR of the aircraft (such as a slot, joint) due to the fact that in the absence of electrical inhomogeneities, there is no scattering of surface EM waves .

The use of RPP allows you to significantly reduce the level of global EPR maxima due to the fact that the principle of operation of the RPP is to partially absorb the energy of the EM wave incident on the material, therefore, to reduce the level of the reflected radar signal.

The implementation of the glazing of the lantern metallized provides EM impermeability in such a way that the glazing, in fact, is an impenetrable inclined wall that reflects the incident EM wave away from the irradiating radar.

The main measures to reduce the component of the onboard equipment complex in the EPR are as follows:

1. The use of frequency-selective structures in the fairing of the antennas, allowing transmit radiation in the operating frequency range of its own antenna and be impermeable to radiation of other frequency ranges (radiating radars). Thus, EM waves incident on antenna radomes from irradiating radars are re-reflected (due to the shape of the radomes formed by surfaces inclined to the vertical plane) away from the direction of irradiation.

2. Turning the optical part of the optical sensors in the idle state with applying RPP on the back side. Thus, in the non-working (passive) state of the sensors (minimum RCS state), the sensor faces the direction

irradiating the radar side with the applied RPP, providing partial absorption of incident EM waves, thereby reducing the RCS.

3. The use of shielding diaphragms in antenna compartments to eliminate the effect wandering wave, when the irradiating wave, after repeated reflection in a closed compartment, is amplified and radiated into outer space. The shielding diaphragm is installed around the antenna post in such a way that it surrounds the post along the periphery. RPP is applied to the diaphragm wall facing the irradiating radar. When irradiated, the protective diaphragm prevents the EM wave from penetrating inside the antenna compartment, while simultaneously absorbing part of the energy of the incident wave and reducing the RCS.

4. Deviation of the plane of the antennas from the vertical and, consequently, the deviation the normals of the antennas from the horizontal plane provide a change in the direction of the reflected EM waves away from the irradiating radar, thereby reducing the EPR of the antennas.

5. Reducing the total number of antennas and using the design of the units airframe as antennas (for example, vertical tail as a communication antenna). Reducing the total number of antennas reduces the overall RCS, tk. each antenna contributes a certain component to the EPR. The use of an existing airframe assembly (VO) as an antenna makes it possible not to use a separate antenna, which naturally reduces the RCS, compared with the option of a separate antenna.

6. Application of an antenna-feeder system based on low-reflective antennas Radar wavelength range. The low-reflective properties of the antennas are ensured due to the fact that they are not protruding beyond the outer contours of the aircraft and do not introduce a component into the EPR of the aircraft due to direct reflection of EM waves.

Comprehensive implementation of the set of these measures provides the maximum effect of reducing visibility with a minimum negative impact on the aerodynamic, weight, technological, operational and other characteristics of the aircraft.

(57) Claim

the air intake and ejection devices are shielded, the in-flight refueling rod compartment is closed by a flap, in addition, the spaces between the individual structural and technological elements of the airframe are filled with conductive sealants, the canopy glazing is metallized, the antenna radomes are made of frequency-selective structures; optical sensors are made with the possibility of turning them out of operation by the back side, with a radio absorbing coating applied to it, in the direction of the irradiating radar; antenna compartments are closed with shielding diaphragms; antenna planes are deflected the spaces between the individual structural and technological elements of the airframe are filled with conductive sealants, the glazing of the canopy is made of metallized, the antenna fairings are made of frequency-selective structures; optical sensors are made with the possibility of turning them out of operation by the back side, with a radio absorbing coating applied to it, in the direction of the irradiating radar; antenna compartments are closed with shielding diaphragms; antenna planes are deflected the spaces between the individual structural and technological elements of the airframe are filled with conductive sealants, the glazing of the canopy is made of metallized, the antenna fairings are made of frequency-selective structures; optical sensors are made with the possibility of turning them out of operation by the back side, with a radio absorbing coating applied to it, in the direction of the irradiating radar; antenna compartments are closed with shielding diaphragms; antenna planes are deflected from the vertical plane; in this case, at least partially, the structures of the airframe units are used as antennas, and the antenna-feeder system is made on the basis of low-reflecting antennas in the radar wavelength range.

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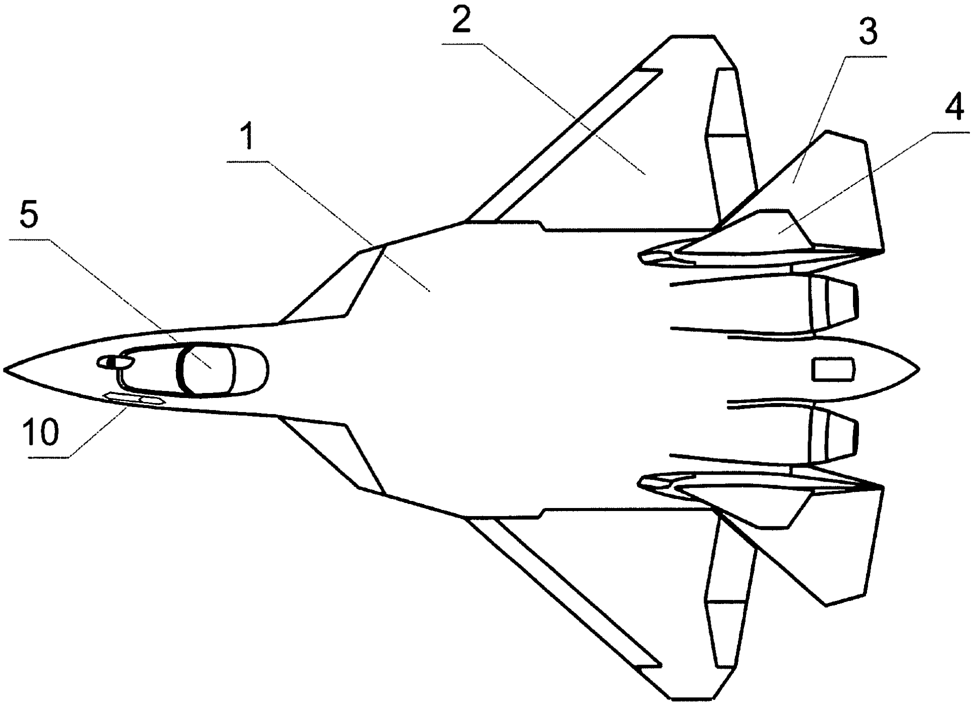

Фиг. 1

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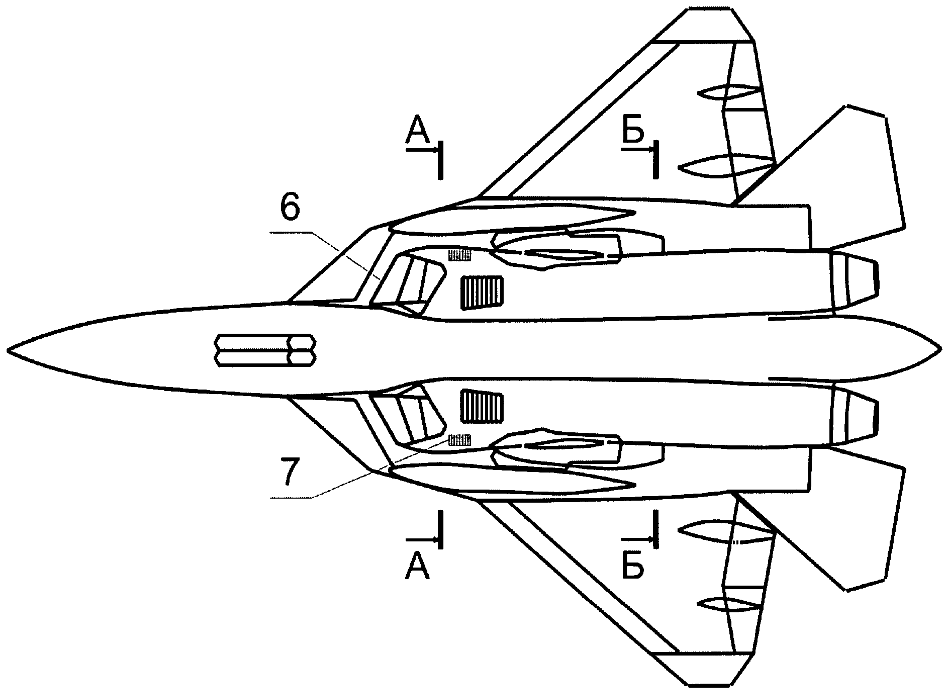

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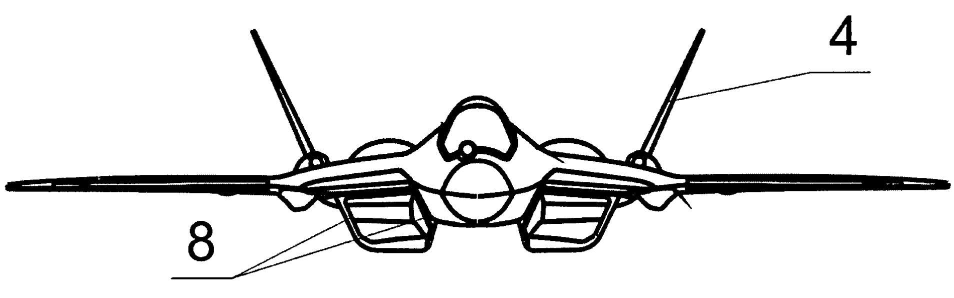
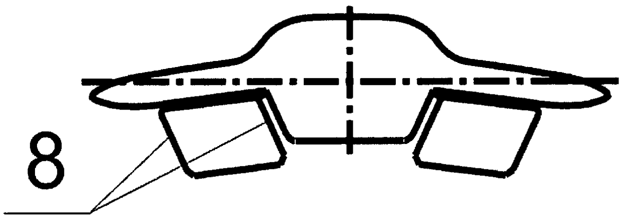


Фиг. 3

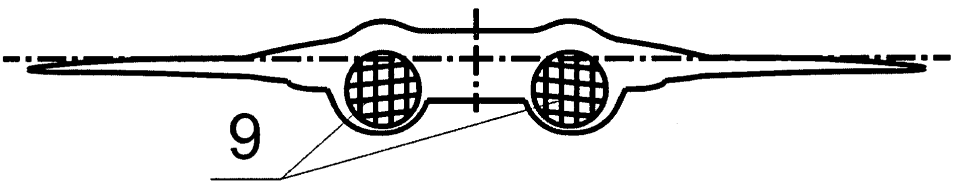
3

А-А



Фиг. 4

Б-Б



Фиг. 5