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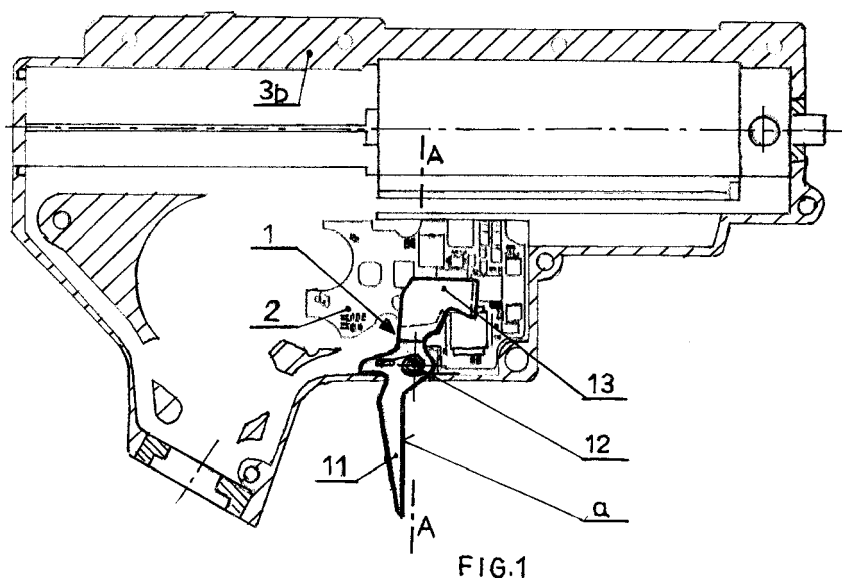
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(57) The subject of the invention is a trigger that improves the sensitivity of detecting a trigger press in gun replicas, in particular ASG with electronic circuits using optical sensors to detect the position of the trigger. The

essence of the solution according to the present invention is that the obscuring surface on the inner surface of the long arm of the angle bracket is a reflecting surface.



## Description

[0001] The subject of the invention is a trigger that improves the sensitivity of detecting a trigger press in gun replicas, in particular ASG with electronic circuits using optical sensors to detect the position of the trigger.

[0002] Airsoft guns (ASG) are usually faithful copies of original firearms made in a 1:1 scale and shoot pellets using compressed gas. They are used in airsoft games, training, military simulations, and its users pay attention not only to how accurately the external appearance has been copied, but also expect them to act in a way that best imitates the operation of a real firearm.

[0003] Automatic electric guns (AEG) are a variant of ASG replicas, in which the electric motor, by means of a gear transmission, compresses the spring.

[0004] In factory models of AEG replicas, the motor is controlled by closing the contacts of the power circuit when the trigger is pressed, which is a mechanical element consisting of one or two parts working together. In AEG replicas, the trigger movement causes direct pressure on the moving part of the trigger switch, and then the sliding moving part causes the contacts to close in the trigger switch and the motor power circuit is closed.

[0005] High pressure air guns (HPA) are a variant of ASGs driven by compressed air. In HPA replicas, the trigger movement is analogous, with the difference that the pressure is exerted on the electronic microswitch. Pressing the trigger activates the solenoid valve, which supplies the appropriate dose of compressed air to the chamber.

[0006] The operation of the trigger in well-known AEG and HPA replicas has several basic disadvantages such as: no possibility to configure the sensitivity of the trigger individually to the user's needs, burning contacts in trigger switches of AEG replicas due to the current flowing in the circuit and the resulting malfunction of the weapon, low resistance of microswitches to mechanical damage and limited number of short-circuit cycles and contacts opening.

[0007] To eliminate the disadvantages of standard mechanical contacts, users install electronic systems in their replicas that detect the trigger position using reliable and very precise optical sensors. Such system work with standard triggers.

[0008] Various triggers that might be used in AEG and HPA replicas are available on the market and compatible with electronic systems having optical sensors detecting the position of the trigger. Some of them are made of aluminum or metal alloy and have the trigger blades in different shapes and colors.

[0009] Utility model application W.128319 disclose a trigger position detection system having printed circuit board comprising a light source and a light receiver, wherein the circuit board is located on the internal surface of a one half of the replicas frame. The Light sources active surface and the light receiver are directed towards the opposite half of the replicas frame, and the trigger

blocks the light emitted by the source.

[0010] Patent application PL234505B1 disclose a trigger position detection system in replica firearms comprising a sensor built from at least one light source and at least one receiver converting the light signal into an electrical signal, wherein the light source and the light receiver are located on a printed circuit board in a way that they are deviated from the vertical axes running perpendicularly to the upper surface of the cylinder edge by an angle from the range of 0° - 90°, and their active surfaces are directed towards the replica trigger.

[0011] European Patent application EP3367041 describes a system for shooting a weapon that includes an activating module able to be coupled to an actuating module of a weapon, said activating module actuates the actuating module and shoots the weapon. The activating module comprises a controller, an emitter and a receiver both optically coupled, where the controller detects an interruption of the beam of light received in the receiver previously emitted by the emitter and for generating, in response to said interruption, a trigger signal to actuate the actuating module and shoot the weapon.

[0012] A trigger for a gun replica bearing in the axis of rotation in both frame halves is attached with a spring around the axis of rotation. **The essence of the solution** according to the present invention is that the obscuring surface on the inner surface of the long arm of the angle bracket is a reflecting surface. The bracket is situated with a long arm perpendicular to the axis of rotation of the trigger and with the short arm facing toward the printed circuit board. The short arms length is less than the distance between the printed circuit board and the opposite half of the frame. The reflecting surface in the release position of the trigger blade only covers the projection of the transmitter. When the trigger blade is moved to the fully depressed position, it simultaneously covers the projection of the transmitter and receiver of the reflected light and the resulting signal of the opto-electrical sensor is processed in the board's electronic layout and activates the ball projectile shot assembly.

[0013] Favorably the trigger has a support at the level of the axis of rotation. The support is projecting in the opposite direction to the position of the angle bracket and in the release position of the trigger blade the support is resting its lower surface on the halves of the frame or on only one half of the frame being pressed by a torsion spring mounted with a coil placed on a pin. The pin is led out on both sides in the axis of rotation of the trigger. The bent end of one arm of the spring is inserted into the longitudinal hole in the support. The second, opposing arm of the spring rests on the frame on the side under the angle bracket.

[0014] Favorably the long arm of the bracket has a two-step recess along the bottom edge.

[0015] Favorably the long arm of the bracket has a cut upper corner on the side opposite to the short arm.

[0016] Favorably the trigger is made of metal and has a polished reflective surface.

**[0017]** Favorably the reflecting surface of the trigger is covered with a light reflecting layer, made especially of silver, aluminum, foil or reflective paint.

**[0018]** The main advantage of the solution described above is a significant increase in the precision of trigger movement detection by increasing the sensitivity thresholds that can be set by the user by up to 500% compared to standard triggers. The use of the trigger eliminates the need for additional stickers or paints reflecting the light emitted by the trigger sensor, glued onto the structural elements of the replica's skeleton. Another advantage of using the trigger is the independence of the trigger sensor operation from the structural elements of the replica's skeleton because the trigger surface is the direct reflecting element. The trigger according to the invention replaces the standard trigger used in replicas.

**[0019]** The subject of the invention is illustrated in the drawing, where Fig. 1 is a vertical section of the replica, Fig. 2 - vertical section of the replica within the trigger unit with the released trigger, Fig. 3 and Fig. 4 - axonometric views of the trigger, Fig. 5 shows the position of the pressed trigger in with reference to photoelements of the trigger sensor located on the PCB, and Fig. 6 - a half-sectional view of the trigger embedded in both halves of the replica frame.

**[0020]** The exemplary trigger system for the replica comprises the following elements built inside the connected frame halves 3a and 3b of the body in the handle or stock:

- a single element trigger 1, bearing in the axis of rotation O in both frame halves 3a, 3b and attached with a spring 16, where the trigger 1 at its upper end above the axis of rotation O has a surface obscuring the light streams in the optoelectric sensor 21, 22, and
- printed circuit board 2, fixed internally to one of the frame halves 3a perpendicular to the axis of rotation O of trigger 1, which comprises an optoelectronic sensor 21, 22 of trigger 1 position, composed of a light transmitter 21 and a light receiver 22 located on the electronic circuit board 2 in center angle  $\omega$  not greater than  $50^\circ$  in relation to the axis of rotation O of trigger 1.

**[0021]** Upper part of the trigger 1 has a form of an angle bracket 13, with a long arm 13x and a short arm 13y, wherein the long arm 13x is perpendicular to the axis rotation O of the trigger 1 and the inner surface of the long arm 13x is a reflecting surface 14, reflecting light emitted by the light emitter 21. The short arm 13y faces towards the electronic circuit board 2, the length of the short arm 13y is being smaller than the distance B between this board 2 and the frame half 3a opposite thereto. The reflecting surface 14 has such dimensions where in the release position of the trigger 11, it covers only the projection of the transmitter 21, while when the trigger 11 is moved to the fully depressed b position, it simulta-

neously covers the projections of the transmitter 21 and the reflected light receiver 22. The resulting optoelectric sensor signal 21, 22 processed in the electronic circuit of the plate 2 activates the ball missile firing unit.

**[0022]** At the level of the axis of rotation O, the trigger 1 has a support 15 protruding in the opposite direction to the position of the angle bracket 13. The support 15 in the released position and the trigger blade 11 rests with its lower surface against both halves of the frame 3a, 3b or only by half of the frame 3b under the pressure of a torsion spring 16 embedded with a coil on the pin 12 brought out on both sides in the axis of rotation O of the trigger 1. The bent end of one arm of the torsion spring 16 is inserted into the longitudinal hole 17 in the bracket 15 of the trigger 1, while the other, opposing arm of the torsion spring 16 rests against the inside of the replica's frame on the side under the angle bracket 13.

#### List of indications

##### [0023]

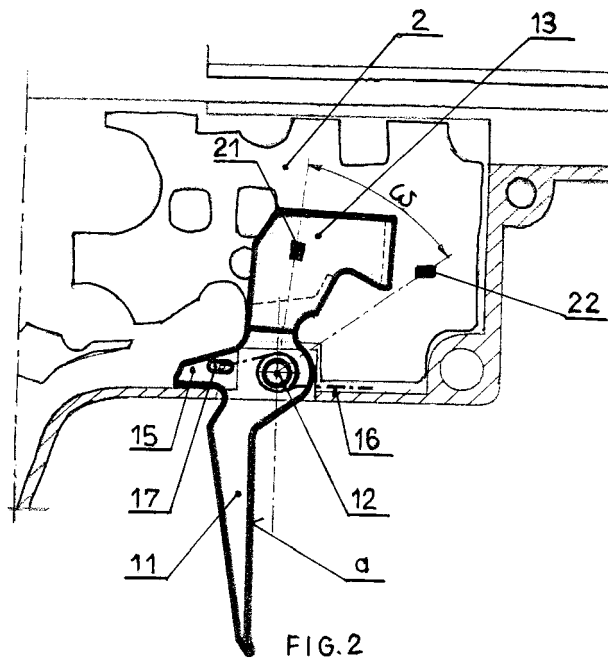
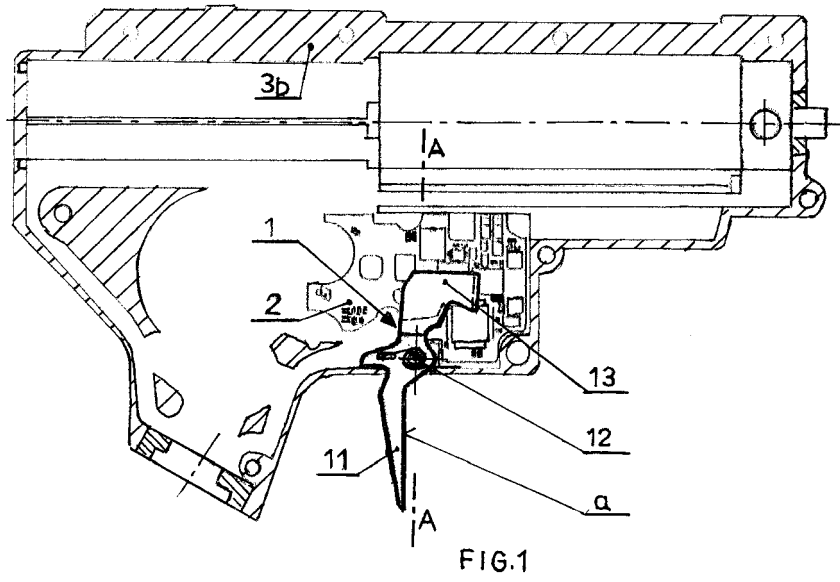
1. Trigger
  11. trigger blade
  12. pin
  13. angle bracket
  - 13x. long arm
  - 13y. short arm
  14. reflecting surface
  15. support
  16. torsion spring
  17. longitudinal hole
  - O. axis of rotation
2. Electronic circuit board
  21. optoelectronic sensor transmitter
  22. optoelectronic sensor receiver
- 3a, 3b right and left half of frame
  - a. trigger blades release position
  - b. trigger blades press position
  - w. angle between optoelectronic sensor transmitter and receiver
  - B. distance between the board and the opposite half of the frame

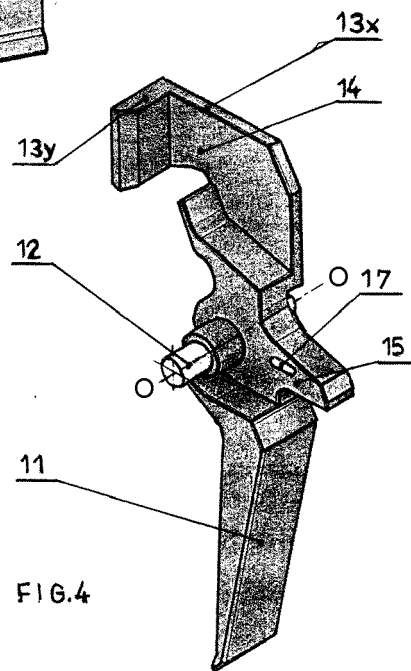
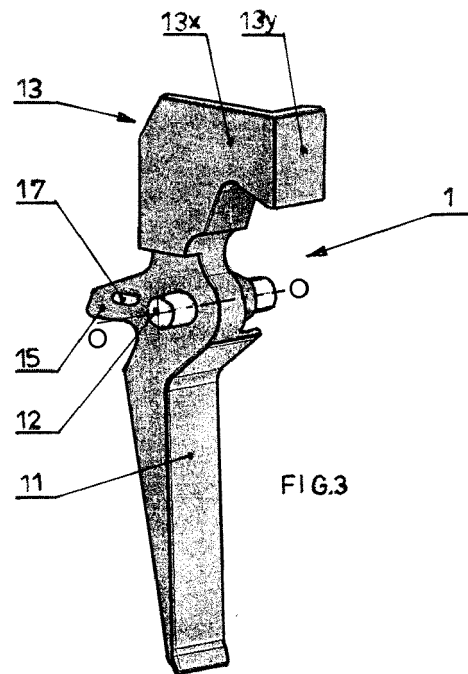
#### Claims

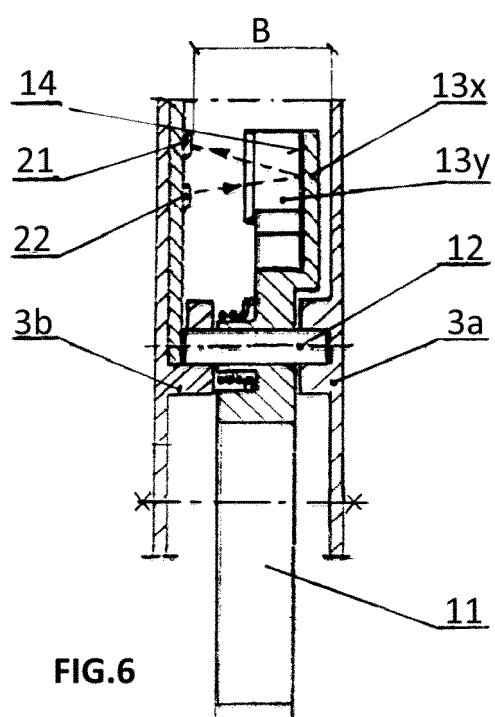
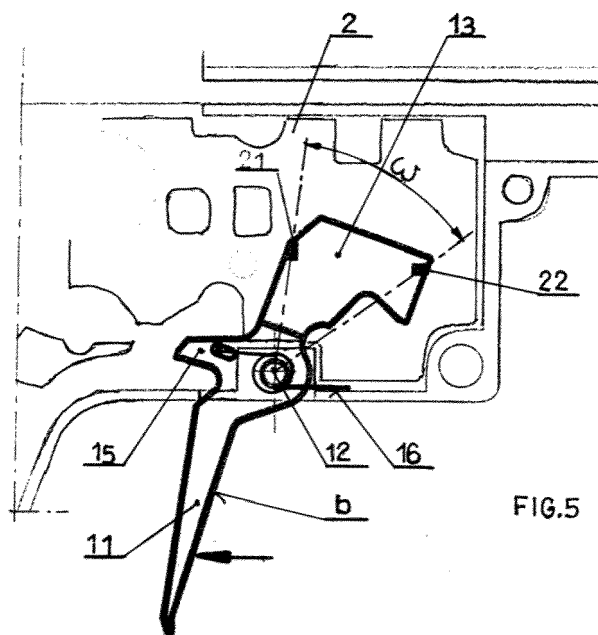
1. A trigger for a gun replica, bearing in the axis of rotation (O) in both frame halves (3a, 3b) and attached with a spring (16) toward the release position (a) of the triggers blade (11) with a perpendicular position to the shot line, wherein the trigger (1) at its upper end above the axis of rotation (O) has a surface obscuring the light streams in the optoelectric sensor (21, 22), **characterized in that** the obscuring surface on the inner surface of the long arm (13x) of the angle bracket (13) is a reflecting surface (14), where-

in the bracket (13) is situated with a long arm (13x) perpendicular to the axis of rotation (O) of the trigger (1) and with the short arm (13y) facing toward the printed circuit board (2), wherein the short arms (13y) length is less than the distance (B) between the board (2) and the opposite half of the frame (3a), wherein the reflecting surface (14) in the release position (a) of the trigger blade (11) only covers the projection of the transmitter (21), and when the trigger blade (11) is moved to the fully depressed position (b), it simultaneously covers the projection of the transmitter (21) and receiver (22) of the reflected light and the resulting signal of the opto-electrical sensor (21, 22) is processed in the board's electronic layout (2) and activates the ball projectile shot assembly.

2. Trigger according to claim 1, **characterized in that** it has a support (15) at the level of the axis of rotation (O), wherein the support (15) is projecting in the opposite direction to the position of the angle bracket (13) and in the release position (a) of the trigger blade (11) the support (15) is resting its lower surface on the halves of the frame (3a, 3b) or on only one half of the frame (3b), being pressed by a torsion spring (16) mounted with a coil placed on a pin (12), wherein the pin (12) is led out on both sides in the axis of rotation (O) of the trigger (1), wherein the bent end of one arm of the spring (16) is inserted into the longitudinal hole (17) in the support (15), wherein the second, opposing arm of the spring (16) rests on the frame on the side under the angle bracket (13).
3. Trigger, according to claim 1, wherein the long arm (13x) of the bracket (13) has a two-step recess along the bottom edge.
4. Trigger, according to claim 1, wherein the long arm (13x) of the bracket (13) has a cut upper corner on the side opposite to the short arm (13y).
5. Trigger, according to claim 1, **characterized in that** the trigger (1) is made of metal and has a polished reflective surface (14).
6. Trigger, according to claim 1, wherein the reflecting surface (14) of the trigger (1) is covered with a light reflecting layer, made especially of silver, aluminum, foil or reflective paint.









## EUROPEAN SEARCH REPORT

Application Number

EP 21 20 4356

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	JP 3 227466 U (GATE ENTPR SP Z O O SP K [PL]) 27 August 2020 (2020-08-27) * claim 1; figures 5-7 * * paragraphs [0019] - [0021] * -----	1-6	INV. F41A19/69 F41A19/10
A	US 2007/189014 A1 (YEH HSIN-CHENG [TW]) 16 August 2007 (2007-08-16) * abstract; figures 1,2 * * paragraphs [0011] - [0015] * -----	1-6	
A	EP 3 553 455 A1 (GATE MENET WOJTAK SP J [PL]) 16 October 2019 (2019-10-16) * figures 5,6,13-16 * * paragraphs [0025], [0026] * * paragraph [0028] * -----	1-6	
			TECHNICAL FIELDS SEARCHED (IPC)
			F41A
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		7 July 2022	Schwingel, Dirk
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			



**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 20 4356

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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