This invention relates to devices for dropping articles from aircraft of the kind having electro-magnetically released systems of levers and the main features of the invention relate to the fact that the first two of the successive levers are connected with each other permanently by means of a link with pivots or like hinges so that they constantly remain in positive connection and are always solidary so that for any position of one of the same there is only one position of the other elements possible, this arrangement ensuring the absolute control of the relative positions of the elements and preventing any possibility of jamming, of accidental false manoeuvres or the like.

The arrangement comprises:

(a) Mechanism for holding and releasing the article.

(b) A safety mechanism.

(c) Signalling mechanism.

This apparatus which may be operated from a distance by means of any electric switch or the like, is constructed with a view to:

(1) To effect automatic attachment without any other manipulation than raising the article to the position in which it is to be held;

(2) To ensure secure locking of the elements by permanently connecting together those parts which have a large movement;

(3) To reduce to the minimum the effort required from the electro-mechanical device in order to diminish as much as possible the weight of iron and copper used for the same and further the electric energy necessary for operation;

(4) To realize a complete security of locking by mechanical locking mechanism adapted to be operated from a distance and maintaining the elements in the closing position.

(5) To ensure the possibility of producing the release by a mechanical or electro-mechanical action if the automatic release is not desired.

(6) To ensure the interruption of the circuit of the main electric driving after the closing of the article.

An apparatus of this type is shown by way of example on the accompanying drawings, in which:

Fig. 1 shows in elevation the mechanism in the position in which it holds the article to be dropped.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a similar view as Fig. 1, the article being released.

Fig. 4 shows the cam in its three working positions.

The apparatus according to the invention comprises essentially two plates 1 connected with one another by the axles 2, 3, 4, 5 which serve as pivot axles for the movable elements, and further by stops 6 and 7. A lever 8 having one hook-shaped end, pivotally mounted on the axle 2, is designed to grip with its beak 9 into a ring 10 attached to the article to be dropped. Two connecting rods 12 hingedly fixed at either side of the end of the straight arm of the lever 8 are hingedly connected at their other ends to the cam lever 13 pivotally mounted on axle 3. A releasing lever 14 which carries the armature and is pivotally mounted on axle 4 bears with its end 15 against the cam 16 of the cam lever 13 holding in this manner the mechanism in the locking position or releasing the same from this locking position. The armature 18 carried by lever 14 is adapted to be attracted by the iron-clad coil 17 in order to release the mechanism. From the lower surface of lever 14 a bent arm projects in which a cam 19 is located for the rotation of which produces successively, according to the position of its advancing part, first the locking of lever 14 in the locking position (position 19° of Fig. 5), second the possibility of electrical release of this lever 14 (position 19° Fig. 5), third the releasing of the lever 14 by a mechanical or electro-mechanical drive without intervention of the coil (position 19° Fig. 5).

An electric interrupter 20 interposed in the circuit of the coil is operated by the elbow lever 21 the end of which is in contact with the curved head 22 of the hook-shaped lever 8, this head forming a cam.
The same interruptor ensures the interruption of the circuit of the coil after the article has been released.

In the position shown in Fig. 3 the mechanism is released, the interruptor is open, the current does not flow through the coil and the lever 14 is ready to be oscillated by the action of spring 23 into the releasing position.

Before hooking on the object to be dropped the switch for the main drive has to be brought into the "open circuit" position whereupon the ring 10 is pushed at 24 against the hook of the lever 8. In pushing vertically from below upward the hook of the lever 8 is raised, the connecting rods 12 push the cam lever 15, the cam-shaped head 23 of which comes in contact with the releasing lever 14 and lifts this lever in putting the spring 23 under tension, up to the moment when the cam-shaped head 16 passes beyond the end 15 of the lever 14 which drops them into the locking position. At the same time, through the intermediary of the elbow lever 21, the interruptor 20 closes and the brush 26 is in contact with the contact plugs 27 so that the circuit of the signaling lever 21 and the signaling device is operated.

The releasing is effected in the following manner: The switch being closed the current flows into the coil which attracts the armature 18 of the releasing lever 14; this lever oscillates and its end 15 releases the cam head 16 of the cam lever 15. At this moment the cam lever 13, under the action of the weight of the system of articulated levers and of the load hooked on the lever 8 by the ring 10, pivots around its axle 3 so that the system of articulated levers is stretched out and the ring 10 is liberated.

At the same time the curved surface 22 of the hook-shaped lever 8 acts upon the elbow lever 21 which opens the switch 20, the brush 26 gets off the contact plugs 27. The circuit of the coil is interrupted, the armature 18 is released and the releasing lever 14 is pulled back by its spring 23 and returns to the initial position.

The above described arrangements are given by way of example only, as other forms of construction may be realized without departing from the principle of the invention as well as regards the elements of the mechanism as those of the switch or the signaling apparatus. The electro-mechanical releasing device which has been described is essentially characterized in that:-

(1) The different elements, liberated by the manipulation of the releasing lever form an articulated system, the elements of which remain permanently in connection wherefrom results the security that the locking and releasing are carried out accurately and with precision.

(2) The effort transmitted to the releasing lever in the locking position is reduced to the minimum by the fact that the lines along which the forces act which cause the releasing of the articulated system, pass as nearly as necessary along the fixed axes of rotation.

(3) At the same time the arrangement of the elements of the articulated system is such that, in the opening position, the movement of force which causes the operation of the releasing lever is maximum and permits of the automatical releasing of the ring, which carries the article to be dropped, simply by a pressure exerted upon the lever.

(4) The pivot axle 4 of the lever 14, which carries the armature, is situated in closest proximity to the coil, this arrangement having the effect to render the releasing effort maximum for a total stroke of the end of the releasing lever, in consideration of the considerable increase of the attractive force resulting from the diminution of the air gap to the minimum for a given number of amp.-turns.

(5) The stroke of each movable element is limited by the play of the elements or by the stops of the articulated system, no element being loosely mounted on its axle, which excludes any possibility of a wrong manoeuvre and of bad engagement.

(6) The emergency device for moving the mechanism into the holding or releasing position consists of one single cam 19 working on two profiles of the releasing lever and adapted to bring the mechanism by any rotation of convenient amplitude successively into the three characteristic states of working: locking, electric current releasing, emergency releasing.

(7) All the parts of the mechanism have parallel pivot axles, all the reactions take place in the same plane and there exists no axial effort acting upon the joints of the system.

We claim:--

An electro-mechanical apparatus for dropping articles of any kind from aircraft, comprising in combination a hook, an arm of said hook, two connecting rods hingedly connected at the lower ends to said arm, an axle fixed at a short distance on the outer side of the plane in which said connecting rods are situated, a cam lever oscillatory mounted on said fixed and hingedly connected to the upper end of said connecting rods, a releasing lever pivotally mounted on a stationary axle bearing with its inner end against the upper end of said cam lever, a curved arm on the lower side of said releasing lever, a armature fixed to the outer end of said releasing lever, and a coil of an electro-magnet adapted to attract said armature, and a cam engaging with said curved arm.

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