

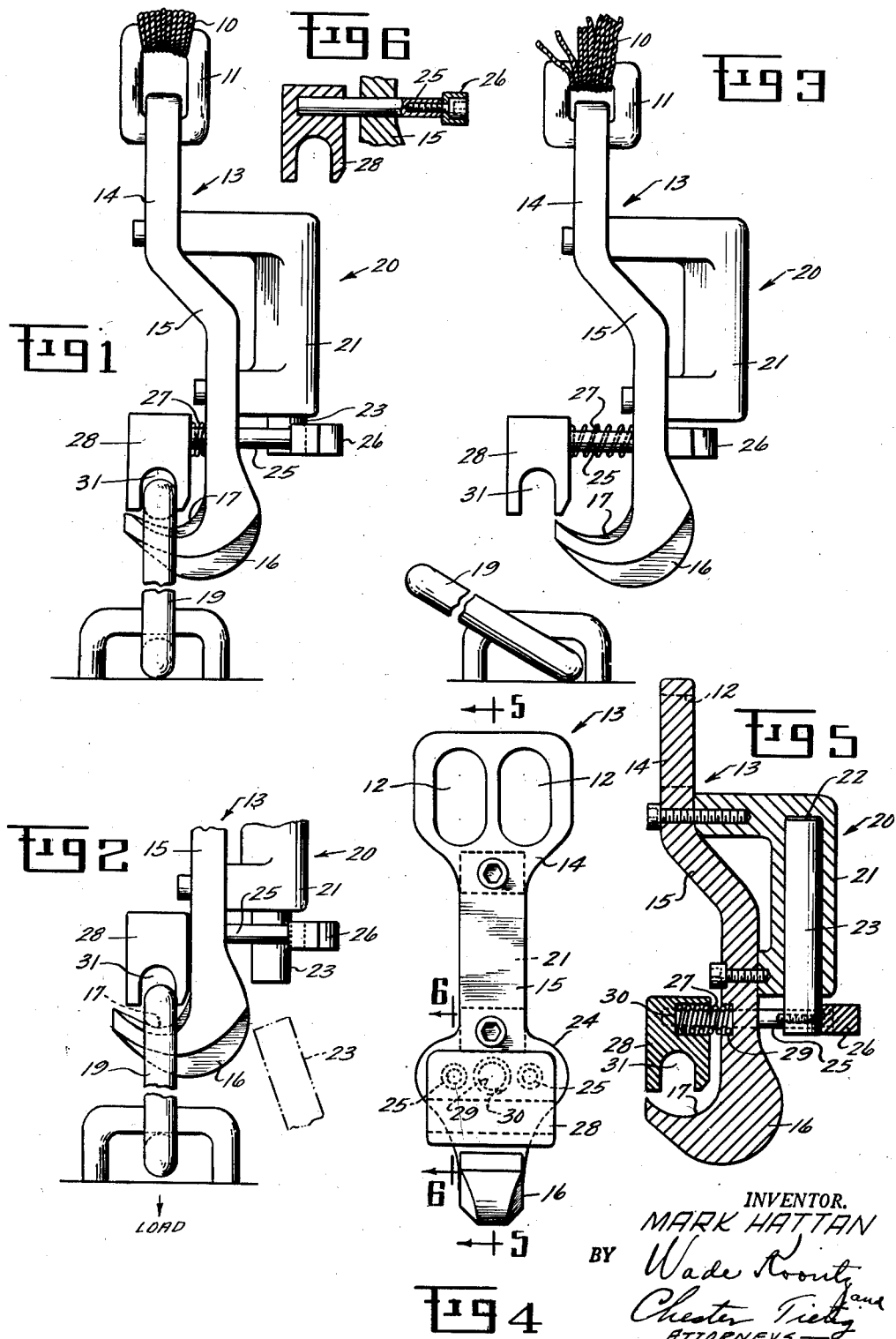
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AUTOMATIC PARACHUTE GROUND RELEASE

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AUTOMATIC PARACHUTE GROUND  
RELEASE

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10 Claims. (Cl. 294—83)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without payment to me of any royalty thereon.

This invention relates to an automatic ground release for parachutes. It may be applied to parachutes carrying either personnel or inanimate loads.

One object of the invention is to provide a device of this character which is simple, strong, inexpensive and positive in its action.

Another object is to provide a device which requires no special tools to adjust; contains no fluids which may freeze or leak; requires no static line to the airplane and which stays with the parachute.

Another object is to provide a device which has an adjustable time delay to prevent opening during any no-load condition following the opening shock.

Referring to the accompanying drawings,

Fig. 1 is a side elevation of the device with load connections, but with no load applied.

Fig. 2 is a side elevation of a fragment comprising the lower half of Fig. 1, the load connections indicating the application of load.

Fig. 3 is a side elevation corresponding to Fig. 1, showing the load connections ejected from the device.

Fig. 4 is a front elevation of the device by itself.

Fig. 5 is a longitudinal section taken on the line 5—5 of Fig. 4.

Fig. 6 is a sectional detail taken on the line 6—6 of Fig. 4.

In Figs. 1 and 3, 10 are the shroud lines extending to the parachute canopy (not shown) 11 is a canopy link, of which there are two (the second not being shown), each link 11 extending through an opening 12 in a hook 13. In the shank 14 of hook 13 there is an offset 15 which serves to center the load vertically. It is also shown in Fig. 5. Below the offset 15 the shank 13 terminates in a bight 16, the inner surface 17 of which slopes toward the shank 13, and thereby forms a reversed parabolic curve. The curved surface 17 is adapted to compel a load-supporting link such as 19, when in contact with surface 17 and under load, to move sideways on surface 17 toward shank 14 into the bight of the parabola.

The time-delay device 20 comprises a dashpot chamber casting 21 which is attached to the shank 14 both above and below the offset portion 15. In it is bored a vertical cylindrical opening 22, in which fits closely, a free piston 23. The latter has a clearance of about 0.0015" on each

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side which should be such that it takes the piston 23 about seven seconds to fall out of the opening 22 when unhindered. For special purposes, the clearance may be varied to make the rate of fall any desired one, but seven seconds is preferred. The piston may be graduated so that when inserted to less than its full length, lesser periods of fall are brought about. The piston 23 is somewhat longer than the opening 22.

Just below the lower end of casting 21 there is a widened portion 24 of the shank 14 (Fig. 4). Through it extend two slidable rods 25. The rods 25 at their right-hand or rear ends are connected by a yoke, the inner surface of which is curved to fit the outer end of the piston 23, which projects a short distance out of dashpot casting 21 when inserted as far as it will go. Between the rods 25 there is a coil spring 27, one end of which is retained in a shallow opening 29 in the shank 14 and the other end in a link ejector 28 by a channel 30 therein. Spring 27 is normally compressed when the device is in the position shown in Figs. 1, 2 and 5, but retains considerable compression when in the position shown in Fig. 3. In other words, it is a rather strong spring; strong enough to eject a load supporting link from the bight 16, but weak enough to be compressed by the movement of the loaded link sinking into the lowest portion of the bight. The ejector 28 is mounted on those ends of the rods 25 which are within the bight 16. Ejector 28 also serves as a retaining device for the link 19 as long as the piston 23 is in the dashpot opening 22 and the link 19 is unloaded.

The operation of the device is as follows:

With the piston 23 absent, the yoke 26 is pressed toward the shank 15, bringing the ejector 28 to the position shown in Fig. 3. The load link 19 is slipped into a channel 31 in the ejector 28, piston 23 inserted and the pressure is released. Link 19 assumes the position shown in Fig. 1, the piston 23 having been meanwhile inserted. Yoke 26 is now pressing against the piston 23, thereby preventing it from falling out.

Now assuming that the parachute and the load, connected by my device, are launched together. The load exerts a pull on link 19, pulling the latter into the bight of the curved surface 17. Side-wise force is transmitted through ejector 28 and rods 25 to compress spring 27, thereby releasing yoke 26 from contact with piston 23. The latter now begins to fall slowly out of opening or chamber 22. If a no-load condition should occur during that time, yoke 26 would again contact the piston 23 and no ejection of link 19 would occur.

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When the load reaches ground however, a no-load condition will occur, if the piston has been set correctly, after the piston has fallen out. A correct setting of the piston is to insert it into opening 22 so far that it will not fall out before the no-load condition due to parachute opening shock occurs, but that it will have fallen out before the load reaches the earth. The setting of the piston in the chamber 22 is therefore chosen with regard to the altitude from which the load and parachute are launched and other considerations such as the diameter of canopy in relation to the weight and air resistance of the load.

The no-load condition at landing causes the spring 27 to expand, which it can do because the link 19 is no longer pulled into the bight of surface 17. The ejector 28 therefore suddenly assumes the position shown in Fig. 3 and link 19 is thrown clear of surface 17. The canopy then cannot drag the load, even though the canopy should be blown along the surface of the ground.

The piston 23 may be flexibly attached by a chain to the yoke 26 to make it recoverable although such attachment is not regarded as part of my invention. The piston may also bear indicia showing the length of time that will be taken to fall from various lengths of insertion.

I claim as my invention:

1. In an automatic parachute release device, a hook having a shank, a dashpot attached to the rear of said shank, time delay means comprising a free piston in said dashpot, means for retaining a load-supporting link in the bight of said hook while the piston remains in the dashpot under a loadless condition, said retaining means comprising a yoke adapted to contact said piston substantially while the latter remains in the dashpot, rods extending transversely through said shank over said bight, an ejector member adapted to fit over a load carrying link and a coil spring concentric with said rods between said ejector and said shank, the length of said rods and the strength of said spring being so chosen that the spring can be compressed sufficiently when a normal load is attached to the load-carrying link to free the piston from contact with the yoke due to the movement of the ejector as it follows the link into the lowest portion of the bight by reason of load stress exerted on the load-carrying link and strong enough to eject said link from the bight substantially as soon as a no-load condition occurs by reason of the load making contact with the ground.

2. In an automatic parachute release device a hook having a bight, a flattened shank and eyes for the attachment of a canopy, an ejecting device mounted through the shank of the hook and being movable over the bight thereof at such distance from the inner surface thereof as to provide room for a load supporting link and being normally spring pressed along said bight and finally beyond said bight when the hook is unloaded, a dashpot attached to that surface of the shank which faces away from the bight, a free piston in said dashpot and projecting therefrom, a retaining yoke for said piston on said ejection device for retaining said piston in the dashpot under no-load conditions, spring means on said ejection device of a strength suitable to urge said retaining yoke against the projecting end of said piston when the hook is in no-load condition and to free said piston to fall when the hook is loaded and to traverse said ejection device beyond the bight of said hook at no-load condi-

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tion if such condition occurs after said piston has dropped free.

3. In an automatic parachute ground release, a shanked hook for attaching the canopy and suspending the load, an ejector for ejecting a load-supporting link outwardly along the bight of said hook and finally free from said hook, said ejector comprising a channeled block slidable across the bight of said hook, a compressed coil spring capable of storing sufficient energy for ejection of the link under no-load condition of said link, said spring being retained between said block and the face of said hook, slidable rods supporting at one end thereof said block and extending through said hook at the shank portion thereof, a yoke attached to the ends of said slidable rods at the other end, a dashpot casting attached to that face of the shank away from which the bight of the hook extends, a free piston in said dashpot casting, said piston extending beyond said casting sufficiently to be in contact with and retained by said yoke and spring when there is no load upon said hook and free of said piston when the hook is loaded said freedom occurring by reason of further compression of said spring due to movement of said ejector over the bight toward said shank due to a load-supporting link occupying the channel of said ejector sinking into the bight of said hook toward the shank thereof.

4. In an automatic parachute release device of the class in which a load retaining ring is retained in the bight of a hook under load and ejected therefrom at no load, a time-delay device attached to said hook vertically on the shank thereof, said time-delay device comprising a dashpot, a close-fitting piston in said dashpot normally projecting therefrom at the lower end thereof, a channeled block extending over the bight of the hook, said channel being adapted to retain a load-supporting link between said bight and said block, slidable rod means extending through the shank and supporting said block on one end and on the other a piston restraining yoke, said yoke being adapted to contact said piston at no-load condition the restraint of said piston being made inoperative by a movement of said channeled block and said link into the bight of said hook under the gravitational urge of the loaded load-supporting link to occupy the lowest position in the bight of said hook whereby to release said yoke from contact with said piston and permit the piston to fall free, and normally-compressed spring means having sufficient potential energy for moving said channeled block beyond the hook upon the occurrence of a no-load condition on the load-supporting link after the fall of said piston, whereby to eject said link from the bight of said hook.

5. In an automatic parachute release device a hook having eyes, a bight and a flat shank, a combined load link retaining and ejection member comprising a channeled block, slidable rods positioned by their ends in said block and pressing said shank, a yoke joining said rods on that side of the shank that is opposite to said block, a dashpot attached to the same side of said shank a close fitting piston in said dashpot positioned to fall away therefrom if unrestrained and projecting from the dashpot when fully inserted therein, a coil spring normally urging said block, and its attached rods beyond the bight of said hook whereby to restrain said piston by contact with said yoke, said spring being of such strength that it may be compressed by the action of a

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loaded load supporting link in the bight of said hook to move the block inward on the bight toward the lowest point thereof and thereby free the piston from contact with said yoke and allow said piston to fall, and after the complete freedom of said piston from said dashpot to eject a load link free of said hook by moving said block and link over the bight and then free of said hook when a no-load condition occurs on said link.

6. A device according to claim 5 in which the shank of the hook is offset to center the load.

7. An automatically releasable parachute load comprising, a hook member including an upper shank portion rigidly connected to a lower hook portion, means at the upper end of said shank portion to connect said hook member to a parachute, said hook portion providing an upwardly opening recessed bight portion to receive a load-carrying link normally depending from said hook portion, a link ejector member mounted on said shank portion for movement transversely thereof and including a link engaging portion between the upper end of said link and said shank portion when said link occupies said bight portion, spring means acting to bias said link ejector in a direction to move said link-engaging portion away from said shank portion, said spring means having a horizontal component weak enough to allow the link to sink into the bight portion while under load, but strong enough to eject the load-carrying link from said bight portion when the load is removed from said link, whereby said link ejector acts to eject said link from said bight portion when the parachute supported load attached to said link reaches the ground and said load is no longer effective to hold said link in said bight portion against the force of the spring biased link ejector.

8. An automatically releasable parachute load connector comprising, a hook member including an upper shank portion rigidly connected to a lower hook portion, means at the upper end of said shank portion to connect said hook member to a parachute, said hook portion providing an upwardly opening recessed bight portion to receive a load-carrying link normally depending from said hook portion, a link ejector member mounted on said shank portion for movement transversely thereof and including a link engaging portion between the upper end of said link and said shank portion when said link occupies said bight portion, spring means acting to bias said link ejector in a direction to move said link-engaging portion away from said shank portion, said spring means having a horizontal component weak enough to allow the link to sink into the bight portion while under load, but strong enough to eject the load-carrying link from said bight portion when the load is removed from said link, means providing a dashpot cylinder on said shank portion opening downwardly, a free piston in said cylinder blocking the potential sidewise movement of said link ejector member and ceasing to block the link ejector upon the latter being forced sidewise under the influence of the load-carrying link sinking into the bight portion, whereupon said piston drops out of said cylinder, whereby the free piston drops from said cylinder by force of gravity during the free fall of a loaded

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parachute and whereby said link ejector acts to eject said link from said bight portion when the parachute supported load attached to said link reaches the ground and said load is no longer effective to hold said link in said bight portion against the force of the spring biased link ejector.

9. In an automatic parachute release device, a hook having a shank, a dashpot attached to the rear of said shank, a free piston in said dash pot, means for restraining said piston during a no-load condition and for retaining a load supporting link by the weight of the load in the bight of said hook when said link is under load, spring means for moving said retaining and restraining devices and link outwardly along the bight of the hook and then free from the hook when the load supporting link becomes unloaded, said spring means having a horizontal component weak enough to allow the link to sink into the bight portion while under load, but strong enough to eject the load-carrying link from said bight portion when the load is removed from said link, said restraining means comprising a yoke, a rod supporting said yoke at its outer end, an ejector supported by said rod at its inner end over said load-supporting link, said rod passing through the shank of said hook and supporting said retaining device, said spring means being mounted about said rod, said yoke being releasable from contact with said piston by the action of the load in moving said restraining means toward the lowest point on the bight of said hook whereupon said piston is free to fall under the action of gravity.

10. In an automatic parachute ground release, a hook for suspending a load, means for retaining a load suspending member within the bight of said hook by the weight of the load upon said member, spring means for ejecting said load suspending member outwardly along the bight of said hook when a no-load condition occurs and finally free of said hook said spring means having a horizontal component weak enough to allow the link to sink into the bight portion while under load, but strong enough to eject the load-carrying link from said bight portion when the load is removed from said link, time delay means carried at the rear of the shank of said hook, a yoke carried to the outer end of said spring means in contact with said time delay means during a no-load condition, said retaining means being positioned over the bight of said hook and actuable thereover so that when the load suspending member is drawn to the lowest point of the bight of said hook by the application of the load thereto, said yoke is released from contact with said time delay means, the operation of said spring means being inhibited by said time delay means until the loss of said time delay means unlocks said spring means.

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