



(51) International Patent Classification:

B64F 1/04 (2006.01)

B64F 1/06 (2006.01)

(21) International Application Number:

PCT/TR2022/051046

(22) International Filing Date:

27 September 2022 (27.09.2022)

(25) Filing Language:

Turkish

(26) Publication Language:

English

(30) Priority Data:

2021/015322

30 September 2021 (30.09.2021) TR

(71) Applicant: TUSAS- TURK HAVACILIK VE UZAY SANAYII ANONIM SIRKETI [TR/TR]; Fethiye Mahallesi Havacilik Bulvari No:17, 06980 Kahramankazan/Ankara (TR).

(72) Inventors: KAYNAR, Nimet Gul; Fethiye Mahallesi Havacilik Bulvari No:17, 06980 Kahramankazan/Ankara (TR). SAHIN, Durmus Ali; Fethiye Mahallesi Havacilik Bulvari No:17, 06980 Kahramankazan/Ankara (TR). TURK, Fatih; Fethiye Mahallesi Havacilik Bulvari No:17, 06980 Kahramankazan/Ankara (TR).

(74) Agent: CAYLI, Hulya; Paragon Consultancy Incorporated, Koza Sokak 63/2 GOP, 06540 Ankara (TR).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: A LOCKING MECHANISM

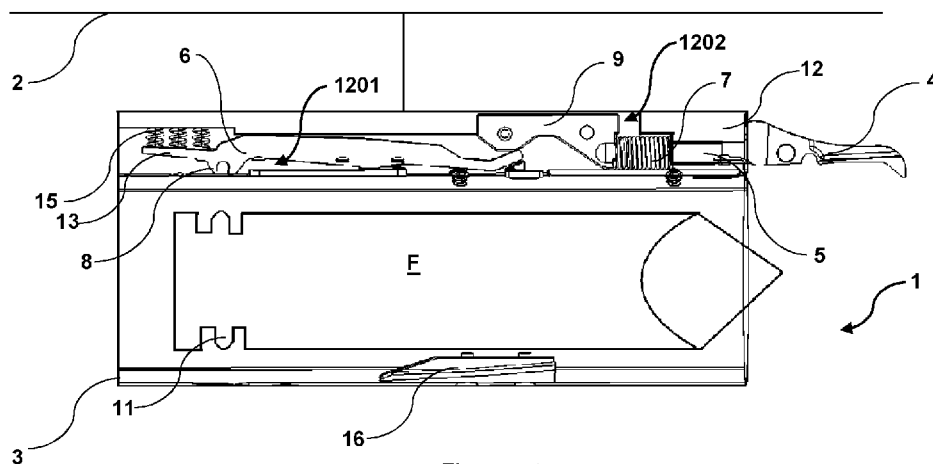


Figure - 1

(57) Abstract: The present invention relates to a body (2) located on an air vehicle; at least one useful load (F) located on the body (2); at least one launcher (3) located on the body (2), which enables the launch and/or release of the useful loads (F) contained therein; a trigger (4) which contacts the useful load (F) on the launcher (3) and allows the useful loads (F) to be launched and/or released from the body (2); a rod (5) extending longitudinally in the launcher (3), wherein when the trigger (4) is moved, the rod (5) can move on an axis that the launcher (3) extends; an arm (6) that is in contact with the rod (5); a first spring (7) located on the rod (5), which allows the rod (5) to be triggered when the energy stored thereon is released; a tab (8) extending outward from the arm (6) to hold the useful load (F).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

A LOCKING MECHANISM

5 The present invention relates to launchers that allow the launch of useful loads on aircraft, helicopters or unmanned aerial vehicles.

Aircraft, helicopters or unmanned aerial vehicles have launchers that allow the launch of rocket-like ammunition used for launching during operation. During the operation, a
10 current is applied to the triggers that contact the useful load, so that the ammunition is provided with moving force by means of the electrical systems provided on the launchers. The ammunition is launched from the air vehicle by the propulsion provided by the trigger.

CN111572798, which is included in the known-state of the art, discloses a launcher
15 design provided on unmanned aerial vehicles. Said patent document discloses a mechanism involved in attaching and locking the ammunition to the air vehicle.

A locking mechanism according to the present invention provides a system which allows the effective removal and installation of ammunition on aircraft, helicopters or unmanned
20 aerial vehicles.

Another object of the present invention is to provide a solution to the safety problems caused by the attachment of ammunition to the launchers.

25 The locking mechanism realized to achieve the object of the present invention, which is defined in the first claim and other claims dependent thereon, comprises a body located on an aircraft, a helicopter, or an unmanned aerial vehicle; at least one useful load (F), e.g. an ammunition, located on the body; a launcher which contains the useful loads (F) and allows the useful loads (F) to be launched from the body; a trigger which contacts the
30 useful load (F) on the launcher and allows the useful loads (F) to be launched from the body by means of the driving power; a rod extending longitudinally in the launcher and capable of moving on the axis it extends; at least one arm in contact with the rod; a first spring located on the rod for storing energy; a tab extending outward from the arm, thereby holding the useful load (F).

The locking mechanism according to the invention comprises the trigger which has an open position (I), wherein if the trigger is triggered by the user, the trigger pulls the rod to allow the arm to release the useful load (F), thus breaking the contact between the tab and the useful load (F); and a locked position (II), wherein the trigger is pushed by the user in contact with the useful load (F) so as to activate the rod, thereby allowing the tab on the arm to come into contact with the useful load (F), wherein the trigger is brought from the open position (I) to the locked position (II) by rotating.

10 In an embodiment of the invention, the locking mechanism comprises an eccentric structure located on the rod in contact with the arm; a first surface located on the eccentric structure and allowing contact with the arm; at least a second surface located on the rod and extending at an inclined angle relative to the first surface and the axis on which the first surface extends.

15 In an embodiment of the invention, the locking mechanism comprises a first part on the arm, which is form-compatible with the first surface and allows the first surface to fit thereon; at least a second part on the arm, which is form-compatible with the second surface.

20 In an embodiment of the invention, the locking mechanism comprises a moment point on the launcher, at which the arm comes into contact with the launcher; the arm which rotates around the moment point when the first surface is substantially disconnected from the first part and pushes the second surface, as the trigger (4) is moved from the locked position (II) to the open position (I); the tab which allows the useful load (F) to be released upon rotation of the arm.

25 In an embodiment of the invention, the locking mechanism comprises a protrusion located on the useful load (F), substantially opposite to the tab, which allows the useful load (F) to be removably attached to the tab.

30

In an embodiment of the invention, the locking mechanism comprises a casing within the launcher, which contains the rod, arm and first spring.

In an embodiment of the invention, the locking mechanism comprises a first housing in the casing, which allows the eccentric structure to move in a determined direction; a second housing limiting the movement of the arm.

5 In an embodiment of the invention, the locking mechanism comprises a stopper located on the arm, substantially opposite to the first spring, which limits the movement of the first spring that is pressed when the trigger moves from the locked position (II) to the open position (I), and is stretched when the trigger moves from the open position (I) to the locked position.

10

In an embodiment of the invention, the locking mechanism comprises the spring which is located to substantially surround the rod, wherein the spring is compressed when the trigger is in the open position (I), wherein the spring triggers the rod when the rod moves from the open position (I) to the locked position (II), allowing the eccentric structure to
15 create a pressure force on the protrusion provided on the arm, thereby separating the tab from the useful load (F) and releasing the useful load (F).

In an embodiment of the invention, the locking mechanism comprises the tab which is form-compatible with the useful load (F) in an attachable and detachable manner.

20

In an embodiment of the invention, the locking mechanism comprises an extension which extends in the direction that the arm extends; a second spring which is connected to the casing at one end and connected to the extension at the other end, wherein the second spring creates a pressing force to prevent the tab from disengaging when the trigger is in
25 the locked position (II).

In an embodiment of the invention, the locking mechanism comprises at least one substantially form-compatible guide on the launcher, which allows the useful load (F) to be removably attached on the launcher in a predetermined manner.

30

In an embodiment of the invention, the locking mechanism comprises the eccentric structure having at least partially a concave form in the region where it is opposite to the first part, and having at least partially a convex form in the region where it contacts with

the second part in an opposite manner, so that the eccentric structure is substantially form-compatible with the first part and the second part.

The locking mechanism realized to achieve the object of the present invention is illustrated in the attached drawings, in which:

Figure 1 is a perspective view of the locking mechanism.

Figure 2 is a perspective view with the trigger in the open position (I).

Figure 3 is a perspective view with the trigger in the locked position (II).

All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

1. Locking Mechanism
2. Body
3. Launcher
4. Trigger
5. Rod
 501. First Surface
 502. Second Surface
6. Arm
 601. First Part
 602. Second Part
7. First Spring
8. Tab
9. Eccentric Structure
10. Moment Point
11. Protrusion
12. Casing
 1201. First Housing
 1202. Second Housing
13. Stopper

14. Extension

15. Second Spring

16. Guide

5 The locking mechanism (1) comprises a body (2) located on an air vehicle; at least one useful load (F) located on the body (2); at least one launcher (3) located on the body (2), which enables the launch and/or release of the useful loads (F) contained therein; a trigger (4) which contacts the useful load (F) on the launcher (3) and allows the useful loads (F) to be launched and/or released from the body (2); a rod (5) extending
10 longitudinally in the launcher (3), wherein when the trigger (4) is moved, the rod (5) can move on an axis that the launcher (3) extends; an arm (6) that is in contact with the rod (5); a first spring (7) located on the rod (5), which allows the rod (5) to be triggered when the energy stored thereon is released; a tab (8) extending outward from the arm (6) to hold the useful load (F).

15

The locking mechanism (1) according to the invention comprises the trigger (4) which has an open position (I), wherein if the trigger (4) is triggered by the user, the trigger (4) pulls the rod (5) to allow the arm (6) to release the useful load (F), thus breaking the contact between the tab (8) and the useful load (F); and a locked position (II), wherein the trigger
20 (4) is pushed by the user in contact with the useful load (F) so as to activate the rod (5), thereby allowing the tab (8) on the arm (6) to come into contact with the useful load (F), wherein the trigger (4) is brought from the open position (I) to the locked position (II) by rotating.

25 There are launchers (3) which allow installation of useful loads (F), e.g. ammunition, on the body (2) on the aircraft, helicopter or unmanned aerial vehicle, and allow launch of the useful loads (F) during operation. While launching the useful loads (F) on the launcher (3), current is applied to the trigger (4), so that the useful load (F) is driven to provide ignition. A rod (5) is provided on the launcher (3), which can move on the axis it extends with the
30 movement of the trigger (4). An arm (6) is located on the launcher (3), which is connected to the useful load (F) at one end and moves with the movement of the rod (5). There is a first spring (7) which is compressed when the trigger (4) is pulled and rotated by the user. A tab (8) is provided on the arm (6), which contacts the useful load (F) and is form-compatible where the useful load (F) is attached.

The trigger (4) is pulled and rotated to the open position (I) by the user. The rod (5) moves and creates a pressure force at one end of the arm (6) and thus, the tab (8) located at the other end of the arm (6) is separated from the useful load (F) so that the useful load (F) is released. Therefore, the useful load (F) can be replaced by a new one by the user. The useful load (F) is placed on the launcher (3) and the trigger (4) is pushed by the user. In this way, the trigger (4) is contacted with the useful load (F) and the trigger (4) is brought to the locked position.

10 In an embodiment of the invention, the locking mechanism (1) comprises an eccentric structure (9) located on the rod (5) in contact with the arm (6); a first surface (501) which provides contact with the arm (6) on the eccentric structure (9); at least a second surface (502) extending to be inclined with the direction along which the first surface (501) extends. The rod (5) contacts the arm (6) through the first surface (501) and the second surface (502). The movement of the rod (5) is transferred to the arm (6) by the first surface (501) and the second surface (502).

In an embodiment of the invention, the locking mechanism (1) comprises a first part (601) located on the arm (6), which is form-compatible with the first surface (501) and opposite to the first surface (501) such that that the first surface (501) fits thereon; a second part (602) located opposite to the second surface (502) on the arm (6). Therefore, when the trigger (4) is in the locked position (II), the first surface (501) and the first part (601) overlap each other and the second surface (502) and the second part (602) overlap each other, substantially in a form-compatible manner.

25 In an embodiment of the invention, the locking mechanism (1) comprises a moment point (10) on the launcher (3), at which the arm (6) comes into contact with the launcher (3); the arm (6) which rotates around the moment point (10) when the first surface (501) is substantially disconnected from the first part (601) and pushes the second surface (502), as the trigger (4) is moved from the locked position (II) to the open position (I); the tab (8) which allows the useful load (F) to be released upon rotation of the arm (6). When the trigger (4) is in the open position (I), the rod (5) moves in the direction it extends. The arm (6) acts as a lever when it is rotated around the moment point (10) when the first surface (501) presses the second part (602). Therefore, the tab (8) is disengaged to release the

useful load (F) from the launcher (3). When needed, the useful load (F) is replaced with a new one by the manufacturer.

5 In an embodiment of the invention, the locking mechanism (1) comprises a protrusion (11) located on the useful load (F), opposite to the tab (8), which allows the useful load to be removably attached to the tab. Since the protrusion (11) has a form-compatible structure with the tab (8), the useful load (F) is effectively held.

10 In an embodiment of the invention, the locking mechanism (1) comprises a casing (12) located in the launcher (3), which contains the rod (5), the arm (6) and the first spring (7). In this way, the casing (12) protects the rod (5), the arm (6) and the first spring (7).

15 In an embodiment of the invention, the locking mechanism (1) comprises a first housing (1201) located in the casing (12), which allows the movement of the eccentric structure (9) to be guided; a second housing (1202) limiting the movement of the arm (6). The first housing (1201) limits the movement of the eccentric structure (9), which moves with the movement of the rod (5), allowing it to move only in a determined direction. The second housing (12) allows the movement of the arm (6) to be guided.

20 In an embodiment of the invention, the locking mechanism (1) comprises a stopper (13) located on the arm (6), opposite to the first spring (7), which limits the movement of the first spring (7) that is pressed when the trigger (4) moves from the locked position (II) to the open position (I), and is stretched when the trigger (4) moves from the open position (I) to the locked position. The stopper (13) limits the movement of the first spring (7) upon
25 contact with the first spring (7).

In an embodiment of the invention, the locking mechanism (1) comprises the first spring (7) which is located to surround the rod (5) and is compressed when the trigger (4) is in the open position, wherein the first spring (7) triggers the rod (5) while the rod (5) moves
30 from the open position (I) to the locked position (II), thereby allowing the eccentric structure (9) to create a pressure force on the protrusion (11) located on the arm (6), and allowing the tab (8) to be separated from the useful load (F). The trigger (4) is pulled and rotated by the user so as to be brought to the open position (I). The first spring (7) is compressed and the first spring (7) is set when the trigger (4) is brought to the locked

position (II). Therefore, the first spring (7) provides precision to the trigger (4), allowing the system to operate safely.

5 In an embodiment of the invention, the locking mechanism (1) comprises the tab (8) which is form-compatible with the protrusion (11) on the useful load (F), such that the tab (8) is removably attached to the protrusion (11). In this way, the useful load (F) is held by the tab (8) more effectively.

10 In an embodiment of the invention, the locking mechanism (1) comprises an extension (14) which extends in the direction that the arm (6) extends; a second spring (15) which is connected to the casing (12) at one end and connected to the extension (14) at the other end, wherein the second spring (15) allows the necessary pressure to be created to removably attach the tab (8) on the protrusion (11).

15 In an embodiment of the invention, the locking mechanism (1) comprises at least one guide (16) located on the launcher (3), which allows the useful load (F) to be removably attached to the launcher (3) in a position predetermined by the user. The useful load (F) is attached to the launcher (3) by means of the guide (16). In this way, problems which occur when the useful load (F) is attached to the launcher (3) in different positions, such as
20 seizing, delayed ignition or explosion, are prevented.

In an embodiment of the invention, the locking mechanism (1) comprises the eccentric structure (9) having a concave form in the region where it is opposite to the first part (601), and having a convex form in the region where it contacts the second part (602) in an
25 opposite manner, so that the eccentric structure (9) is substantially form-compatible with the first part (601) and the second part (602). Therefore, the rod (5) can trigger the arm (6) and rotate the arm (6) around the moment point (10).

CLAIMS

1. A locking mechanism (1) comprising a body (2) located on an air vehicle; at least one useful load (F) located on the body (2); at least one launcher (3) located on
5 the body (2), which enables the launch and/or release of the useful loads (F) contained therein; a trigger (4) which contacts the useful load (F) on the launcher (3) and allows the useful loads (F) to be launched and/or released from the body (2); a rod (5) extending longitudinally in the launcher (3), wherein when the trigger (4) is moved, the rod (5) can move on an axis that the launcher (3) extends; an
10 arm (6) that is in contact with the rod (5); a first spring (7) located on the rod (5), which allows the rod (5) to be triggered when the energy stored thereon is released; a tab (8) extending outward from the arm (6) to hold the useful load (F), **characterized by** the trigger (4) which has an open position (I), wherein if the trigger (4) is triggered by the user, the trigger (4) pulls the rod (5) to allow the arm (6) to release the useful load (F), thus breaking the contact between the tab (8)
15 and the useful load (F); and a locked position (II), wherein the trigger (4) is pushed by the user in contact with the useful load (F) so as to activate the rod (5), thereby allowing the tab (8) on the arm (6) to come into contact with the useful load (F), wherein the trigger (4) is brought from the open position (I) to the locked position
20 (II) by rotating.
2. A locking mechanism (1) according to claim 1, **characterized by** an eccentric structure (9) located on the rod (5) in contact with the arm (6); a first surface (501) which provides contact with the arm (6) on the eccentric structure (9); at least a
25 second surface (502) extending to be inclined with the direction along which the first surface (501) extends.
3. A locking mechanism (1) according to claim 2, **characterized by** a first part (601) located on the arm (6), which is form-compatible with the first surface (501) and
30 located opposite to the first surface (501) such that that the first surface (501) fits thereon; a second part (602) located opposite to the second surface (502) on the arm (6).

4. A locking mechanism (1) according to claim 3, **characterized by** a moment point (10) on the launcher (3), at which the arm (6) comes into contact with the launcher (3); the arm (6) which rotates around the moment point (10) when the first surface (501) is substantially disconnected from the first part (601) and pushes the second surface (502), as the trigger (4) is moved from the locked position (II) to the open position (I); the tab (8) which allows the useful load (F) to be released upon rotation of the arm (6).
- 5
5. A locking mechanism (1) according to any of the above claims, **characterized by** a protrusion (11) located on the useful load (F), opposite to the tab (8), which allows the useful load (F) to be removably attached to the tab.
- 10
6. A locking mechanism (1) according to any of the above claims, **characterized by** a casing (12) located in the launcher (3), which contains the rod (5), the arm (6) and the first spring (7).
- 15
7. A locking mechanism (1) according to claim 6, **characterized by** a first housing (1201) located in the casing (12), which allows the movement of the eccentric structure (9) to be guided; a second housing (1202) limiting the movement of the arm (6).
- 20
8. A locking mechanism (1) according to any of the above claims, **characterized by** a stopper (13) located on the arm (6), opposite to the first spring (7), which limits the movement of the first spring (7) that is pressed when the trigger (4) moves from the locked position (II) to the open position (I), and is stretched when the trigger (4) moves from the open position (I) to the locked position.
- 25
9. A locking mechanism (1) according to any of the claims 5 to 8, **characterized by** the first spring (7) which is located to surround the rod (5) and is compressed when the trigger (4) is in the open position (I), wherein the first spring (7) triggers the rod (5) while the rod (5) moves from the open position (I) to the locked position (II), thereby allowing the eccentric structure (9) to create a pressure force on the protrusion (11) located on the arm (6), and allowing the tab (8) to be separated from the useful load (F).
- 30

10. A locking mechanism (1) according to any of the claims 5 to 9, **characterized by** the tab (8) which is form-compatible with the protrusion (11) on the useful load (F), such that the tab (8) is removably attached to the protrusion (11).

5

11. A locking mechanism (1) according to any of the claims 6 to 10, **characterized by** an extension (14) which extends in the direction that the arm (6) extends; a second spring (15) which is connected to the casing (12) at one end and connected to the extension (14) at the other end, wherein the second spring (15) allows the necessary pressure to be created to removably attach the tab (8) on the protrusion (11).

10

12. A locking mechanism (1) according to any of the above claims, **characterized by** at least one guide (16) located on the launcher (3), which allows the useful load (F) to be removably attached to the launcher (3) in a position predetermined by the user.

15

13. A locking mechanism (1) according to any of the claims 3 to 12, **characterized by** the eccentric structure (9) having a concave form in the region where it is opposite to the first part (601), and having a convex form in the region where it contacts the second part (602) in an opposite manner, so that the eccentric structure (9) is substantially form-compatible with the first part (601) and the second part (602).

20

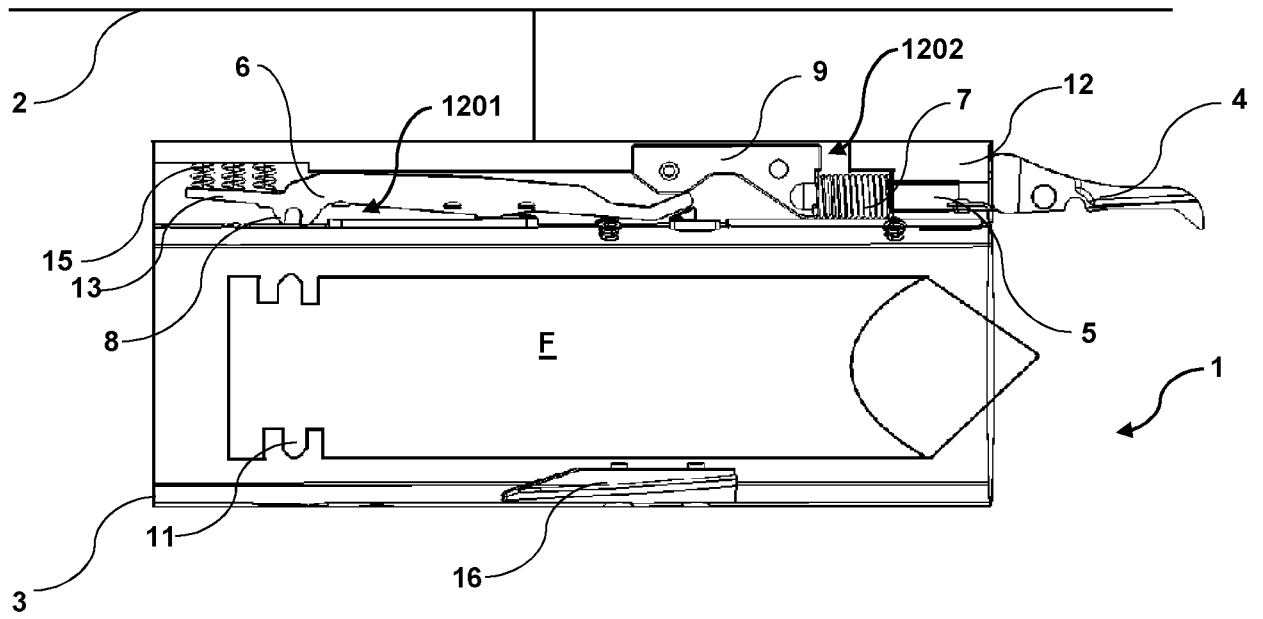


Figure - 1

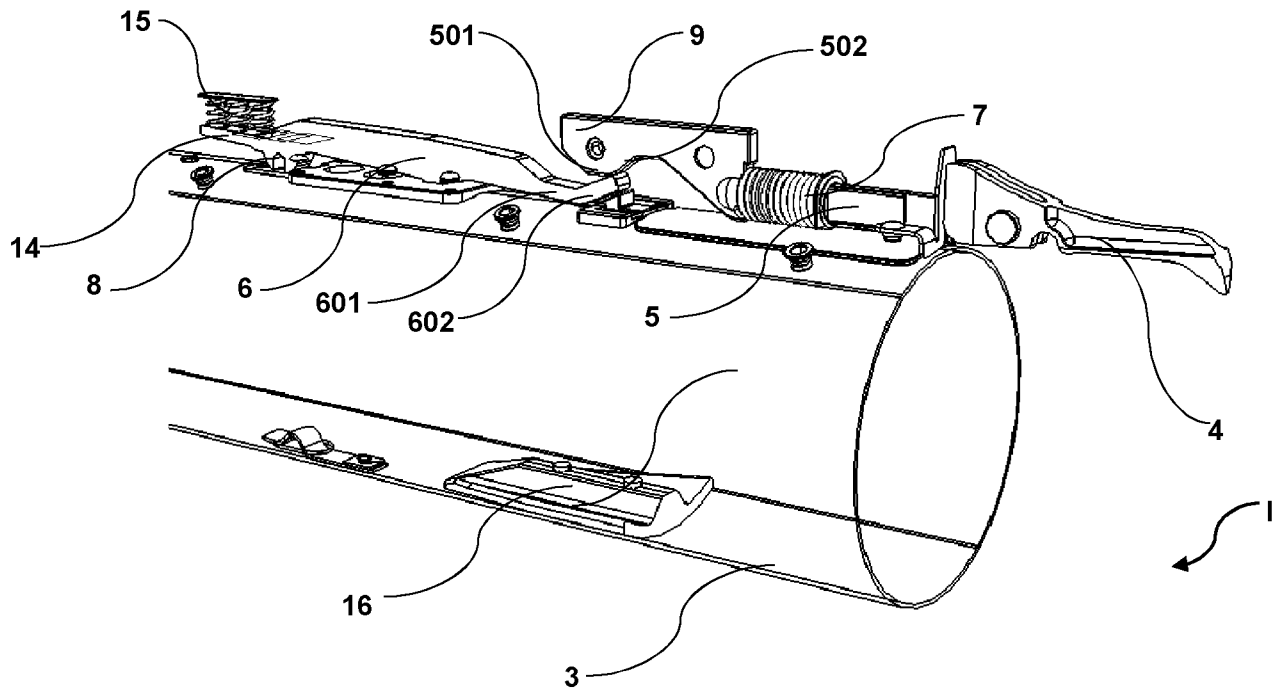


Figure – 2

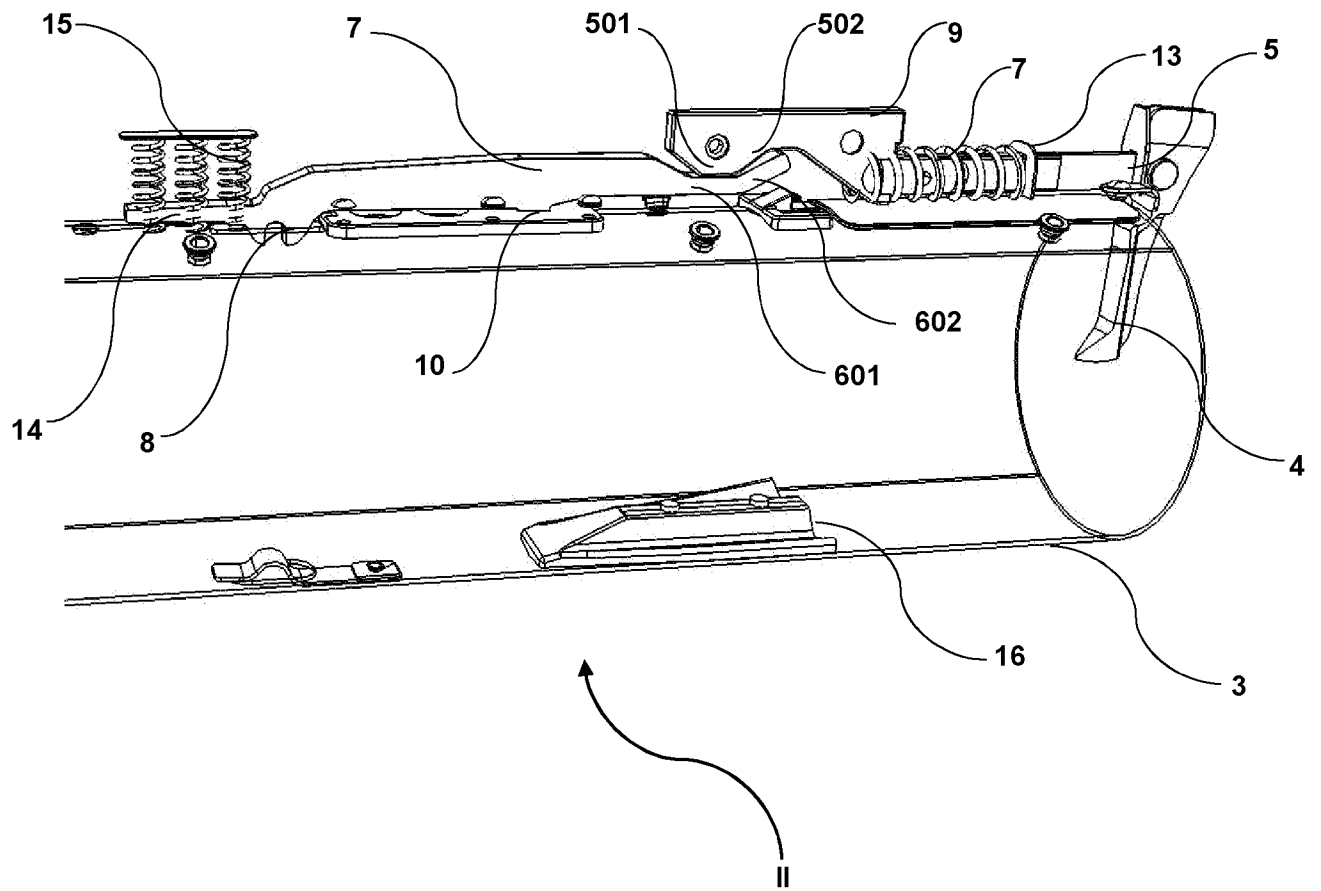


Figure – 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/TR2022/051046

A. CLASSIFICATION OF SUBJECT MATTER

B64F 1/04 (2006.01)i; B64F 1/06 (2006.01)i

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)

B64F 1/04; B64F 1/06

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

Turkpatent Database

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

EPO Abstract & Fulltext Databases, WPI Data. Search Terms Used:launcher, spring, aircraft, load, ammunition, helicopter, aerie
l_vehicle, launch, fuselage, payload, trigger, rod, lever, mechanism**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0141672 A1 (GQ DEFENCE EQUIP LTD [GB]) 15 May 1985 (1985-05-15) Whole document	1-13
A	CN 213566480 U (XINYU BOXUN AUTOMOBILE CO LTD) 29 June 2021 (2021-06-29) Whole document	1-13
A	CN 208802149 U (SHENZHEN PORTABILITY & PRECISION TECH CO LTD) 30 April 2019 (2019-04-30) Whole document	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

27 January 2023

Date of mailing of the international search report

27 January 2023

Name and mailing address of the ISA/TR

Turkish Patent and Trademark Office (Turkpatent)

Hippodrom Caddesi No. 13

06560 Yenimahalle

Ankara

Türkiye

Telephone No. +903123031000

Facsimile No. +903123031220

Authorized officer

Nafiz KUTLU

Telephone No. +903123031226

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/TR2022/051046

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
EP	0141672	A1	15 May 1985	GB	8428015	D0	12 December 1984
				GB	2150895	A	10 July 1985
				JP	S60121197	A	28 June 1985
CN	213566480	U	29 June 2021	NONE			
CN	208802149	U	30 April 2019	NONE			