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(54) Title of the Invention: **Child support strap**
Abstract Title: **Size adjustable arm restraint attaching to child seat shoulder straps**

(57) A child car seat restraint has a web 60 with an attachment at each end, one end attachable to a harness shoulder strap (14, fig 1), another end attachable to the seat 62 or another shoulder strap, and having a size or tautness adjustment. Embodiments have drawstring locks, elasticated cord, inflatable webs or friction buckles and straps. The system may be used with a 5-point harness, and the web releasably attached to the shoulder straps with hook and loop, or zip fasteners, or buttons with height adjustment. The web may be retrofitted to existing systems, or provided with a car seat. The web covers an area between a shoulder strap and a chair shell to limit a child sliding an arm or shoulder out from under the shoulder straps.

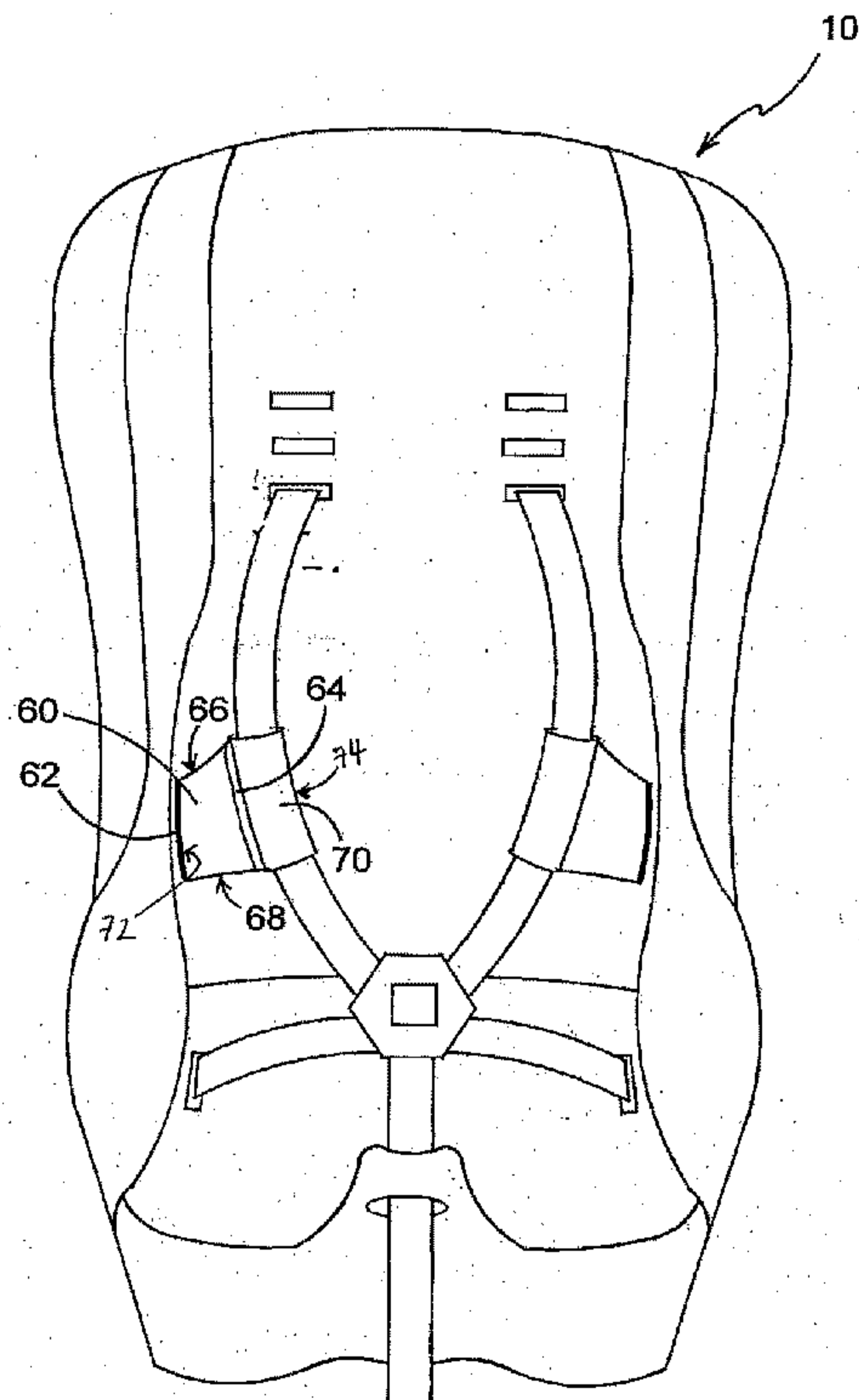


FIGURE 2

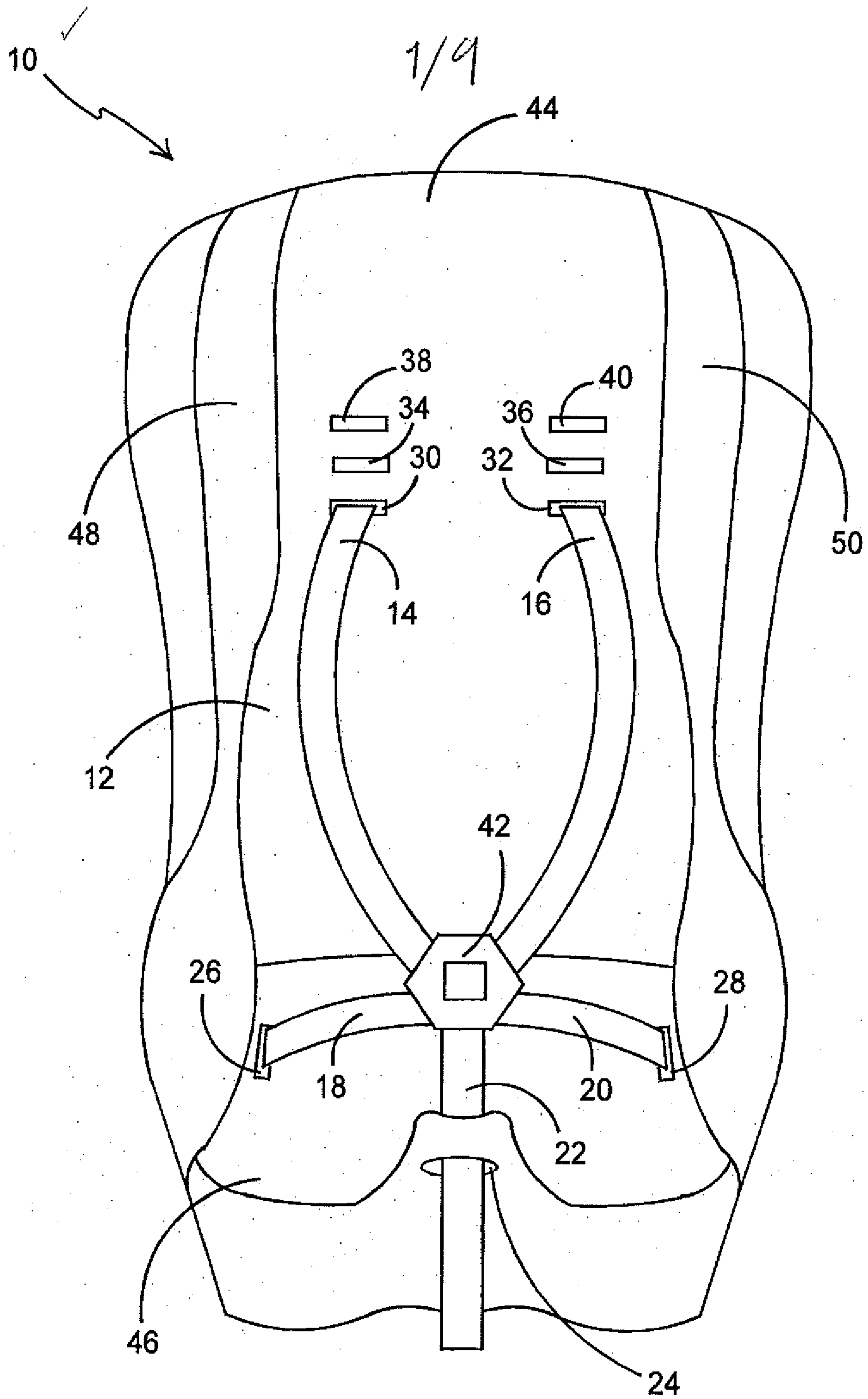


FIGURE 1

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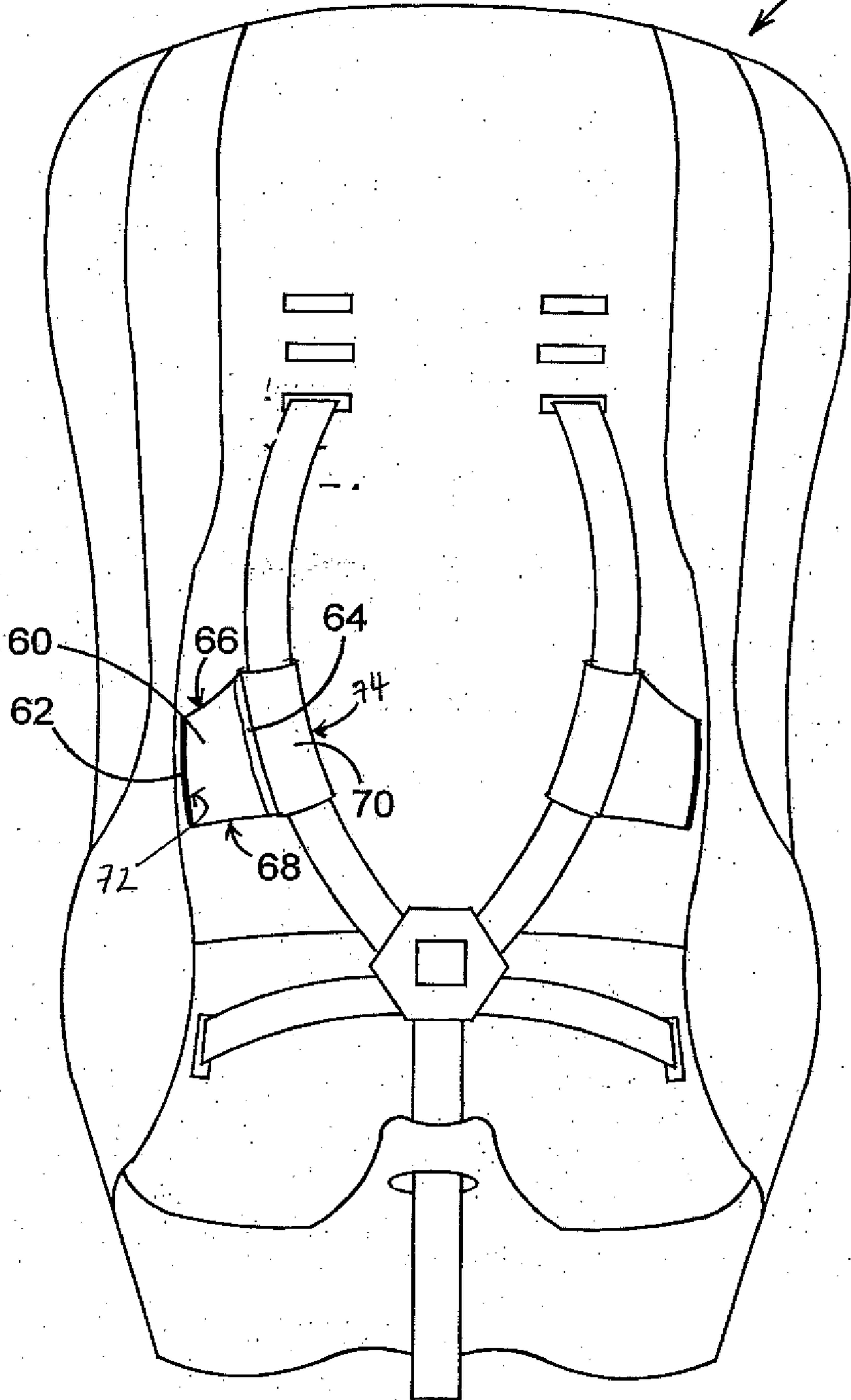


FIGURE 2

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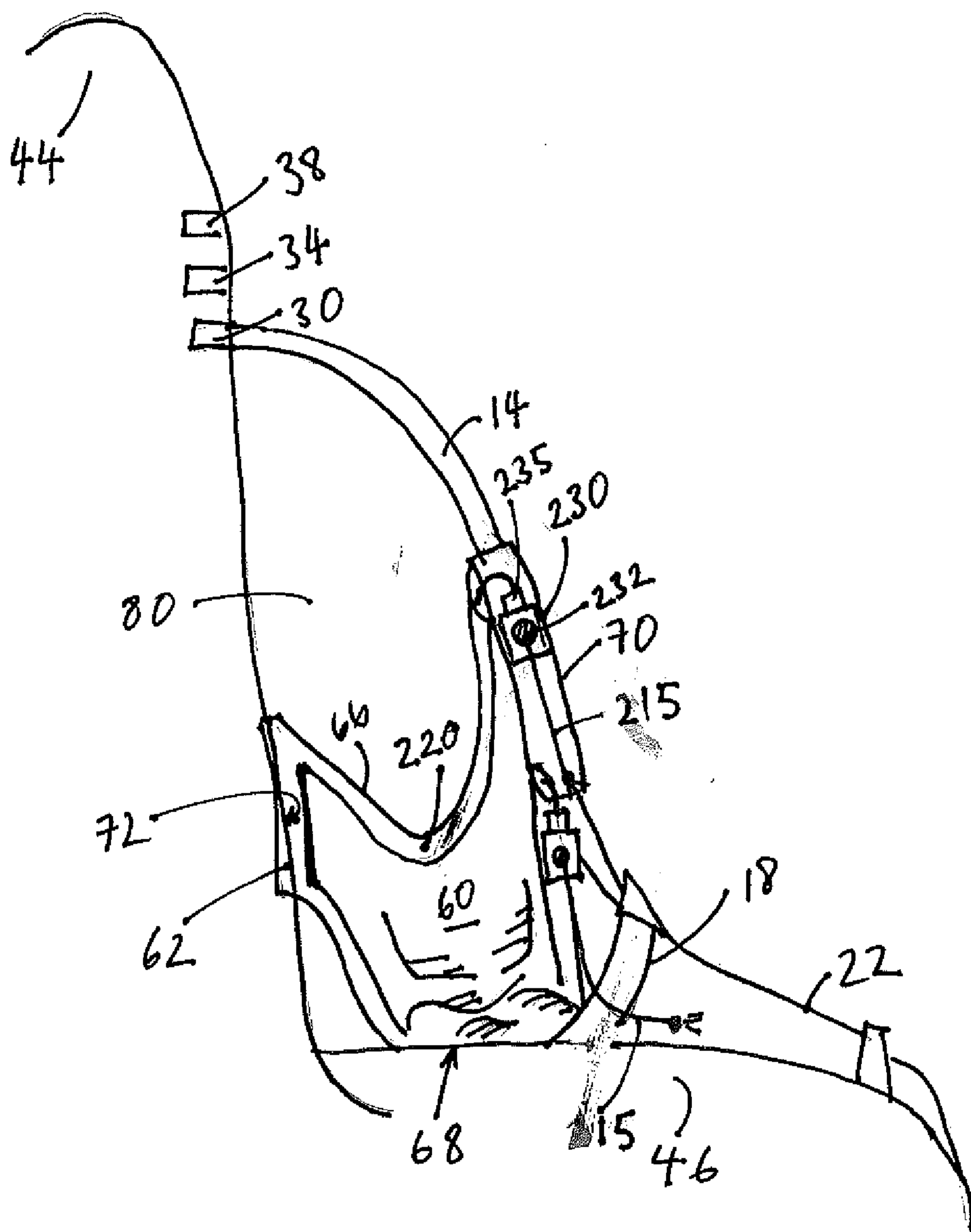
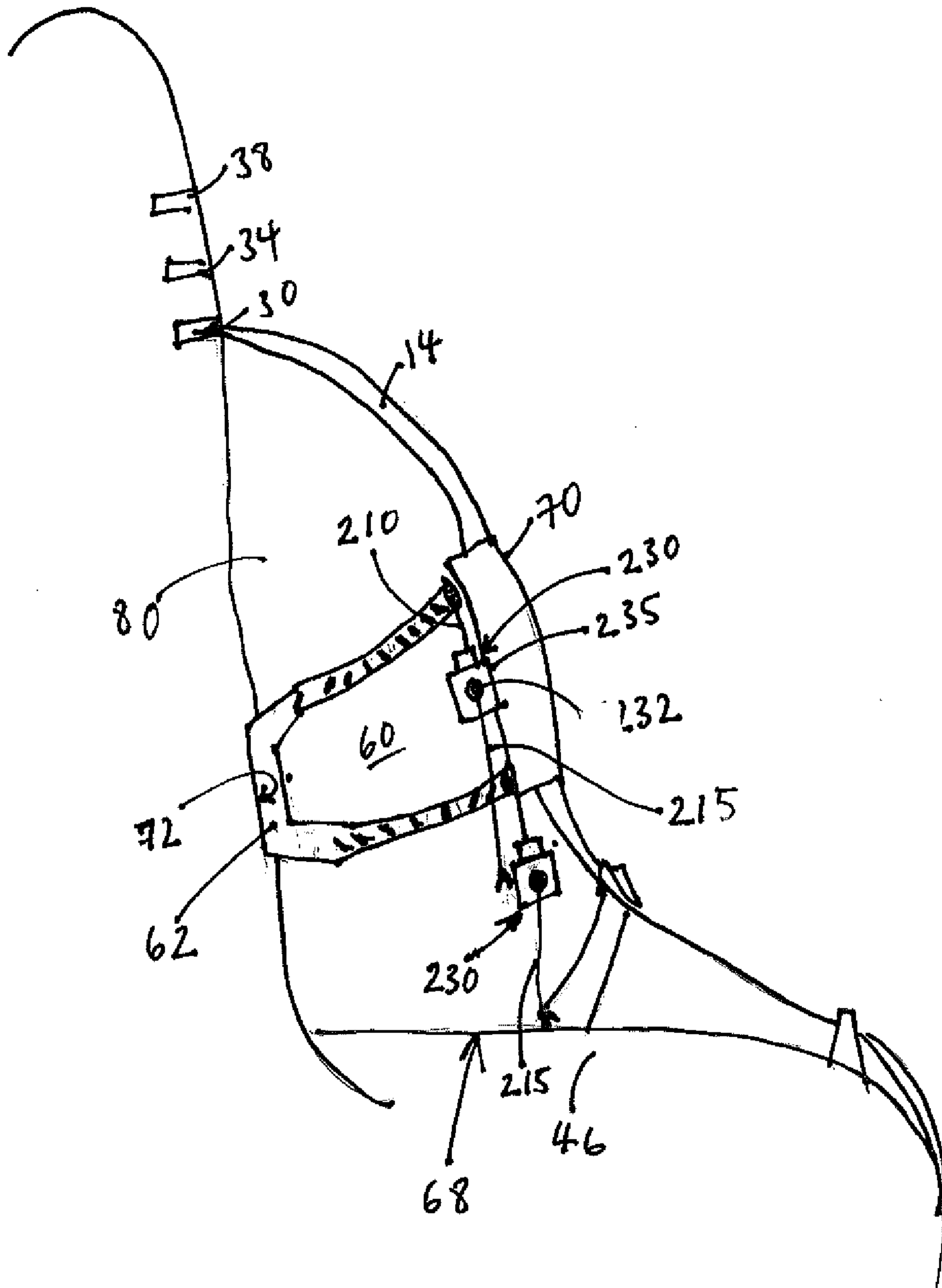


FIGURE 3A

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FIGURE 3B

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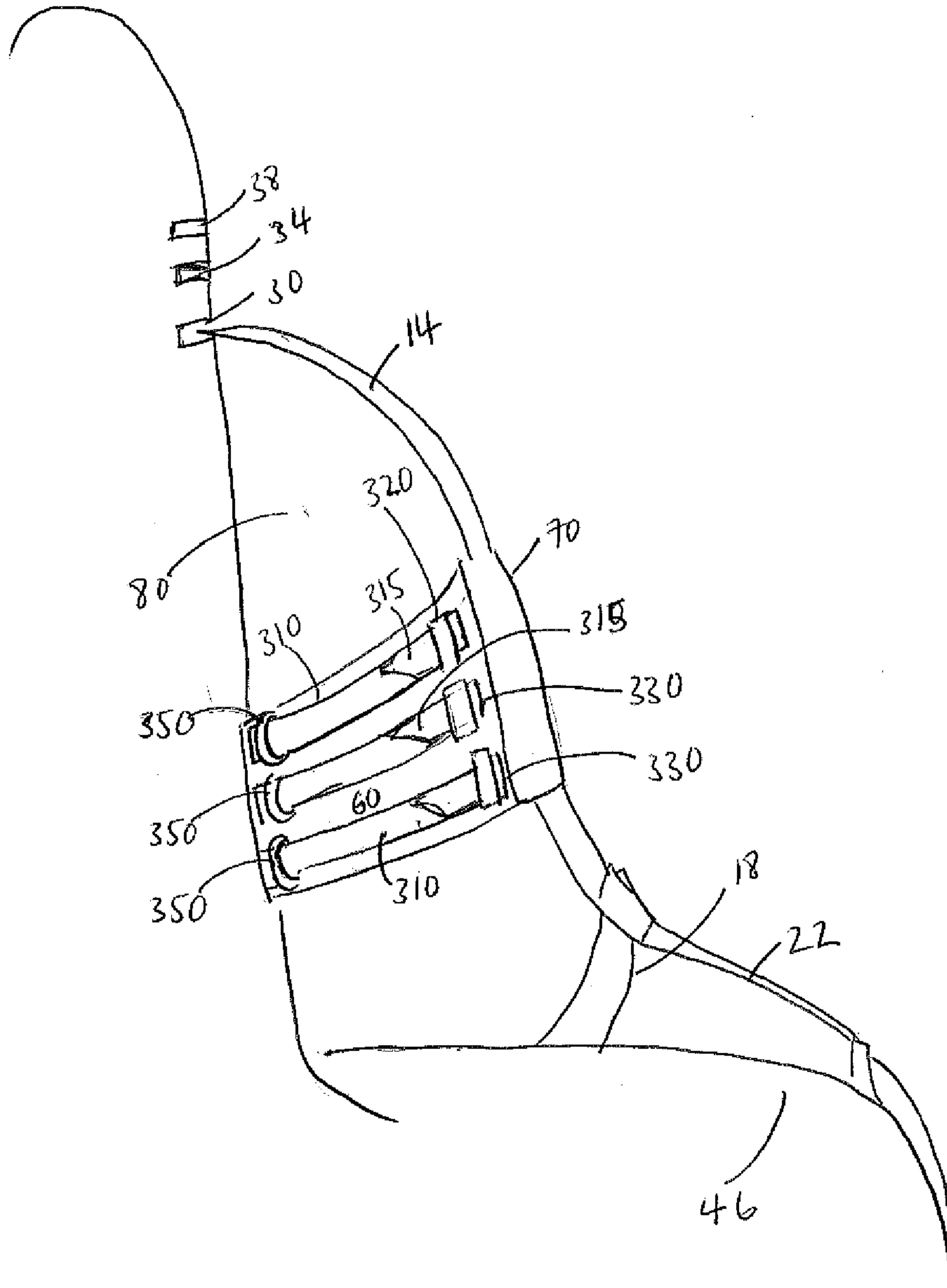


FIGURE 4

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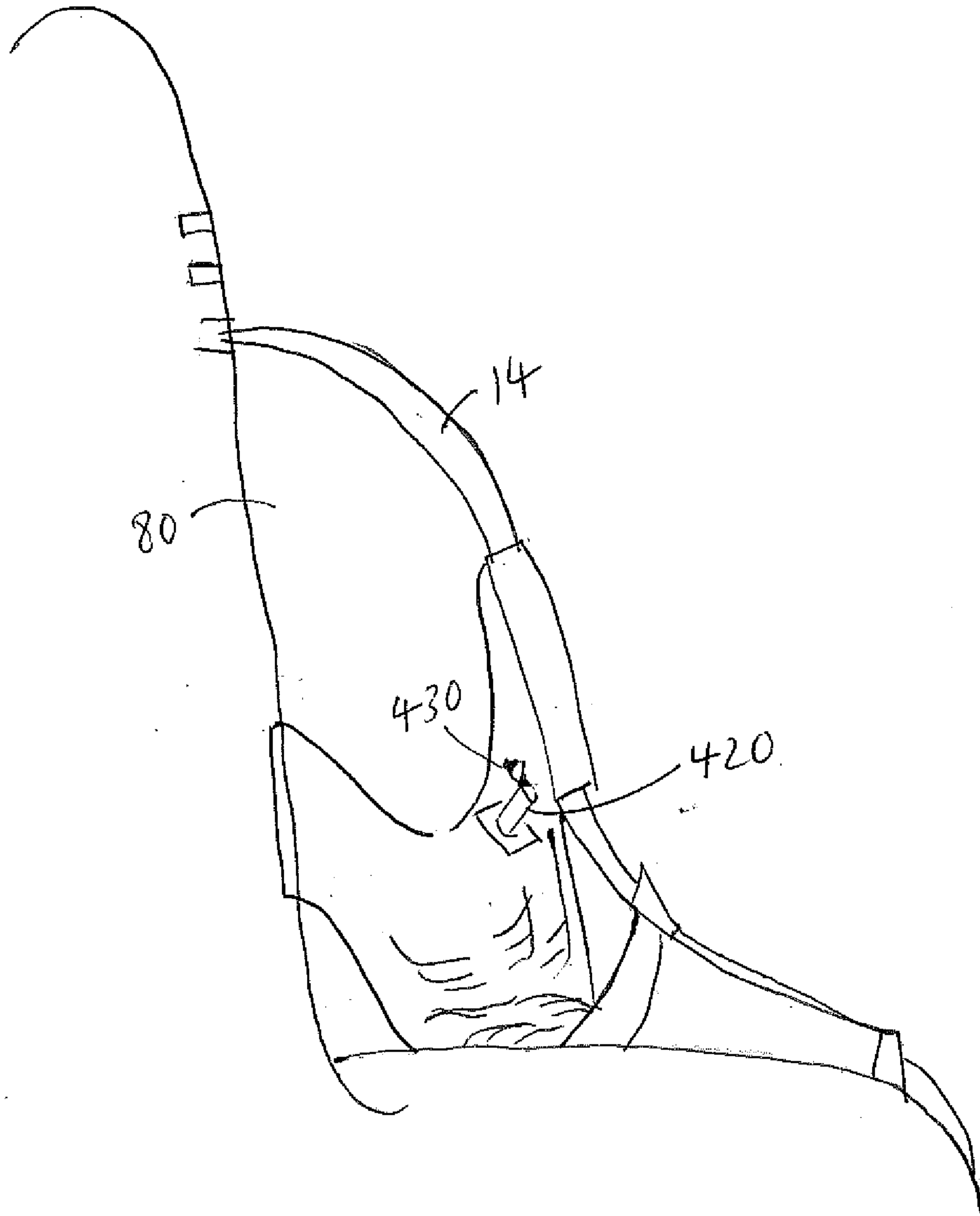


FIGURE 5A

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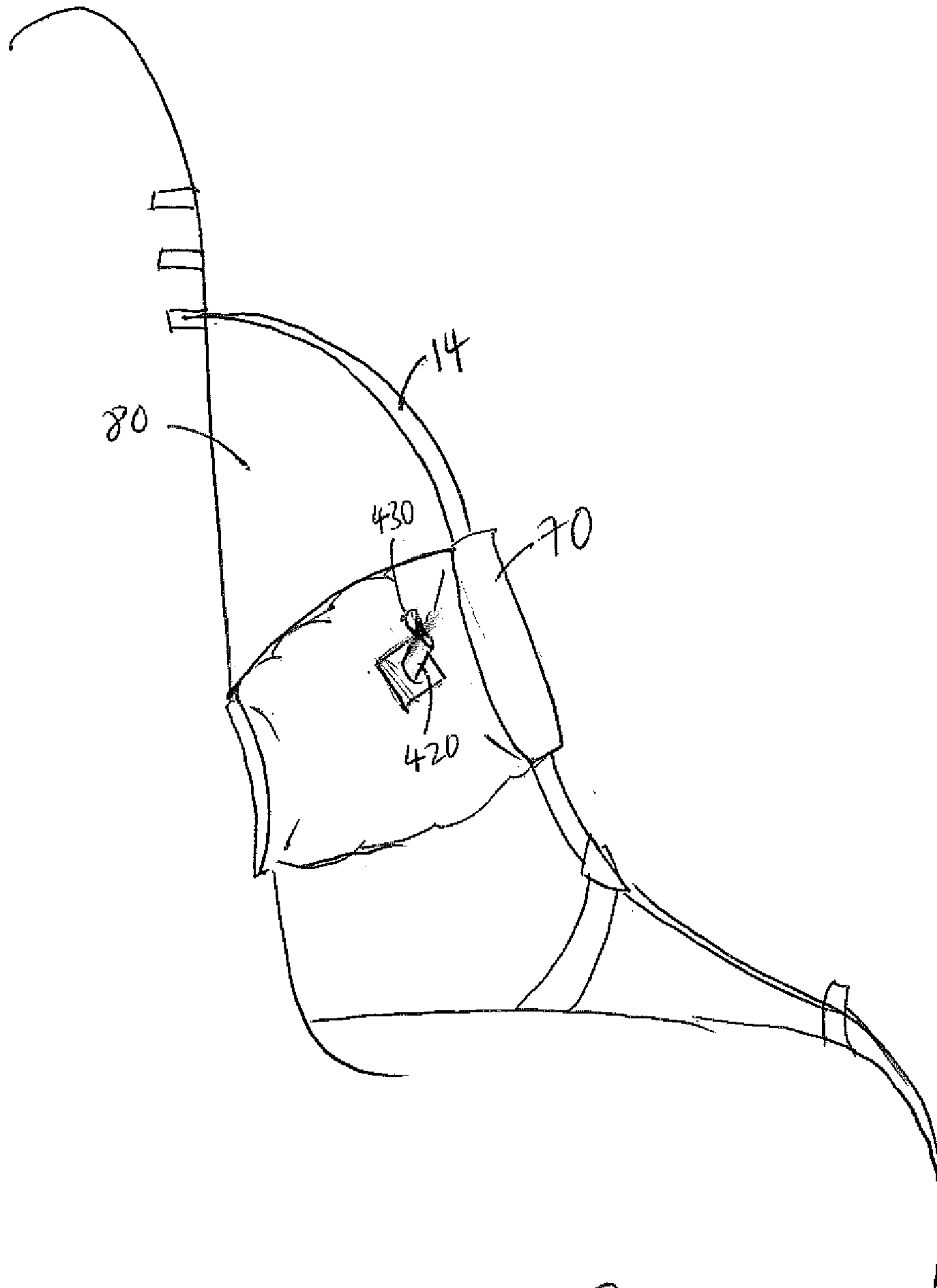


FIGURE 5B

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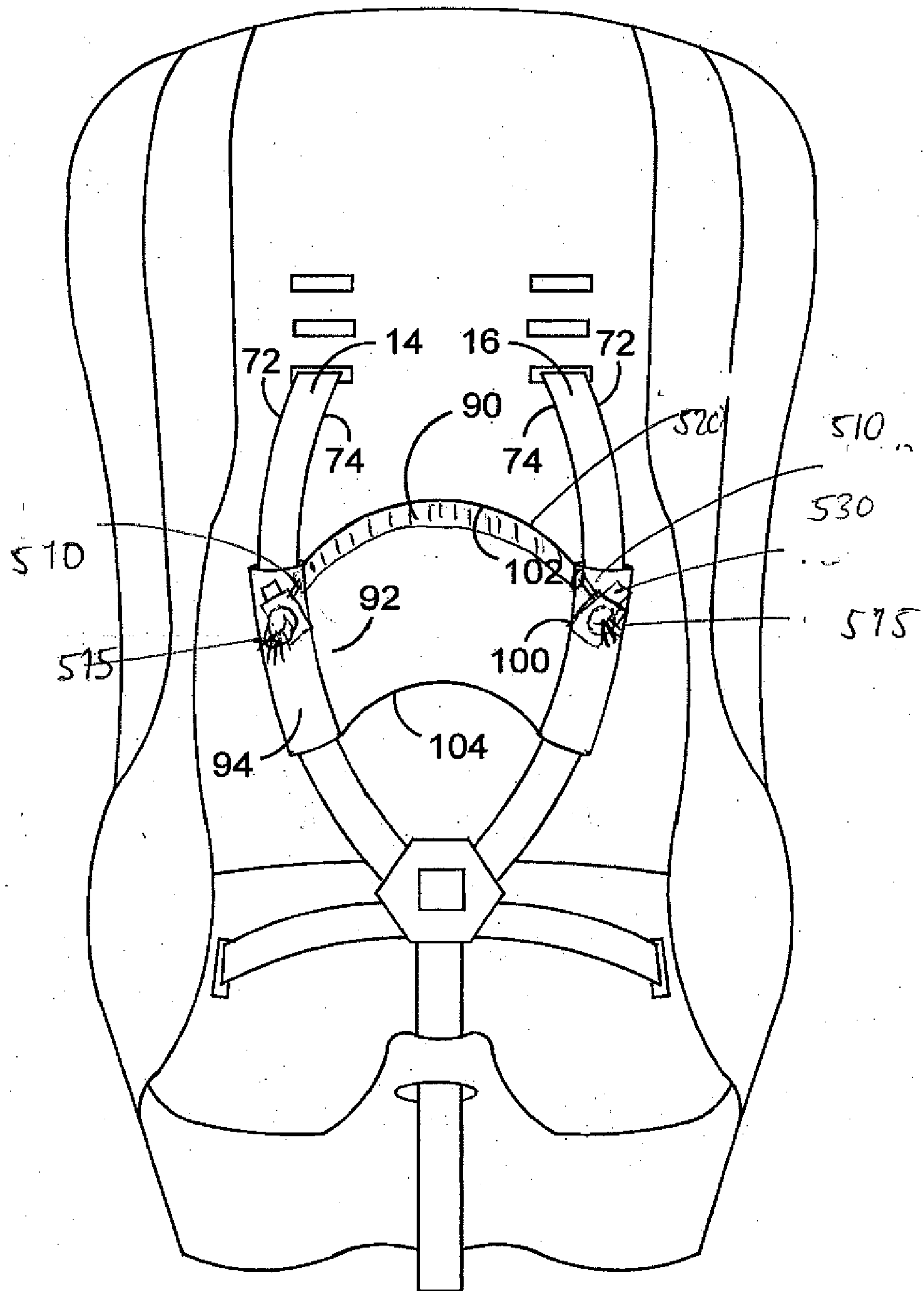


FIGURE 6

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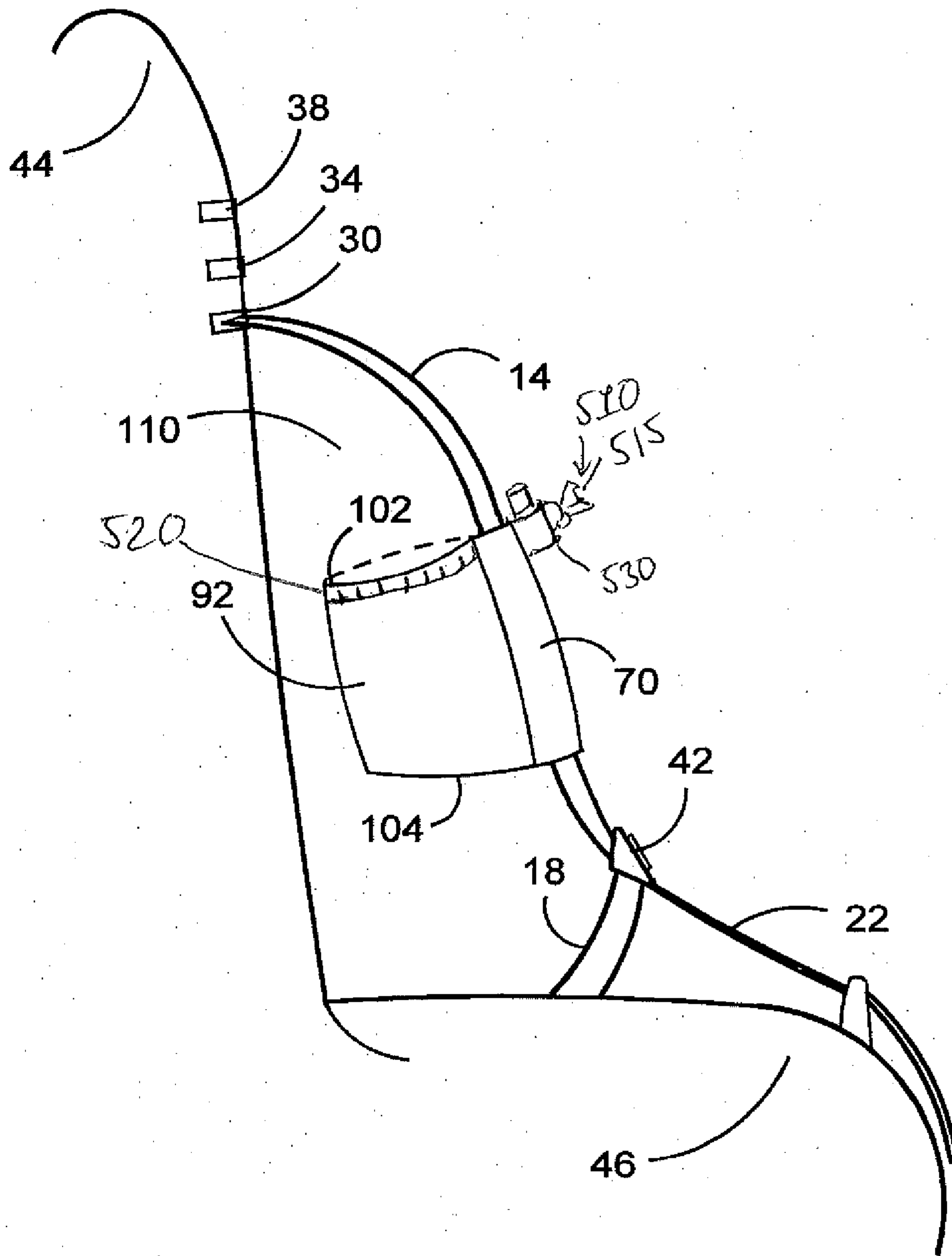


FIGURE 7

Child support strap

Technical field

5 The present invention relates to a child safety device configured to prevent a child from removing their arms from the straps of a car seat.

Background

10 It is known to provide young children, especially those under the age of 12, with a child safety seat for travelling in a vehicle. Different types of seats vary in the position of the child and size of the seat. The United Nations European Regional standard ECE R129 categorise such different seat types into 4 Groups: 0-3.

15 Forward facing and rear facing child support seats in groups 0-2, typically incorporate an integrated three-point harness (straps across both shoulders and crotch), or five-point harness (straps across both shoulders, the pelvic area and crotch), which is designed to minimise the risk of injury in the event of a crash by spreading the force across as large an area as possible. The three- or five- point harness also restrains the child's lower body: preventing the child from sliding out of the seat and/or the harness. These seats are typically designed for children from birth through to 4 years old, and often contain adjustable harnesses. It is also known for these seats to have interchangeable covers, so that they may be removed and cleaned or replaced.

25 A problem with a child seat is that a child is able to easily manipulate their arms through the underside of the shoulder strap, thereby removing their shoulders from the shoulder strap. This essentially converts the harness into a lap harness which is potentially dangerous in the event of an accident, since, whilst the child's body is not restrained, the entire restraining force is concentrated onto the midriff of the child. It is therefore desirable to be able to prevent a child from removing their shoulders from the shoulder straps.

30 As such, there exists a need to provide a system which overcomes one or more of the aforementioned disadvantages.

Summary of the invention

The present invention provides a child restraining system for use with a child restraining seat, the seat comprising a harness and a shell, the harness comprising a first shoulder strap, the child restraining system comprising a first end and a second end and at least one web that extends between the first end and the second end, said first end comprising first shoulder strap attachment means that enable the at least one web to be attached to the first shoulder strap of the harness, and said second end comprising first seat attachment means that enable the at least one web to be attached to a first portion of the seat, the at least one web being configured such that, in use, the at least one web covers a first area between the first shoulder strap and the shell, thereby limiting the ability of a child to slide an arm or a shoulder out from under the first shoulder strap, wherein the web comprises adjustment means that enable a first maximum extension of the at least one web to be adjusted.

“Covering an area” is used herein to mean “occupying an area”, as opposed to merely obscuring an area.

The term “child restraining seat”, as used herein, refers to a safety seat designed to protect children from injury or death during vehicle collisions. The child restraining system of the present invention may be adapted for use with various different types of child restraining seats. Preferably, the child restraining system may be particularly suitable for use with a child restraining seat designated as Groups 0-2 under the United Nations European Regional standard ECE R129. However, the invention may be used with other seats of other Groups in the standard.

The harness of such a child restraining seat may be configured in various different ways. Preferably, the child restraining system of the present invention is used with a three- or a five-point harness. Such harnesses comprise two shoulder straps. Alternatively, the child restraining system of the present invention may be used with a child restraining seat comprising other types of harness.

Embodiments of the child restraining system may be suitable for use in new child restraining seats, or may be incorporated into existing seat shells. In some embodiments, the web may be used in an existing seat by incorporating the web into an interchangeable seat cover. The web may be incorporated into said seat cover by fixedly attaching a portion of the web to the seat cover.

The first shoulder strap attachment means of the child restraining system could be any means suitable for attaching a piece of webbing material to a shoulder strap. For instance, the first shoulder strap means could comprise one or more of hook and loop fasteners (e.g. Velcro™), zip fasteners, buttons, snap fasteners, and a buckle system. Alternatively, the first shoulder strap means may comprise means wherein the at least one web is permanently fixed to the first shoulder strap, for instance by riveting or stitching, for example. In some embodiments the web and the shoulder strap may even be formed out of a single piece of material. In such embodiments the first shoulder strap attachment means would be the material in a connecting region between the shoulder strap and the web.

The first portion of the seat to which the at least one web of the present invention is able to attach to via the seat attachment means may comprise any portion of a child restraining seat. For example, the first portion may comprise a portion of the harness other than a first shoulder strap, for example a second shoulder strap. Preferably, the first portion of the seat to which the at least one web attaches via the first seat attachment means comprises a portion of the seat cover or the seat shell. For instance, the first portion of the seat may be a portion of the shell forming the backrest of the seat, or a seating portion. "Seating portion", as used herein, refers to the portion of the seat onto which the buttocks rest.

As such, the first seat attachment means of the child restraining system could be any one or more of the following: hook and loop fasteners (e.g. Velcro™), zip fasteners, buttons, snap fasteners, a buckle system, riveting, and stitching. As described in relation to the first shoulder strap attachment means, the web and the first portion of a seat, for instance a shoulder strap or another part of the harness, may even be formed from a single material. Where the web and second shoulder strap are formed from the same piece of material, the first seat attachment means would be the material in a connecting region between the shoulder strap and the web.

In use, the first shoulder strap attachment means attach the web to the first shoulder strap and the first seat attachment means attach the web to a portion of the seat.

In such a configuration, a portion of a web between the first and second ends may be slack, so as to define a slack portion. Such a slack portion may allow a portion of the web to be displaced in a direction away from the torso of the child, by pulling the web taut. The provision of a certain amount of slack in the web may allow for limited movement of the child sitting in the seat to enhance the comfort of the child. Clearly, however, excessive

slack allows the child too much freedom of movement, so that they may, for example, slide their arm out from under the shoulder strap.

5 A "maximum extension" of a web may therefore be defined as the maximum distance that any portion of the web may be displaced when the web is assembled, i.e. when the at least one web is attached to the first shoulder strap and the web is attached to the seat portion via the shoulder strap attachment means and the seat attachment means, respectively.

10 Accordingly, the present invention enables a user, for example a parent or guardian, to reduce a maximum extension of the web so as to confine a volume of space between the web and the shoulder strap which the child may use to slide their arm through. In this way, the child may be prevented from sliding their arm out from under the shoulder strap.

15 The maximum extension of the web may typically be dependent on the size of the child being restrained in the seat. Hence, the present invention provides the ability of the child restraining system to be functional with children of different sizes, and indeed may reduce or eliminate the need for a parent to replace the child restraining system as the child grows.

20 Preferably, the at least one web of the child restraining system comprises a first web, the first web consisting of one web, wherein the first shoulder strap attachment means enable the first web to be attached to the first shoulder strap and the first seat attachment means enable the first web to be attached to the shell, for instance a backrest or a seating portion
25 of the shell.

In such a case, the first maximum extension of the at least one web may refer to the maximum distance that any portion of the first web may be displaced when the web is assembled, i.e. when the first web is attached to the first shoulder strap and the first seat
30 portion.

"One web" here refers to a single continuous piece of webbing material. The web may be any suitable material such as cloth, a sheet of cloth or plastic, woven materials, elasticised cloth etc. Preferably, the webbing material comprises an elastic material. "Elastic" here
35 may refer to a material that a user may easily stretch by an appreciable amount. For instance, a user may easily stretch the webbing material by 2% of an original length. More preferably, the webbing material comprises a breathable, elasticated material. The

webbing material may comprise an open weave polymer mesh. In some embodiments the webbing material may comprise one or more of nylon or rayon.

5 Preferably, the adjustment means of the child restraining system comprise at least one binding element that is attached to, and/or passes through, an adjustment portion of the at least one web, and is displaceable towards a different fixed portion of the at least one web, such that the adjustment and fixed portions of the at least one web are drawn together thus reducing the first maximum extension of the at least one web. In such a case, the binding element may be displaceable towards the fixed portion of the at least one web in a direction that lies in a transverse plane of the child restraining seat.

15 Preferably, the binding element of the child restraining system comprises one or more lengths of a material, for example the child restraining system may comprise a drawstring mechanism, wherein the at least one binding element comprises a drawstring.

20 Where the binding element comprises a length of material, a slack length of the one or more lengths of the material may define the maximum extension of the web. The term "slack length" as used herein refers to a continuous length of one of the one or more lengths of material that is not under tension.

The "binding element" of the present invention may comprise any means suitable for drawing portions of the at least one web together.

25 In certain embodiments, the child restraining system also comprises at least one locking element to lock a position of the at least one binding element relative to the fixed portion of the at least one web. Any suitable locking element may be used, for example the locking element may comprise a buckle configured to pin the binding element against displacement.

30 In some embodiments, the binding element may comprise a button, and the locking element may comprise a button hole. In such embodiments, the button may be sewn on to a portion of the at least one web. As such, the button may be displaced towards the button hole to reduce the first maximum extension of the at least one web.

35 Alternatively, each of the binding element and the locking element may comprise one of the two halves of a press stud. Where the binding element comprises a button or half of a press stud, it is preferable that a plurality of button holes, or receiving halves of the press

stud, are provided, such that the corresponding adjustment portion of the at least one web can be locked at a range of different displacements according to the size of the child.

5 In other embodiments, the locking element may comprise a drawstring lock comprising telescoping cylinders, each cylinder having its own lateral aperture and each of the lateral apertures receiving the drawstring. In such embodiments, the lateral apertures are urged apart by a lock spring such that, in a released state, opposing edges of the apertures in the cylinders clamp the drawstring. A user is then able to manually urge the lateral apertures towards one another to align the apertures such that the drawstring can be
10 freely drawn through the lock, or the lock may be moved along the drawstring.

Preferably, the locking element comprises a tamper-proof element. For instance, where the locking element comprises a drawstring lock, the force required to align the apertures may be higher than a maximum force that can be exerted by a child's hand.

15 Preferably, the at least one web of the child restraining system comprises a plurality of webs. In such a case, each web may have its own respective binding element, each binding element being attached to, or passing through, a respective adjustment portion and being displaceable towards a respective different fixed portion such that the respective
20 adjustment portion and the respective fixed portion are drawn together. In such embodiments, whilst each web has its own binding element, it is not necessary for the respective adjustment portion of said web to be located on that same web. For instance, the respective adjustment portion of a given web may be located on that web, whilst the respective fixed portion is located on a different web, or vice versa. Alternatively, the
25 respective adjustment portion of a given web, as well as the respective different fixed portion of that same web may both be located on said web.

Embodiments of the child restraining system of the present invention may comprise a first and a second web, each consisting of one web. In such a case, the child restraining system
30 may comprise second seat attachment means that enable the second web to be attached to a second portion of the seat. Accordingly, the second web is configured such that, in use, the second web covers a second area, different from the first area. For example, the second web may be configured to cover a second area that is higher up than the first area, but is also located between the first shoulder strap and the shell. Alternatively, the second
35 area could be an area between the first shoulder strap and a second shoulder strap of the harness. In such an embodiment, one of the first and second shoulder straps may be intended to restrain a left shoulder of a child, and the other of the first and second shoulder straps may be intended to restrain a right shoulder of said child.

Aspects of the configuration of the second web that enable it to cover said second area may include the size and shape of the second web. For example, a second web configured to cover an area between the first shoulder strap and the shell that is higher up relative to the first area could be that the second web has a smaller width than the first web, or
5 tapers more drastically than the first web.

In a further aspect, the invention provides a child restraining seat according to claim 16. Preferably, such a child restraining seat comprises a second shoulder strap, and the child
10 restraining system of said child restraining seat comprises second shoulder strap adjustment means to enable the at least one web to be attached to the second shoulder strap.

Brief Description of Figures

15 Specific embodiments of the present invention will now be described with reference to the accompanying figures in which:

Figure 1 shows a typical child seat with a five point harness;

20 Figure 2 shows a front elevation of a child restraining system according to the first embodiment of the invention;

Figures 3A-B show side elevation of the child restraining system of Figure 2 showing the adjustment system 200 associated with the right web before (Figure 3A) and after (Figure
25 3B) adjustment;

Figure 4 shows a front elevation of an adjustment system 200 of a child restraining system according to a second embodiment of the invention;

30 Figures 5A-5B show a side elevation of an adjustment system of a child restraining system according to a third embodiment of the invention showing the embodiment before (Figure 5A) and after (Figure 5B) adjustment;

Figure 6 shows a front elevation of an adjustment system 200 of a child restraining system
35 according to a fourth embodiment of the invention; and

Figure 7 shows a side elevation of an adjustment system 200 of a child restraining system according to the fourth embodiment of the invention.

Detailed Description

5 Figure 1 shows a typical child seat with a five-point harness known in the art. There is shown a car seat shell 10; a harness 12 comprising: two shoulder straps 14, 16; two midriff straps 18, 20; and a crotch strap 22, which may pass through a guiding loop 24. The midriff straps 18, 20 are attached to the car seat shell 10 through guides 26, 28, and are attached to the car seat shell 10 through known means (not shown). The shoulder
10 straps 14, 16 pass through guides 30, 32, and are attached to the car seat shell 10 by known means (not shown). Typically, there are guides 34, 36 and 38, 40 at various heights allowing the height of the shoulder straps 14, 16 to be adjusted. The shoulder straps 14, 16 midriff straps 18, 20 and crotch strap 22 converge at a buckle 42. There is also shown a backrest 44, seating portion 46 and side walls 48, 50. The car seat shell 10 may also
15 have a removable cover, typically made of synthetic material, allowing for easy replacement of the exterior whilst keeping the car seat shell 10.

A similar design is also known, which incorporates a three-point harness instead of the five point harness 12.

20

The present invention does not concern improvements of these known features and these numbers will be adhered to in the remainder of the specification.

Referring now to Figure 2, a child restraining system according to the present invention is
25 shown fitted to the child restraining seat of Figure 1.

In this embodiment there is shown a child restraining system comprises a left and a right web 60, respectively associated with the left 14 and the right 16 shoulder strap. Each web 60 has associated with it: a backrest attachment 62; a shoulder strap attachment 64; and
30 an adjustment system 200 comprising a drawstring. The adjustment system 200 is described in more detail with reference to Figures 4A-B. The web 60 comprises a top edge 66, a bottom edge 68 and a distal edge 72. The web 60 is attached to the shoulder strap 14 via a shoulder strap attachment tube 70.

35 In the preferred embodiment the web 60 is constructed of an elasticised breathable material. In further embodiments the material is the same material used in the car seat cover, or in yet another embodiment is made of the same material used in the harness. The breathable material prevents discomfort for the child, especially in hot climates where the additional layer of material is undesirable. The web 60 may also be padded at the top

edge 66 and bottom edge 68 for comfort. The web 60 is attached to the backrest 44 via the backrest attachment 62. In a further embodiment the web 60 is attached to the nearest sidewall 48, 50 of a shoulder strap 14, 16 to which the web 60 is attached. The backrest attachment 62 is preferably fixedly attached to the backrest 44. The attachment means
5 may be any known suitable means such as being sewn, riveted etc.

The web 60 may supplement the harness 12, by equally distributing the force of an impact across the side of the child's body as well as onto the shoulder straps 14, 16 midriff straps 18, 20 and crotch strap 22. In such an embodiment the choice of material for the web 60 and backrest attachment means 62 is dictated by the relevant safety standards to which
10 the car seat and harness must comply.

In a further embodiment the web 60 is only intended to prevent the child removing their arms out from under the shoulder strap 14, and does not act to equally distribute force
15 during an impact. In such embodiments the web need not be fixedly attached to the backrest 44 and may have removable backrest attachment means 62 such as a zip fastener, buttons, hook and loop, snap fasteners etc. (not shown).

Each of the webs 60 of the child restraining system are attached to its respective shoulder strap by shoulder strap attachment means 64. The web 60 is attached by forming a tube
20 70 in a proximal edge 74 of the web that encircles the shoulder strap 14, 16. The web 60 is fixed in said tubular configuration about the shoulder strap 14, 16 by the shoulder strap attachment means 64 which here comprise a hook and loop fastener. The shoulder strap attachment means 64 are preferably detachable for safety reasons, allowing the child to
25 be quickly removed from the seat, if required. The attachment means 64 may be any known suitable means such as a zip, buttons etc.

Preferably, the shoulder strap attachment means 64 may comprise various height settings, such that the web 60 can be attached at different heights on the shoulder strap 14, 16.
30 For instance, where the shoulder strap attachment means 64 comprises a hook and loop fastener, as in the present embodiment, the portion of said fastener that is fixedly attached to the shoulder strap 14, 16 may extend beyond the length of the tube 70, such that the tube 70 can be attached to the shoulder strap 14, 16 at different positions along the length of the same.

35 Alternatively, the shoulder attachment means may comprise snap fasteners. In such a case, the tubes 94, 96 may contain a row of snap fasteners which spans a length greater

than the height of the web 90, in order to provide for various height settings. The web 90 is then attached to the snap fasteners at the desired position along the tube.

5 In other embodiments the web 60 may not comprise the tube 70 for attachment to the shoulder strap 14, 16. In such cases, the shoulder strap attachment means 64 may fix the web 60 directly to the shoulder strap 14, 16. For instance, the web 60 could be fixed directly to the shoulder strap 14, 16 by a line of stitching that passes through both the strap 14, 16 and the web 60.

10 The web 60 is directly attached to the backrest 44 along its distal edge 72 via the backrest attachment means 62. In some embodiments the backrest attachment 62 is physically attached to the car seat shell 10. For example, if the backrest attachment 62 was a rivet, the rivet would be anchored into the car seat shell 10. In such embodiments the attachment means are preferably inserted into the car seat shell 10 during the
15 manufacturing stage of the seat so as not to compromise the integrity.

In other embodiments the backrest attachment 62 is incorporated into a fabric cover of the car seat shell 10 via the detachable covers. For example, in the case of hook and loop attachment means, the car seat cover would have an area of hooks and the web 60 would
20 contain an area of loops, or vice versa. This allows the web 60 to be fitted onto an existing car seat shell 10 without need for working the car seat shell 10 and potentially comprising the integrity.

In a further embodiment the backrest attachment 62 may comprise various height settings, such that the web can be attached at different heights on the backrest. For
25 instance, the backrest attachment means may comprise a vertical row of snap fasteners allowing a user to choose at which height they wish to attach the web 60. An advantage of this embodiment is that the web may be quickly released from the backrest to allow a child to be removed from the seat quickly in case of emergency. In some such
30 embodiments the shoulder attachment means 64 may be fixedly attached to the shoulder straps 14, 16. In these embodiments, the child may still be removed from the seat quickly in the case of an emergency because the backrest attachment 62 is not fixed.

An aspect of the present invention is that the web 60 in use, is positioned such that it
35 prevents the child from sliding their hand, or hands, underneath the shoulder strap 14. The web 60 therefore acts as a barrier between the part of the seat and the straps 14, 16. Preferably the web 60 must be sufficiently taut so as to prevent the child from placing their hand under the strap 14 whilst also ensuring that the child is sufficiently comfortable.

In the event that the web 60 is too loose the area available for the child to slide their arm out from under the shoulder strap 14 is too large and the effectiveness of the web is reduced. In the event that the web 60 is too tight the user will experience discomfort which is undesirable.

5

Furthermore, a web 60 which is suitable for a first child may be less suitable for a second child. For example if the first child is much larger than the second child a web suitable for the second child may be too tight for the first child. Similarly as a child grows the web 60 may no longer be appropriate.

10

An aspect of the invention is that various adjustments means 200 are provided on the web 60 allowing for the size of the volume space between the shoulder strap and the upper edge of the web to be adjusted. Figures 3 to 7 show various embodiments of the adjustment means for the web 60.

15

Figure 3A-B show a side elevation of the child restraining system of Figure 2 both before (Figure 3A) and after (Figure 3B) adjustment by a user to reduce an area available for a child to slide their arm out from under the right shoulder strap 14. There is shown the car seat shell 10 and the web 60 as described with reference to Figures 1 and 2. There is also shown a volume space 80 as defined by the top edge of the web 66, the backrest 44 and shoulder strap 14. The web 60 further comprises an adjust system 200 configured to adjust the size of the volume space 80 as described in further detail below.

20

In use the child will insert their arm through the volume space 80 and will use the seat in the normal manner. In a typical child car seat the straps are tightened but the child may be able to remove an arm from a shoulder strap 14, 16 by inserting a hand under the side edge of the shoulder strap 72 and pulling their arm through. In the present invention the volume space 80 is greatly reduced preventing the child being able to insert their arm under the shoulder strap 14.

25

30

The size of the volume space 80 is defined by the top edge of the web 66 which is manipulated using the adjustment system 200 in the manner described below. The volume space 80 can also be reduced or enlarged by adjusting the position of the shoulder strap attachment tube 70 along the length of the shoulder strap. In use, it is desirable for the top edge of the web 66 to be as close to the shoulder strap 14 as possible to minimise the possibility of a child inserting their hand and arm under the shoulder strap 14. However, the volume space 80 should be large enough for a child to insert their arms without discomfort.

35

It is to be understood that the adjustment system 200 of the right web 16 of the child restraining system of Figure 2 is configured substantially the same as the adjustment system 200 of the left web 14. In the particular embodiment shown, each web 60 is independently adjustable, however this need not be the case. For instance, a common drawstring may be threaded through portions of each of the left and right webs.

In the embodiment shown the adjustment system 200 comprises a drawstring 210 which is threaded through a hem 220 formed in the web, said hem 220 running along the top edge 66, the distal edge 72 and the lower edge 68 of the web 60. The loose ends 215 of the drawstring 210 emerge from the open ends of the hem at both the top edge 66 and the bottom edge 68 of the web 60.

A drawstring lock 230 is provided where each of the loose ends 215 of the drawstring 210 emerges from the hem 220, at each of the top 66 and the bottom 68 edges of the web. The drawstring locks 230 are threaded onto the loose ends 215 of the web 60.

Each of the drawstring locks 230 comprise two telescoping cylinders 235, said cylinders 235 having a lateral aperture 232 in which the drawstring 610 is received. The lateral apertures 232 are urged apart by a lock spring (not shown) such that, in a released state, the opposing edges of the apertures in the cylinders 235 clamp the drawstring 210.

Accordingly, in its released state the drawstring lock 230 is clamped in position along the length of the drawstring 210. A user is then able to manually urge the lateral apertures 232 towards one another to align the apertures 232 such that the lock 230 may be moved along the length of the drawstring 210.

In a preferred embodiment, the force provided by the lock spring is greater than that which can be exerted by a child's hand. As such, a child would be unable to manually urge the cylinders together to adjust the position of the drawstring lock 230 along the length of the drawstring 210. Hence, a child would not be able to adjust the maximum extension of the web 60, as described below.

The adjustment system 200 according to the embodiment allows a user to adjust a maximum extension of the web 60 so as to confine volume space 80 defined by the top edge of the web 66, the backrest 44 and shoulder strap 14. It is desirable to limit such a volume 80 because, where this space is too large, a child may be able to slide their arm out from under the shoulder strap.

The adjustability function according to the present invention also results in the web 60 being suitable for children of a wide range of ages, heights and weights.

5 In Figure 3A the length of the drawstring 210 inserted in the hem 220 (L) is L_1 . Length L defines both the conformation and the configuration of the top edge 66 of the web 60. The "configuration of the top edge 66" here refers both to a shape of the top edge 66 in space, i.e. whether the material of the top edge 66 is substantially straight, or whether the material of the top edge 66 folds or bunches up. The "configuration of the top edge 66"
10 here refers to a position of the top edge relative to the point at which the shoulder strap 14 passes through the guides 34, 38. Specifically, where length L is large, the top edge 66 is able to be pulled downwards relative to the guides 34, 38 than where length L is small.

15 As discussed above, the "maximum extension" of the web 60 is the maximum distance that any portion of the web may be displaced when the web is assembled, i.e. when the at least one web is attached to the first shoulder strap and the web is attached to the seat portion via the shoulder strap attachment means and the seat attachment means, respectively. As such, in the particular embodiment, the maximum extension also defines
20 the maximum distance that the top edge 66 may extend from the guides 34, 38.

According to the embodiment of Figures 3A-3B, the user reduces the maximum extension of the web 60 by adjustment at both the top 66 and bottom 68 edges of the web 60. In each case, the user manually urges the cylinders 235 of the drawstring lock 230 together
25 and draws the drawstring 210 through the apertures 232 to adjust the length of the drawstring 210 inside the hem 220.

Figure 3B shows the embodiment of Figure 3A when the adjust system 200 has been used to reduce the maximum extension of the web 60.

30 In Figure 3B the user has reduced the maximum extension of the web 60 by drawing the drawstring 210 to adjust the length of the drawstring 210 inside the hem 220. Accordingly, the length of the drawstring portion inside the hem 220, is reduced to L_2 , as shown in Figure 3B. As the drawstring 210 is adjusted, the webbing material forming the hem 220
35 bunches up, i.e. the material of the hem 220 is drawn proximally inwards. As such, the maximum extension of the web is reduced.

In some embodiments the drawstring 210 may be made from elasticated cord comprising rubber or alternatively an elastic fibre such as elastane. In such embodiments, the length of the ends 215 of the drawstring 210 that hang loose on a proximal side of the drawstring lock may be reduced.

5

Referring to Figure 4, a second embodiment of the adjustment system 300 of the present invention is shown.

10 In Figure 4 there is shown a child seat and child restraining system as described with reference to Figures 1 to 3.

In the second embodiment the drawstring mechanism has been replaced by three straps 310 that each extend in a transverse direction from the distal edge 72 of the web to the proximal edge 74 of the web. The straps 310 are substantially equally vertically spaced on the web 60, and are each fixed to the proximal edge 74 of the web by a vertical line of stitching 330. The straps are each anchored to the distal edge 72 of the web by a respective D-ring 350 by threading the strap 310 through the opening 355 of the ring portion of the D-ring 350 and looping said strap 310 back towards the proximal edge 74 of the web. Each of the loose ends 315 of the straps 310 are then threaded through a respective friction buckle 320 provided proximal to the line of stitching 320 fixing the strap 310 to the web 60, such that the loose end 315 is folded back in the direction of the distal edge 72 of the web 60.

25 The friction buckle 320 of the present invention fixes the strap 310 against inadvertent sliding. However, a user may overcome the force provided by the friction buckle 320 to hold the strap 310 in place by pulling the strap 310. Preferably, the force needed to pull the strap 310 to overcome the friction buckle is greater than a force that can be exerted by a child's hand.

30 In the present embodiment, the maximum extension of the web is adjusted to be smaller by pulling the loose end of any one or more of the straps 310, such that the length of the strap 310 between the D-ring 350 and the friction buckle 320 is reduced. Accordingly, the web 60 conforms such that the D-ring 350 and the friction buckle 320 are drawn closer together.

35

Alternatively, the maximum extension of the web 60 may be adjusted to be larger by pulling a portion of the strap 310 between the D-ring 350 and the friction buckle 320

outwards from the torso of the child to increase the distance between the D-ring 350 and the friction buckle 320.

5 In further embodiments, the child restraining system of the present invention may comprise any number of straps 310.

Figures 5A-B show a third embodiment of the adjustment system 400 of the child restraining system of the present invention. There is shown a child seat and child restraining system as described with reference to Figures 1 to 3.

10

In the third embodiment, the web 60 comprises an inflatable band 450. A mouth piece 410 is provided on the web 60 proximal to the shoulder strap 14. The mouth piece 410 comprises a rigid tube 420 and a hinged stopper 430.

15 The maximum extension is adjusted by removing the stopper 430 from the rigid tube 420 and either allowing air inside the band 450 to escape, or feeding more air into the band 450. The band 450 may be inflated by a user orally blowing air into the band 450, or alternatively using an air pump.

20 As the band 450 is inflated, the pressure on the webbing material increases, pulling the web 60 taut and causing the web to expand outwards, away from a direction in which a child's torso would be positioned. As such, the web 60 no longer sags under its own weight, but is hoisted upwards, and expands to fill the volume of space 80 underneath the shoulder strap 14. Accordingly, a smaller volume is available for a child to slide an arm out from
25 under the strap.

In such an embodiment the webbing material comprises an air tight material, for instance the webbing material may comprise a vinyl sealing.

30 Figure 5B shows the embodiment of Figure 5A in which the inflatable band 450 has been inflated so as to reduce the volume space 80.

Referring now to Figures 6 and 7, a fourth embodiment of the child restraining system according to the present invention is shown.

35

Figure 6 is a front elevation of a fourth embodiment of the invention. There is shown the seat and child restraining system as described above. There is also shown a web 90, which comprises a back panel 92, shoulder attachment tubes 94, 96, shoulder attachment means

98 and 100, the back panel having a top edge 102 and a bottom edge 104, and an adjustment system 500 comprising a drawstring mechanism.

5 In this embodiment the web 90 is solely attached to the harness 12 and is not attached to the shell 10 or the shell cover. The web 90 is attached to the shoulder straps 14, 16 by the shoulder attachment means 98, 100. As in the embodiment described above with reference to Figure 2, the web defines a tube 94, 96 which is sealed at the attachment means 98, 100. As was also described in relation to Figure 2, the shoulder strap attachment means 64 may comprise various height settings, such that the web 60 can be
10 attached at different heights on the shoulder strap 14, 16.

As described in relation to the first, second and third embodiments, the attachment means may be any suitable means such as zip, hook and loop, buttons, snap fastener etc.

15 The drawstring mechanism of the fourth embodiment is configured substantially similarly to the first embodiment, however in the present embodiment preferably a single drawstring 510 is used. As such, the adjustment mechanism comprises a hem 520, a drawstring 510 and two drawstring locks 230. In this embodiment, a mid-portion of the drawstring 510 is inserted in the hem 420, said hem 520 running along the top edge 102
20 of the web 90. The drawstring locks 230 are configured substantially the same as the drawstring locks 530 of Figures 2-3. Again, in Figure 6 the drawstring locks 530 are threaded over the drawstring 510 and clamped in place where the loose ends of the drawstring 510 emerge from the open ends of the hem 520.

25 In the present embodiment, the drawstring is made from elasticated cord. Each of the loose ends of said drawstrings are tied in a respective knot 515. In this way, the loose ends do not hang down, and as such do not present a hazard to young children who may tamper with the loose ends. Of course, an embodiment comprising two webs, as described in relation to Figures 2-3 may similarly comprise a drawstring made from an elasticated
30 cord, and/or have loose ends of the drawstring tied in knots.

The drawstring mechanism of Figure 6 is adjusted in the same manner as was described in relation to Figures 3A-B.

35 Figure 7 shows a side elevation of a child restraining strap according to the fourth embodiment of the invention. There is shown the web as described with reference to Figure 4 and further shows a volume space 110.

As in the first, second and third embodiments, the web 90 and back panel 92 define a volume space 110 between the top edge of the back panel 102 and shoulder strap 14. As with the first embodiment of the invention the volume space allows the child to insert their arms through but prevents them from removing their arms from the shoulder strap by way of inserting a hand under the strap. Again, the size of the volume space 110 is defined by the top edge of the web 66 which is manipulated using the adjustment system 200 in the manner described below. The volume space 110 can also be reduced or enlarged by adjusting the position of the shoulder strap attachment tube 70 along the length of the shoulder strap.

10

The advantage of the embodiment described with reference to Figures 6 and 7 is that it allows for a retrofit of the invention to existing child car seats. It simply requires the strap 90 to be fastened on the shoulder straps 14, 16 by the attachment means 98, 100. Such an embodiment advantageously does not require the working of an existing car seat, which may compromise the structural integrity of the car seat shell 10. Furthermore, as the invention only comprises a web of material and fastening means it is relatively inexpensive and easily fitted onto existing seats providing a cheap, easy-to-fit enhancement to known existing car seats.

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20

As will be appreciated the embodiments of Figures 6 and 7 may also comprise the adjustment systems 200 as shown in Figure 4 (the use of straps) and Figure 5 (the inflatable portion).

25

In all embodiments, in addition to the adjustment means the child restraining system may comprise further features to increase the comfort of the child. In an embodiment the web is further integrated with a known monitor (not shown). The monitor is configured to measure one or more of a child's heartbeat, temperature, sleep patterns in a known manner. In an embodiment where the monitor measures heartbeat data, in the event of an accident such information may be accessed by emergency services.

30

CLAIMS:

1. A child restraining system for use with a child restraining seat having a harness:
5 the child restraining system comprising at least one web having a first end and a second end, wherein the first end comprises first shoulder strap attachment means that enable the at least one web to be attached to a first shoulder strap of the harness of the child restraining seat, and said second end comprises attachment means that enable the at least one web to be attached to a first portion of the child restraining seat,
10 the at least one web being configured such that, in use, the at least one web covers a first area between the first shoulder strap and the child restraining seat, thereby limiting the ability of a child to slide an arm or a shoulder out from under the first shoulder strap, wherein the web further comprises adjustment means that enable the size or tautness of the least one web to be adjusted.
15
2. A child restraining system according to claim 1 wherein the first portion of the child restraining seat to which the second end attachment means is configured to attach is a second shoulder strap or a seat portion of the child restraining seat.
- 20 3. A child restraining system according to claim 1 or 2 comprising a plurality of webs.
4. A child restraining system according to any preceding claim wherein the adjustment means comprise at least one binding element that is attached to, and/or passes through, an adjustment portion of the at least one web and is displaceable towards a different fixed
25 portion of the at least one web such that the adjustment and fixed portions of the at least one web are drawn together thus reducing the first size of the at least one web.
5. A child restraining system according to claim 4 comprising at least one locking element to lock a position of the at least one binding element relative to the fixed portion
30 of the at least one web.
6. A child restraining system according to claim 4 or 5 wherein, in use, the at least one binding element is displaceable towards the fixed portion of the at least one web in a direction that lies in a transverse plane of the child restraining seat.
35
7. A child restraining system according to any of claims 4-6 when dependent on claim 3, wherein each web has its own respective binding element, each binding element being attached to, or passing through, a respective adjustment portion of the at least one web and being displaceable towards a respective different fixed portion of the at least one web

such that the respective adjustment portion and the respective fixed portion of the at least one web are drawn together.

5 8. A child restraining system according to claim 7, wherein each binding element of each web is attached to, or passes through, a respective adjustment portion of that web and is displaceable towards a respective different fixed portion of that web such that the respective adjustment portion and the respective fixed portion of the web are drawn together.

10 9. A child restraining system according to claim 7 further comprising a second web, wherein the binding element of the second web adjusts a second size or tautness of the second web which is independent of the size of tautness of the first web.

15 10. A child restraining system according to any of claims 4-9 wherein the at least one binding element comprises at least one length of a material.

11. A child restraining system according to claim 10 wherein a slack length of the at least one length of the material defines the size of the at least one web.

20 12. A child restraining system according to claim 10 or 11 comprising a drawstring mechanism, wherein the at least one binding element comprises a drawstring.

25 13. A child restraining system according to claim 5, wherein the at least one locking element comprises a tamper-proof element.

14. A child restraining system according to claim 11 when claim 10 is dependent on claim 5 wherein the at least one locking element comprises a drawstring lock comprising telescoping cylinders.

30 15. A child restraining system according to claim 14 with each cylinder having its own lateral aperture, each of the lateral apertures receiving the drawstring, the lateral apertures being urged apart by a lock spring such that, in a released state, opposing edges of the apertures in the cylinders clamp the drawstring, wherein a user is able to manually urge the lateral apertures towards one another to align the apertures such that
35 the drawstring can be freely drawn through the lock, or the lock may be moved along the drawstring.

16. A child restraining system according to claim 13 and 12 wherein the drawstring lock also forms the tamper proof element in that the force required to align the apertures is higher than a maximum force that can be exerted by a child's hand.

- 5 17. A child restraining seat comprising:
a harness comprising a first shoulder strap;
a shell; and
a child restraining system according to any preceding claim.

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Examiner: Terence Newhouse

Claims searched: 1-17

Date of search: 4 December 2019

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-3,17	WO2010/015842 A1 KNIGHT, note adjustment in page 8 lines 4-8, page 9 lines 4-11, page 9 line 28 to page 10 line 4 & page 10 lines 28-30
X	1,2,4-6,10,11,17	EP2332786 A1 KLAPPA, see paras 0052-3 and figs noting web with attachments 30
X	1-6,10,11,13,17	US5154487 A WARBURTON, note web 16,18 with attachment 38-44 & col 3 lines 13-14 and adjustment 22 in col 3 lines 47-54
X	1-11,13,17	US6007156 A CHANG, note e.g. web 5b in fig 2 with adjustment at buckle 4
X	1,2,4-6,10,11,17	GB2521884 A DAVIS, see e.g. the first full para on page 4

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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International Classification:

Subclass	Subgroup	Valid From
B60N	0002/28	01/01/2006
B60R	0022/10	01/01/2006