

The invention relates to the field of loads which can be released, for example from an aircraft to which they are fixed, and in particular their safety device for preventing their unexpected arming before the release of these loads. The invention also makes it possible to prevent the arming of these loads after they have been released, if the loads have to be released inert.

The majority of loads which can be released, for example bombs, are equipped with a certain number of control system (sic), for example firing fuses, which it is necessary to trigger at defined moments and, in particular, with a certain delay for reasons essentially of safety when releasing the load.

With reference to Figure 1, the firing fuses 4, constituting triggering means, when they are placed at the front of the load 3, that is to say in ogive mounting, are armed through the exterior of the load, by means of a cable 5, often called "releasable safety device", hooked to the carrier 1, that is to say in general an aircraft.

The fact that this draw cable, or releasable safety device, passes to the outside of the load has the drawback that arming of the fuse may take place in an untimely or accidental manner. In effect, on handling the load, for the mounting of various elements, or for its mounting on the carrier, the draw cable may be actuated involuntarily. The fuse is then armed, and the load is operational; its operation may be brought about at any moment whatever. When an explosive load is involved, it is obvious that this type of event should not take place or should not be possible. Similarly, in the case of an airborne explosive load, any object whatever or a winged creature may accidentally cause the cables to be pulled, and thus the fuse to be armed, and likewise the load, putting the existence of the carrying vehicle in danger.

There exist, at the present time, devices making it possible to reduce the risks of accidental arming: (sic).

The French Patent Application FR-A-2 562 654

describes a safety device for preventing arming of an airborne load before the latter is released. This device also allows for inert release, that is to say without the arming of the load. This safety device is intended to be associated with a release mechanism, so as to provide for effective triggering of the system, solely when released from the equipped vehicle. This safety device includes a clip traversed freely by an arming cable, when it is open, and clipped onto the arming cable when it is closed.

Moreover, the European Patent Application EP-A 0 124 884 describes, with reference to Figure 1, a portable load (1) comprising a firing fuse triggered by means of a cable, hooked to the carrier in the same way as before, but passing, for its major part, inside the load, thus reducing the risks of accidental arming. When the cable is drawn at the moment of release, it frees a striker which comes to activate the firing fuse.

The object of the invention is to create an arming device independent of the dimensions of the load for which it is intended and of such a design that it can be manufactured independently of the load, and mounted on the latter at any moment whatever, and in particular at the last moment.

The load is of the same type as that described in Patent Application EP-A-0 124 884, in that it comprises firing triggering means which have to be armed by the release, by means of a draw cable passing to the interior of the load.

More precisely, the present invention relates to a safety arming device in a load which can be released from a carrier below which it is fixed, the load comprising means for triggering firing which have to be armed by the releasing, by means of a draw cable passing inside the load and linked, on the one hand, to the carrier, and, on the other hand, to a first part of the arming device, situated inside the load in proximity to the said triggering means, and intended to carry out arming of the said triggering means by means of an

element of a fuse, the said arming device being characterised in that the first part comprises mechanical means producing a thrust on an arming rack constituting the said element, when the cable is pulled, and a spring
5 fixed to the cable in such a way as to be compressed during releasing of the load, and to extend after the cable is broken in order to allow rewinding of the cable inside the load, and in that it comprises a second part linked to the first part by the draw cable, having a
10 feeler coming out of the load by the action of the cable and locking the said cable when the feeler abuts against the carrier, thus preventing unintentional arming before releasing.

The invention and its characteristics will be
15 better understood on reading the description which follows, and which is illustrated by the following figures representing:

- Figures 1 and 2b, an airborne releasable load which is equipped with an arming device according to the
20 prior art;

- Figure 2a, an airborne releasable load according to a possible variant of the prior art;

- Figure 3, a diagram of the operating principle of the device according to the invention;

25 - Figures 4a and 4b, a possible embodiment of the device according to the invention, installed in a releasable load;

- Figures 5a and 5b, a possible variant embodiment of part 10B of the device according to the
30 invention.

The reference to Figures 2a and 2b, representing respectively a load 3 in ogive mounting, that is to say with firing means such as a fuse 4 placed at the front of the load and a load 3 with a base mounting, that is to
35 say with a firing fuse 6 placed at the rear of the load. It can be seen that, in these two cases, a draw wire 5 is fixed, on the one hand to the carrier 1 and, on the other hand, to the fuse 4, that is to say to the triggering means. This draw cable 5 penetrates as soon as possible

and as close as possible to the inside of the load 3 so as to reach the fuse 4 by a route entirely internal to the load.

With reference to Figure 3 and according to the invention, an arming device 10 is interposed, placed within the load 3, and on which the draw cable 5 acts. Upon releasing the load, the draw cable 5, fixed to the support 1, acts on this arming device which mechanically arms the triggering means 4, and more precisely the firing fuse. This arming device also constitutes a safety device preventing any irregular and involuntary arming of the firing fuse 4.

Figure 4a is a partial sectional view of the load according to the invention. The main elements represented on the other figures are seen therein, except the support and the means for fastening the load to the latter. These elements are the load itself 3, the triggering means 4, which here are a firing fuse screwed to the front of the load, the draw cable 5 and the arming device 10 placed at the centre of the load and in contact with the firing fuse 4. In this embodiment, the arming device is divided into two parts. A first part 10a is placed in mechanical contact with the firing fuse 4, and centred like the latter on the longitudinal axis of the load. The second part of the arming device, indexed 10b, is placed at the spot at which the draw cable 5 comes out of the load, that is to say at the surface of the latter opposite the lower part of the carrier. The housing in which the first part 10a of this arming device is found already exists on the majority of existing explosive loads. These two parts are linked by a duct 6 containing the draw cable 5. The latter is represented here with an extender wire 7 which is itself fastened to the support. This extender is chosen in such a way that it breaks under a defined mechanical tension.

The first part of the arming device 10a has as its first function to push an arming rack 8 of the fuse 4, and as its second function to rewind the draw cable 5, once arming has been performed. The second part 10b of

the arming device has the function of preventing the untimely arming of the fuse, that is to say untimely pulling of the cable 5 or of the extender 7 before releasing the load.

5 The firing fuse 4 represented in this Figure 4a, has as its main part a feeler 9 which may be translated, by virtue of the arming rack 8, so as to exit at the front end of the firing fuse. A safety cap 14 is fixed in advance over the hole 11 by which the feeler 9 exits from
10 the fuse. The arming rack 8 is accessible through the front face of the firing fuse.

 In this figure there may be noted a toothed wheel 12, engaging in the arming rack 8, and whose shaft exits to the outside of the fuse and around which a lever 13
15 may pivot. It is the latter which is used in the devices according to the prior art for arming. In effect it is after this that the draw cable is attached.

 The first part of the arming device consists of a casing 15 within which an arming stem 16 may slide,
20 which pushes the arming rack 8. At the rear end of this casing 15 is fixed the duct 6 in which the draw cable 5 is placed, which opens out within the said casing to come to pass within the groove of a pulley 17 so as to be sent back in the opposite direction to the rear of the casing.
25 There, the draw cable 5 is fixed to a washer 18 in order to push an arming finger 19 against the arming stem 16. The rewinding function is provided by the fact that the arming finger 19 is placed within a spring 20. The latter and the arming finger are placed tangentially to the two
30 strands of the draw cable in order to provide the following operation.

 When the draw cable 5 is pulled with respect to the load, its end fixed to the ring 15 compresses the spring 20 and makes the arming finger 19 translate
35 towards the arming step 16, until it pushes it by a few centimetres, so as to arm the fuse.

 In the general operating process of the system, the draw cable 5 or its extender 7 is broken at a moment of the release, which brings about the release of the

spring 20, resuming its initial position, and thus rewinding the cable 5, so that it does not drag outside the releasable load.

5 The second part 10b of the arming device may be produced in the following way. In the orifice 21 formed on the surface of the load, and through which the draw cable or its extender 7 comes out, is placed a feeler sleeve 22 which may slide and thus come out in such a way as to project from the load. A stop 23 is provided to
10 limit the movement. An arming ball 24 is fixed after the draw cable 5 in the duct 6 forming a bend towards the sleeve 22, in order to obtain an exit perpendicular to the axis of the load. The arming ball 24 is placed close to this sleeve. The load is positioned under its carrier
15 so that the feeler sleeve 22 may encounter a fixed obstacle of this carrier when it comes out of the load.

This second part 10b of the arming device operates in the following way. When the draw cable, retained by the carrier, moves within the duct 6, the
20 arming ball 24 comes into contact with the internal end 27 of the feeler sleeve. The movement of the cable continuing, the feeler sleeve comes out of the load until it encounters a fixed part of the carrier via its external end 28, when the pulling of the cable takes place
25 when the load is still fastened to the carrier. In this case it can be seen that the pulling of the cable 5 is limited by this feeler sleeve coming to abut against the carrier. The position of the arming ball 24 with respect to the feeler sleeve 22 and the translation distance of
30 the feeler with respect to the carrier is calculated in such a way that arming cannot take place in this case, that is to say that the arming stem 16 is not activated by the arming finger 19 when the feeler sleeve comes to abut against the carrier.

35 The arming of the fuse before release is therefore not possible. It can also be seen that, if the carrier is separated from this feeler sleeve, which is the case upon release of the bomb, the sleeve can continue its translation until the arming stem completely

pushes the arming rack 8. The feeler sleeve is placed within the stop 23, and possesses a shoulder 30 arranged within the load with respect to this stop 23. The distance separating this shoulder of the stop is greater than the distance separating the external end 28 of the feeler sleeve and the carrier. This distance corresponds to the necessary distance for translation of the arming finger 19, so that arming of the firing fuse 4 takes place. In this way, when the shoulder 30 of the feeler sleeve 22 arrives against the stop 23, the draw cable 5 remaining fixed, by means of its extender 7 to the carrier, the load being in free fall, the extender 7 breaks, its resistance to the tension being insufficient to withstand the fall of the load. From this moment the rewinding of the draw cable takes place as was described previously.

Figure 4b represents, in the form of a cross-section of the load, the arrangement of the arming device 10 according to the invention. The arming finger 19 is again seen, surrounded by the spring which is placed at the periphery of the arming device, and the pulley 17, which is placed further within the arming device. The rest of the volume of the latter is occupied by rolls of explosive 40 which serve as a relay between the firing means and the load proper. They will be initiated at the moment of the triggering brought about by the firing fuse.

In the embodiment which is described, the mounting of the feeler sleeve 22 is done after the mounting of the draw cable 5, by pulling on the latter, in order to make it pass through a slot 29 cut in the sleeve 22.

With reference to Figures 5a and 5b, the part 10B of Figure 4a of the device may be produced differently. The feeler sleeve is replaced, for its feeler function, by a feeler lever 50, pivoting around an axis XX' parallel to the direction of the cable 52. An arming ball 53 is still used to move a moveable element; in this case, it takes the form of the feeler lever 50. In

effect, the cable 52 carrying this arming ball passes into a slot 54 of the lever, narrower than the ball. Upon release, the cable is pulled and the arming ball 53 comes to abut against a stop 55 and the edges of the slot 54, and pivots the lever, which will possibly come to abut against the carrier structure 56, in the event of untimely pulling of the cable. A positioning ball 57 is provided above the slot 54 to position the cable 52, and bring back the lever 50 against the body 22 of the bomb after release, in the case where the cable is brought back into the body.

The device according to the invention has certain advantages which are as follows.

It may be mounted in a sealed way in the load with or without the firing means, that is to say the fuse.

The firing fuse may be mounted clipped onto the assembly of the load equipped with its arming device.

Certain configurations may be applied on the device according to the invention; they are as follows.

A storage cap indexed 41 in Figure 4a may be used to stop the hole 21 of the feeler 22, in a leaktight way. It is also possible to provide a wider adapter on the feeler sleeve 22, in order to facilitate its possible arrival in abutment on an element of the carrier.

The feeler sleeve must be wide enough to be able to put in two draw cables. In effect, the load may be equipped with several arming devices, each controlling a special apparatus for a particular function and must in this case receive several orders.

In the case where several arming devices are mounted on the same load, the draw balls 24 may have various shapes in order not to catch each other.

It should also be noted that no energy is stored in the arming device used.



CLAIMS

1. Safety arming device in a load which can be released from a carrier (1) below which it is fixed, the load comprising means for triggering firing (4) which have to be armed by the releasing, by means of a draw cable (5) passing inside the load and linked, on the one hand, to the carrier (1), and, on the other hand, to a first part (10A) of the arming device (10), situated inside the load in proximity to the said triggering means, and intended to carry out arming of the said triggering means (4) by means of an element of a fuse, the said arming device (10) being characterised in that the first part (10A) comprises mechanical means (16, 18, 19) producing a thrust on an arming rack (8) constituting the said element, when the cable is pulled, and a spring (20) fixed to the cable (5) in such a way as to be compressed during releasing of the load, and to extend after the cable is broken in order to allow rewinding of the cable inside the load, and in that it comprises a second part (10B) linked to the first part by the draw cable, having a feeler (22; 50) coming out of the load by the action of the cable and locking the said cable when the feeler abuts against the carrier, thus preventing unintentional arming before releasing.

2. Safety arming device according to Claim 1, characterised in that the mechanical means consist of a washer (18) to which the cable (5) is fixed so as to push, when the cable is pulled, an arming finger (19) against an arming stem (16), which stem exerts the thrust on the said arming rack (8) of the triggering means (4).

3. Arming device according to Claim 1 or 2, for a releasable load in which the means for triggering firing (4) are on the longitudinal axis of the load, the arming device being characterised in that the first part (10A) of the arming device (10) is situated on the longitudinal axis of the load, in contact with the said means for triggering firing.

4. Arming device according to any one of the preceding claims, characterised in that the feeler is a feeler



sleeve (22) surrounding the draw cable (5) at the site where the latter comes out of the load, and in that the second part (10B) of the arming device (10) comprises an arming ball (24) fixed on the draw cable (5), at a short distance from the feeler sleeve, the draw cable forming a bend between the two, in such a way that, when the draw cable is pulled, the arming ball drives the feeler sleeve outwards from the load.

5. Arming device according to Claim 4, characterised in that the said feeler sleeve (22) has a shoulder (24) [sic], which, when the draw cable (5) is pulled, abuts against a stop (23) fixed onto the load (3), in such a way as to cause the breaking of an extender (7) of the draw cable fixed to the carrier (1) when the load is released.

6. Arming device according to any one of Claims 3 to 5, characterised in that it is mounted on a load comprising several triggering means which have to be triggered at different moments for the different devices, and in that the arming device comprises several first parts (10A) and a single, common second part (10B), all the draw cables (5) passing inside a single feeler (22).

7. Device according to any one of Claims 1 to 3, characterised in that the feeler is a feeler lever (50) pivoting around an axis (X, X') perpendicular to the cable (52), the lever having a slot (54) into which passes an arming ball (53) which is fixed on the cable (52) at a short distance from the feeler lever (50), the slot (54) being narrower than the arming ball (53) so that, when the cable is pulled, the arming ball (53) drives the feeler lever (50) in rotation.

8. Device according to Claim 7, characterised in that it comprises a positioning ball (57) fixed on the cable (52) above the slot (54) in order to position the cable and bring it back inside the load.

9. Arming device according to any one of the preceding claims, characterised in that the triggering means (4) of the load on which it is mounted trigger an airborne military explosive load, the carrier (1) being an



aircraft.

10. Arming device according to Claim 1, characterised
in that it is installed inside a radial groove (25)
placed on the longitudinal axis of the load and in a
5 perpendicular plane.