

June 8, 1954

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2,680,476

HYDRAULIC SNUBBER FOR SHOULDER HARNESS

Filed March 7, 1952

Fig. 1

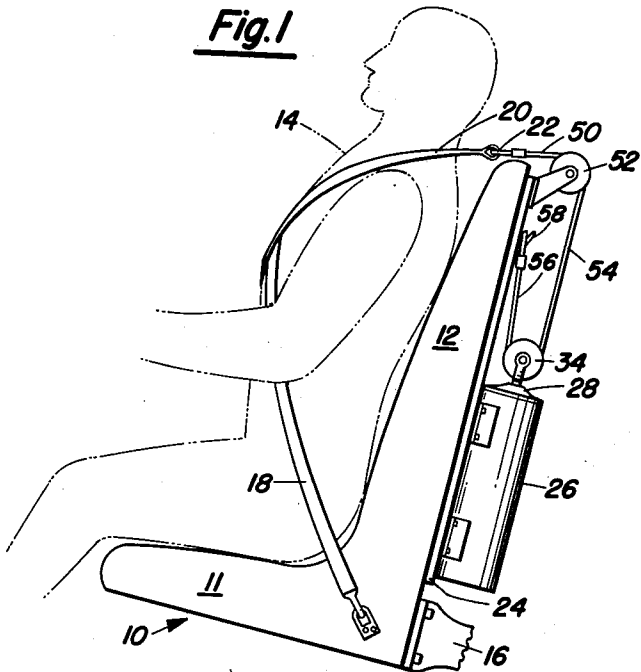
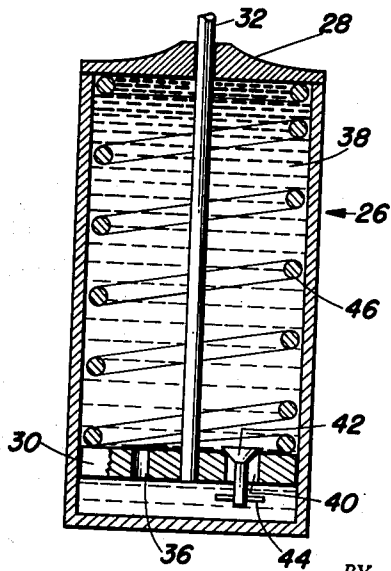


Fig.2



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UNITED STATES PATENT OFFICE

2,680,476

HYDRAULIC SNUBBER FOR SHOULDER HARNESS

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Application March 7, 1952, Serial No. 275,447

4 Claims. (Cl. 155-189)

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

1

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 shoulder harness for use in airplanes and other fast moving craft to prevent personnel from being thrown forward from their seats when the craft is rapidly decelerated as in a crash landing. It is described herein as applied to the pilot of an airplane, although obviously it may be used in any situation where in impact threatens injury to the occupant of a seat.

The invention aims to produce a harness mechanism which will permit the pilot freedom of movement to a maximum degree compatible with the safety features of the device. Specifically, the pilot may lean forward in his seat to reach the instrument panel, and the harness will oppose such movement but lightly so long as it is gradual. During the time while the pilot is leaning forward, he is subject to a perceptible force tending to restore him to normal position, but when he subsequently resumes his normal posture, the mechanism quickly adjusts itself to its normal, fully operative, position, and exerts no force on the pilot. But the mechanism will strongly resist rapid forward movement of the pilot's body from the seat, as would occur in sudden deceleration.

It is an object of the invention to provide a harness mechanism of the type above indicated, which permits the pilot to move forward slowly and to remain in a forwardly displaced position subject to a slight restoring force, and to remain in normal posture subject to no restraining force; but which strongly opposes sudden forward movement.

It is a further object of the invention to provide a harness mechanism which is completely automatic in that it requires no adjustment or other conscious act on the part of the wearer to make it fully effective when disaster threatens.

It is a further object of the invention to provide a harness mechanism which can be worn continuously during flight with a minimum of discomfort, so that there will be a minimum tendency on the part of the pilot to remove it or loosen it during periods when he anticipates no need for it.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description.

2

Fig. 1 is a view in side elevation of a pilot's seat equipped with mechanism embodying the invention; and

Fig. 2 is an enlarged view in vertical section of the hydraulic mechanism.

The mechanism shown in Fig. 1 includes a pilot's seat 10, of any usual type, comprising a cushion portion 11 and a backrest 12 to accommodate a pilot in the position indicated at 14. The seat is fixedly mounted in place by means indicated diagrammatically at 16. The pilot is provided with a shoulder harness of usual construction, having straps 18 secured to the seat at either side and straps 20 which pass over the pilot's shoulders and are secured to the looped end 22 of a flexible cable described hereinafter.

On the rear plane surface of the backrest 12 is mounted a plate 24 which supports a hydraulic cylinder 26 having a head 28. Within the cylinder is a piston 30 having a piston rod 32 the upper end of which is bifurcated and carries a sheave 34 for the flexible cable above mentioned.

The piston 30 is formed with a restricted port 36 for the passage of hydraulic fluid 38 which occupies all or a substantial portion of the space within the cylinder 26. It is also formed with a larger port 40 which is controlled by a check valve of any suitable construction, but which as shown comprises a gravity-seating poppet valve 42 having a depending stem provided with a stop 44 to limit upward movement of the valve.

The piston 30 is urged downwardly toward its retracted position by a compression spring 46 having little or no initial stress, so that when the piston is at or near its lowermost position, as shown in Fig. 2, the spring is exerting but little force on it.

As seen in Fig. 1, the flexible cable comprises a horizontal reach 50 which extends from the harness 18, 20 to a sheave 52 mounted on the upper end of plate 24; a downwardly extending reach 54 extending from sheave 52 to sheave 34; and an upwardly extending reach 56 extending from sheave 34 and terminating in a looped end which engages a stud 58 mounted on plate 24.

In operation, the respective parts of the harness mechanism remain in the positions shown so long as the pilot remains in normal posture. Upon slow forward movement of the upper portion of the pilot's torso, the flexible cable draws piston 30 upwardly, and hydraulic fluid flows through port 36 from the upper surface of piston 30 to the lower surface thereof; resistance to such movement comes chiefly from the spring 46, which opposes an increasing but not a strong force as the pilot

3
leans farther forwardly. If the pilot then suddenly returns to his normal posture, spring 46 quickly moves piston 30 to its retracted position, valve 42 opening to permit rapid upward flow of the fluid. Sudden forward movement of the pilot's body is restrained by the rate of fluid flow through port 36, valve 42 remaining seated.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In combination with a vehicle having a chair therein provided with a rigid back and a harness for the chair occupant having its lower portion secured to the chair; a hydraulic cylinder mounted on said back, a piston in said cylinder having a piston rod, a sheave at the outer end of said rod, a flexible cable fixed to said back extending through said sheave and fixed to the upper portion of said harness, said piston being formed with a restricted bypass to permit limited flow of hydraulic fluid past said piston in either direction, a port in said piston, a check valve in said port preventing flow therethrough under influence of tension in said cable but permitting free flow in the opposite direction, and yielding means urging said piston toward retracted position.

2. In combination with a chair having a rigid back and a harness for the chair occupant having its lower portion secured to the chair; a hydraulic cylinder fixedly related to said back, a piston in said cylinder and having a piston rod, anti-friction means at the outer end of said rod, a flexible cable having one end fixed relative to said back and extending into engagement with said anti-friction means and thence to the upper portion of said harness, means securing the other end of said cable to the upper portion of said harness, said piston being formed with a restricted bypass permitting limited flow of hydraulic fluid past said piston in either direction and a valved port preventing flow therepast under influence of tension in said rod but permitting

free flow in the opposite direction, and yielding means urging said rod to retracted position within said cylinder.

3. In combination with a chair having a rigid back and a harness for the chair occupant having its lower portion secured to the chair; a hydraulic cylinder fixed to said back, a piston movable toward and away from retracted position in said cylinder and having a piston rod formed with an eye at its outer end, a flexible cable having one end fixed to said back and its other end secured to the upper portion of said harness with a loop therebetween slidably related to said eye, said piston being provided with a restricted bypass permitting flow of hydraulic fluid therepast in either direction and a valved port preventing flow therepast under influence of tension in said rod but permitting free flow in the opposite direction, and a spring urging said piston to retracted position.

4. Snubber mechanism for use with a seat and a shoulder harness, comprising a flexible cable secured at one end to the seat and at its other end to the harness with a loop between said ends, and means for maintaining said loop under tension comprising a hydraulic cylinder, a piston freely movable therein toward retracted position and movable but slowly in the other direction, yielding means urging said piston toward retracted position, and a piston rod fixed to said piston and having its outer end formed with an aperture in sliding engagement with said loop.

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