

FIREARM SUPPORT

DESCRIPTION**5 Technical field**

The invention relates to a firearm support for a firearm, which can be advantageously used in a vehicle.

Technological background

In the defense field, it is known that firearms have a
10 field of aim that is substantially rectangular or square,
as, in known firearm supports, the angular range in
elevation/depression and the azimuthal angular range (or
traverse) are independent of one another. In other words,
the limit profile delimiting the possible trajectories of
15 the projectiles coming out of the firearm is substantially
rectangular or square.

Known firearm supports for a firearm suffer from some drawbacks.

One drawback lies in the fact that firearms can often
20 open fire within a firing profile having an irregular
shape; hence, in order to avoid hitting undesired objects,
it is necessary to reduce the traverse angle and/or the
elevation/depression angle of the firearm, thus obtaining a
firing profile that is too reduced. This drawback can
25 occur, for example, when the arm is installed on a vehicle
having an opening with an irregular shape or when it is
necessary to open fire without the risk of hitting
important elements of the vehicle itself, such as for
example the fuel tank, the blades of the helicopter, etc.

30 Summary of the invention

An object of the invention is to provide a firearm support for a firearm, which is able to solve this and

other drawbacks of the prior art and which, at the same time, can be produced in a simple and economic fashion.

In particular, one of the advantages of the invention lies in the possibility of exploiting - as much as possible
5 - the field of aim within which a firearm can open fire, though operating in total safety and minimizing the risk of hitting undesired objects.

A further advantage lies in the possibility of creating a firing profile with an irregular shape.

10 According to the present invention, this and other objects are reached by means of a firearm support for a firearm having the features set forth in the appended independent claim.

The appended claims are an integral part of the
15 technical teachings provided in the following detailed description concerning the invention. In particular, the appended dependent claims define some preferred embodiments of the invention and describe optional technical features thereof.

20 **Brief description of the drawings**

Further features and advantages of the invention 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
25 accompanying drawings, wherein:

- figures 1a and 1b are perspective views of a first variant according to the invention, in two different operating positions;
- figure 2 is a schematic side view of the variant shown
30 in figures 1a and 1b;
- figures 3a and 3b are perspective views of a second variant according to the invention, in two different

operating positions;

- figures 4a and 4b are perspective views of a detail of the invention, in two different operating positions;

- figures 5a, 5b, 5c, 5d are perspective views of a detail of the invention, in different operating positions.

Detailed description of the invention

In the introduction to the description, you will find a non-limiting description of an explanatory support system, with which the firearm support can be associated, with special reference to the use in vehicles.

The vehicle on which the support system can be installed comprises a compartment to accommodate the crew, wherein the compartment has:

- a bearing surface 4,
- an upper structure 6 overlooking the bearing surface 4, and
- an opening 8, through which a firearm 10 is going to shoot.

The support system comprises:

- an anchoring portion 20, for being fixed, preferably in a removable manner, to the upper structure 6 and is located in the compartment,
- a mobile support 22, or mobile support structure, which is coupled to anchoring portion 20 in a mobile manner, for receiving firearm 10, and is able to allow firearm 10 to move between an operating position, in which firearm 10 is ready to shoot through opening 8, and a non-operating position, in which firearm 10 is retracted. When firearm 10 is retracted, the space taken up inside the compartment is minimized.

Firearm 10 can be, for example, a machine gun, an electric machine gun, a Gatling machine gun, a gas-operated

reloading machine gun or other types of known firearms.

With reference to the preferred variants shown in the accompanying drawings, the vehicle can be an aircraft, such as for example a helicopter or a fixed-wing airplane. Alternatively, the support system can be applied to further vehicles, such as for example a ship or a ground vehicle (for example a vehicle with tracks or a vehicle on wheels). In case of an aircraft, the upper structure of the compartment can be the fuselage.

Bearing surface 4 substantially is the floor of the vehicle, on which the crew can usually walk and which, if necessary, can also be used as a loading surface. Upper structure 6 comprises the side walls and the ceiling of the compartment; upper structure 6 can be the fuselage of an aircraft. Therefore, according to the invention, the support system for the firearm substantially hangs - or is suspended - from said upper structure 6. In this way, the bearing surface substantially remains free, thus minimizing the space occupied in the compartment of the vehicle.

According to an embodiment, anchoring portion 20 can be fixed to at least one rib or spar belonging to upper structure 6 of the compartment, in particular to the fuselage of the aircraft. Furthermore, anchoring portion 20 can be associated with further structural elements belonging to upper structure 6 of the vehicle, such as beams, panels, etc.

With reference to the variant shown in figures 1a, 1b, and 2, mobile support 22 can slide on anchoring portion 20, especially projecting under it. Anchoring portion 20 is an oblong element. In particular, anchoring portion 20 is designed to be fixed to a plurality of ribs or spars (indicated, by way of example, with 6). Anchoring portion

20 includes a system of guides 24, to enable the sliding movement of mobile support 22. By mere way of example, the variant of the support system shown herein can advantageously be installed in a helicopter, maybe a Boeing® CH-47 helicopter. As it is known, CH-47 is a tandem rotor helicopter having a rear loading ramp to load men and equipment, such as ground vehicles. Rear ramp 9 is used to open and close opening 8 through which firearm 10 is going to shoot. This support system can be associated with other types of vehicles or aircrafts having a rear loading ramp.

According to a particular embodiment, in the operating position, firearm 10 at least partly projects from opening 8 and, in the non-operating position, said opening can be completely closed.

Preferably, mobile support 22 comprises an arm 26, which is connected, at a first end of its, to anchoring portion 20 in a mobile manner, and is connected, at a second end of its, to a firearm support 28, which is able to allow firearm 10 to rotate relative to arm 26.

With reference to figures 1a and 1b, arm 26 can slide relative to anchoring portion 20. In particular, the support system comprises a sliding bracket 30, which can slide on the system of guides 24 and is coupled to arm 26. Arm 26 is interposed between a pair of sliding brackets 30. For example, arm 26 is coupled between the pair of sliding brackets 30 by means of pins 32, in a removable manner. It is clearly possible to also use other known fixing means to enable the coupling between arm 26 and sliding brackets 30.

Figures 1a and 3a show the support system in the operating position; figures 1b and 3b show the support system in the non-operating position. With reference to the variant shown in figures 1a and 1b, in the non-operating

position, mobile support 22 is farther away from opening 8 through which firearm 10 is going to shoot. In this position, it is possible to close opening 8, for example by closing rear ramp 9.

5 With reference to the variant shown in figures 3a and 3b, mobile support 22 can rotate relative to anchoring portion 20. Anchoring portion 20 is fixed to upper structure 6; for example, anchoring portion 20 is coupled, preferably in a removable manner, to at least one rib or
10 spar. Advantageously, anchoring portion 20 includes a pair of brackets 34 coupled to upper structure 6, in particular to a rib or spar. Mobile support 22 comprises arm 26, which is connected, at a first end of its, to anchoring portion 20 in a mobile manner, and is connected, at a second end of
15 its, to a firearm support 28, which is able to allow firearm 10 to rotate relative to arm 26. Preferably, arm 26 can rotate relative to anchoring portion 20. In particular, arm 26 is hinged to anchoring portion 20, so as to rotate around a rotation axis; advantageously, this rotation axis
20 is substantially horizontal.

Conveniently, though not necessarily, there is provided an actuator means (or "actuator") to control the movement of mobile support 22 relative to anchoring portion 20. For example, the actuator means controls the movement
25 of arm 26 relative to anchoring portion 20. Advantageously, the actuator means is also designed to keep said mobile support 22, and in particular arm 26, in a predetermined position relative to anchoring portion 20.

With reference to the variant shown in figures 3a and
30 3b, the actuator means includes a cord or rope 36, which is connected to arm 26 so as to allow it to rotate around the rotation axis. Similarly, a chain can be used. Rope 36 is

operated by an operating mechanism. In the example shown herein, the operating mechanism can be manually operated by a user. In particular, the operating mechanism includes a turning handle 38, for being held by a user and, by
5 turning, winds and - respectively - unwinds rope 36, thus controlling the rotation of arm 26. According to a different variant, rope 26 is operated by an automatic operating mechanism.

With reference to the variant shown in figures 1a, 1b,
10 and 2, the actuator means advantageously is a linear actuator to control the sliding movement of mobile support 22 relative to anchoring portion 20.

Generally speaking, the actuator means can be manually-operated or automatic. For example, in case of
15 automatic operation, it is possible to use a motor means, conveniently an electric motor, which is controlled by a control unit. It is possible to provide a known interface, through which the user gives orders to the control unit so as to operate the actuator means and move mobile support 22
20 relative to anchoring portion 20.

Figure 3a shows the support system in the operating position; figure 3b shows the support system in the non-operating position. In the non-operating position, mobile support 22 and firearm 10 do not interfere with opening 8
25 through which firearm 10 is going to shoot, and opening 8 can be closed. For example, the opening can be a side opening made on the side of an aircraft, such as a helicopter.

Advantageously, with reference to the variants
30 including arm 26, said arm 26 is made of carbon fiber or titanium. In this way, the weight of the support system can be minimized, in particular reducing the mechanical forces

acting upon the bearing structure of upper structure 6, including, for example, the ribs and spars.

Optionally, a first locking system allows mobile support 22 to be locked, in a releasable manner, relative to anchoring portion 20 in a mutual position. Preferably, the locking system allows mobile support 22 to be locked, in a releasable manner, relative to anchoring portion 20 in a plurality of mutual positions. In particular, the first locking system allows arm 26 to be locked, in a releasable manner, relative to anchoring portion 20 in at least one mutual position. With reference to the first variant shown herein, the mutual position corresponds to a linear position assumed by arm 26 along the oblong element of anchoring portion 20, in the direction of the sliding line of arm 26. With reference to the second variant shown herein, the mutual position corresponds to an angular mutual position between arm 26 and anchoring portion 20, with reference to a rotation axis around which arm 26 can be moved relative to anchoring portion 20. For example, a first mutual position is associated with the operating position and a second mutual position is associated with the non-operating position.

The first locking system can be manually activated/deactivated by a user. Alternatively, the locking system can be activated/deactivated by means of a control unit; for example, the user can act upon an interface to generate a locking/release signal to activate/deactivate the mutual locking between the respective components. For example, this first locking system can be used when there are no actuator means to move mobile support 22 relative to anchoring portion 20. With particular reference to figures 3a and 3b, arm 26 can be locked in the operating condition

and in the non-operating condition by means of a pin passing through holes 35 made in at least one bracket 34 and the arm 26.

The support system can be advantageously installed in
5 an existing vehicle in a quick and effective manner.

Advantageously, firearm 10 can move relative to arm 26. In particular, firearm support 28, in a known manner, allows firearm 10 to rotate in elevation and in traverse, so as to allow the user to aim at a target and start
10 shooting.

Firearm support 28 comprises an innovative mechanism, for defining the limit profile delimiting the possible trajectories of the projectiles coming out of firearm 10. This profile is also known as "field of aim" or "firing
15 profile".

As we will explain more in detail below, the aforesaid mechanism operates - in an advantageous manner - by means of a principle substantially of the "cam" type.

Firearm support 28 for firearm 10 comprises:

- 20 - a body 104, which is provided with at least one profile 106 on its surface;
- a feeler pin 100, for striking against profile 106 and being coupled to firearm 10 so as to follow the movement of said firearm 10;
- 25 - a support element 108, rotatable around a first axis z-z (traverse axis) relative to body 104, support element 108 being also adapted to be coupled to firearm 10, thus allowing a mutual rotation between said firearm 10 and said support element 108 around a second axis x-x (elevation
30 axis).

Conveniently, when using the system, the first axis z-z is substantially vertical, in particular when firearm 10

is in the operating position.

Feeler pin 100 includes a first end 101, which can be coupled to firearm 10, and a second end 102, which is adapted to strike against profile 106. In figure 4a the second end 102 is spaced apart from profile 106, whereas in figure 4b the second end 102 strikes against profile 106.

In the embodiment shown, feeler pin 100 is mobile in a guided manner relative to support element 108 and is preferably shaped like a rod having, on opposite sides, the first end 101 and the second end 102.

Preferably, the second end 102 comprises a rolling element, such as a roller, for sliding along profile 106, thus guiding the movement of firearm 10.

The cooperation between profile 106 and feeler pin 100 delimits the angular width allowed to firearm 10 around the second axis x-x (elevation axis), depending on the angular position of support element 108 relative to body 104 with reference to the first axis z-z (traverse axis). By determining the shape of profile 106 it is possible to configure and select the most appropriate conformation of the field of aim within which firearm 10 can shoot. For example, it is possible to configure a field of aim that exploits as much as possible the space allowed by the space of vehicle where firearm 10 is installed, though without the risk of opening fire on parts of the vehicle. On the contrary, according to the prior art, the field of aim is substantially rectangular or square, as, in known firearm supports, the angular range in elevation/depression and the traverse angular range (or azimuthal angular range) are independent of one another.

For example, it is possible to choose a field of aim having a profile shaped according to the needs, for example

even with a polygonal shape with more than four sides, and the polygon can be regular or irregular. Furthermore, the field of aim can comprise curved segments and, if necessary, curved segments as well as straight segments.

5 Advantageously, the field of aim is consistent with opening 8 through which firearm 10 can shoot. As a matter of fact, opening 8 usually does not have a perfectly rectangular shape, but, instead, it can have a complex shape; thanks to innovative firearm support 28, it is possible to enlarge
10 the area of the field of aim as much as possible, though operating in total safety, namely without hitting, in an undesired manner, parts of the vehicle. Therefore, profile 106 can comprises curved and/or straight portions. In the example shown in figures 4a and 4b, profile 106 has a shape
15 similar to the one of an "upside-down U".

By mere way of example and with reference to figures 4a and 4b, when the firearm is its operating position, the first axis z-z defines the azimuthal or traverse angle and the second axis x-x defines the elevation/depression angle
20 of the firearm.

The first axis z-z lies on a plane that is substantially perpendicular to the second axis x-x. The first axis z-z and the second axis x-x can be mutually incident or skew.

25 By way of example, body 104 has a shape that is substantially suited to laterally overlap a stationary upright (if necessary carried by arm 26 and not numbered in the drawings) relative to which support element 108 can rotate. In particular, body 104 has the shape of a
30 longitudinally cut sleeve, which can be laterally applied to the aforesaid fixed upright (if necessary, in a removable manner, as described more in detail below).

Preferably, body 104 comprises a fixed portion 110 (for example a shaped overhang laterally projecting outwards from body 104) and a mobile portion 112 (for example a shaped overhang laterally projecting outwards from body 104), which can be moved to a plurality of mutual positions relative to the fixed portion 110, so as to change the configuration of profile 106. In particular, fixed portion 110 and mobile portion 112 define profile 106 with which feeler pin 100 can cooperate, which is different depending on whether said portions 110, 112 are aligned and/or adjacent or are in distant and/or staggered positions.

By varying profile 106 you can change the field of aim. This aspect is advantageous because it allows the user to change the field of aim in a simple and quick manner, for example based on the type of vehicle and on the limit trajectories that the projectiles of firearm 10 can cover without damaging parts of the vehicle on which firearm support 28 is mounted. Sometimes it is also possible that, in the same vehicle, the field of aim needs to be changed for different reasons; for example, in some helicopters, an external fuel tank can be mounted on the aircraft: in this case, the field of aim could dangerously intercept the tank, thus posing a risk to the safety of the crew, hence the shooting range needs to be changed. Or, for example, when the blades of an helicopter rotate at a low speed or are still, the ends of these blades can bend downwards due to their own weight and, therefore, the trajectory of the projectiles coming out of firearm 10 could dangerously hit the blades; hence, the shooting range needs to be changed limiting the maximum elevation of firearm 10. In this case, the user releases mobile portion 112 from its current

position relative to fixed portion 110, moves mobile portion 112 towards a further mutual position and fixes it: by so doing profile 106 changes and, as a consequence, the shooting range changes as well.

5 Conveniently, mobile portion 112 can slide on fixed portion 110. For example, respective guides 114 are provided on mobile portion 112 or on fixed portion 110. Furthermore, there are conveniently provided known fixing means (for example screws 115, snapping means, quick-
10 release means, bayonet systems, etc.) to fix, in a removable manner, mobile portion 112 to fixed portion 110 in a mutual position among the plurality of mutual positions that these portions 110, 112 can assume. Preferably, mobile portion 112 can be fixed between two end
15 position of guide 114, corresponding to a maximum field of aim and to a minimum field of aim, respectively.

With reference to the variant shown herein, feeler pin 100 is constrained to support element 108 in a sliding manner. In particular, feeler pin 100 is adapted to slide
20 substantially parallel to the first axis z-z. Conveniently, a primary guide 116 is coupled to support element 108 and enables the sliding movement of feeler pin 100. Optionally, an elastic means, such as a spring 120, is interposed between feeler pin 100 and primary guide 116 so as to push
25 feeler pin 100 towards a relative position with respect to primary guide 116 and, therefore, with respect to support element 108.

Preferably, support element 108 comprises a lateral bracket 118, or a lateral single-arm, for being coupled to
30 a side of firearm 10. Alternatively, support element 108 comprises a pair of arms, between which firearm 10 can be mounted.

Support element 108 (in particular the distal portion of lateral bracket 118) comprises a coupling system 122, for being coupled to firearm 10 in a releasable manner. Coupling system 122 comprises a mobile striker 124, which
5 is configured to follow, in a constrained manner, the rotation of firearm 10 around the second axis x-x and to control the movement of feeler pin 100. In particular, mobile striker 124 is a rotary lever, which strikes against the first end 101 of feeler pin 100. Optionally, coupling
10 system 122 is coupled to firearm 10 by means of a known pin system.

In the preferred embodiment shown herein, body 104 has a curved shape (with reference to the first axis z-z), in particular body 104 has a semi-cylindrical shape.
15 Preferably, profile 106 is a protuberance on the outer surface of body 104.

Figures 5a and 5b show body 104, in which mobile portion 112 assumes two different positions relative to fixed portion 110. In the convenient variant shown herein,
20 fixed portion 110 comprises a first profile 106a and mobile portion 112 comprises a second profile 106b; said first profile 106a and second profile 106b forming the profile against which feeler pin 100 is going to strike. In figure 5a, the first profile 106a and the second profile 106b are
25 aligned with one another and form a continuous profile, namely substantially without corners or gaps; on the other hand, in figure 5b, the first profile 106a and the second profile 106b are not aligned and, therefore, form a profile with corners.

30 Body 104 is advantageously configured to be removed from support element 108 and be reassembled so as to be turned upside-down by 180° relative to said support element

108 (for example on a stationary upright - not numbered -
on which said support element 108 is fitted is a mobile
manner), so as to obtain a different field of aim with one
single body 104. Figures 5a and 5b show body 104 configured
5 to be fixed on support element 108 with a first
orientation, whereas figures 5c and 5b show body 104
oriented upside-down relative to figures 5a and 5b. Figures
5c and 5d show body 104, in which mobile portion 112
assumes two different positions relative to fixed portion
10 110. In the convenient variant shown herein, fixed portion
110 comprises a further first profile 107a and mobile
portion 112 comprises a further second profile 107b; said
further first profile 107a and further second profile 107b
forming the profile against which feeler pin 100 is going
15 to strike. In figure 5c, the further first profile 107a and
the further second profile 107b are aligned with one
another and form a continuous profile, namely substantially
without corners or gaps; on the other hand, in figure 5d,
the further first profile 107a and the further second
20 profile 10b are not aligned and, therefore, form a profile
with corners. The first profiles 106a and 107a are profiles
that externally protrude on fixed portion 110. The second
profiles 106b and 107b are both comprised on mobile portion
112.

25 Advantageously, firearm support 28 comprises primary
locking means to selectively lock the rotation of support
element 108 relative to body 104 in any mutual angular
position. Advantageously, coupling system 122 comprises
secondary locking means to selectively lock the rotation of
30 firearm 10 relative to support element 108 in any mutual
angular position. For example, the primary and/or secondary
locking means can be mechanical and can be activated by a

user by means of known intervention means, such as a lever, a push-button, a turning handle, etc.

Preferably, firearm support 28 can be provided with adjustment means to limit the rotation of firearm 10 relative to support element 108, around the second axis x-x, to a preferred angular range. It is also possible to provide firearm support 28 with adjustment means to limit the rotation of support element 108 relative to the body, around the first axis z-z, to a preferred angular range.

Advantageously, support element 108 and/or body 104 can be made of carbon fiber or titanium.

Firearm support 28 is conveniently associated with an arm 26 and with a support system, as described and discussed above. However, this firearm support 28 can also be associated with other types of support systems. For example, firearm support 28 can be fixed to a bearing surface or plane 4, for example by means of a lower arm similar to arm 26. Advantageously, a seat is coupled to the lower arm in a rotary manner (in particular around a substantially vertical axis), so as to allow the user to rotate firearm 10 while sitting on the seat, thus operating in a more comfortable manner during the use of the firearm.

Naturally, the principle of the invention being set forth, embodiments and implementation details can be widely changed relative 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.

CLAIMS

1. Firearm support for a firearm comprising:

a body provided with a profile on a surface of the body;

a feeler pin, for striking against the profile and for being coupled to the firearm so as to follow movement of said firearm;

a support element, rotatable around a first axis relative to the body, the support element being coupled to the firearm, allowing mutual rotation between said firearm and said support element around a second axis;

wherein the body comprises a fixed portion and a mobile portion, for being fixed in a plurality of positions relative to the fixed portion, so as to change a configuration of the profile;

wherein the fixed portion comprises a first profile and the mobile portion comprises a second profile; said first profile and second profile forming the profile against which the feeler pin strikes in a first position;

wherein the fixed portion comprises a further first profile and the mobile portion comprises a further second profile; said further first profile and said further second profile forming the profile against which the feeler pin strikes in a second position.

2. The firearm support according to claim 1, wherein the profile and the feeler pin delimit angular width allowed to the firearm around the second axis, depending on an angular position of the support element relative to the body with reference to the first axis.

3. The firearm support according to claim 1, wherein the first axis lies on a plane substantially perpendicular to the second axis.

4. The firearm support according to claim 1, wherein the mobile portion is slidable on the fixed portion.

5. The firearm support according to claim 1, wherein the feeler pin is slidably constrained to the support element.
6. The firearm support according to claim 5, wherein the feeler pin is suited to slide substantially parallel to the first axis.
7. The firearm support according to claim 1, wherein the support element comprises a lateral bracket, for being coupled to a side of the firearm.
8. The firearm support according to claim 1, wherein the support element comprises a coupling system, for being releasably coupled to the firearm; the coupling system comprising a mobile striker, which is configured to follow, in a constrained manner, rotation of the firearm around the second axis and to control movement of the feeler pin.
9. The firearm support according to claim 8, wherein the mobile striker is a rotary lever, which strikes against a first end of the feeler pin.
10. The firearm support according to claim 1, wherein the body is configured to be removed from the support element and be reassembled so as to be turned upside-down by 180° relative to said support element.