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(73) Patenthaver: **Mack Rides GmbH & Co. KG, Mauermattenstrasse 4, 79183 Waldkirch, Tyskland**

(72) Opfinder: **Burger, Günter, Am Hahnenhof 3a, 79183 Waldkirch, Tyskland**
Sornik, Frank, Am Hahnenhof 3b, 79183 Waldkirch, Tyskland
HAUER, Roman, Freiestrasse 5A, 79183 Waldkirch, Tyskland
GORDT, Dennis, Rosenweg 9, 79312 Emmendingen, Tyskland

(74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**

(54) Benævnelse: **INDRETNING TIL FASTSPÆNDING AF EN PASSAGER I EN FASTSPÆNDING I EN FORLYSTELSE**

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Mechanism for restraining a passenger in a restraint system of an amusement ride

The invention relates to an apparatus for restraining a passenger held in a restraint of an amusement ride according to the preamble of claim 1 and a method for restraining a passenger held in a restraint of an amusement ride according to the preamble of claim 11.

Retention systems on amusement rides are known, for example, from EP 1020212 B1, which discloses a retention system for amusement vehicles, by means of which passengers are held on their lower body. This type of restraint is generally preferred by passengers because, in contrast to constricting shoulder straps, maximum freedom of movement is enabled, and thus an intense riding experience is given. The document WO01/74626A1 discloses retention systems on amusement rides according to the state of the art.

The secure holding of the passengers on the thighs depends on various ergonomic measures, such as, for example, the full-surface placement of the legs in a fixed restraint and/or on a moveable restraint of a passenger seat. Here and in the following, a fixed restraint is understood to mean a restraint, which is immobile in relation to the passenger receptacle and which serves to accommodate a body and/or body region of the passenger, e.g. a seat shell, back shell, front shell, reclining shell, etc. A moveable restraint is understood as a restraint, which is moveable in relation to the passenger reception means and which is used for fixing and restraining the body and/or body regions of the passenger in the fixed restraint, e.g. lap bars, shoulder bars, stomach bars, back bars, leg bars etc. Due to the different body dimensions of the passengers, there is a wide range of people which must be taken into account in the ergonomic design of the retention system. This also requires, for example, an individually adjustable position of the moveable restraint for the positive inclusion of the passenger in the retention system.

With conventional retention systems, as described for example in EP 1020212 B1, the passenger themself assumes the correct sitting position and the placement of the moveable restraint close to the body, wherein the correct sitting position and the placement close to the body are checked by the operator of the amusement ride. For

various reasons, such as incorrect behaviour, bulky clothing or objects carried by the passenger, the correct sitting position and the placement of the moveable restraint close to the body can be restricted.

However, retention systems are also conceivable in which a maximum position of the moveable restraint, which relates to the most corpulent person who is allowed to ride, is recognised by means of sensors. However, this type of retention system is inadequate because, for example, a child would be granted clearance as a result of the system as soon as the moveable restraint is just below the maximum position. In this case, there would be such a large gap between the child's thigh and the moveable restraint that the child could easily get out through, which of course should not be allowed to happen for safety reasons.

Sensor arrangements on restraints for passengers are known from the automotive industry. For example, DE 199 83 956 B4 discloses an occupant sensor that recognises the presence of an occupant on the lower part of a seat for controlling an airbag retention system.

A restraint bar for securing a person in vehicles, especially for amusement rides, is known from DE 100 16 213 C1. However, the sensor of DE 100 16 213 C1 does not recognise any object carried between a shoulder bar and the passenger and thus does not ensure a form fit between the restraint bar and the passenger.

The object of the invention is to provide a retention system that ensures a required form fit in an amusement ride between the retention system and the passenger and thus increases the safety of retention systems in amusement rides. Here and in the following, positive form fit is understood to mean that the moveable restraint rests against or on the passenger.

The object of the invention is achieved by an apparatus with the features of claim 1 and by a method with the features of claim 11.

Advantageous configurations and developments of the invention are given in the dependent claims.

The apparatus according to the invention for restraining a passenger held in a restraint of an amusement ride has at least one sensor arrangement, which in turn has means with which a form fit between a passenger and the apparatus can be checked.

With the sensor arrangement according to the invention, a form fit between the passenger and the restraint of an amusement ride, such as roller coasters in amusement parks, is checked, wherein the adjustment of the form fit is not limited to the upper body of the passenger and the restraint, as is customary in the automotive industry, but must also be ensured, for example, between the thighs of the passenger and the restraint.

A sensor-based check of the form fit between the passenger and the restraint of an amusement ride increases the safety of the operation of amusement rides and ensures clearance for the amusement ride only when the restraint has a correct placement close to the body. The apparatus according to the invention supports the operator of the amusement ride in recognizing, for example, an incorrect sitting position and/or the moveable restraint not having a placement close to the body due to objects impairing the form fit.

The apparatus for restraining a passenger in an amusement ride is configured such that the means of the sensor arrangement can recognise the body and/or body positions of passengers.

The recognition of the body and/or body positions of passengers ensures that clerance for the amusement ride is only given when the passenger is in the correct sitting position. Different body dimensions of the passengers can thus be easily recognised. Furthermore, it can be recognised whether, in order to intensify the driving experience, a passenger would like to gain more freedom in the back or seat area by stretching the body when loading, whereby the form fit between the passenger and the restraint could no longer be reliably ensured without sensor-based recognition of the body and/or body

positions. In this case, however, the apparatus recognises that a form fit is no longer ensured, and clearance is not initiated.

According to a further development of the invention, the means of the sensor arrangement are configured with a predetermined restraint position for a comparative measurement of individual body parts and/or body regions of passengers.

Such a comparative measurement of individual body parts and/or body regions with a predetermined restraint position has the advantage that foreign objects, such as prostheses, can be recognised.

It has proven to be particularly advantageous if the sensor arrangement has an optical scanner which carries out comparative measurements of individual body parts and/or body regions of passengers with a predetermined restraint position. Here, the scanner can visually capture the passenger and compare the image captured in this way with the specified restraint position.

The sensor arrangement advantageously has a temperature sensor and/or a surface measurement sensor and/or a pressure sensor and/or a sensor that recognises a displaceable or compressible medium and/or an ultrasonic sensor and/or an infrared sensor.

For example, temperature sensors, which record the body temperature of passengers, recognise objects carried by the passenger or bulky clothing worn by the passenger. If there are such objects between the body and the temperature sensor, a pre-set minimum temperature would not be reached and the clearance signal would be negative.

According to a preferred embodiment of the invention, a moveable restraint is provided, whereby the means of the sensor arrangement are configured for monitoring a close placement of the moveable restraint on the body of the passenger.

With the sensor-based monitoring of the placement of the moveable restraint close to the body, incorrect behaviour of the passenger, for example excessive stretching of the body when loading in the back and/or buttocks area, can be easily recognised. The sensor-based monitoring of the placement of the moveable restraint close to the body is therefore particularly well suited to supporting the operator of the amusement ride and thus helps to reduce human errors and to increase the safety for the passengers.

According to the invention, the apparatus is configured to grant clearance for the amusement ride.

The clearance is only given after a positive confirmation signal from the means of the sensor arrangement. This increases the safety, in that the required form fit between the retention system and the passenger is ensured.

The restraint of the apparatus according to the invention in particular has a seat shell, a moveable restraint and a back shell.

A restraint with a seat shell, a moveable restraint and a back shell represents particularly good ergonomics in restraints for amusement rides.

The sensor arrangement is advantageously disposed in the restraint of the seat shell, the moveable restraint, or the back shell. Sensors, which are disposed in the seat shell and the back shell, ensure a correct recognition of the sitting position of the passenger in the restraint of the amusement ride. Sensors in the moveable restraint monitor the placement of the moveable restraint close to the body.

In order to capture as much information as possible about the dimensions of the passenger's body, the apparatus preferably has several sensor arrangements, wherein the sensor arrangements are disposed in the restraint, in the moveable restraint, or in the moveable restraint and the seat shell and/or the back shell.

For example, one sensor arrangement can have temperature sensors and another sensor arrangement can have pressure sensors, so that in addition to the body

temperature and/or the temperature-dependent distance measurement of passengers, additional pressing forces from passengers in the restraint of the amusement ride can be recognised. Reading out the body temperature and/or the distance based on the temperature measurement and the pressing forces from passengers contributes to a better recognition of the body or body parts of the passengers and the differentiation from objects.

In a further development of the invention, the sensor arrangement is partially or completely disposed outside the restraint of the amusement ride. A sensor arrangement disposed outside the restraint of the amusement ride could, for example, be disposed in the station of the amusement ride and could recognise the form fit between the passenger and the restraint of the amusement park even while the amusement ride is driving through the station.

The restraining of a passenger held in a restraint of an amusement ride is adjusted according to the invention in that a measurement unit recognises the dimensions of the passenger recognised by the means of the sensor arrangement as an input signal. The measurement unit forwards the input signals to an adjustment device. The adjustment device adjusts the restraint to the dimensions of the passenger before the start of the amusement ride.

A method of this type supports the operator of the amusement ride in recognizing incorrect behaviour, such as an incorrect sitting position, bulky clothing or objects that impair the form fit. Clearance for the amusement ride, which with known retention systems could previously take place within the closed position range of the moveable restraint even when the moveable restraint was not in the correct closed position, is now only possible when the moveable restraint is actually placed close to the body.

In a further development of the invention, the dimensions of the passenger are recognised when driving through the amusement ride through the starting area of the amusement ride.

This further development of the method according to the invention makes it possible to determine the correct form fit between the retention system and passengers even during the operation of the amusement ride.

The adjustment device of the method according to the invention preferably has a servomotor. With a servomotor, for example, the moveable restraint can be adjusted particularly easily.

The invention is explained in detail using the exemplary embodiments in the following figures.

In the figures:

Fig. 1 shows a front view of an exemplary embodiment of an apparatus for restraining a passenger held in a restraint of an amusement ride,

Fig. 2 shows a detail view of a restraint with an apparatus for restraining a passenger according to Fig. 1.

Fig. 3 shows a block diagram to illustrate the method according to the invention for Fig. 1

Fig. 1 shows a front view of an exemplary embodiment of an apparatus 1 for restraining a passenger 20 held in a restraint 40 of an amusement ride 10.

Fig. 2 shows a detail view of a restraint 40 with an apparatus 1 according to Fig. 1.

Fig. 3 schematically shows the method according to the invention for adjusting the apparatus according to Fig. 1 using a block diagram.

In order to avoid unnecessary repetitions, Figs. 1 to 3 are addressed jointly below.

The exemplary embodiment shows an amusement ride 10 with an apparatus 1 for restraining a passenger 20. The passenger 20 is held in a restraint 40, wherein the restraint 40 is received in a passenger reception means 12, for example a vehicle, a gondola, or a cabin. The amusement ride can be, for example, a rail-bound amusement ride in an amusement park, in particular a roller coaster.

Modern retention systems on amusement rides 10 are conceived in such a way that they hold the passenger 20 securely with as few points of contact as possible. The restraint 40 of the exemplary embodiment in Fig. 1 holds the passenger 20 e.g. on their thighs, not shown here.

The apparatus 1 has a sensor arrangement 30 which has means 34 with which a form fit between the passenger 20 and the apparatus 1 can be monitored. In the exemplary embodiment shown here, the sensor unit 30 has a temperature sensor 34a that recognises the body temperature of passengers 20. However, the sensor arrangement 30 is not limited to temperature sensors 34a. Surface sensors 34b, pressure sensors 34c, sensors 34d that recognise a displaceable or compressible medium, or capacitive sensors 34e or ultrasonic sensors 34f or infrared sensors 34g or other sensors for recognizing the dimensions of a passenger 20 can also be used here.

These means 34 of the sensor arrangement 30 can recognise bodies 22 and/or body positions 24, e.g. a seated body position 24 of the passenger 20, as shown in the exemplary embodiment of Fig. 1, or body regions 26 of passengers 20.

Due to the different body dimensions of the passengers 20, there is a large range of people who have to be taken into account in the ergonomic design of the restraint 40. This also requires, for example, the individually adjustable position of the moveable restraint 46, in which the means 34 of the sensor arrangement 30 can be disposed. The means 34 of the sensor arrangement 30, disposed in the moveable restraint 46, monitor the form fit between the passenger 20 and the moveable restraint 46 or the restraint 40. The body 22 of the passenger 20 is constrained in the restraint 40 such that the passenger 20 is enclosed in the restraint 40 in a form-fitting manner. The body cannot then escape

from the restraint 40 either through acceleration forces that occur or through its own power.

In the exemplary embodiment, a scanner 36 is shown, which is arranged separately from the restraint 40. The scanner 36 carries out a comparative measurement of individual body parts and/or body regions of passengers 20 with a predetermined restraint position. For the comparative measurement, the scanner 36 expediently captures an optical image of the passenger 20, which can then easily be compared with a predetermined restraint position. Such an optical comparative measurement enables passengers 20 to recognise foreign objects, for example rucksacks, bags, etc., easily and reliably.

The restraint 40 shown has a seat shell 42, a back shell 44 and a moveable restraint 46. The sensor arrangement in the exemplary embodiment in Fig. 2 comprises temperature sensors 34a, arranged in the moveable restraint 46, and pressure sensors 34 c, arranged in the back shell 44 and the seat shell 42. Restraints 40 with other sensors are of course also conceivable. The use of sensors that quantitatively recognise various measured variables, such as, in the exemplary embodiment, temperature sensors 34a, which recognise the body temperature of passengers 20, and pressure sensors 34c, which recognise pressing forces of passengers 20 in the back shell 44 and the seat shell 42, ensures a reliable recognition of the body 22 and the body positions 24 of a passenger 20.

The means 34 of the sensor arrangement 30 can be disposed in the restraint 40 or outside of the amusement ride 10, for example in the starting area, and can monitor the form fit between the passenger 20 and the restraint 40 when the amusement ride 10 drives through the starting area or before the amusement ride 10 starts.

In the method shown for restraining a passenger 20 held in a restraint 40 of an amusement ride 10 by an apparatus 1, an adjustment device 50 is used. A measurement unit 52 receives as an input signal the dimensions of the passenger 20 recognised by the means 34 of the sensor arrangement 30. The measurement unit 52 forwards the input signals to the adjustment device 50. The adjustment device 50 can adjust the restraint 40 of the amusement ride before the start and/or while the amusement ride 10 is driving

through the starting area. In the simplest case, the adjustment device has a servomotor 54, which adjusts a placement close to the body of the moveable restraint 46 on the body 22 of the passenger 20.

The sensor-based monitoring of the body position 24 and the placement of the moveable restraint close to the body 46 by means of sensor arrangements 30 increases the safety, so that the form fit between the passenger 20 and the restraint 40 is ensured.

The apparatus 1 for restraining passengers 20 supports the operator of amusement rides 10 in recognizing incorrect behaviour, such as, for example, incorrect sitting position, bulky clothing or objects which impair the form fit. Clearance for the amusement ride 10, which previously could take place within the closed position range of the moveable restraint 46 even when the moveable restraint 46 was not in the correct closed position, is now only possible when the moveable restraint 46 actually rests close to the body 22 of the passenger 20.

As an assistance system to support the operator, the apparatus 1 shown in the exemplary embodiment helps to reduce human errors and thus to increase the safety for the passengers 20.

List of reference signs

1	apparatus for restraining
10	amusement ride
12	passenger reception means
20	passenger
22	body
24	body position
26	body region
30	sensor arrangement
34	means
34a	temperature sensor
34b	surface sensor
34c	pressure sensor
34d	sensor that recognises a displaceable or compressible medium
34e	capacitive sensor
34f	ultrasonic sensor
34g	infrared sensor
36	scanner
40	restraint
42	fixed restraint
46	moveable restraint –
50	adjustment device
52	measurement unit
54	servomotor

Patentkrav

1. Indretning (1) til fastspænding af en passager (20) fastspændt i en fastspænding (40) i en forlystelse (10) med mindst en sensoranordning (30), hvor fastspændingen (40) omfatter en ubevægelig fastspænding (42) og en bevægelig fastspænding (46),
hvor sensoranordningen (30) omfatter organ (34) til genkendelse og overvågning af en kropsposition (24) af passageren (20) i forhold til den ubevægelige fastspænding (42), hvor sensoranordningen (30) omfatter organ (34) til genkendelse og overvågning af mindst en partiel formslutning mellem passageren (20) og fastspændingen (40), og
hvor indretningen (1) er konfigureret til udstedelse af en starttilladelse til forlystelsen (10).

2. Indretning (1) ifølge krav 1,
kendetegnet ved, at
sensoranordningen (30) omfatter organ (34) til genkendelse af en krop (22) og/eller kropsområder (26) og/eller kropspositioner (24) af passagerer (20).

3. Indretning (1) ifølge krav 1 eller 2,
kendetegnet ved, at
sensoranordningen (30) omfatter organ (34) til en sammenligningsmåling af kroppen (22) og/eller kropsområder (26) af passagerer (20) i forhold til en foruddefineret kropsposition (24).

4. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
sensoranordningen (30) omfatter en scanner (36).

5. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
sensoranordningen (30) omfatter en temperatursensor (34a), og/eller en overflademålesensor (34b), og/eller en tryksensor (34c) og/eller en sensor (34d), som detekterer et forskydeligt eller komprimerbart medium, og/eller en kapacitiv

sensor (34e), og/eller en ultralydssensor (34f) og/eller en infrarødsensor (34g).

6. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
sensoranordningen (30) omfatter organ (34) til genkendelse og overvågning af en tæt anbringelse af den bevægelige fastspænding (46) på passagerens (20) krop (22).

7. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
indretningen (1) er konfigureret til udstedelse af en starttilladelse til forlystelsen (10).

8. Indretning (1) ifølge krav 7,
kendetegnet ved, at
organerne (34) af sensoranordningen (30) er placeret i den ubevægelige fastspænding (42) og/eller i den bevægelige fastspænding (44).

9. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
indretningen (1) omfatter flere sensoranordninger (30), hvor sensoranordningerne (30) er anbragt i fastspændingen (40), i den bevægelige fastspænding (46) eller i den bevægelige fastspænding (46) og sædeskallen (42) og/eller rygskallen (44).

10. Indretning (1) ifølge et af de foregående krav,
kendetegnet ved, at
sensoranordningen (30) er delvist eller fuldstændigt anbragt uden for forlystelsens (10) fastspænding (40).

11. Fremgangsmåde til fastspænding af en passager (20) fastspændt i en fastspænding (40) i en forlystelse (10) gennem en af indretningerne (1) ifølge et af de foregående krav med en justeringsanordning (50),
kendetegnet ved, at
en måleenhed (52) detekterer under anvendelse af mindst en af sensoranordningerne (30) passagerens (20) mål, sender disse til

justeringsanordningen (50), og justeringsanordningen (50) justerer fastspændingen (40) til passagerens (20) mål før start af forlystelsen (10), og en starttilladelse gives først efter et positivt tilbagemeldingssignal fra organet (34) af sensoranordningen (34), når den påkrævede formslutning mellem fastspændingssystemet og passageren er garanteret.

12. Fremgangsmåde ifølge krav 11,
kendetegnet ved, at
passagerens (20) mål detekteres ved gennemkørsel af forlystelsen (10) gennem forlystelsens (10) startområde.

13. Fremgangsmåde ifølge krav 11,
kendetegnet ved, at
en start for forlystelsen (10) frigives efter justering af fastspændingen (40) til passagerens (20) mål.

14. Indretning (1) ifølge et af kravene 1 til 10 med en justeringsanordning (50),
kendetegnet ved, at
justeringsanordningen (50) omfatter en servomotor (54).

Fig. 1:

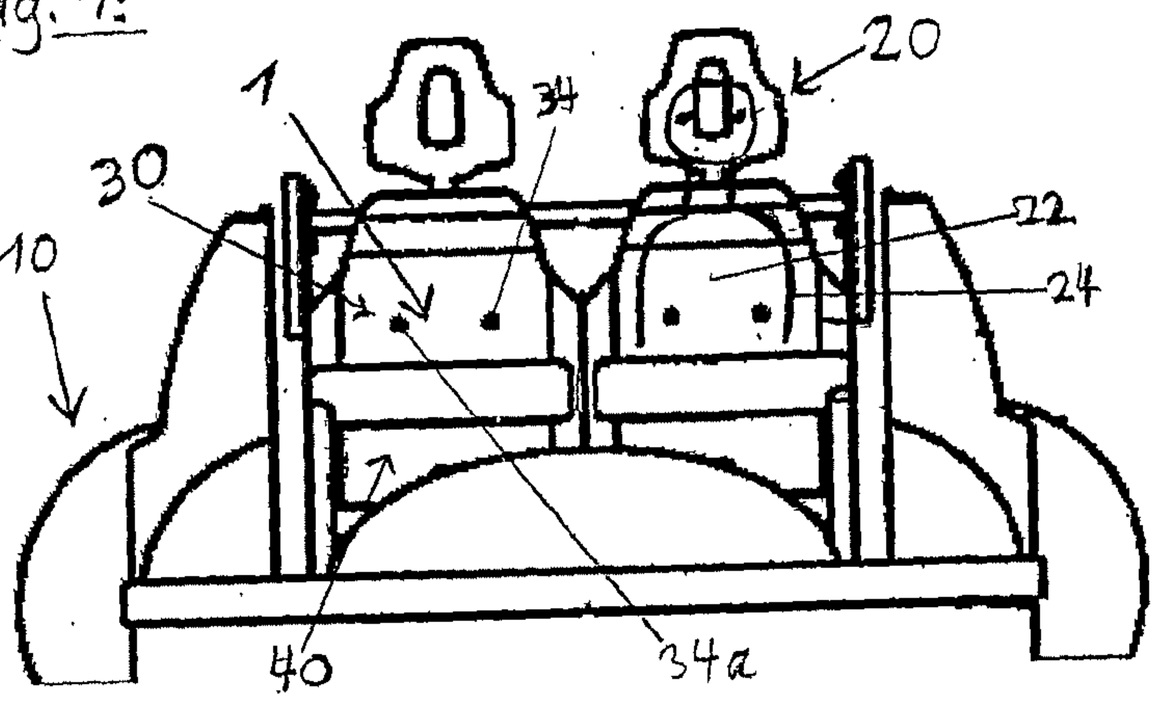

Fig. 2:

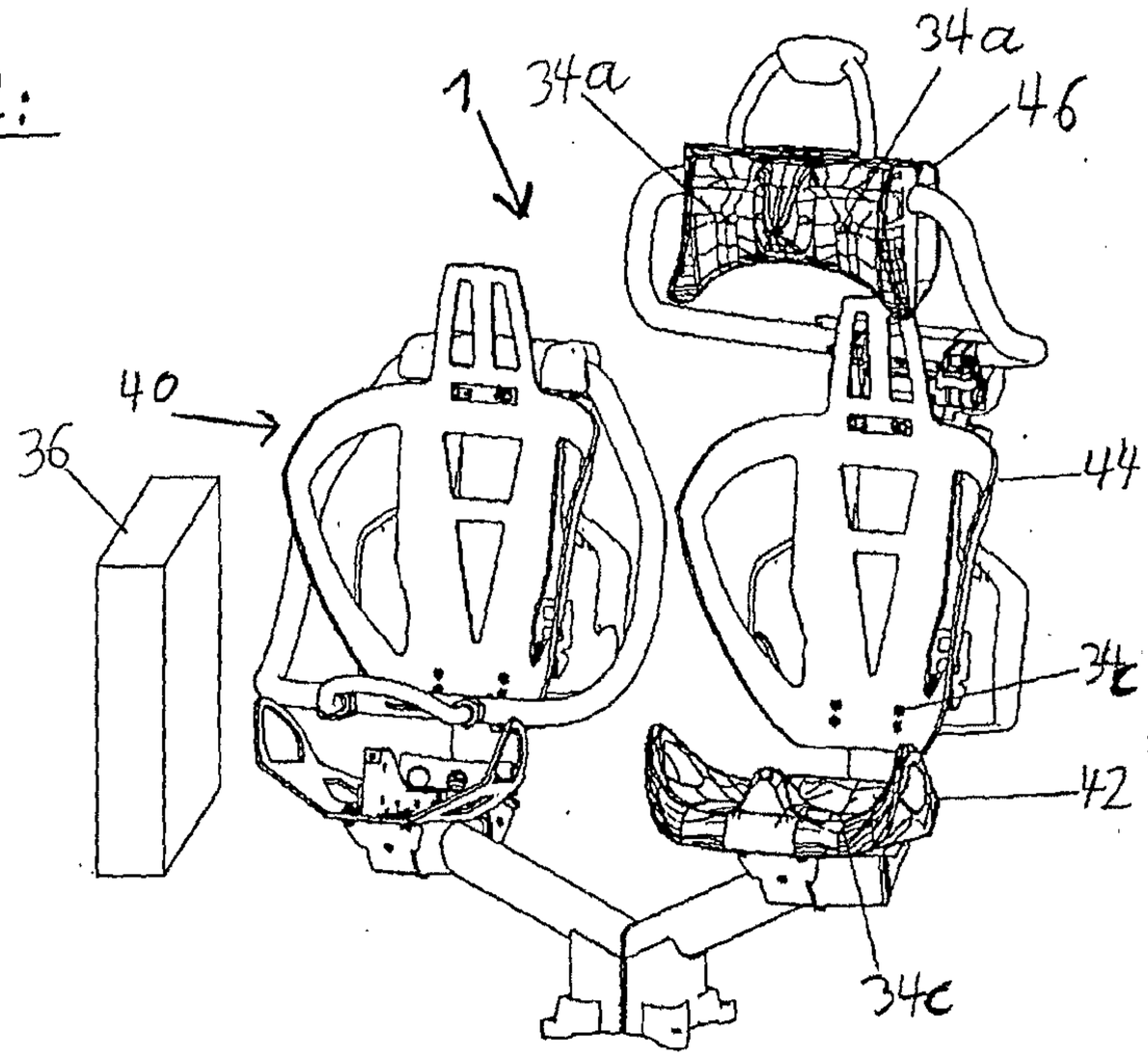

Fig. 3: