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"Mine-sowing device for aircraft"

The present invention relates to a mine-sowing device for aircraft.

Helicopters are generally used for the rapid sowing of mines and for this purpose are
5 equipped with mine-sowing devices.

A known type of mine-sowing device comprises a cage frame, a plurality of magazines for mines housed vertically in the frame and located in parallel rows, at least one control slide
10 guided for movement in the frame between a first and a second position, a plurality of shafts each rotatably supported by the frame in correspondence with a respective one of the rows and kinematically connected to the slide,
15 and a plurality of security levers mounted on each of the shafts, each in correspondence with a respective one of the magazines, each shaft being movable angularly with the respective levers between a first position, corresponding
20 to the first position of the slide, in which the levers allow the mines to leave the magazines, and a second position, corresponding to the second position of the slide, in which the levers prevent the mines leaving the magazines.

25 In known mine sowing devices the bottoms of the magazines are closed by respective doors controlled by the security levers and a certain number of mines are stacked in each. By means

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of electrical controls the doors of the magazines may be opened in sequence or individually, thus releasing the mines contained therein.

The security levers prevent accidental opening
5 of the magazine doors and reclose the latter in case of need. Generally the security levers fixed to the rotatable shafts are all kinematically connected to the control slide or slides; the movement of the or each control slide by means
10 of an electric motor simultaneously operates all the security levers.

The electric motor, however powerful, is not, however, able to achieve instantaneous or almost instantaneous movement which would nevertheless
15 by very important in both normal and emergency operations.

Indeed, in normal operations instantaneous opening of the doors allows the pilot to carry out the sowing of the mines in rapid succession
20 without having had to start the opening considerably in advance in terms of time (and hence space) relative to the predetermined dropping zone. Furthermore, the possibility of almost instantaneous opening would allow the
25 opportune sowing of mines in zones not foreseen in the operational plan, but occasionally identified by the pilot.

Even more evident is the need for extremely rapid operation in emergency situations. If, for
30 example, the pilot finds himself in difficulties

(due to breakdown of the aircraft or because of opposition), he must be able to abandon the load of mines in the least time possible. Alternatively the pilot may realise unforeseeably
5 that the zone in which he is operating is not suitable and must break off the sowing as quickly as possible.

The problem thus arises of providing a mine sowing device for aircraft in which the security levers
10 are operable almost instantaneously by the pilot.

The object of the present invention is to solve this problem.

According to the present invention, there is
15 provided a mine sowing device of the aforesaid type which includes a first spring constantly biasing the slide towards the first position, a second, stronger, spring urging a drawpiece against the slide towards the second position
20 in opposition to the first spring, removable means for retaining the slide in the second position against the action of the first spring, and removable means for retaining the drawpiece against the action of the second spring.

25 In the mine sowing device according to the invention the movement of the security levers, both in opening and closing, is very rapid; in fact the control slide is moved by springs which, as is well known, give up all their stored elastic energy
30 almost instantaneously.

Further characteristics and advantages of the invention will become clearer from the following description of a preferred embodiment, given with reference to the appended drawings, in which:

Figure 1 is a partly cut away perspective view of a mine sowing device according to one the embodiment of the invention and

Figures 2, 3 and 4 are interrupted sectional views of a detail of the mine sowing device of Figure 1 in three different operative conditions.

The illustrated mine sowing device comprises a parallelepiped shaped cage frame 1 having a harness 2 for hitching to the barycentric hook 3 of a helicopter (not illustrated) and two similar skids indicated 4 on which the frame 1 rests when it is on the ground. The two skids 4 are substantially parallel and have respective first ends 5 hinged to the frame 1 while their other ends 6 are floating, as will be better explained below.

The frame 1 contains a plurality of identical magazines, each indicated 7, for housing mines 8; the magazines 7 are located in vertically arranged positions in parallel rows and are closed at their bottom ends by respective doors 9 supported by the frame 1 and movable angularly on command in conventional manner.

A respective security lever 10 is arranged in correspondence with each door 9.

The door security levers 10 of one row are all rigidly fixed to one of a plurality of parallel shafts each indicated 11.

The shafts 11 are rotatably supported by the
5 frame 1 and are all kinematically connected to two control slides indicated 12 (of which only one is visible in Figure 2, 3 4) supported by the frame 1 and arranged perpendicular to the shafts 11 in correspondence with respective
10 ends 13 of the latter. For example, the kinematic connections are effected by shaping all the ends 13 in the form of pinions and the slides 12 in the form of racks, at least the portions thereof which are in engagement with the
15 pinion ends 13.

The slides 12 are mirror-imaged, as are all the parts relating thereto; hence, for greater simplicity and clarity, the following description relates to a single slide 12 shown in Figures
20 2, 3, 4, it being understood that this description applies in mirror image to the other slide.

The slide 12 is slidable longitudinally on the frame 1, being guided by pins 14 rigid with the frame 1 which engage in slots 15 formed longitudinally
25 in the slide 12. The slide 12 is thus movable longitudinally between two positions: in the first position (to the left with respect to the orientation of Figures 2, 3, 4) the levers 10 are oriented downwardly, allowing the

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opening of the doors 9 and the exit of the mines 8; in the second position (to the right) the levers 10 are oriented horizontally, preventing the opening of the doors 9.

- 5 The slide 12 is further provided with two control devices generally indicated 16 and 17, housed in a casing 18; the device 16 controls the movement from the second to the first position, moving the slide 12 towards the left, 10 while the device 17 controls the opposite movement, as will be explained in detail below.

- The device 16 comprises a crank 19 pivotally supported by the casing 18 about a pin 20 the axis of which is substantially parallel to the 15 shafts 11; the crank 19 has an upper forked arm 21 engaged with a pin 22 rigid with the slide 12 and a lower rod-shaped arm 23.

- The arm 21 is connected resiliently to the casing 18 by a first spring 24 tensioned between 20 the arm 21 itself and a part 25 of the casing 18 to the left of the crank 19.

- The device 16 includes a lever 26 in sliding engagement with the arm 23; the lever 26 is hinged to the casing 18 and is thrust constantly 25 towards the arm 23 by a spring 27. The lever 26 has a seat 28 for coupling with the arm 23 and retaining it against the action of the spring 24 on the crank 19.

The device 16 further includes a pawl 29 acting on the lever 26, hinged to the casing 18 and controlled by an electromagnet 30.

5 The device 17 includes a rod 31 substantially parallel to the slide 12 and guided for longitudinal movement in the casing 18. A drawpiece 32 is fixed to the rod 31 and is engaged at one end with an abutment 33 on the slide 12.

10 The rod 31 is further provided with a shoulder 34; a second spring 35 (which is stronger than the first spring 24) surrounds the rod 31 and is compressed between an abutment 36 of the casing 18 and the shoulder 34.

15 The device 17 also includes a lever 37 in sliding engagement with the drawpiece 32 at its end not in engagement with the abutment 33; the lever 37 is hinged to the casing 18 and is thrust constantly towards the drawpiece 32 by
20 a spring 38.

The lever 37 has a seat 39 for coupling with the drawpiece 32 to retain it against the action of the spring 35 on the rod 31.

25 The device 17 further includes a pawl 40 acting on the lever 37, hinged to the casing 18 and controlled by an electromagnet 41.

The rod 31 is arranged to be driven by the floating end 6 of the skid 4 through a bellcrank lever 42; the lever 42 is rotatably supported by a pin 43 rigid with the casing 18 and comprises
5 a substantially vertical arm 44 extending upwardly and hinged to the rod 31 and a substantially horizontal arm 43 hinged to the floating end 6.

The operation of the mine sowing device described
10 is explained below.

In Figure 2, the slide 12, the devices 16 and 17 and other parts connected thereto can be seen in the position assumed during sowing of the mines. In this phase, the security levers
15 10 are pivoted downwardly to allow the doors 9 to open. It is seen that the slide 12 is in the first position (to the left); the first spring 24 is unloaded while the second spring 35 is loaded, retained by the drawpiece 32 which
20 is locked by the lever 37.

After the desired sowing has been carried out (or in the case of emergency) it is possible to return the security levers 10 to their horizontal positions. For this purpose it is
25 necessary to energise the electromagnet 41 which, by moving the lever 37 with the pawl 40, disengages the drawpiece 32. The spring 35 can thus extend, thrusting the drawpiece 32

against the abutment 33 and thus causing the slide 12 to move to the right from the first to the second position.

During this movement, the shafts 11 rotate, carrying the security levers 10 into their horizontal positions while the spring 24 is loaded, since the force of the spring 35 is prevalent. When the slide 12 has reached the second position, the arm 23 of the crank 19 enters the seat 28 in the lever 26, becoming locked there. The position reached is that illustrated in Figure 3.

At this point, the helicopter returns to the starting base and rests the mine sowing device on the ground. The weight of the mine sowing device causes the skids 4 rotate about their hinged ends 5 so that their floating ends 6 move closer to the frame 1, operating essentially as feelers.

The relative movement between the frame 1 and the skid 4 is transmitted by the bellcrank lever 42 to the rod 31 which is thus drawn towards the left; thus the spring 35 is compressed by the drawpiece 32 until this enters the seat 39 in the lever 37, remaining locked there. In this phase, the slide 12 remains stationary while the drawpiece 32 moves away from the abutment 33. The position reached is that illustrated in Figure 4.

When the helicopter lifts the mine sowing device again after the load thereof has been reinstated, nothing moves, since the drawpiece 32 and the crank 19 are both locked. The security
5 levers 10 are held in the horizontal position preventing the opening of the doors 9.

If it is wished to start the sowing of the mines, it is necessary first to move the security levers 10 by energising the electromagnet 30
10 which, by moving the lever 26 with the pawl 29, disengages the crank 19. The spring 24 then moves the crank 19 which drives the slide 12 towards the left. The movement of the slide 12 is not obstructed by the device 17 since the
15 drawpiece 32 has previously been disengaged from the abutment 33. During this movement, the shafts 11 rotate, moving the security levers 10 into their vertical positions.

The device has now resumed the position of
20 Figure 2.

As is clear from what has been described above, a mine sowing device according to the present invention solves the technical problem of the rapidity of operation of the security levers
25 completely. In fact the weight of the mine sowing device is such as to allow a very strong spring 35 to be used which ensures almost instantaneous operation.

A further advantage of the mine sowing device

described is the elimination of the use of a large amount of electrical power by the helicopter. This fact, as well as having obvious advantages in itself, results in a further advantage. In fact, the electrical connection between the mine sowing device and the helicopter is in parallel with the mechanical connection, creating serious problems of interference upon rotation of the mine sowing device during flight. These problems may be limited by the use of rotary brush and track connectors which are not, however, very suitable for large powers since they introduce an electrical contact resistance into the circuit. The elimination of the power cable thus avoids the need to tackle these problems.

It is clear from what has been described that there is not simply one possible embodiment of the invention. Many practical variations are possible. For example, the springs may be replaced by other resilient elements or even by hydraulic or pneumatic cylinders. Again, the slide may be replaced by a member movable angularly in a kinematically equivalent manner. Also the skids may be replaced by other feelers of different forms and with different mechanisms.



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CLAIMS

1. A mine-sowing device for aircraft, comprising a cage frame, a plurality of magazines for mines housed vertically in the frame and located in parallel rows, at least one control slide
5 guided for movement in the frame between a first and a second position, a plurality of shafts each rotatably supported by the frame in correspondence with a respective one of the rows and kinematically connected to the slide,
10 and a plurality of security levers mounted on each of the shafts, each in correspondence with a respective one of the magazines, each shaft being movable angularly with the respective levers between a first position, corresponding
15 to the first position of the slide, in which the levers allow the mines to leave the magazines, and a second position, corresponding to the second position of the slide, in which the levers prevent the mines leaving the magazines, in which the
20 device further includes a first spring constantly biasing the slide towards the first position, a second, stronger, spring urging a drawpiece against the slide towards the second position in opposition to the first spring, removable means
25 for retaining the slide in the second position against the action of the first spring, and removable means for retaining the drawpiece against the action of the second spring.
2. A mine-sowing device according to Claim 1,
30 including at least one feeler located below the



- frame and movable relative thereto when the mine sowing device rests on the ground, the feeler being kinematically connected to the drawpiece, so that the drawpiece is movable by
- 5 the feeler towards engagement with the removable retaining means in opposition to the second spring when the device rests on the ground.
3. A mine-sowing device according to Claim 2, in which at least one feeler includes at least
- 10 one skid having one end hinged to the frame and a floating end kinematically connected to the drawpiece.
4. A mine-sowing device according to Claim 2 or Claim 3, including a rod guided for axial
- 15 movement relative to the frame, the drawpiece being fixed to the rod, the second spring being located around the rod and compressed between the drawpiece and a shoulder fixed relative to the frame, and the feeler being
- 20 kinematically connected to the rod.
5. A mine-sowing device according to Claim 4, in which the slide and the rod are substantially parallel and movable horizontally alongside each other, the slide being formed with an
- 25 abutment for engagement by drawpiece.
6. A mine-sowing device according to Claim 5, in which the removable retaining means for the drawpiece comprise a lever constantly urged towards the drawpiece by resilient means, a seat



in the lever for coupling with the retaining means of the drawpiece, and a pawl controlled by an electromagnet acting on the lever to disengage it from the drawpiece.

5 7. A mine-sowing device according to Claim 3 and 5, including a bellcrank lever rotatably supported by a pin rigid with the frame, one arm of the bellcrank lever being hinged to the rod, the other arm being hinged to the said
10 floating end of the skid.

8. A mine-sowing device according to any one of the preceding claims, in which the first spring is tensioned between the frame and a crank which is pivoted on the frame and engaged
15 with a pin on the slide.

9. A mine-sowing device according to Claim 8, in which the removable means for retaining the slide in the second position include a lever constantly urged towards the crank by
20 resilient means, a seat in the lever for coupling with and retaining the crank, and a pawl controlled by an electromagnet acting on the lever to disengage it from the crank.

10. A mine-sowing device according to Claim 7,
25 including two said skids mechanically connected in parallel to each other.

11. A mine-sowing device substantially as herein described with reference to and as shown in the accompanying drawings.
