Jan. 10, 1967 J. T. O'HANLAN 3,296,635

INFLATABLE SEAT CUSHION

Filed Nov. 17, 1964

Fig. 1.

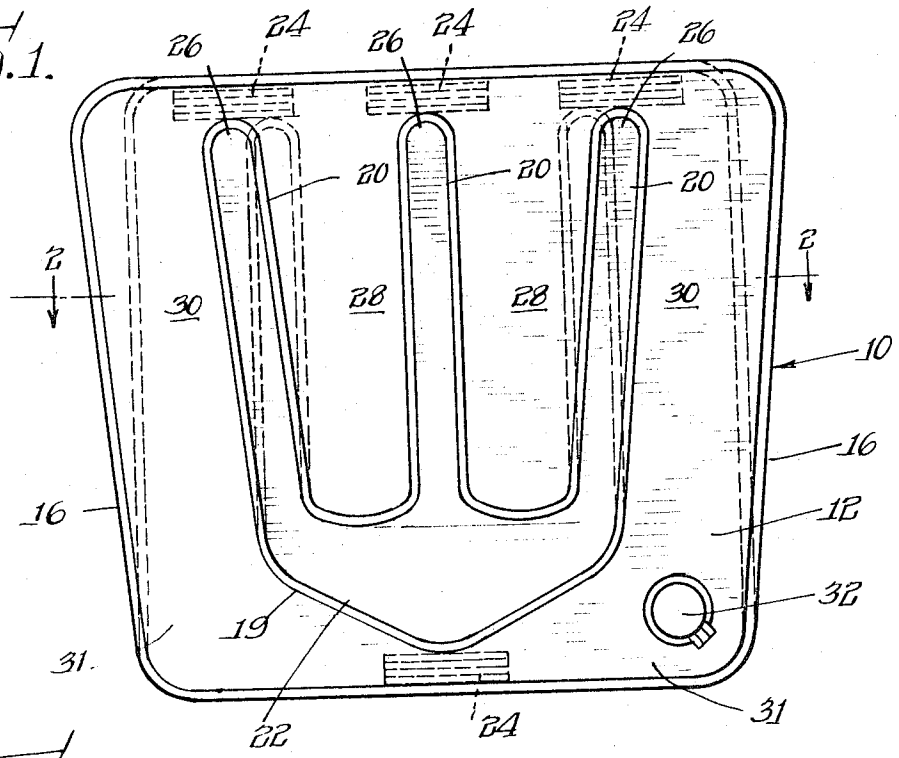


Fig. 2.

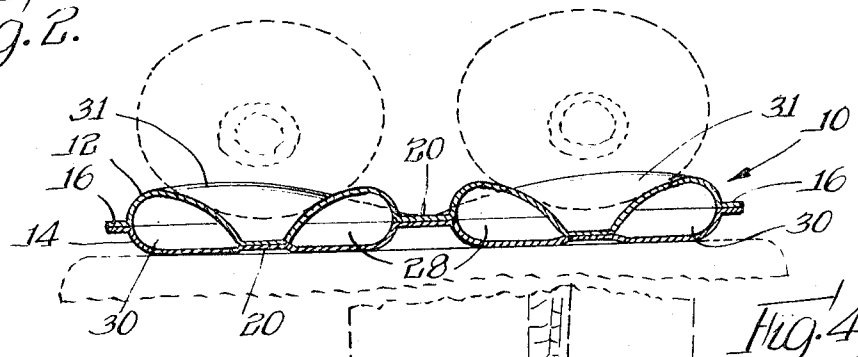


Fig. 4.

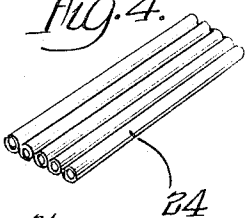
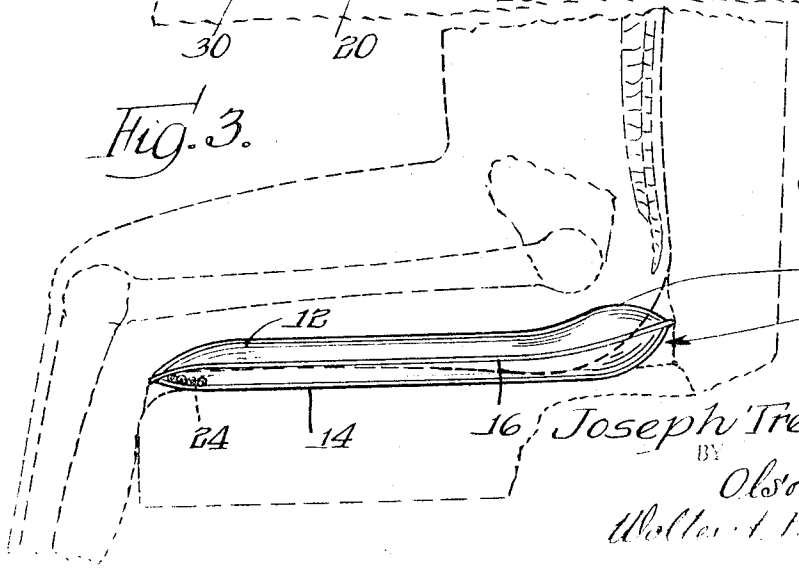


Fig. 3.



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INFLATABLE SEAT CUSHION

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This invention relates generally to an inflatable cushion aand more particularly to an inflatable cushion suitable for use with an airplane ejection seat.

The problem and deficiencies of the prior art

While inflatable cushions are generally well known, the specific requirements in the airplane industry are for an inflatable cushion that is suitable for supporting the airplane pilot comfortably during extended periods of use in both short and long range flights. Where the cushion is to be utilized with an airplane ejection seat, the cushion must be capable of absorbing the extremely high ejection pressures in a balanced manner and without bursting.

A broad object of the invention is to provide an inflatable seat cushion suitable for comfortably supporting a man's seated weight.

A more specific object is to provide an inflatable seat cushion suitable for comfortably supporting an airplane pilot's seated weight during long and short periods of flight.

A further object is to provide a novel inflatable seat cushion, which may be suitably inflated with survival fluid, air, water or other fluids.

A more specific object is to provide an inflatable seat cushion wherein the weight of the legs of a seated man is supported radially inwardly and upwardly toward the thigh-bones with substantially the same amount of support on the inner portion of the legs as on the outer portion of the legs.

Another object is to provide an inflatable cushion suitable for use for an airplane ejection seat wherein upon ejection, the weight of a seated occupant's body is supported equally by his thighbones and buttocks bearing down against the seat.

A further object is to provide an inflatable airplane ejection seat cushion suitable for supporting a pilot's seated weight medially and laterally and suitable for maintaining the legs of the pilot in supported fashion away from the seat in normal seated position.

Another object is to provide an inflatable seat cushion of such a structure arrangement as to concur closely to the structural arrangement of the skeletal frame of the body of the seated pilot to support the anatomy of the pelvic girdle and to maintain the tail-bone of the pilot above the seat.

A more specific object is to provide such an inflatable air cushion with a trio of noninflatable passageways whereby the support given to the inner portions of a seated occupant's thighs is substantially the same as the support given to the outer portion of the thighs.

A further object is to provide such a cushion wherein the areas about the noninflatable areas are maintained at a substantially equalized pressure.

A more specific object relating to the preceding object is to provide novel fluid passageways to enable fluids within the cushion to flow freely from one inflatable portion to the other for equalization of fluid pressure despite varying shifting pressures of an occupant's body.

These and other objects of the invention will appear from the description, the accompanying drawing and appended claims.

For a more complete understanding of the invention, reference should now be had to the drawings wherein:

FIG. 1 is a top plan view of an embodiment of the invention, the embodiment being shown in noninflated condition by a full line and in inflated condition by a broken line;

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is a side elevation view of the embodiment of the invention shown in FIGS. 1 and 2;

FIG. 4 is a perspective view of the means provided in FIG. 1 to equalize fluid pressure within the cushion.

Description of the invention

Referring now in greater detail to the drawing, an inflatable seat cushion **10** is seen, conforming in general outline to the shape of a seat. Inflatable cushion **10** comprises a top **12** and a bottom **14** sheet formed advantageously of a relatively flexible resinous plastic, the two sheets being conventionally heated sealed at their edges to form a standard tear-sealed peripheral edge **16**.

A central noninflatable portion is also heat sealed along its peripheral edge **19** to form three forwardly extending elongated noninflatable fingers **20**, the two outer fingers being positioned generally in line with the thighbones of an occupant of the seat, and a palm **22** which is chosen to be, but is not necessarily triangular in shape. As seen in FIG. 1, the fingers in noninflated condition are slightly spread apart at their tips to provide substantially parallel fingers to underlie the thighbones when properly inflated. Palm **22** is positioned in use at the rear of the supporting seat under the pelvic girdle of the occupant.

A plurality of pressure resistant pass through tubes or channels **24** of a relatively more rigid material than the balance of the cushion are positioned within the seat, one set of tubes being located rearwardly at the rear of the noninflatable palm **22**; and three other sets of tubes are located forward of the fingers **20** between a tip **26** of each finger and the peripheral seal at the front of the cushion. The small pass through tubes **24** comprise pressure resistant channels permitting the inflating fluid utilized in the cushion to be continuously free flowing, forming an open channel for passage of fluids therethrough despite the downward weight of an occupant of the seat at these points tending to close off the channels. The tubes allow inflating fluids to move freely between the inflated areas of the cushion, resulting then in a uniformly equalized fluid pressure.

The unique positioning of the noninflatable fingers and palm results in the formation of four spaced apart inflatable zones, best seen in FIG. 2, two intermediate zones **28** being positioned between the fingers **20** and two outer zones **30** having a triangular-shaped rear portion **31** supporting the buttock muscles above the seat.

A conventional inlet **32**, FIG. 1, for receipt of fluids to inflate the cushion is provided with suitable conventional closure means.

Mode of operation of the invention

Having described the invention, its mode of operation will be related for a clearer understanding of the invention. In forming an inflatable cushion for an airplane seat, it is particularly desirable to provide a cushion to support the weight of a seated man's body equally on all sides. It is particularly desirable to provide an inflatable seat cushion wherein the inner portions of a man's legs are supported with substantially the same supporting pressure as the support given the outer portions of the thighs and the buttocks muscles to ensure maximum comfort to the man seated thereon with maximum support given in predetermined areas. It is further desirable where the supporting seat is the cushion comprising an ejection seat to provide such a seat whereby upon ejection, the weight of the pilot's body presses downwardly through the media of the thighbone and buttocks muscles directly

against the supporting seat rather than on the cushion so as to avoid psychological and other damage due to bursting of the inflated cushion; or shifting of fluids to one side of the cushion tending to tilt the occupant of the seat and eject him in a tilted or spinning manner, rather than directly upwardly as desired.

It is also desirable to provide means in such a cushion to maintain all inflated areas of the cushion at substantially the same fluid pressure despite forward and rearward shifts in weight of the occupant's body during flight; and tremendous upwardly directed pressures upon ejection tending to close off the fluid passageways.

Such a cushion meeting the above requirements has been provided and comprises an inflatable cushion having a noninflatable portion comprising three forwardly directed fingers having tips, the fingers being slightly spread toward the tips in noninflated condition moving inwardly on inflation of the cushion to provide four substantially parallel or inwardly directed inflated zones to support the thighs in conformity to their configuration.

Four zones of substantially rigid fluid pass through tubes have been provided in the fluid inflatable seat cushion: between the tips of the fingers and the peripheral edges of the cushion; and another zone of fluid pass through tubes has been provided positioned rearwardly of the palm between the palm and the rearmost peripheral edge of the cushion.

Conventional means are provided for sealing the cushion with a fluid; and means are also provided for sealing the fluid inlet to maintain fluid therein.

In operation, the inflatable cushion is positioned in supported relationship over a supporting airplane ejection seat and inflated with a fluid which may be air, water, survival fluid or the like, to a predetermined pressure. The fluid flows into the cushion completely filling the areas about the three fingers and on the outer sides of the fingers, to form four inflated forwardly directed zones and two rear corner zones positioned to support the thighbones and pelvic girdle of the seated man maintaining the tailbone away from the seat. The outer portions of the thighs are supported radially inwardly and upwardly with respect to the thighbone by the two outer inflated zones. Two inner forwardly directed zones ensure proper support for the inner portions of a man's thighs with substantially the same support as that given by the outer inflated zones. The central noninflatable finger ensures that the inner portions of the thighs are firmly supported by providing two separate inner thigh support zones.

The two rear corner inflated zones support the rearmost side portions of the buttocks of a seated man ensuring that he is correctly positioned on the seat for maximum comfort and supporting the tail-bone away from the seat and preventing point injury to the tail-bone upon ejection of the seat.

In normal seated position and especially when the occupant of the seat shifts his weight forwardly, the weight of the thighs tend to close off passageways between the various inflated portions resulting in an uncomfortable shifting of fluid within the cushion. To provide maximum comfort with firm, continuous resilient but uniform support, means has been provided to ensure freedom of movement of fluid within the cushion and advantageously comprises separate sets of fluid pass through tubes of a substantially rigid material.

Upon ejection of the ejection seat and its seated occupant from the airplane, it is highly desirable to ensure that he is firmly supported in a balanced manner against the ejection seat itself rather than against the cushion which might tend to throw the occupant's weight to one side or the other. It is also desirable to transmit the extremely high ejection pressures to the occupant of the seat in a diffused manner rather than concentrated at one point, such as at the tail-bone, which could easily result in severe injury. The manner in which the noninflatable areas are positioned directly beneath the thighbones ensures a safe diffused transmission of the ejection pressure.

The thighbones of the seat occupant are positioned directly above the noninflatable areas and upon ejection, almost instantaneously, come into supporting encounter with the ejection seat. The pelvic girdle is pressed downwardly against the noninflated palm and underlying ejection seat in like manner. Thus, the ejection forces are safely transmitted in a uniformly low pressure over a broad area of the thighbones and pelvic girdle rather than encountering the occupant's body in concentrated form at any particular point.

Since the forces are transmitted in a balanced manner to the thighbones and pelvic girdle, ejection proceeds smoothly upwardly from the plane with the occupant's weight being centrally carried, avoiding the dangers of lateral shifts of the occupant's weight which tend to throw the ejection seat and its occupant into a spin.

Since many modifications of the invention described above and illustrated in the various figures may be made, the invention should not be limited thereto; and it thus is contemplated by the appended claims to cover any modifications as fall within the true spirit and scope of this invention.

The invention is hereby claimed as follows:

1. A fluid inflatable cushion for a supporting seat adapted to the shape of the seat and to the shape of the buttocks and thighs of the occupant of the seat and including fluid inlet and fluid stopper means, said cushion comprising: a top and a bottom sheet of elastomeric fluid impervious material being joined together at their peripheral edges to form a forward and rear edge and two sides edges; a noninflatable area within said cushion comprising a pair of fingers and a palm, said fingers having forward tips, said fingers being of predetermined width and extending longitudinally toward the forward edge of said cushion, said palm being of relatively greater width than said fingers extending transverse the seat intermediate the sides and rearwardly of the fingers to permit bearing contact of the thighs and buttocks of the occupant downwardly on the seat; and a plurality of transversely extending tubes positioned between the sheets forwardly of said fingers intermediate the tips of said fingers and the forward joined edge of said cushion, said tubes being of relatively more rigid material than the balance of said cushion and a plurality of said tubes being positioned rearwardly of said palm intermediate the palm and the rear edge of said cushion, said tubes permitting a free flow of fluids from one inflatable portion of the cushion to another.

2. A fluid inflatable cushion for a supporting seat adapted to the shape of the seat and to the shape of the buttocks and thighs of the occupant of the seat, said cushion comprising: a top and a bottom sheet of fluid impervious material, said sheets being joined to form a fluid tight seal at their peripheral edges, said sheets being further joined to form a fluid tight seal defining noninflatable areas within the cushion, said noninflatable areas separating and defining inflated areas for supporting the thighs and buttocks of an occupant of the seat; and means within the inflatable areas of the cushion intermediate the noninflatable areas and the peripheral edges to continuously equalize the pressure of fluids within the various inflatable areas of a cushion in inflated condition while the occupant is seated thereover.

3. A fluid inflatable cushion for a supporting seat adapted to the shape of the seat and to the shape of the pelvic girdle and thighs of the occupant of the seat and including fluid inlet and fluid stopper means, said cushion comprising: a top and a bottom sheet of fluid impervious material, said sheets being joined to form a fluid tight seal at their peripheral edges, said sheets being further joined to form a fluid tight seal of noninflatable areas within the cushion, said noninflatable area comprising three forwardly extending longitudinal fingers, said fingers having forward tips; one being a central finger and a left and right finger, and a generally triangularly shaped palm

positioned rearwardly of said fingers, said fingers being spaced apart and having inflatable areas therebetween and on the sides of the outer two fingers, said center finger being positioned on the longitudinal center line of said cushion and the left and right finger being positioned in the area of the thighbones of the occupant of the seat; a plurality of sets of transversely extending relatively rigid tubes positioned within the cushion between the two sheets, at least one of said sets being secured in place between the finger tips and the forward edge of said cushion, another of said sets being secured in place between the rear edge of said cushion and the palm of said noninflatable areas to resist compression by the weight of an occupant of the seat to permit a free flow of inflating fluid from one inflatable area of said cushion to another.

4. A fluid inflatable cushion for supporting the thighs and buttocks of an occupant of a seat, said cushion comprising: a top and a bottom sheet of fluid impervious material connected together to form a forward and a rear edge and two sides edges; a non-inflatable area within said cushion formed by interconnecting said top and bottom sheets, said non-inflatable area including a plurality of longitudinally extending finger sections interconnected by a transversely extending palm section; a plurality of longitudinally extending outer inflated zones being located between the outer side edges and said finger sections of said cushion, and a longitudinally extending inner inflated zone located intermediate said finger sections, said inner and outer inflated zones being adapted to support the thighs of the occupant of the seat; a transversely extending inflated rear end zone located intermediate said palm section and the rear edge of said cushion, said rear end zone interconnecting said outer inflated zones to support the buttocks of the occupant of the seat; and a plurality of tranversely extending inflated forward end zones located between forwardmost end portions of said finger sections and the forward edge of said cushion for interconnecting said outer inflated zones and said inner inflated zone, said forward end zones providing fluid communication between said outer inflated zones and said inner inflated zone.

5. A cushion as set forth in claim 4 further including: a plurality of groups of transversely extending tubes located between said top and bottom sheets in said transversely extending inflated forward end zones, a group of said tubes being positioned between a forwardmost end of each of said finger sections and the forward edge of said cushion, said tubes being of a relatively rigid material for enabling fluid to flow between the outer inflated zones and the inner inflated zone when the thighs of the occupant of the seat are pressed downwardly against the forward end zones.

6. A cushion as set forth in claim 4 further including: a group of transversely extending tubes located between

said top and bottom sheets in said transversely extending inflated rear end zone intermediate said palm section and the rear edge of said cushion, said tubes being of a relatively rigid material for enabling fluid to flow between the outer inflated zones when the buttocks of the occupant of the seat are pressed downwardly against the rear end zone.

7. A fluid inflatable cushion for supporting thighs of an occupant of a seat, said cushion comprising: a top and a bottom sheet of fluid impervious material, said sheets being connected to form a fluid tight seal at their peripheral edges, said sheets being further connected to form a non-inflatable area within the cushion, said non-flatable area including a plurality of longitudinally extending finger sections, said plurality of finger sections including a central finger section positioned intermediate a plurality of outer finger sections; said finger sections being spaced apart and having inflatable areas therebetween to support the thighs of an occupant of the seat, said central finger section being located at a first vertical level relative to the seat and said outer finger sections being located at a second lower vertical level relative to the seat to enable the thighs of the occupant of the seat to be readily forced downwardly to press the outer finger sections against the seat.

8. A fluid inflatable cushion for supporting thighs and buttocks of an occupant of a seat, said cushion comprising: a top and a bottom sheet connected together at their peripheral edges to form a rear edge and two sides edges; a non-inflatable area intermediate said edges including a plurality of fingers and a palm, said fingers extending longitudinally toward the forward edge of said cushion, said palm extending transversely to interconnect said fingers to enable the thighs and buttocks of the occupant of the seat to press said palm and a pair of said fingers downwardly against the seat; and a plurality of groups of tranversely extending tubes positioned between said top and bottom sheets, a group of said tubes being positioned between a foremost end of each of said fingers and the forward edge of said cushion, and a group of said tubes being positioned rearwardly of said palm intermediate said palm and the rear edge of said cushion, said tubes enabling a free flow of fluid from one inflatable portion of the cushion to another.

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