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3,158,344

EJECTION SEAT FACE CURTAIN RESTRAINT SYSTEM

Filed Sept. 30, 1963

3 Sheets-Sheet 1

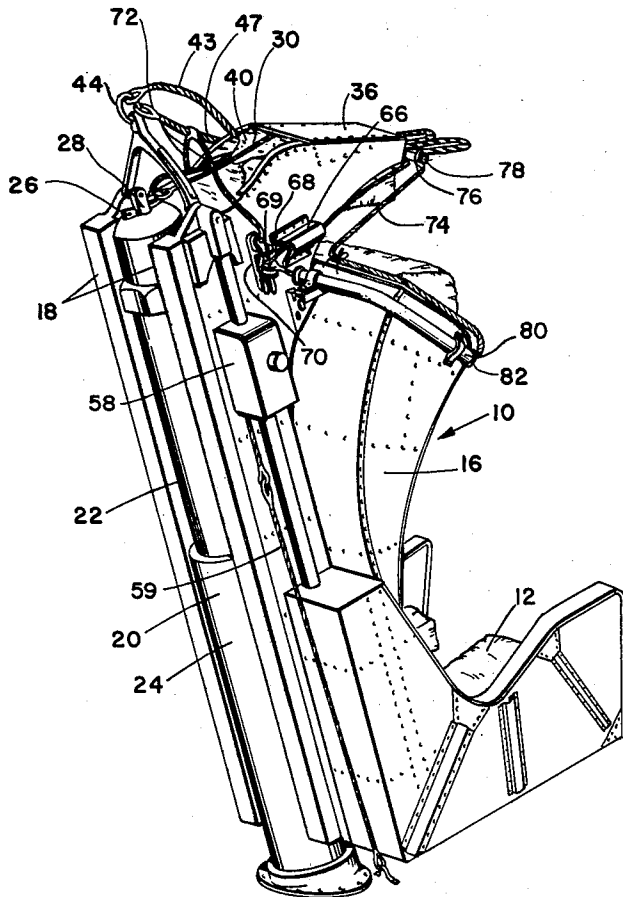


Fig. 1

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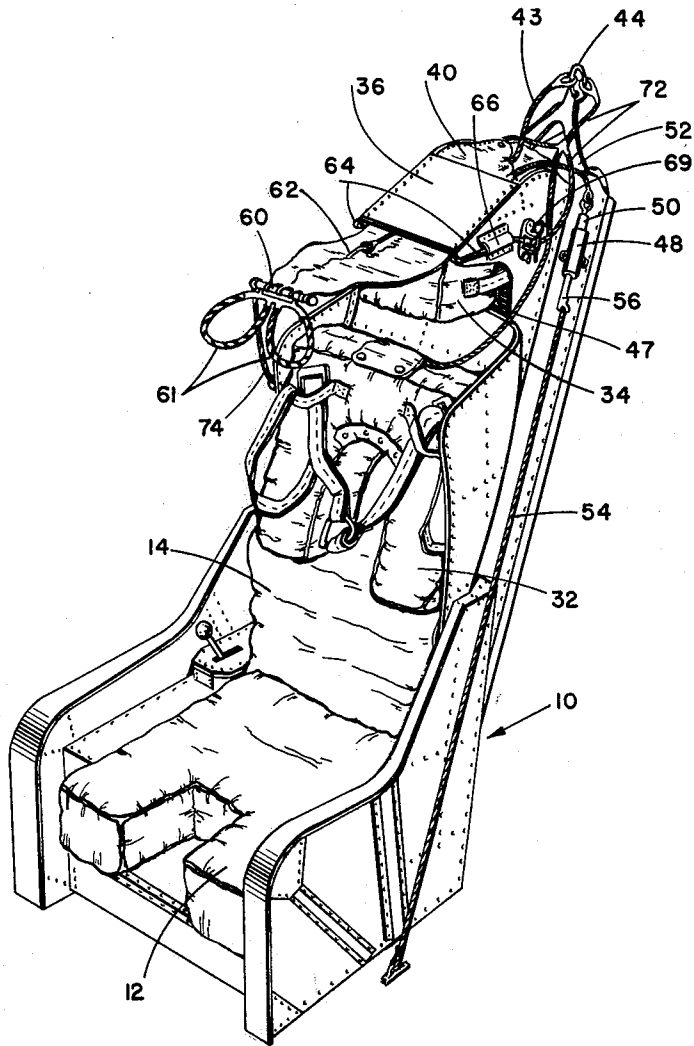


Fig. 2

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3 Sheets-Sheet 3

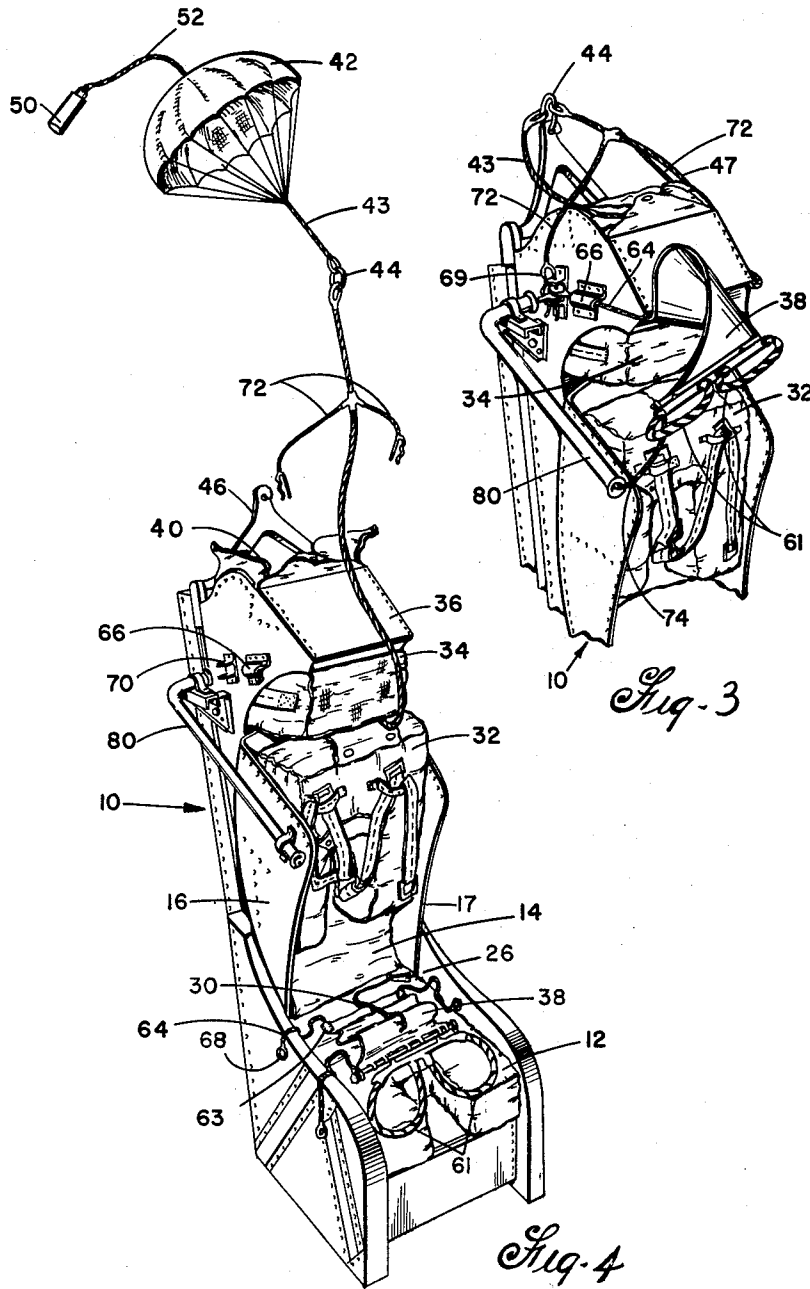


Fig. 4

Fig. 3

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## EJECTION SEAT FACE CURTAIN RESTRAINT SYSTEM

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5 Claims. (Cl. 244-122)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to aircraft ejection seats and particularly to the face curtain for protecting the occupant's head.

As an emergency escape, aircraft are equipped with seats which are catapulted clear of the aircraft. As the seat moves upward and away from the aircraft, a small parachute, called a drogue, opens to stabilize the seat in its ejection flight. The drogue is then detached from the seat and pulls out the personnel parachute. In so doing the seat occupant is separated from the seat and lowered to the surface.

The ejection operation is initiated by firing a seat ejection gun mounted at the back of the seat. The firing takes place normally, by the occupant drawing a curtain down over his face for protection against the force of the airstream, since there is a connection between the curtain and the ejection gun firing mechanism. The drogue parachute is released with the firing of a drogue gun a short time after the seat is ejected. The drogue gun, the drogue parachute and the face curtain are all mounted near the upper portion of the seat.

Because of the violent force of ejection, there is a downward pull on the arms of the occupant as he holds the face curtain over his head. At times it has been impossible for the seat occupant to maintain his grip on the face curtain. Consequently, it was pulled out of his hands and blown rearwardly over the back of the seat. Instances where this occurred before the drogue gun fired, because of the face curtain length, it had fallen over the drogue parachute and drogue gun. After the drogue gun fired, it penetrated the face curtain. Entanglement of parachute lines and interference or a stopping of further steps in the ejection operation resulted.

With this in mind it is an object of this invention to provide improvement in ejection seat face curtains which will limit its rearward movement so as not to interfere in the sequence of operations and which allows its detachment from the seat to permit an occupant to readily leave the seat.

Other objects and advantages will become apparent from the following description of the typical embodiment of the invention shown in the accompanying drawing, wherein:

FIG. 1 is a perspective view of an ejection seat employing the invention;

FIG. 2 is a similar view showing the other side of the seat and with the face curtain withdrawn;

FIG. 3 is a perspective view of an upper portion of the seat showing the face curtain withdrawn and blown free;

FIG. 4 is a perspective view of the seat showing the face curtain disconnected.

Referring to the drawing, 10 indicates an ejection seat intended for mounting in an aircraft, not shown. The seat has a horizontal, occupant supporting bottom 12, from which a back 14 inclines upwardly and slightly rearwardly, and has sides 16 and 17. A pair of parallel, vertical extending guides or slippers, 18, are secured to the rearward side of the seat back 14 which are slidably

receivable in channels, not shown, fastened to the aircraft for directing the upward movement of the seat.

The seat 10 is expelled from the aircraft by firing an ejection gun, 20, located behind the seat. It has a piston 22 secured to the seat and a cylinder 24 secured to a fixed part of the aircraft. An explosive charge in the ejection gun is detonated by withdrawing a pin 26 from a firing mechanism 28 by a pull on a cord or lanyard 30. The pressure of the resulting expanding gas from the detonation of the explosive charge propels the ejection gun's cylinder, with the seat, upwardly and out of the aircraft.

The personnel parachute, 32, is located on the forward side of the seat's back 14. Above that there is a head rest 34, which is under a forwardly opening container 36 that houses the face curtain 38. Behind the face curtain container there is an open top compartment 40 in which the drogue parachute 42 (FIG. 4) is stored. This is a small parachute which is releasably attached at an upper portion of its lift line 43, which has a link 44, to a shackle 46 secured to the back of the seat. The drogue parachute 42 opens shortly after the seat is ejected and orients and stabilizes it. The end, 47, below the link 44, of drogue parachute lift line 43 is secured to the canopy of the personnel parachute 32 for deploying the latter after the lift line 43 has been released from the shackle 46.

The drogue parachute 42 is deployed with ejection from a drogue gun 48 of a piston 50 that is connected to its canopy by a line 52. The drogue gun 48 is mounted on the left side, 17, of the seat near the top and is fired shortly after the seat has been ejected from the aircraft. Usually, a line 54 secured to a fixed part of the aircraft withdraws a sear 56 from the drogue gun firing mechanism (not shown) with rise of the seat to discharge the drogue gun. Upon firing the drogue gun, its piston 50 is sent flying upward pulling the drogue parachute 42, out of its compartment, with it.

The shackle 46, which attaches the drogue parachute 42 to the seat, is opened automatically a short time after the seat is stabilized with the drogue parachute's deployment by a timing mechanism 58 which is actuated with the withdrawal of a sear, not shown. A line 59 secured to a fixed part of the aircraft and to the sear withdraws the latter with rise of the seat. The manner in which this is accomplished is not deemed necessary for understanding of this invention and will not be described.

The face curtain 38, which is generally a rectangular piece of fabric, in its non-operative position, is folded in the face curtain compartment 36 with its forward end at the opening to the container 36, which is above the seat of occupant's head, not shown. Secured to the forward end of the face curtain there is a rigid bar 60 carrying two bales or handles 61 and 61 by which the face curtain may be withdrawn from its container. The ejection gun firing lanyard 30 is connected to the top of the face curtain in a suitable manner as shown at 62 in FIG. 2. Its length is such that withdrawal of the face curtain 38 tensions the lanyard sufficiently to remove the ejection gun's firing pin 26 as shown in FIG. 1, and fires the gun.

Secured, as by stitches, 63 FIG. 4, to each of the rearward corners of the face curtain 38 there is a non-extensible, flexible member or strap 64. These extend substantially horizontally and rearwardly through guides 66 secured to the sides of the face curtain container 36 for holding a withdrawn curtain, FIG. 2, to the seat. The free end of the strap or rearward restraint 64 carries an apertured fitting, 68, FIG. 1, which is releasably secured by a pin 69 to an anchor or apertured lug 70 mounted on the sides of the face curtain container 38 and/or the drogue parachute compartment 40 at the rearward end of the guide 66. For removal of the face curtain pins 69, there is a flexible line or cord 72 that connects them

with the drogue parachute lift line 43 at a point intermediate of its connection with the shackle 46 and the top of the personnel parachute 32. When the drogue parachute lift line 43 is separated from the shackle 46, it pulls out the personnel parachute 32 and in so doing the pins 63 are withdrawn whereby the face curtain is disconnected from the lugs 70.

A face curtain on an ejected seat that is free, that is, one that is not held at the handle by a seat occupant will be carried rearward by the wind blast. Because of its length, the face curtain will cover the top of the seat including the mechanism as the drogue gun 48 and the drogue parachute compartment 40. Should this occur before the drogue gun has fired, the drogue piston 50 will be propelled through the face curtain. The lines attached to the drogue parachute, as its lift line 43, become entangled and opening of the personnel parachute may not take place.

This is avoided by the provision of a downward restraint 74 attached to the forward end of the face curtain 38 to limit its upward and rearward movement. The downward restraint 74 is a piece of non-extensible fabric, such as Dacron webbing, which has an apertured fitting 76, secured to each end. It is disposed on the side opposite the drogue gun 48 with its forward fitting, 76, secured by a nut 78 to the right end of the face curtain handle rod 61 on the forward end of the face curtain. The downward restraint 74 passes downward into the forward end of a guide tube 80, about which it is trained and then rearwardly and upwardly to the lug 70. The fitting on the rearward end of the restraint 74 is releasably secured by the pin 69 to lug 70, together with the curtain's rearward restraint 64 which is on the same side of the seat. Removal of the face curtain pins 69, as previously explained, will release not only both rearward restraints 64 but also the downward restraint 74, so as to completely free the face curtain, as in FIG. 4.

Guide tube 80 is designed to follow the side contour of the ejection seat. It extends from the lug 70 downwardly and toward the front of the seat. Its rearward end opens at a right angle to and over the lug 70. It extends outwardly, since the portion of the seat to which the lug 70 is attached is narrower than the portion housing the personnel parachute 32, and then forwardly and downwardly at about a 45° angle. Its forward end 82 is under the opening to the face curtain container 36 and its edges are rolled so that the restraint 74 may be flexed about them without damage. The length of the downward restraint 74 is sufficient to reach from lug 70 to the face curtain container 36 opening while passing through the guide tube 80 without any substantial slack, FIG. 1. So disposed, the downward restraint 74 causes no interference with the seat occupant whether the face curtain 38 is stored in its container 36 or withdrawn.

When the face curtain 38 is free, that is, withdrawn but not held at the handle 61 and still attached by the pins 69, the airstream will inflate it and carry it back, as in FIG. 3. The unrestrained forward corner of the face curtain 38 will turn over, FIG. 3, but the face curtain will not reach back far enough to cover any of the mechanism, as the drogue gun 48 or the drogue parachute 42.

Although only one downward restraint 74 is shown, a similar one may be provided for the other forward corner of the face curtain 38. However, from tests little additional advantage was found by such modification.

Even though only one embodiment of the invention has been shown and described, many modifications within the scope of the appended claims are contemplated.

What is claimed is:

1. In an aircraft ejection seat having sides, a parachute disposed on said seat having a lift line, a face curtain disposed in an upper portion of said seat adapted to be drawn downwardly over a seat occupant's head,

(a) anchoring means secured to said upper portion of said seat;

(b) a strap connected at one end to a rearward portion of said curtain;

(c) an elongated flexible member secured at one end to a forward portion of said face curtain; means connected to said lift line releasably securing the other ends of said strap and said elongated flexible member to said anchoring means for releasing said ends with deployment of said parachute;

(d) and means training said elongated flexible member downwardly and forwardly from said anchoring means on the side of said seat to said forward portion of said face curtain.

2. The device of claim 1 wherein said means training said elongated flexible members is a guide tube secured to a side of said seat.

3. The device of claim 2 wherein said guide tube is directed downwardly and forwardly at substantially a forty-five degree angle from said anchoring means.

4. In an aircraft ejection seat having sides and provided with a drogue parachute disposed on the top thereof with its lift line releasably secured to said seat and its end connected for deploying a personnel parachute upon release of said lift line from said seat;

(a) a face curtain stored in an upper portion of said seat adapted to be drawn downwardly over a seat occupant's head;

(b) a strap secured at one end to a rearward portion of said face curtain;

(c) an anchor secured to the upper portion of said seat;

(d) a flexible, downward restraint secured at one end to a forward portion of said face curtain;

(e) pin means securing the other ends of said strap and downward restraint to said anchor;

(f) means training said downward restraint downwardly and forwardly from said anchor; and

(g) flexible means securing said pin means to said drogue parachute lift line intermediate its releasable connection to said seat and to said personnel parachute.

5. In an aircraft ejection seat having sides and provided with a drogue parachute disposed on the top thereof with its lift line releasably secured to said seat and its end connected for deploying a personnel parachute upon release of the lift line from said seat;

(a) a forwardly opening container having sides secured at the upper portion of said seat;

(b) a face curtain disposed in said container adapted to be withdrawn downwardly to cover a seat occupant's head;

(c) a flexible strap secured at one end to a rearward portion of said face curtain;

(d) an anchor secured to the side of said container;

(e) a guide tube secured to the side of said seat with one end near said anchor and its other end disposed forwardly thereof and under the opening of said container;

(f) a flexible member secured to a forward end of said face curtain and extending through said guide tube;

(g) a pin releasably securing the other end of said flexible strap and said flexible member to said anchor; and

(h) flexible means connecting said pin to said lift line intermediate its releasable connection and its end connecting it to the personnel parachute.

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