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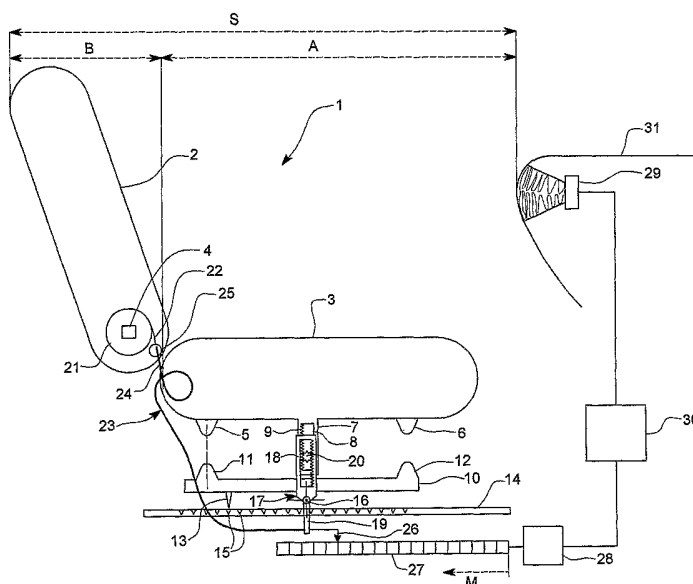
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(54) Title: A VEHICLE SEAT



(57) Abstract: A food analysis system (2) comprises an analysis sub-system (4) for generating measurement data from a food or a food component (12) and a cooperable computer sub-system (6) for processing the so generated data to determine an indication of a compositional characteristic of the food or food component (12). The system (2) further comprises a handheld remote user interface (20), such as may be provided by a suitably configured mobile telephone, adapted to establish a wireless telecommunication link with one or both the analysis sub-system (4) and the computer sub-system (6) and which is cooperable therewith to provide a user with a message indicating the results of the determination.

A VEHICLE SEAT

Description of Invention

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THE PRESENT INVENTION relates to a vehicle seat, and more particularly relates to a vehicle seat which has a moveable backrest.

Conventional vehicle seats often incorporate mechanisms which allow the position of the seat and the angle of the backrest of the seat to be adjusted relative to the vehicle to suit the particular size and build of an occupant of the seat. The adjustment of the position of the seat and the angle of the backrest is particularly important in the case of the driver's seat, as this allows the position of the seat and the angle of the backrest to be set so as to be comfortable for the driver and allow the driver to drive the vehicle easily.

In modern vehicles the position and angle of a vehicle seat is often controlled electronically by a control system. Such an electronic control system allows an occupant of the seat to position and angle the seat initially under manual control according to their requirements, and for data corresponding to the seat position and angle to be saved to a memory in the control system. If the position or angle of the seat is altered, for instance by another occupant using the seat at a later date, the control system may use the saved data to control electric motors to change the position and angle back to the manually set position and angle when the original occupant of the seat wishes to use the seat. This allows the seat to be returned to the correct position and angle for the original occupant of the seat, without the original occupant having to manually adjust the position and angle of the seat for a second time.

In order for such a control system to control the position and angle, the control system requires sensors to provide the data relating to the position of the seat and the angle of the backrest of the seat. Previously proposed

arrangements have utilised several relatively complex sensors to provide the data relating to the position of the seat and the angle of the seat back.

5 In many vehicles a safety arrangement is provided which is at least partly controlled in dependence upon the position of a seat occupant relative to the vehicle. Such a safety arrangement may incorporate an air-bag which is positioned in front of an occupant of the seat, to be inflated to protect the occupant in the event that an accident occurs. The air-bag may be inflated in different manners, depending upon the position of the occupant. For
10 instance, if the occupant is far from the air-bag during the initial stages of the inflation of the air-bag, the air-bag may be inflated at a relatively high speed, whereas if the occupant is sitting forwardly, close to the air-bag, a lower inflation speed will be appropriate.

15 One way of determining the position of the occupant relative to the air-bag, is to assume that the occupant is seated with their back against the backrest of the seat, and to determine the distance between the backrest and the uninflated air-bag. The front of the chest of the seat occupant is, in such a situation, only a predetermined short distance in front of the backrest. Data
20 relating to the position of the backrest of the seat can be fed into a control unit which calculates the estimated distance between the sternum or chest bone of the occupant and the uninflated air-bag. The control unit can then control the inflation of the air-bag according to whether the occupant is far from the air-bag, or close to the uninflated air-bag

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The present invention seeks to provide an improved vehicle seat.

According to this invention there is provided a vehicle seat comprising a squab and a backrest, the squab being mounted on a support, the backrest
30 being mounted to effect a movement relative to the squab, a mount to be fixedly secured to the chassis of a vehicle, the support being longitudinally movably mounted on the mount, the seat further comprising a position

measurement arrangement which incorporates an indicator element and a measuring unit, the measuring unit being configured to measure the position of the indicator element relative to the measuring unit, the indicator element being moveable relative to the measuring unit in response to longitudinal
5 movement of the support relative to the mount and to longitudinal movement of the upper part of the backrest relative to the support, the measuring unit providing an output indicative of the longitudinal position of the upper part of the backrest relative to the mount.

- 10 In one family of embodiments the measuring unit is configured to measure the linear position of the indicator element relative to the measuring unit.

Conveniently the measuring unit is fixed relative to the mount.

- 15 Advantageously the said flexible drive element is an inner wire of a Bowden cable, the outer sheath of the Bowden cable being mounted at both ends to the squab of the seat, and the inner wire being moveable relative to the outer sheath upon rotation of the rotatable element, with movement of the inner wire moving the said indicator element relative to the support.

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- Preferably the said indicator element is moveable along the longitudinal length of the measuring unit when the indicator element is moved in response to movement of the backrest relative to the support, the measuring unit measuring the position of the indicator element along the measuring unit and
25 providing the said output in response to the measured position of the indicator element.

Preferably the seat may be moved longitudinally relative to the said mount to a selected one of a plurality of predetermined positions.

30

Conveniently the measurement unit is divided into a plurality of sections along its longitudinal length, with each section corresponding to a said

predetermined position of the seat along the longitudinal length of the mount, the indicator element being moved to the section corresponding to a specific predetermined position upon movement of the seat to that specific predetermined position.

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Advantageously the squab, together with the backrest, is tiltable relative to the mount, with the indicator element being moveable relative to the said measuring unit in response to tilting of the squab relative to the mount.

10 Preferably the squab is pivotally mounted to the support, there being a pivot element pivotable in response to tilting of the squab relative to the support, the pivot element having an arm which is connected to the indicator element, the arm acting to move the indicator element by a specific predetermined amount as the squab is tilted through a predetermined movement.

15

Advantageously the squab is pivotally attached to the support by a link arrangement, the link arrangement having a first link element pivotally connecting one end of the squab to the support and a second link element pivotally connecting the other end of the squab to the support, there being a
20 third link element which is pivotally connected to the link arrangement, with the third link element being movable in response to pivotal movement of the link arrangement as the squab is tilted relative to the support, the third link element having an arm which is connected to the indicator element, the arm acting to move the indicator element by a specific predetermined amount
25 upon movement of the third link element as the squab is tilted through a predetermined movement.

Conveniently the said arm is connected to the outer sheath of the said Bowden cable, with the outer sheath of the Bowden cable being moveable in
30 response to movement of the arm, and movement of the outer sheath of the Bowden cable moving the indicator element by said predetermined amount.

Preferably the indicator element is associated with a compounding mechanism to affect the movement of the indicator element in response to a pivotal movement of the backrest relative to the squab, the compounding mechanism providing a compounded movement of the indicator element in response to a plurality of predetermined movements of the seat.

Conveniently the compounding mechanism affects the movements of the indicator element in response to said pivotal movements of the backrest and in response to at least one further movement selected from longitudinal movement of the seat and tilting of the squab and backrest of the seat.

Advantageously the squab of the seat is moveable away from or towards the mount, so that the squab may be raised or lowered within a vehicle in which it is mounted.

In a further family of embodiments of the invention the measuring unit is configured to measure the angular position of the indicator element relative to the measuring unit.

Preferably the measuring unit measures the rotational angle of the indicator element relative to the measuring unit.

Advantageously the measuring unit is fixed relative to the support, with the indicator element being rotatable relative to the support.

Conveniently a planetary gear assembly is provided, with part of the gear assembly being driven rotationally in response to longitudinal adjustment of the seat, and part of the gear assembly being driven rotationally in response to reclining of the backrest of the seat, and with part of the gear assembly driving the indicator element.

Preferably the sun gear is driven in response to reclining of the backrest, a planetary gear holder drives the indicator element and an outer ring gear, engaging the planetary gears, is driven in response to longitudinal adjustment of the seat.

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Conveniently the outer part of the outer ring gear engages a fixed rack.

Advantageously the output of the measuring unit is connected to a flexible lead extending to a fixed processor.

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Preferably an output from the measuring unit which is indicative of the position of the backrest is transmitted to a control unit which forms part of a safety arrangement installed in the vehicle to protect an occupant of the seat in the event that an accident occurs, the safety arrangement incorporating an

15 air-bag and the deployment of the air-bag being controlled by the control unit in dependence upon the position of the backrest of the seat.

Conveniently an output from the measuring unit which is indicative of the position of the backrest is connected to a mechanism for automatically

20 adjusting the position of the seat, so that the said mechanism can move the seat to a predetermined position which is measured by the said measuring unit.

Preferably the mount includes at least one rail, the support being mounted on

25 said rail for longitudinal movement.

Advantageously, the vehicle seat is mounted in a motor vehicle.

In order that the invention may be more readily understood, and so that

30 further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic view of a vehicle seat in accordance with a first embodiment of the present invention,

FIGURE 2 is a view of the vehicle seat of Figure 1, with the vehicle seat
5 having been lowered,

FIGURE 3 is a view of the vehicle seat of Figure 1, with the backrest of the seat having been tilted rearwardly,

10 FIGURE 4 is a view of the vehicle seat of Figure 1, with the squab of the seat having been tilted rearwardly,

FIGURE 5 is a view of the vehicle seat of Figure 1, with the squab of the seat having been tilted forwardly,
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FIGURE 6 is a diagrammatic view of part of the vehicle seat of Figure 1, showing a measurement unit in further detail, with the backrest in an upright position,

20 FIGURE 7 is a view corresponding to Figure 6 with the backrest inclined fully rearwardly,

FIGURE 8 is a diagrammatic view of a vehicle seat in accordance with an alternative embodiment of the invention,
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FIGURE 9 is a view of the vehicle seat of Figure 8, with the backrest of the seat having been tilted rearwardly,

FIGURE 10 is a view of the vehicle seat of Figure 8, with the vehicle seat
30 having been moved forwardly,

FIGURE 11 is a view of the vehicle seat of Figure 8, with the vehicle seat having been moved rearwardly, and

FIGURE 12 is a diagrammatic view of a vehicle seat in accordance with
5 another embodiment of the invention.

Referring initially to Figure 1, a vehicle seat 1 has a backrest 2 which is pivotally mounted to a squab 3 in such a way that the backrest 2 can pivot about a pivot axis 4 to allow the backrest 2 to be tilted forwardly or rearwardly.

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In this embodiment the tilt angle and the height of the squab 3 are independently adjustable.

A pair of downwardly depending stops 5,6 are mounted to the underside of the squab 3, are at the front of the squab 3 and are at the rear of the squab 3. A rack 7 is mounted on a central region of the underside of the squab 3, to depend downwardly from the underside of the squab 3. The rack 7 forms part of a position monitoring arrangement which monitors the position of the squab 3. The rack 7 is of generally rectangular cross-section, with a rectangular aperture 8 which extends substantially vertically downwardly, formed within it. A row of teeth 9 form the rear edge of the rectangular aperture 8.

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The purpose of the downwardly depending stops 5,6 and the rack 7 will become clear from the description below.

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Positioned beneath the squab 3 is a support carriage 10, which forms the lower part of a support arrangement for the squab of the seat 1. The support carriage 10 incorporates upwardly extending stops 11,12 which extend upwardly from the support carriage 10, are at the front and rear, are at the rear of the support carriage 10. The upwardly extending stops 11,12 are positioned so as to be respectively directly below the downwardly depending

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stops 5,6 on the squab 3. The support arrangement allows the squab 3 to be raised or tilted, and the distance between the respective upwardly extending stops 11,12 and downwardly depending stops 5,6 to be adjusted.

- 5 The support carriage 10 incorporates a retractable locking pin 13 which depends downwardly from the underside of the support carriage 10. The locking pin 13 is biased in a vertically downward direction, away from the underside of the support carriage 10. The locking pin 13 is connected to a retraction mechanism (not shown for the purposes of simplicity) which
10 enables the locking pin 13 to be retracted upwardly, into the support carriage 10.

The support carriage 10 is slideably attached to a mount, which in this preferred embodiment is in the form of at least one rail 14. The rail 14
15 incorporates fixing elements which allow the rail 14 to be fixed to the floor of a motor vehicle. The rail 14 incorporates twenty spaced-apart locking grooves 15 at discrete positions along its longitudinal length. The locking grooves 15 are each substantially V-shaped so as to receive the end of the locking pin 13. When the locking pin 13 is not retracted, the end of the
20 locking pin 13 extends into one of the locking grooves 15, and locks the support carriage 10 to prevent the support carriage 10 from sliding along the rail 14.

An occupant of the seat may use the retraction mechanism to retract the
25 locking pin 13 to its retracted position, away from the locking grooves 15 (as shown in Figure 1) in order to allow the support carriage 10 and the seat 1 to be slid along the longitudinal length of the rail 14 to a desired position. The occupant may then release the locking pin 13 so that the end of the locking pin 13 extends into one of the locking grooves 15 to lock the seat 1 in the
30 desired position. Thus the seat 1 may be locked in a selected one of twenty evenly spaced-apart possible seat positions.

Attached to each side edge of the support carriage 10 is a pivot bracket (not shown for the sake of simplicity) which holds a pivot pin 16. The pivot axis thus defined extends horizontally, transversely to the axis of the rail 14 on which the seat is mounted. A pivot element 17 is rotatably mounted to the
5 pivot pin 16, to pivot about the horizontal pivot axis.

The pivot element 17 comprises an upper rack section 18 and a lower arm 19. The upper rack section 18 is located above the pivot pin 16 and the arm 19 depends downwardly below the pivot pin 16. The upper rack
10 section 18 is of similar size and shape to the rack 7 which is mounted to the squab 3, having a rectangular aperture, which in an initial position is substantially vertically orientated, with a row of teeth forming the forward edge of the aperture. The upper rack section 18 extends upwardly from above the
15 pivot pin 16, so as to be overlapping with the downwardly depending rack 7 mounted on the squab 3. The purpose of the pivot element and the lower arm 19 will become clear from the following description.

A cogwheel 20 engages the rack 7 and also engages the upper rack section 18 of the pivot element 17. The cogwheel 20 is connected to a
20 locking arrangement (not shown for the sake of simplicity) which holds the cogwheel 20 in a fixed position, unless an occupant of the seat deactivates the locking mechanism to allow the cogwheel 20 to rotate.

A resilient biasing arrangement, such as one or more springs (not shown) is
25 provided to bias the seat squab 3 upwardly, biasing the whole squab 3 upwardly, whilst also biasing both the front, and the rear, of the squab 3 upwardly.

If the height of the squab 3 is adjusted, without the squab 3 being tilted, the
30 cogwheel 20 will be moved vertically upwardly or downwardly (depending upon whether the squab 3 is moved up or down) and the angle of inclination of the pivot element 17 will remain unchanged, as shown in Figure 2.

However, if the squab 3 is tilted, the cogwheel 20 will be moved forwardly or backwardly, causing the pivot element 17 to tilt and move the lower arm 19. For instance, if the squab 3 is tilted rearwardly the cogwheel 20 will be moved forwardly, causing the pivot element 17 to tilt in a clockwise sense to an inclined position, thus moving the tip of the lower arm 19 rearwardly.

A rotatable element in the form of a pulley wheel 21 with a peripheral groove is fixed to one side of the lower part of the back-rest 2 of the seat 1 in such a way that a central axis around which the wheel 21 rotates is aligned with the pivot axis 4. A recliner mechanism (not shown for the sake of simplicity) is also attached to the lower part of the backrest 2. The recliner mechanism enables an occupant of the seat 1 to change the angle of the backrest 2 relative to the squab 3 by pivoting the backrest 2 about the pivot axis 4. When the backrest 2 is pivoted about the pivot axis 4, the pulley wheel 21 is rotated.

Attached to the pulley wheel 21 is one end of the inner wire 22 of a Bowden cable 23. The Bowden cable 23 has an outer sheath 24 and one end of the outer sheath 24 is attached to a fixing bracket 25 that is fixed to the rear part of the squab 3.

The other end of the outer sheath 24 of the Bowden cable 23 is attached to the lower end of the arm 19 on the pivot element 17. The inner wire 22 extends out from the outer sheath 24, beyond the arm 19, to an indicator element 26 so that movement of the wire cable 22 moves the indicator element 26. The inner wire 22 of the Bowden cable 23 thus forms a flexible drive element which is connected between the pulley wheel 21 and the indicator element 26. When the pulley wheel 21 is rotated the inner wire 22 is wound onto or off from the pulley wheel 21. The inner wire 22 is moved relative to the outer sheath 24 and this causes the indicator element 26 to move.

The indicator element 26 is slidably mounted on a measurement unit 27, and the indicator element 26 is constrained to move along the length of the measurement unit 27. The measurement unit 27 is fixed relative to the mount which in this preferred embodiment is the rail 14. The measurement unit 27
5 is connected to provide a signal to a processor 28, which is indicative of the position M of the indicator element 26, along the measurement unit 27. The position M of the indicator element 26 is dependent not only upon the adjusted position of the seat 1 along the rail 14, but also upon the angle of inclination of the backrest 2 relative to the squab 3. For instance, if the
10 backrest 2 is inclined rearwardly the inner wire 22 of the Bowden cable 23 is pulled through the outer sheath 24 and the indicator element 26 is moved to the left as shown in Figure 1, thus moving towards the rear part of the said section of the measurement unit 27.

15 The measurement unit 27 is divided along its length into twenty sections of equal length. Each of the sections of the measurement unit 27 corresponds to one of the locking grooves 15 on the rail 14. The indicator element is moved along the measurement unit 27 when the seat 1 is slid along the rail 14. As the seat 1 moves the distance between two adjacent locking
20 grooves 15 the indicator element 26 moves the length of one of the sections of the measurement unit 27. The processor 28 can determine, from the position M of the indicator element 26 along the measurement unit 27, which section of the measure unit 27 is located adjacent the indicator element 26, and can thus determine the selected position of the seat 1 along the rail 14.

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Thus the processor 28 can provide an output indicative of the adjusted position of the seat which is determined by identifying the section of the measurement unit 27 where the indicator element 26 is positioned. The processor 28 can also provide an output indicative of the inclination of the
30 backrest 2, by determining the relative position of the indicator element 26 within the relevant section of the measurement unit 27. In this preferred embodiment the processor 28 processes the signals indicative of the position

of the seat 1 and calculates a distance S, which is the distance between the upper part of the backrest 2 and an air-bag unit 29.

5 The processor 28 is connected to provide a signal to a control unit 30 in a safety arrangement which is installed in the vehicle. The control unit 30 is connected to the air-bag unit 29 which is installed in part of the dashboard 31 of the vehicle which is in front of an occupant of the seat 1. The control unit 30 may thus control the deployment of the air-bag unit 29 in dependence upon the signal provided by the processor 28 which is indicative of the
10 distance S between the upper part of the backrest 2 and the air-bag unit 29.

The distance S between the air-bag unit 29 and the upper part of the backrest 2 can be split into two lengths. The first length is the length A between the air-bag 29 and the rear of the squab 3 and the second length is
15 the distance between the upper part of the backrest 2 and the rear of the squab 3. The distance S can thus be written as:

$$S = A + B$$

20 An occupant of the seat 1 can adjust the angle of the backrest 2 relative to the squab 3 by controlling the recliner mechanism to pivot the backrest 2 about the pivot axis 4. If the occupant reclines the backrest 2 by pivoting the backrest 2 in an anticlockwise direction about the pivot axis 4 the pulley wheel 21 is rotated in an anticlockwise direction. As the pulley wheel 21 is
25 rotated in the anticlockwise direction the inner wire 22 of the Bowden cable 23 is wound on to the wheel 21 and the inner wire 22 is pulled out from within the outer sheath 24 and adjusts the position M of the indicator element 26 along the measurement unit 27, within the section of the measurement unit 27 which is appropriate to the seat squab position, as shown in Figure 3.

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Thus, the processor 28 provides an output indicative of the position of the squab 3 of the seat 1 and the inclination of the backrest 2, but more

particularly the position of the upper part of the backrest 2 which can indicate the position of the front part of the chest of the seat occupant.

5 In this preferred embodiment, the squab 3 is tiltable relative to the support carriage 10. The angle of the squab 3 is normally locked in position, but the angle of the squab 3 may be adjusted by the occupant when the occupant controls a tilting mechanism (not shown). The squab 3 may be tilted forwardly or rearwardly, and pivot about the effective axis through the centre of the squab 3. The squab 3 may be tilted rearwardly until the rear downwardly
10 depending stop 5 contacts the rear upwardly extending stop 11, as shown in Figure 4. As the squab 3 is tilted rearwardly the backrest 2 of the seat 1 also tilts rearwardly, and the backrest 2 is moved in a direction away from the air-bag unit 30.

15 As the squab 3 is tilted rearwardly, the rack 7 on the squab 3 moves the cogwheel 20 forwardly. The cogwheel 20 exerts a force on the upper rack section 18 of the pivot element 17 which causes the pivot element 17 to pivot about the pivot pin 16. The movement of the pivot element 17 about the pivot pin 16 causes the lower end of the arm 19 to be moved rearwardly. As the
20 lower end of the arm 19 is moved rearwardly the arm 19 moves the lower end of the Bowden cable 23 rearwardly, and hence moves the indicator element 26 rearwardly along the measurement unit 27. The distance by which the upper part of the backrest 2 has moved away from the air-bag unit 29 is represented by the distance that the indicator element 26 is moved
25 along the measurement unit 27. The processor 28 senses the position M of the indicator element 26 and provides a signal to the control unit 30 so that the control unit 30 may alter the deployment characteristics of the air-bag unit 29 to match a condition in which the occupant is far from the air-bag unit 29.

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The squab 3 may also be tilted forwardly relative to the support carriage 10, until the front downwardly depending stop 6 contacts the front upwardly

extending stop 12, as shown in Figure 5. When the squab 3 undergoes a forward tilting movement the squab 3 pivots forwardly about the pivot pin 16 and the seat back 2 is moved forwardly, closer to the air-bag unit 30. As the squab 3 is tilted forwardly the rack 7 moves with respect to the pivot
5 element 17, and the cogwheel 20 causes the pivot element 17 to rotate in an anticlockwise direction and move the lower end of the arm 19 forwardly. The forward movement of the lower end of the arm 19 moves the lower end of the Bowden cable 23 and the indicator element 26 forwardly, along the measurement unit 27. The processor 28 senses the distance that the
10 indicator element 26 moves along the measurement unit 27 and provides a signal to the control unit 30, so that the control unit 30 may adjust the deployment characteristics of the air-bag 29 to match a condition in which the occupant is close to the airbag unit 29.

15 In this preferred embodiment an occupant of the seat 1 can operate the retraction mechanism to retract the locking pin 13 to allow the seat 1 to be slid along the rail 14. As the occupant slides the seat 1 along the rail 14 the arm 19 also moves together with the seat 1, and the arm 19 thus moves the indicator element 26 along the measure unit 27. Once the seat 1 is in the
20 desired position the occupant releases the retraction mechanism to allow the locking pin 13 to extend into the nearest locking groove 15 on the rail 14, to lock the seat 1 relative to the rail 14.

In this preferred embodiment each of the locking grooves 15 corresponds to
25 one of the sections of the measurement unit 27. Therefore, the measurement unit 27 can measure which section the indicator element 26 is adjacent and provide a signal to the processor 28 which is indicative of which locking groove 15 the locking pin 13 is locked into, thus indicating the position of the squab 3 of the seat 1.

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The measurement unit 27 of this preferred embodiment can also measure the position M of the indicator element 26 within an individual section of the

measurement unit 27. The position M of the indicator element 26 within a section of the measurement unit 27 corresponds to the angle of the backrest 2 relative to the squab 3 and/or the angle of the squab 3 relative to the support carriage 10. The measurement unit 27 may therefore produce an
5 output to the processor 28 which is indicative of the position M of the indicator element 26 within a section of the measurement unit 27 which corresponds to the angle of the backrest 2 and/or the squab 3. The position M of the indicator elements 26 along the measurement unit 27 corresponds to the distance S between the upper part of the backrest 2 and the air-bag unit 29.

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The distance A between the rear of the squab 3 and the air-bag unit 29 is set by the position at which the seat 1 is locked along the rail 14. Each of the discrete positions along the rail 14 corresponds to a section of the measurement unit 27, and the position of the groove 15 at which the seat 1 is
15 locked in relation to the other grooves 15 on the rail 14 corresponds directly to the position of a section along the measurement unit 27.

Referring now to Figure 6, a seat 1 is locked in the sixth groove along the rail 14 and the backrest 2 of the seat 1 is in an upright position. When the
20 seat 1 is in this configuration the indicator element 26 is positioned over the front edge of the sixth section of the measurement unit 27. If the seat 1 were to be slid, with the backrest 2 still in the upright position, along the rail 14 to another locking groove 15, the indicator element 26 would be moved to lie over the front edge of another of the sections of the measurement unit 27.
25 However, if the backrest 2 of the seat 1 is tilted rearwardly the indicator element 26 is moved along the measurement unit 27, away from the front edge of the section in which it has been placed according to the chosen locking groove 15.

30 If the backrest 2 is tilted rearwardly the upper part of the backrest 2 moves away from the rear part of the squab 3 by distance B and the indicator element 26 moves along the measurement unit 27 by a distance B_M . The

distance B is much greater than the distance B_M , by a factor of ten. Thus, the Bowden cable arrangement effectively scales the distance B by a factor of ten, so that the distance B_M moved by the indicator element 26 is represented by the ratio $B_M = B/10$.

5

When the backrest 2 is in its upright position $B = 0$, and the indicator element 26 is positioned over an edge of one of the sections of the measurement unit 27 and B_M also equals 0. When the backrest 2 is inclined in its most rearwardly inclined position the distance B is equal to 10, and the distance B_M of the indicator element 26 is 10/10 which equals 1. Thus, a reader skilled in the art will appreciate that rearward inclination of the backrest 2 will result in the indicator element 26 moving from the front edge of a section of the measurement unit 27, along the length of that section, until the backrest 2 is fully reclined and the indicator element 26 is adjacent the front edge of the next section of the measurement unit 27, as shown in Figure 7.

Therefore, it can be seen that the position M of the indicator element 26 along the measurement unit 27 can be represented in the form of a number having the distance A as an integer part and the distance B as a decimal part (i.e. A.B). The position M is thus determined by the equation:

$$M = A + B_M = A + (B / 10)$$

The processor 28 processes the signal from the measurement unit 27 which corresponds to the position M and can calculate the distance S from the values A and B and provide a signal to the control unit 30 so that the control unit 30 may control the deployment of the air-bag unit 29 according to the distance S between the upper part of the backrest 2 and the air-bag 29.

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The arrangement described above is in the form of a compounding mechanism which provides a compounded movement to the indicator

element 26 in response to one or more predetermined movements of the seat 1 including a longitudinal adjustment of the whole seat 1, a pivotal adjustment of the backrest 2 relative to the squab 3, and a pivotal adjustment of the entire seat 1. Each of these movements contributes to the final positioning of the backrest 2 of the seat 1, and consequently contributes to the final positioning of the sternum or chest bone of an occupant, sitting on the seat 1 with his or her back pressed against the backrest 2, as measured relative to a fixed point in front of the seat 1, such as, for example, an air-bag housing containing an air-bag. In operation of the compounding mechanism each of the movements contributes to the final position of the indicator element 26 relative to the measurement unit 27.

The compounding mechanism incorporates the Bowden cable 23, the inner wire 22 of which moves relative to the outer sheath 24 in dependence upon the angular inclination of the backrest 2 of the seat 1 relative to the squab 3. The indicator element 26, carried by the end of the inner wire 22 of the Bowden cable 23 thus moves in response to the inclination of the backrest 2. However, because the outer sheath 24 of the Bowden cable 23 is mounted to the seat 1, if the entire seat 1 is moved, then the mounted end of the Bowden cable 23 moves, thus moving the indicator element 26 relative to the fixed measurement unit 27. Because the end of the outer sheath 24 of the Bowden cable 23 is mounted on an arm 19, with that arm moving in response to specific movements of the seat 1, such as a tilting of the squab 3 of the seat 1, again the indicator element 26 is moved, relative to the fixed measurement unit 27, as a consequence of the tilting of the squab 3 of the seat 1.

In an alternative embodiment the support carriage 10 and the support arrangement for the seat 1 may be modified, as shown in Figure 8. However, many of the parts of this alternative embodiment are identical to parts of the seat 1 of the preferred embodiment as described above. Therefore, the same

reference numerals will be used in the description below for the corresponding parts in this alternative embodiment.

In this alternative embodiment the arrangement is such that the tilting of the squab 3 and the adjustment of the height of the squab 3 happen
5 simultaneously. This allows the seat 1 to be adjusted according to the size or shape of an occupant. For instance, a short person can lower the front part of the squab 3 and position the front part of the squab 3 forwardly so that that person can reach the pedals of the vehicle. A taller person may locate the
10 squab 3 in a rear position, with the squab 3 horizontal.

In this alternative embodiment the upwardly extending stops 11, 12 incorporate respective support apertures 32 and 33. The support aperture 33 in the front upwardly extending stop 12 pivotally receives a pin which is
15 mounted to one end of a front link element 34. The front link element 34 extends from the front upwardly extending stop 12 to a position where the other end of the front link 34 is over-lapping the side of the squab 3, where the front link element 34 is pivotally mounted to the squab 3.

20 An L-shaped link element 35 has a first section 36 and a second section 37 which are connected together at approximately 90° to one another. The end of the first section 36 is pivotally connected to the rear upwardly extending stop 11. The first section 36 extends upwardly and is angled towards the rear of the vehicle to join the second section 37. A pin is mounted to the L-shaped
25 link element 35 where the first section 36 is connected to the second section 37, and the pin is rotatably mounted in an aperture 38 which passes through the rear downwardly depending stop 5 on the squab 3.

The front link element 34 and the L-shaped link element 35 thus provide a link
30 arrangement between the squab 3 of the seat 1 and the support carriage 10 to guide movement of the squab 3 in a desired manner. The seat 1 of this alternative embodiment also incorporates a locking arrangement (not shown

for the sake of simplicity) which retains the links 34 and 35 in a fixed position so that the link elements 34 and 35 do not allow the squab 3 to move relative to the support carriage 10. However, under manual control from an occupant of the seat 1, the locking arrangement may be released to allow the links 34
5 and 35 to pivot and allow the squab 3 to tilt and move upwardly or downwardly but also forwardly or rearwardly relative to the mount which in this alternative embodiment is also in the form of a rail 14.

10 A three-way link element 39 is pivotally connected at its upper end to the side of the squab 3 at a position which is slightly forwardly from the mid point along the length of the squab 3. A long link element 40 is pivotally mounted at one end to the free end of the three-way link element 39. The long link element 40 extends rearwardly from the end of the three-way link element 39 and the other end of the long link element 40 is pivotally mounted to the free
15 end of the second section 37 of the L-shaped link element 35. A guide pin 41 is mounted to the side of the long link element 40 close to where the long link element 40 is joined to the three-way link element 39. The purpose of the guide pin 41 will become clear from the following description.

20 A second L-shaped link element 42 has a long section 43 and a short section 44 which are connected at approximately 90° to one another. The end of the long section 43 is pivotally mounted at a point which is half-way along the side of the three-way link element 39. The long section 43 incorporates a slot 45 which has rounded ends, with the slot 45 being
25 positioned close to where the long section 43 is joined to the three-way link element 39. The generally rectangular aperture 45 runs part-way along the length of the long section 43, but at a slight angle to the edge of the long section 43. The slot 45 is dimensioned to receive the guide pin 41 so that the guide pin 41 may be slid along the length of the slot 45.

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The short section 44 of the second L-shaped link element 42 depends downwardly from the lower end of the long section 43, and the short

section 44 forms an arm to which the lower end of the outer sheath 24 of the Bowden cable 23 is fixed. The inner wire 22 extends out from the lower end of the outer sheath 24 of the Bowden cable 23 and is attached to the indicator element 26, so that the inner wire 22 can move the indicator element along the measurement unit 27.

In a similar manner to that described above an occupant of the seat 1 of this alternative embodiment may use the recliner mechanism to pivot the backrest 2 about the pivot axis 4 to tilt the backrest 2 forwardly or rearwardly. If the backrest 2 is tilted rearwardly the pulley wheel is rotated in an anticlockwise direction which winds the inner wire 22 of the Bowden cable 23 partly around the wheel 21. As the inner wire 22 winds around the pulley wheel 21 the inner wire 22 pulls the indicator element 26 rearwardly along the measurement unit 27, as shown in Figure 9. The measurement unit 27 can thus provide a signal to the processor 28 which is indicative of the angle of the backrest 2, so that the processor 28 may provide an output to the control unit 30 which can control the deployment characteristics of the air-bag unit 29 accordingly.

The seat 1 of this alternative embodiment is also slideable along the rail 14, but does not have discrete positions in which it can be locked. However, adjustments to the height of the squab 3 will also result in a forward or backward movement of the squab 3. If the occupant wishes to move the seat 1 downwardly the occupant can release the squab 3 to allow the links 34 and 35 to pivot in an anticlockwise direction about their pivot on the support carriage 10, to a position shown in Figure 11. The configuration of the link elements 34 and 35 of this alternative embodiment are such that when the squab 3 is moved downwardly the squab 3 of the seat 1 is also moved rearwardly whilst simultaneously being tilted rearwardly. This downward and rearward movement of the squab 3 moves the backrest 2 rearwardly and downwardly, away from the air-bag unit 29.

When the occupant moves the seat 1 downwardly the second section 37 of the L-shaped link element 35 pivots in an anticlockwise direction, which results in the end of the second section 37 pulling the long link element 40 rearwardly. The rearward movement of the long link element 40 causes the lower end of the three-way link element 39 to also be pulled rearwardly and pivot about its upper pivot point. The rearward movement of the three-way link element 39 pushes the second L-shaped link element 42 rearwardly. The second L-shaped link element 42 moves rearwardly and is guided into a pivotal movement as the guide pin 41 contacts the walls of the slot 45. This rearward movement and pivoting of the second L-shaped link element 42 moves the short section 44 rearwardly, causing the Bowden cable 23 and the indicator element 26 to move rearwardly along the measurement unit 27. The measurement unit 27 measures the position of the indicator element 26 and provides an output to the processor 28, so that the processor 28 can provide a signal to the control unit 30 to deploy the air-bag 29 accordingly.

An occupant of the seat can also move the squab 3 and the backrest 2 upwardly, by unlocking the squab 3 and pivoting the link elements 34 and 35 in a clockwise sense, to a position shown in Figure 10. As the link elements 34 and 35 pivot in the clockwise sense, the squab 3 and the backrest 2 are moved upwardly whilst simultaneously being moved forwardly and tilted forwardly. This upward and forward movement of the squab 3 moves the backrest 2 forwardly and upwardly, closer to the air-bag unit 29.

When the occupant moves the seat 1 upwardly, the second section 37 of the L-shaped link element 35 pivots in a clockwise direction, which results in the end of the second section 37 pushing the long link element 40 forwardly. The long link element 40 pushes the three-way link element 39 forwardly, so that the three-way link element 39 pivots in an anticlockwise direction about its upper pivot point. The forward pivoting movement of the three-way link element 39 pulls the second L-shaped link element 42 forwardly, and the second L-shaped link element 42 is constrained into a pivotal movement as

the guide pin 41 contacts the walls of the generally rectangular aperture 45. This forward movement and pivoting of the second L-shaped link element 42 moves the short section 44 forwardly, causing the Bowden cable 23 and the indicator element 26 to be moved forwardly along the measurement unit 27.

- 5 The measurement unit 27 measures the position of the indicator element 26 and provides an output to the processor 28 so that the processor 28 can provide a signal to the control unit 30 to deploy the air-bag 29 accordingly.

- 10 In this alternative embodiment, the forward or backward position of the seat 1 within the vehicle may also be adjusted by sliding the seat 1 along the rail 14.

- The embodiments described thusfar have each incorporated a measurement unit 27 for measuring the linear position of the indicator element 26. However, in a further embodiment, shown in Figure 12, the measurement unit
15 may be in the form of an angular measurement unit 46. This further embodiment incorporates many of the same features as the embodiments described above, and thus the same reference numerals will be used when describing this further embodiment.

- 20 The seat 1 of this further embodiment is slideably mounted to a mount which is in the form of at least one rail 47 by a slide arrangement (not shown for the purposes of simplicity) with the seat 1 being moveably longitudinally along the rail 47. A horizontal rack 48 is mounted to part of the rail 47, with the longitudinal length of the horizontal rack 48 being parallel to the longitudinal
25 length of the rail 47. The horizontal rack 48 presents a row of teeth 49 along its upper surface. The purpose of the horizontal rack 48 will become clear from the description below.

- 30 In this further embodiment, the support carriage 10 is fixed to the underside of the squab 3, with the squab 3 not being moveable relative to the support carriage 10. An axle 50 is fixed to one side of the support carriage 10, and provides a pivot for a lower pinion gear 51. The lower pinion gear 51 has

teeth which engage the teeth 49 of the horizontal rack 48 such that linear movement of the pinion gear 51 along the length of the rack 48 causes the pinion gear 51 to rotate.

- 5 A planetary gear arrangement 52 is mounted to the side of the squab 3, above the lower pinion gear 51. The planetary gear arrangement 52 has a central pinion gear 53 which is rotatably mounted to a central axle 54 that is fixed to the side of the squab 3. The central axle 54 is aligned vertically with the axle 50 which supports the pinion gear 51. The central pinion gear 53
10 essentially forms a "sun" gear in the planetary gear arrangement 52, that is to say the central part of the planetary gear arrangement 52 around which the other parts of the arrangement may rotate.

- Three planetary gears 55 are positioned equidistantly from one another
15 around the edge of the central pinion gear 54. Each of the three planetary gears 55 is supported by a respective planetary axle 56 on a ring shaped planetary gear holder 57. The three planetary gears each engage the central pinion gear 54. The planetary gear holder 57 thus allows the planetary gears 55 to rotate and orbit the central pinion gear 54, with the planetary gear
20 holder 57 being rotated as the planetary gears 55 orbit.

- A gear ring 58 is fitted around the outer edges of the planetary gears 55. The gear ring 58 has teeth around its inner edge and teeth around its outer edge. The teeth around the inner edge of the gear ring 58 engage the teeth on the
25 outer edge of each of the planetary gears 55, with the gear ring 58 providing additional support to hold the planetary gears 55 against the central pinion gear 54. The teeth around the outer edge of the gear ring 58 engage the teeth of the lower pinion gear 51, such that rotation of the lower pinion gear 51 rotates the gear ring 58.

30

One end of a first drive belt 59 is fitted around a pulley which protrudes from the central pinion gear 54, and the other end of the first drive belt 59 is fitted

around a backrest pulley 60 which is fixed to the lower part of the backrest 2. The backrest pulley 60 is fast with the backrest 2, and is positioned such that the centre of the backrest pulley 60 is aligned with the pivot axis about which the backrest 2 pivots when the backrest 2 is tilted relative to the squab 3. Thus, it will be appreciated that when the backrest 2 is tilted relative to the squab 3 the backrest pulley 60 is rotated, causing the first drive belt 59 to be driven to rotate the central pinion gear 54.

One end of a second drive belt 61 is fitted around the edge of the planetary gear holder 57, and the other end of the second drive belt 61 is fitted around an indicator pulley 62. The indicator pulley 62 is rotatably mounted to the rotational measurement unit 46, with the indicator pulley 62 being equivalent to the indicator element 26 of the embodiments described above. However, in this further embodiment the indicator pulley 62 is moveable in a rotational sense rather than a linear sense.

The rotational measurement unit 46 is, in this further embodiment, a rotary potentiometer, and the indicator pulley 62 is mounted to the rotatable shaft of the potentiometer. A reader skilled in the art will appreciate that rotation of the indicator pulley 62 will cause the shaft of the potentiometer to rotate and alter the potential difference across terminals on the potentiometer. The terminals of the potentiometer provide an output which is indicative of the rotational position of the indicator pulley 62 relative to the rotational measurement unit 46.

25

The output from the rotational measurement unit 46 is connected to an upper end of a flexible lead 63. The upper end of the flexible lead 63 is attached to the lower side of the support carriage 10, and a lower end of the flexible lead 63 is connected to the rail 47. The flexible lead 63 is of a greater length than the distance between the support carriage 10 and the rail 47, and thus the flexible lead 63 may flex as the seat 1 is moved longitudinally relative to

the rail 47, in such a way that the flexible lead 63 does not substantially impede the longitudinal movement of the seat 1.

5 The lower end of the flexible lead 63 is connected to the processor 28, and thus it will be appreciated that the flexible lead 63 provides an electrical connection between the rotational measurement unit 46 and the processor 28, so that an output from the rotational measurement unit 46 may be transmitted to the processor 28.

10 Once a seat in accordance with the present invention has been manufactured, the seat can be mounted within a motor vehicle. In the case of the two embodiments described above the seat is assembled together with the mount, which in these embodiments is in the form of the rail 14, and then the mount is fixed to the floor of a motor vehicle to mount the seat within the
15 vehicle. However, the manufacturing process may alternatively occur in a different manner, in which the mount is formed to be integral with the floor of a motor vehicle, and the other components of the seat are assembled separately and then subsequently mounted to the mount within the vehicle.

20 The embodiments described thus far have incorporated a mount in the form of the rail 14, but the mount may alternatively be a metal plate which can be fixed to or may be formed integral with the floor of a motor vehicle.

25 When used in this Specification and Claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

Claims

1. A vehicle seat (1) comprising a squab (3) and a backrest (2), the squab
5 (3) being mounted on a support (10), the backrest (2) being mounted to effect
a movement relative to the squab (3), a mount (14,47) to be fixedly secured to
the chassis of a vehicle, the support being longitudinally movably mounted on
the mount (14,47), characterised in that the seat (1) further comprises a
10 position measurement arrangement which incorporates an indicator element
(26,62) and a measuring unit (27,46), the measuring unit (27,46) being
configured to measure the position of the indicator element (26,62) relative to
the measuring unit (27,46), the indicator element (26,62) being moveable
relative to the measuring unit (27,46) in response to longitudinal movement of
15 the support (10) relative to the mount (14,47) and to longitudinal movement of
the upper part of the backrest (2) relative to the support (10), the measuring
unit (27,46) providing an output indicative of the longitudinal position of the
upper part of the backrest (2) relative to the mount (14,27).
2. A vehicle seat (1) according to Claim 1 wherein the measuring unit (27)
20 is configured to measure the linear position of the indicator element (26)
relative to the measuring unit (27).
3. A vehicle seat (1) according to Claim 2 wherein the measuring unit (27)
is fixed relative to the mount (14).
25
4. A vehicle seat (1) according to Claim 2 or 3 wherein the backrest (2) is
pivotaly mounted on the squab (3) and a rotatable element (21) is mounted to
the backrest (2) of the seat (1) with the rotatable element (21) being rotatable
when the backrest (2) moves in a pivotal movement relative to the squab (3),
30 a flexible drive element (22) being connected between the rotatable element
(21) and the indicator element (26) so that when the rotatable element (21) is
rotated the flexible drive element (22) is wound on to or off from the rotatable

element (21), which leads to a movement of the flexible drive element (22) that causes the flexible drive element (22) to move the indicator element (26).

5 5. A vehicle seat (1) according to Claim 4 wherein the said flexible drive element (22) is an inner wire of a Bowden cable (23), the outer sheath (24) of the Bowden cable (23) being mounted at both ends to the squab (3) of the seat (1), and the inner wire (22) being moveable relative to the outer sheath (24) upon rotation of the rotatable element (21), with movement of the inner wire (22) moving the said indicator element (26) relative to the support (10).

10

6. A vehicle seat (1) according to any one of Claims 3 to 5 wherein the said indicator element (26) is moveable along the longitudinal length of the measuring unit (27) when the indicator element (26) is moved in response to movement of the backrest (2) relative to the support (10), the measuring unit (27) measuring the position of the indicator element (26) along the measuring unit (27) and providing the said output in response to the measured position of the indicator element (26).

7. A vehicle seat (1) according to any one of Claims 2 to 6 wherein the seat (1) may be moved longitudinally relative to the said mount (14) and secured in a selected one of a plurality of predetermined positions.

8. A vehicle seat (1) according to Claim 7 wherein the measurement unit (27) is divided into a plurality of sections along its longitudinal length, with each section corresponding to a said predetermined position of the seat (1) along the longitudinal length of the mount (14), the indicator element (26) being moved to the section corresponding to a specific predetermined position upon movement of the seat (1) to that specific predetermined position.

30

9. A vehicle seat (1) according to any one of the preceding Claims wherein the squab (3), together with the backrest (2), is tiltable relative to the

mount (14,47), with the indicator element (26,62) being moveable relative to the said measuring unit (27,46) in response to tilting of the squab (3) relative to the mount (14,47).

5 10. A vehicle seat (1) according to Claim 9 wherein the squab (3) is pivotally mounted to the support (10), there being a pivot element (17) pivotable in response to tilting of the squab (3) relative to the support (10), the pivot element (17) having an arm (19) which is connected to the indicator element (26), the arm acting to move the indicator element (26) by a specific
10 predetermined amount as the squab (3) is tilted through a predetermined movement.

11. A vehicle seat (1) according to Claim 9 wherein the squab (3) is pivotally attached to the support (10) by a link arrangement, the link
15 arrangement having a first link element (34) pivotally connecting one end of the squab (3) to the support (10) and a second link element (35) pivotally connecting the other end of the squab (3) to the support (10), there being a third link element (42) which is pivotally connected to the link arrangement, with the third link element (42) being movable in response to pivotal
20 movement of the link arrangement as the squab (3) is tilted relative to the support (10), the third link element (42) having an arm (44) which is connected to the indicator element (26), the arm (44) acting to move the indicator element (26) by a specific predetermined amount upon movement of the third link element (42) as the squab (3) is tilted through a predetermined
25 movement.

12. A vehicle seat (1) according to Claim 11 wherein the said arm (44) is connected to the outer sheath (24) of the said Bowden cable (23), with the outer sheath (24) of the Bowden cable (23) being moveable in response to
30 movement of the arm (44), and movement of the outer sheath (24) of the Bowden cable (23) moving the indicator element (26) by said predetermined amount.

13. A vehicle seat (1) according to any one of the preceding Claims wherein the indicator element (26) is associated with a compounding mechanism to affect the movement of the indicator element (25) in response to a pivotal movement of the backrest (2) relative to the squab (3), the
5 compounding mechanism providing a compounded movement of the indicator element (26) in response to a plurality of predetermined movements of the seat (1).

14. A vehicle seat (1) according to Claim 13 wherein the compounding
10 mechanism affects the movements of the indicator element (26) in response to said pivotal movements of the backrest (2) and in response to at (1) and tilting of the squab (3) and backrest (2) of the seat (1).

15. A vehicle seat (1) according to any one of the preceding Claims wherein the squab (3) of the seat (1) is moveable away from or towards the
15 mount (14), so that the squab (3) may be raised or lowered within a vehicle in which it is mounted.

16. A vehicle seat (1) according to Claim 1 wherein the measuring unit (46)
20 is configured to measure the angular position of the indicator element (62) relative to the measuring unit (46).

17. A vehicle seat (1) according to Claim 16 wherein the said indicator
25 element (62) is rotatable relative to the said measuring unit (46), and the measuring unit (46) measures the rotational angle of the indicator element (62) relative to the measuring unit (46).

18. A vehicle seat (1) according to Claim 14 wherein the measuring unit
30 (46) is fixed relative to the support (10), with the indicator element (62) being rotatable relative to the support (10).

19. A vehicle seat (1) according to any one of Claims 16 to 18 wherein a planetary gear assembly (52) is provided, with part of the gear assembly (52) being driven rotationally in response to longitudinal adjustment of the seat (1), and part of the gear assembly being driven rotationally in response to reclining of the backrest (2) of the seat (1), and with part of the gear assembly (52) driving the indicator element (62).

20. A vehicle seat (1) according to Claim 19 wherein the sun gear (53) is driven in response to reclining of the backrest (2), a planetary gear holder (57) drives the indicator element (62) and an outer ring gear (58), engaging the planetary gears (55), is driven in response to longitudinal adjustment of the seat (1).

21. A vehicle seat (1) according to Claim 20 wherein the outer part of the outer ring gear (58) engages a fixed rack (48).

22. A vehicle seat (1) according to any one of Claims 16 to 21 wherein the output of the measuring unit (46) is connected to a flexible lead (63) extending to a fixed processor (28).

20

23. A vehicle seat (1) according to any one of the preceding Claims wherein an output from the measuring unit (27,46) which is indicative of the position of the backrest (27) is transmitted to a control unit (30) which forms part of a safety arrangement installed in the vehicle to protect an occupant of the seat (1) in the event that an accident occurs, the safety arrangement incorporating an air-bag (29) and the deployment of the air-bag (29) being controlled by the control unit (30) in dependence upon the position of the backrest (27) of the seat (1).

24. A vehicle seat (1) according to any one of the preceding Claims wherein an output from the measuring unit (27,46) which is indicative of the position of the backrest (2) is connected to a mechanism for automatically

adjusting the position of the seat (1), so that the said mechanism can move the seat (1) to a predetermined position which is measured by the said measuring unit (27,46).

- 5 25. A vehicle seat (1) according to any one of the preceding Claims wherein the mount (14) includes at least one rail, the support (10) being mounted on said rail for longitudinal movement.

- 10 26. A vehicle seat (1) comprising a squab (3) and a backrest (2), the squab (3) being mounted on a support 10, the backrest (2) being mounted to effect a movement relative to the squab (3), a mount (14,47) to be fixedly secured to the chassis of a vehicle, the support being longitudinally movably mounted on the mount (14,47), characterised in that the seat (1) further comprising a position measurement arrangement which incorporates an indicator element
15 (26,62) and a measuring unit (27,46), the measuring unit (27,46) being configured to measure the position of the indicator element (26,62) relative to the measuring unit (27,46), the indicator element (26,62) being moveable relative to the measuring unit (27,46) in response to longitudinal movement of the support (10) relative to the mount (14,47) and to longitudinal movement of
20 the upper part of the backrest (2) relative to the support (10), the measuring unit (27,46) providing an output indicative of the longitudinal position of the upper part of the backrest (2) relative to the mount, wherein the back rest (2) is pivotally mounted on the squab (3) and a rotatable element (21) is mounted to the backrest (2) of the seat (1) with the rotatable element (21) being
25 rotatable when the backrest (2) moves in a pivotal movement relative to the squab (3), a flexible drive element (22) being connected between the rotatable element (21) and the indicator element (26) so that when the rotatable element (21) is rotated the flexible drive element (22) is wound on to or off from the rotatable element (21), which leads to a movement of the
30 flexible drive element (22) that causes the flexible drive element (22) to move the indicator element (26).

27. A vehicle seat (1) comprising a squab (3) and a backrest (2), the squab (3) being mounted on a support 10, the backrest (2) being mounted to effect a movement relative to the squab (3), a mount (14,47) to be fixedly secured to the chassis of a vehicle, the support being longitudinally movably mounted on the mount (14,47), characterised in that the seat (1) further comprising a position measurement arrangement which incorporates an indicator element (26,62) and a measuring unit (27,46), the measuring unit (27,46) being configured to measure the position of the indicator element (26,62) relative to the measuring unit (27,46), the indicator element (26,62) being moveable relative to the measuring unit (27,46) in response to longitudinal movement of the support (10) relative to the mount (14,47) and to longitudinal movement of the upper part of the backrest (2) relative to the support (10), the measuring unit (27,46) providing an output indicative of the longitudinal position of the upper part of the backrest (2) relative to the mount, and the measuring unit (46) being configured to measure the angular position of the indicator element (62) relative to the measuring unit (46), a planetary gear assembly (52) being provided, with part of the gear assembly (52) is provided, with part of the gear assembly (52) being driven rotationally in response to longitudinal adjustment of the seat, and part of the gear assembly being driven rotationally in response to reclining of the backrest (2) of the seat (1), and with part of the gear assembly (52) driving the indicator element (62).

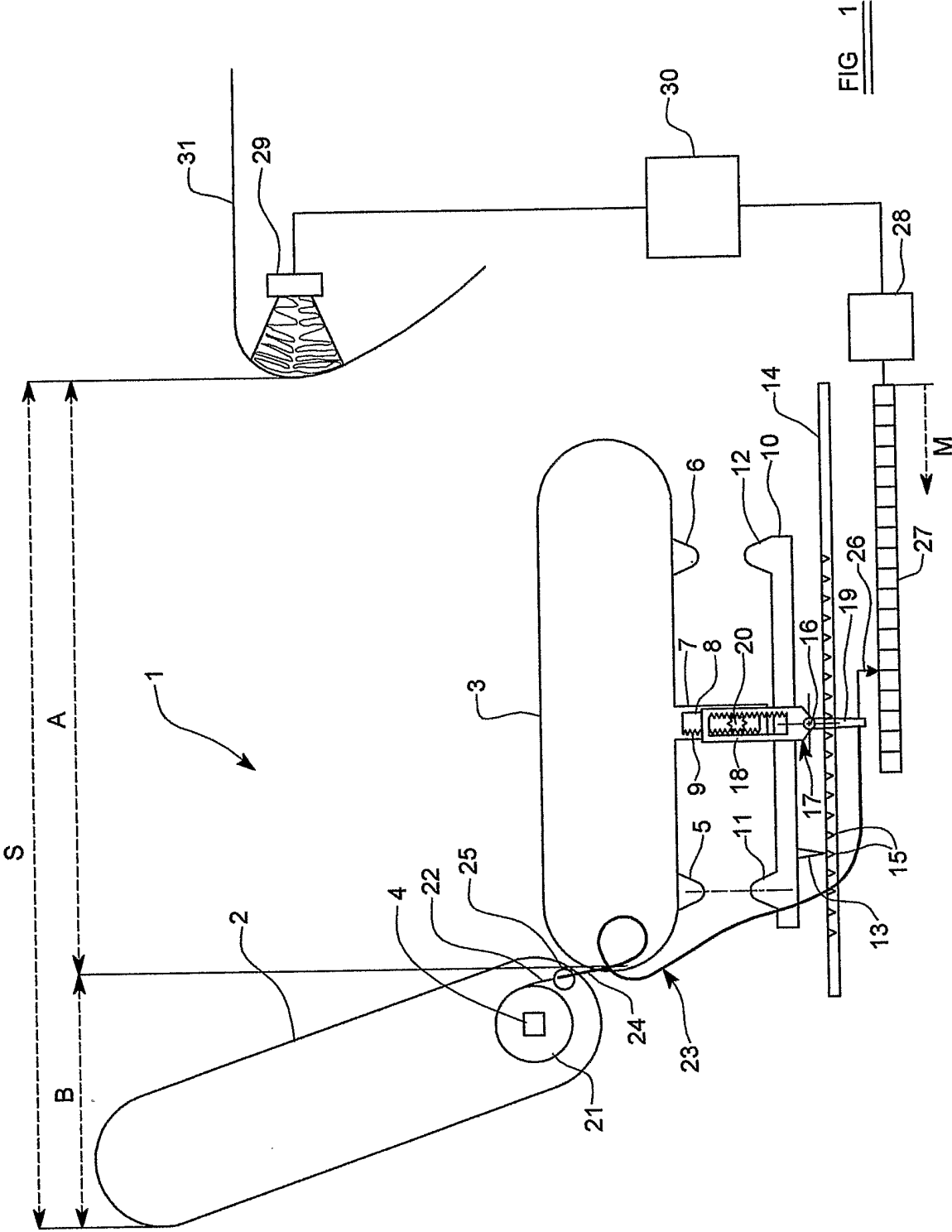
28. A vehicle seat (1) according to any one of the preceding Claims wherein the vehicle seat (1) is mounted in a motor vehicle.

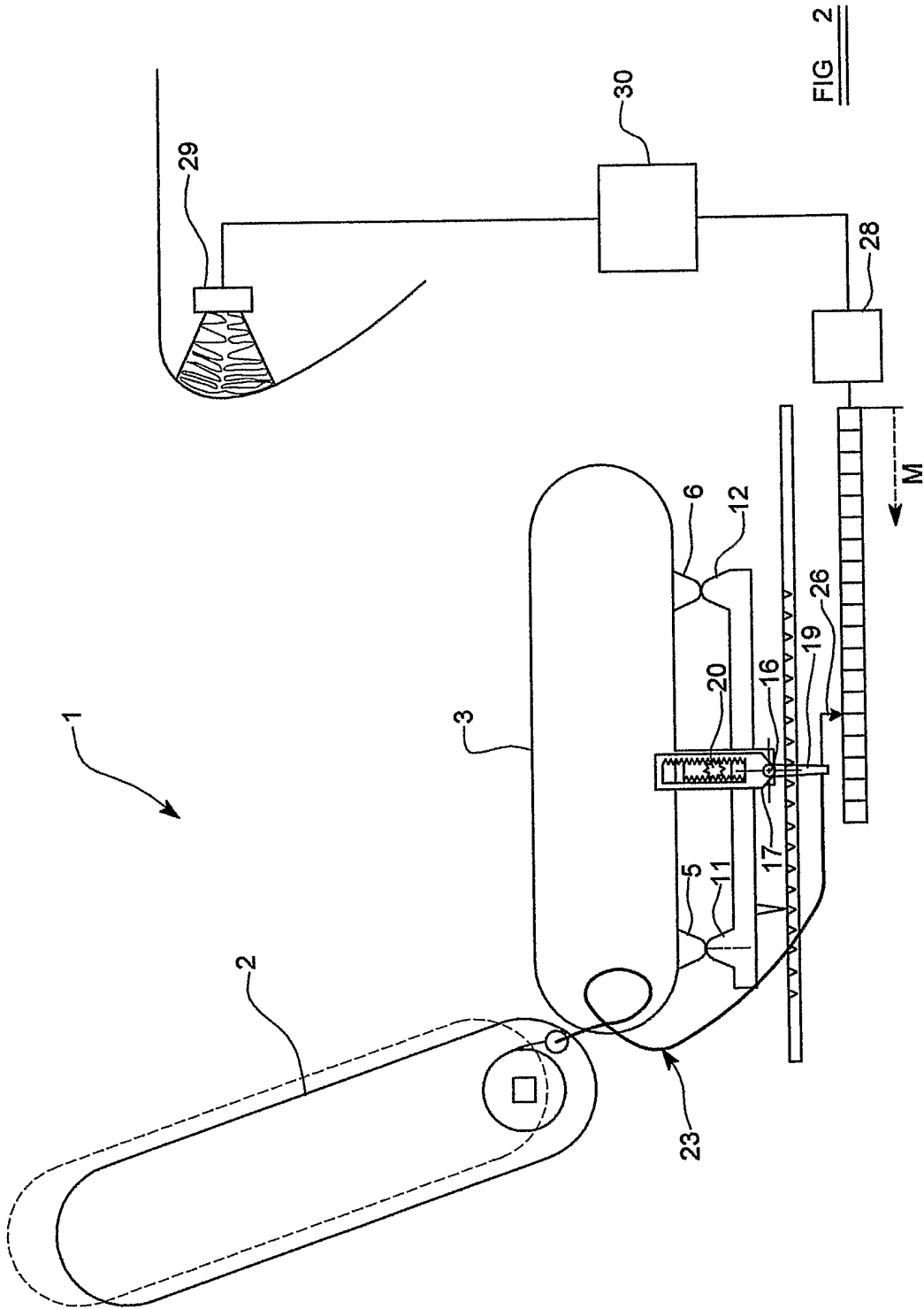
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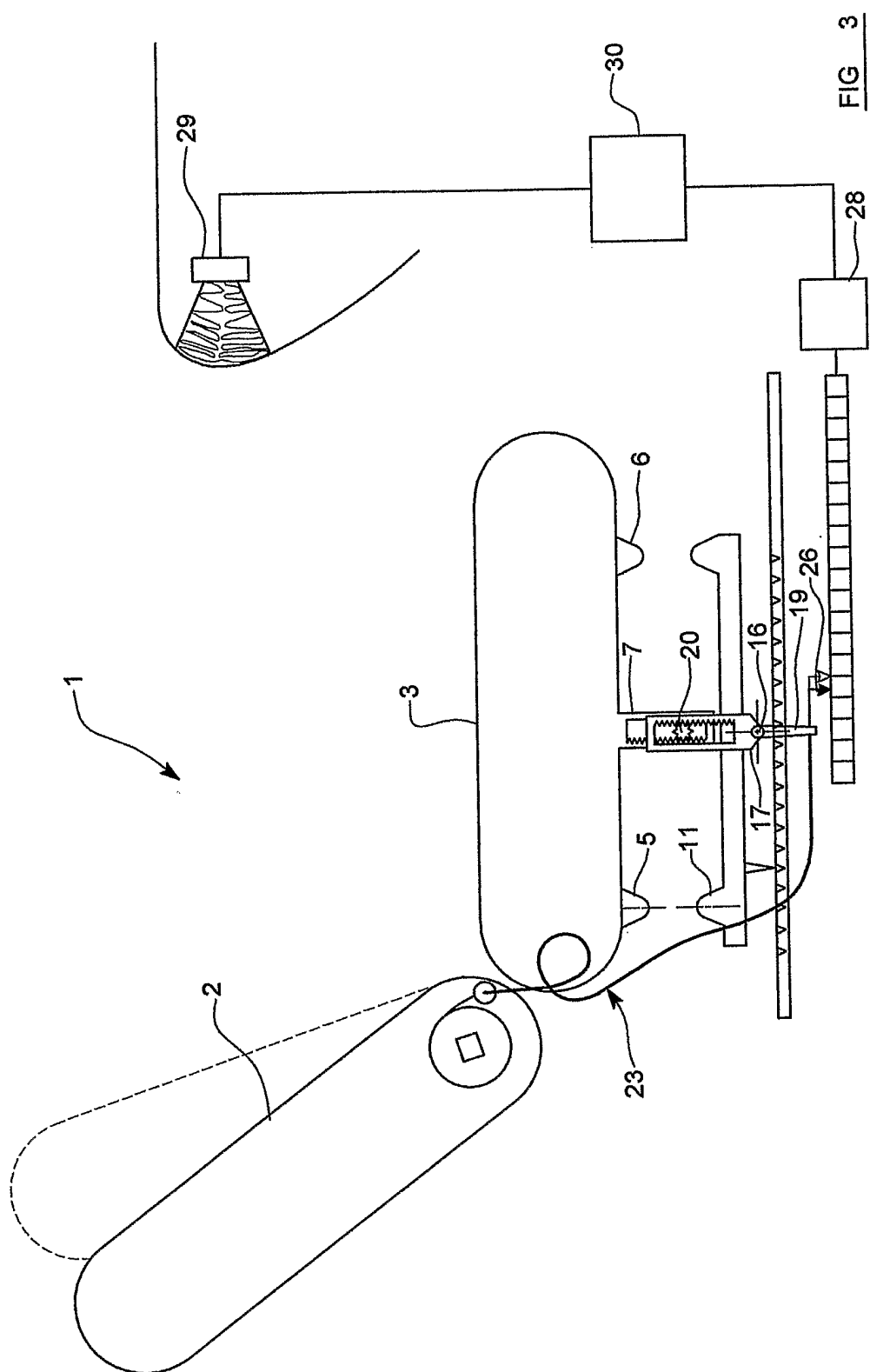
29. A vehicle seat substantially as herein described with reference to and as shown in Figures 1 to 7 of the accompanying drawings.

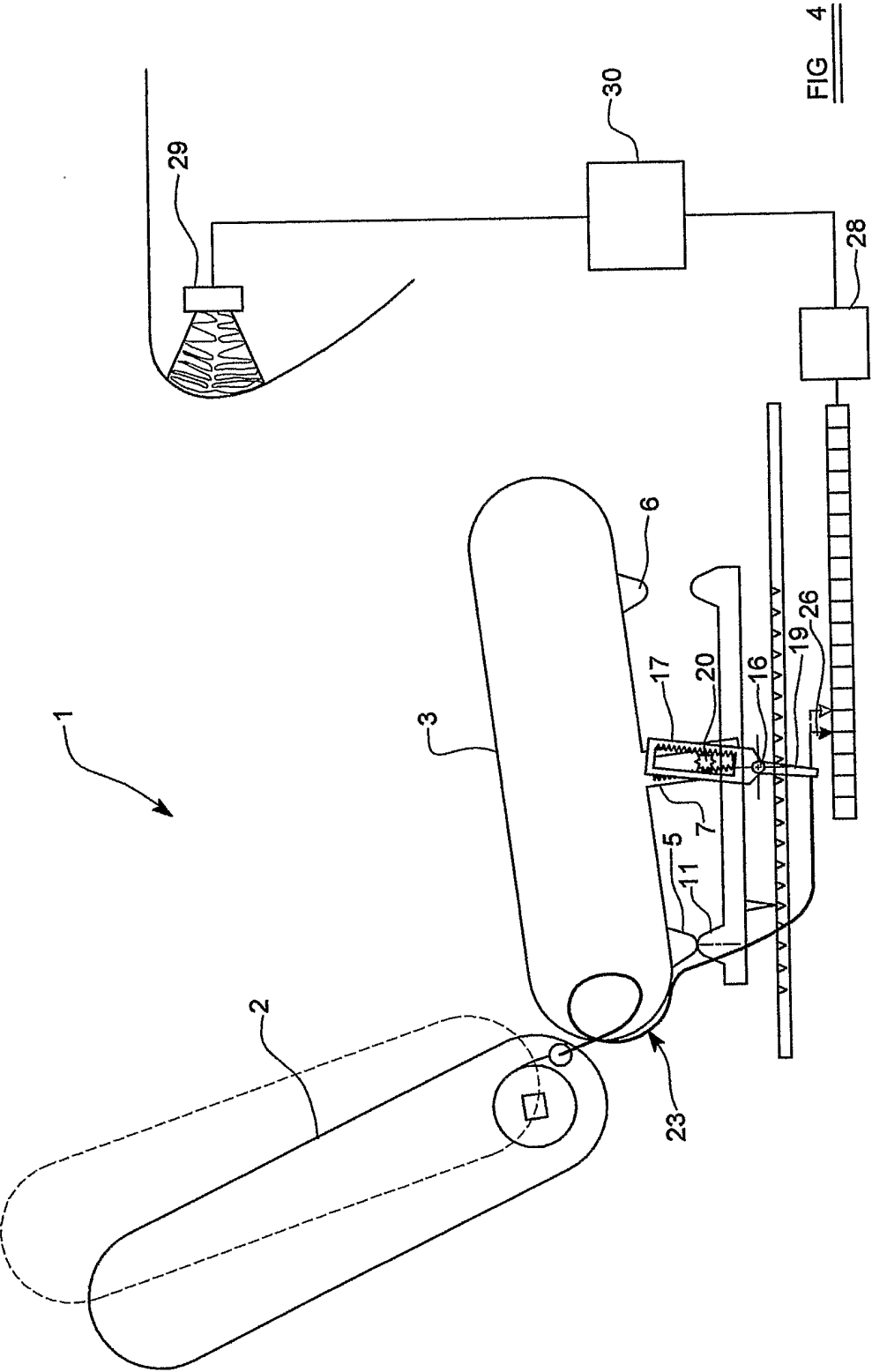
30. A vehicle seat substantially as herein described with reference to and as shown in Figures 8 to 11 of the accompanying drawings.

31. A vehicle seat substantially as herein described with reference to and as shown in Figure 12 of the accompanying drawings.









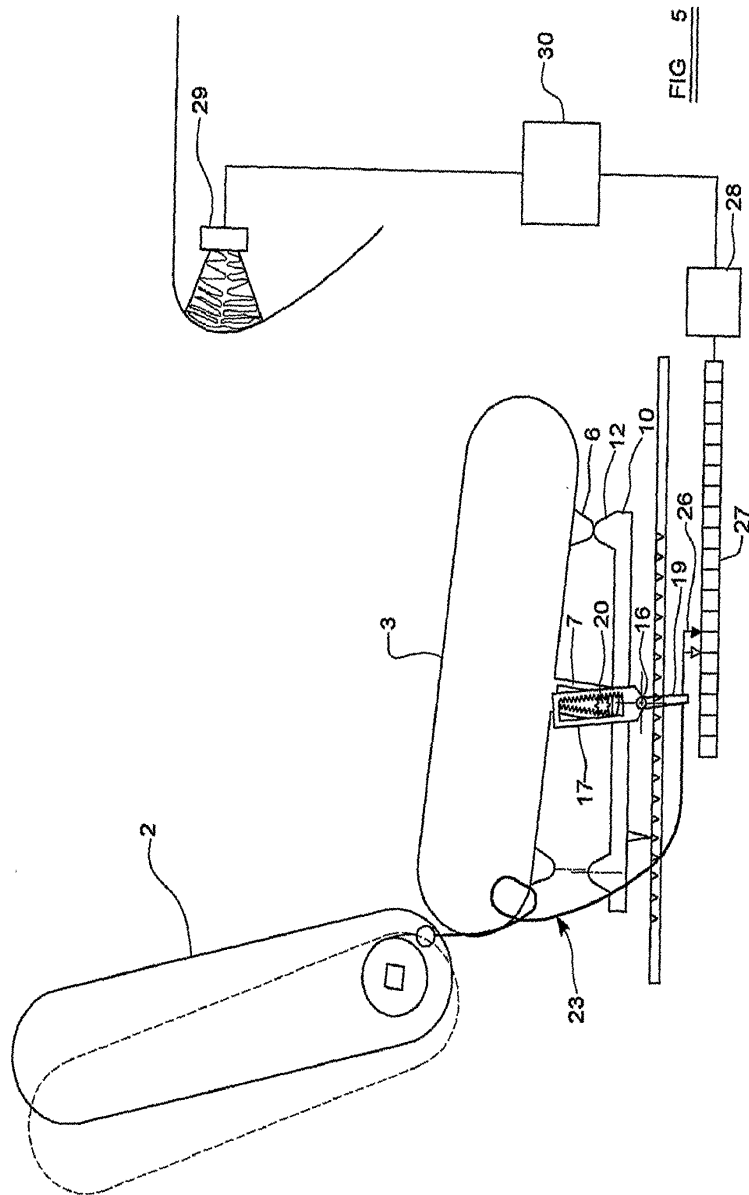


FIG 6

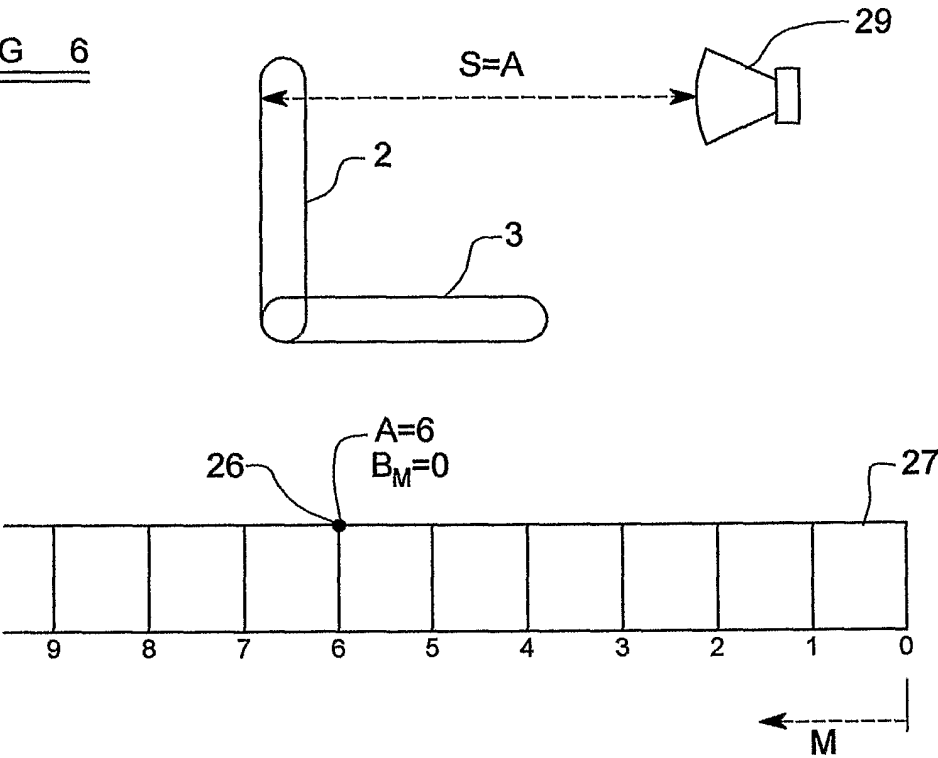
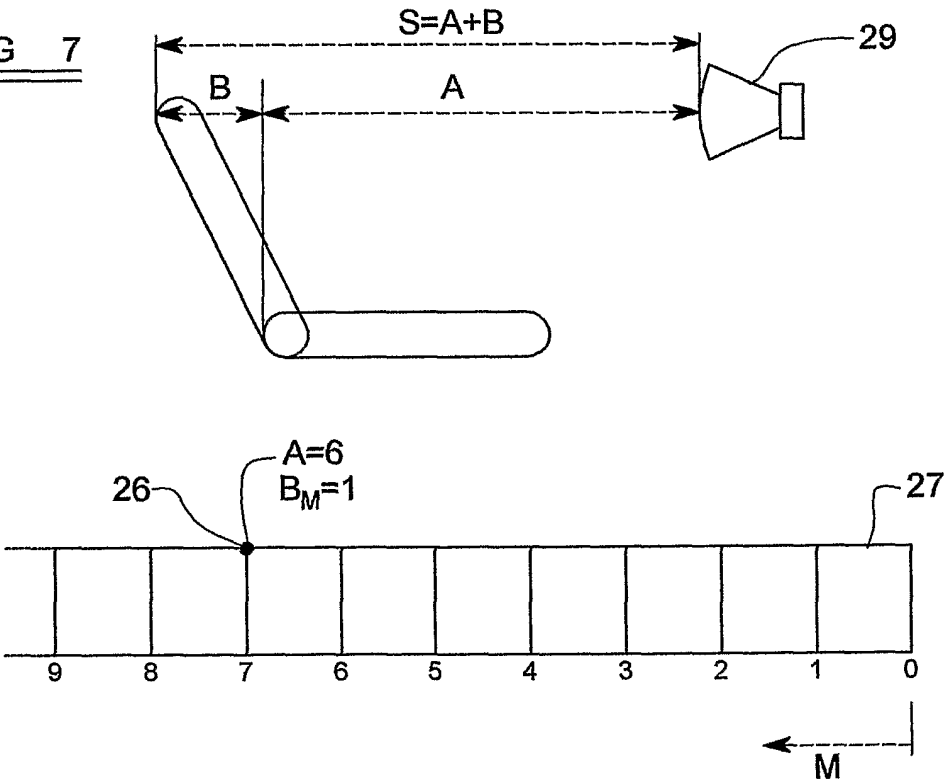
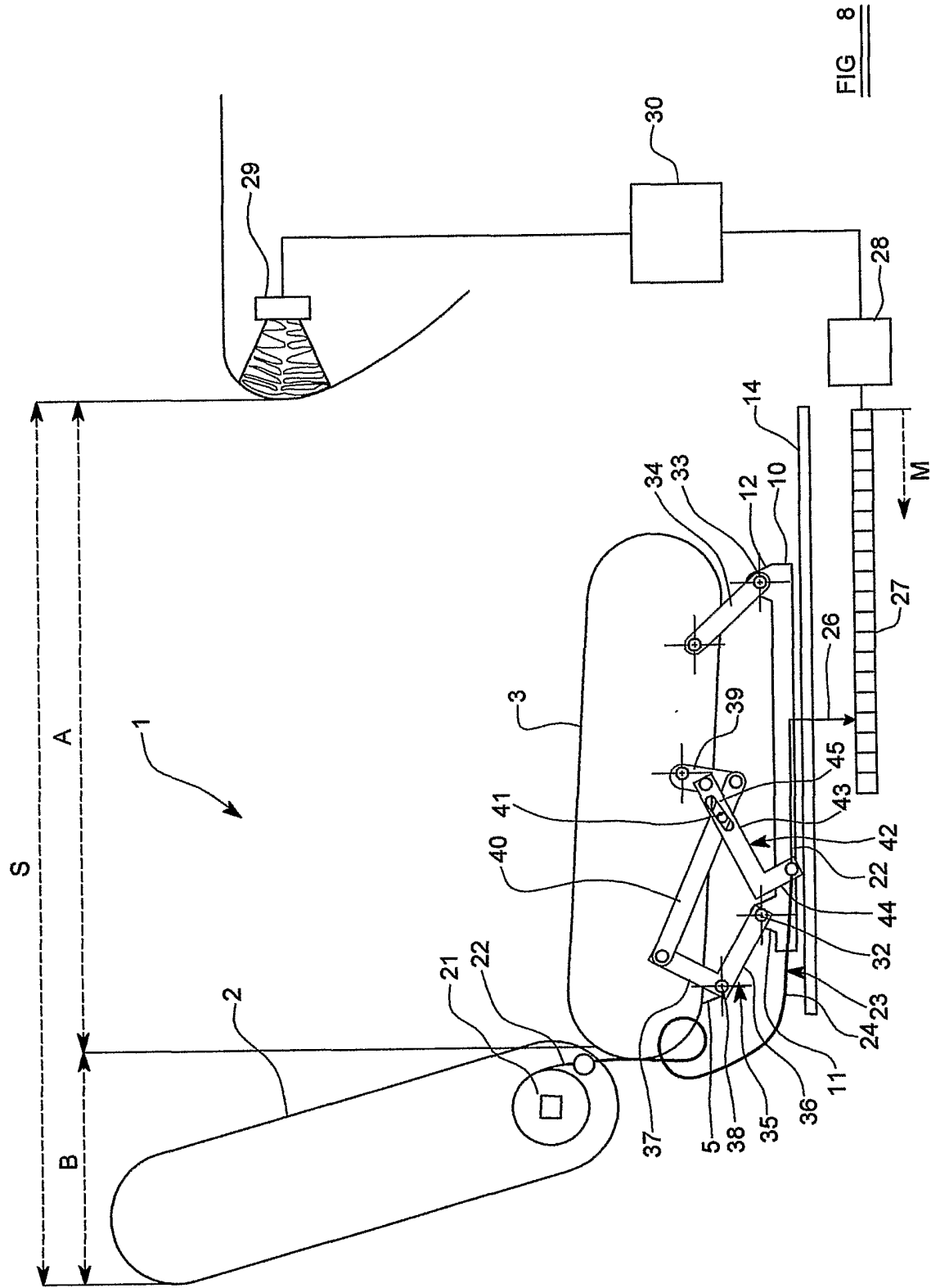
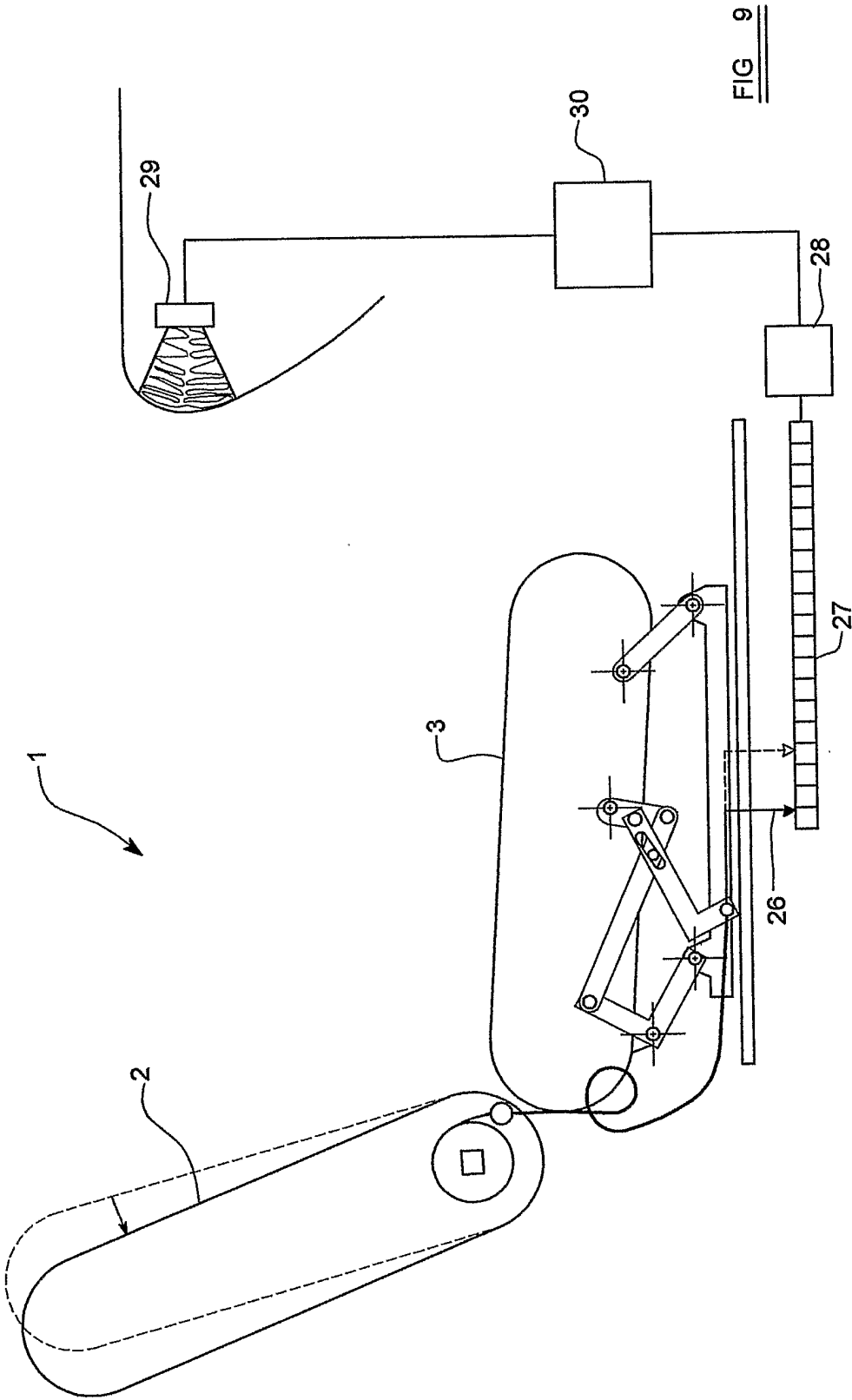
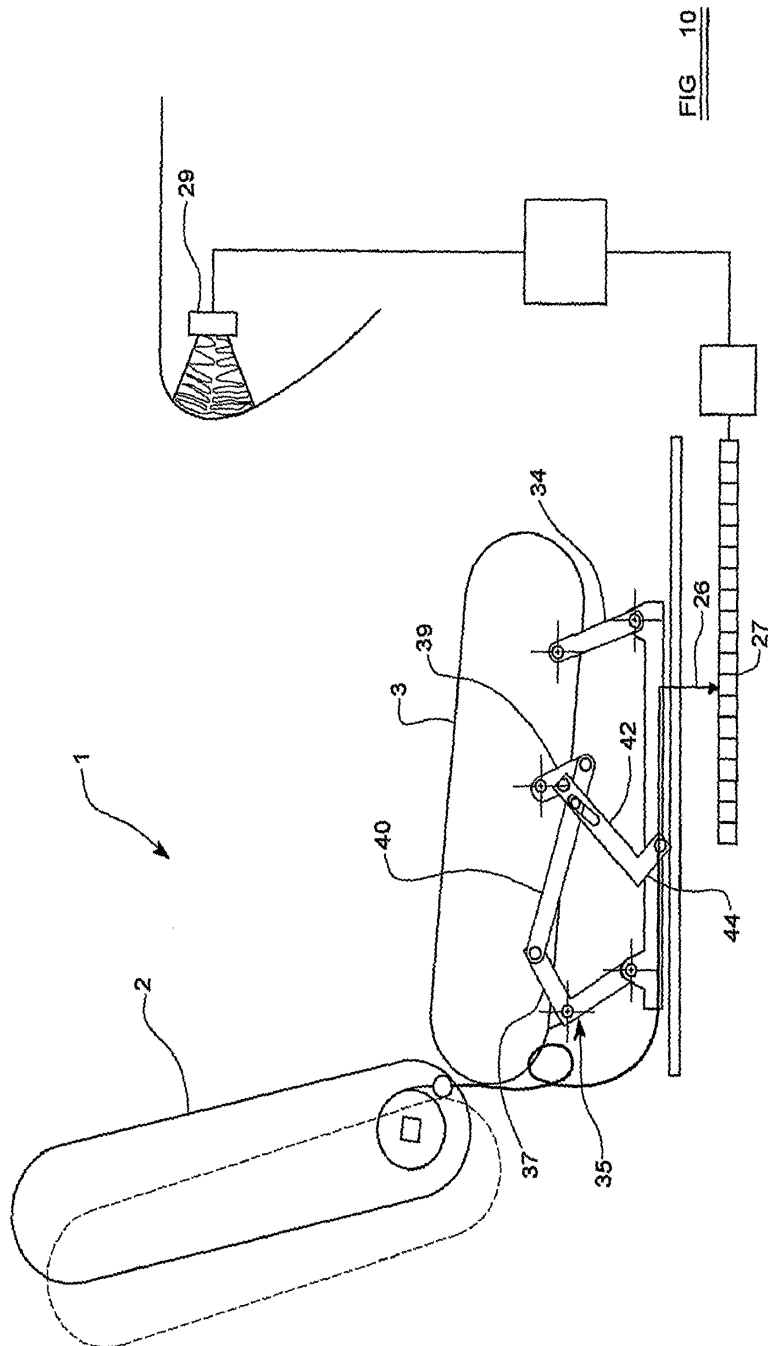


FIG 7

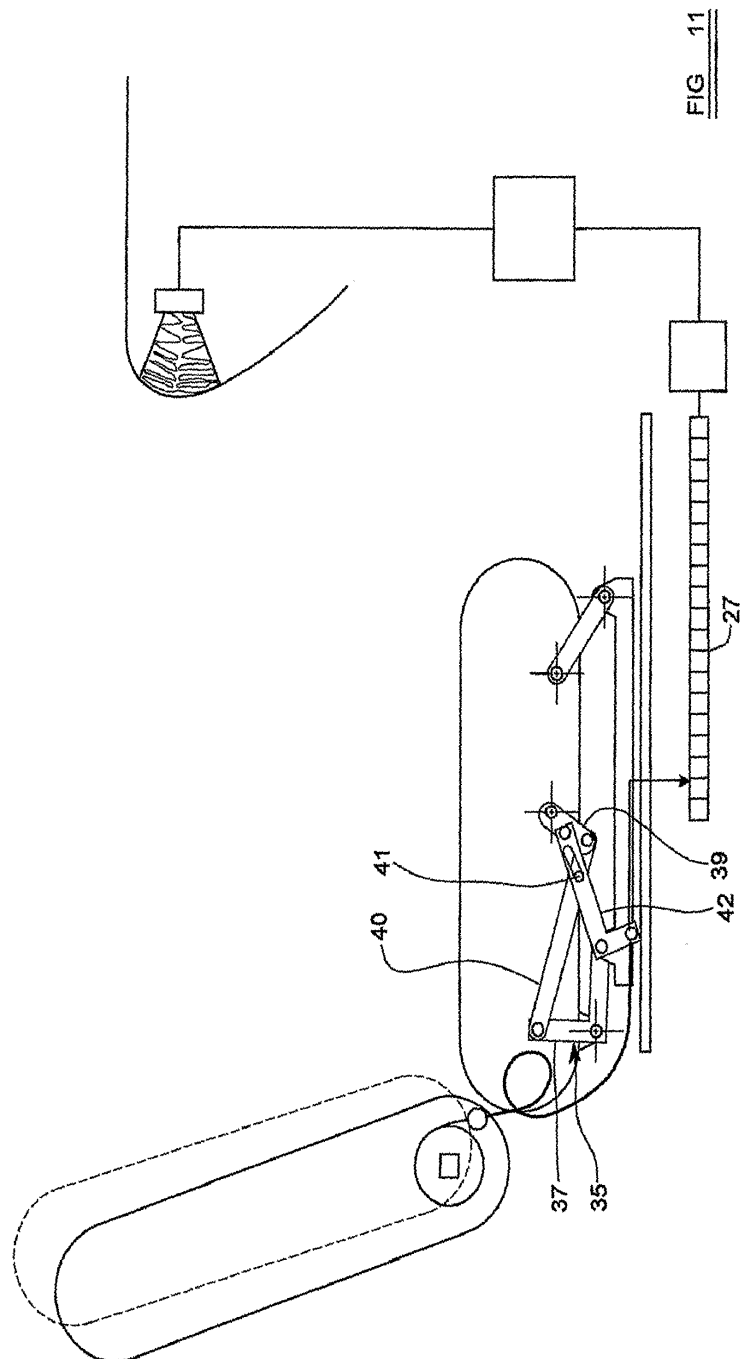


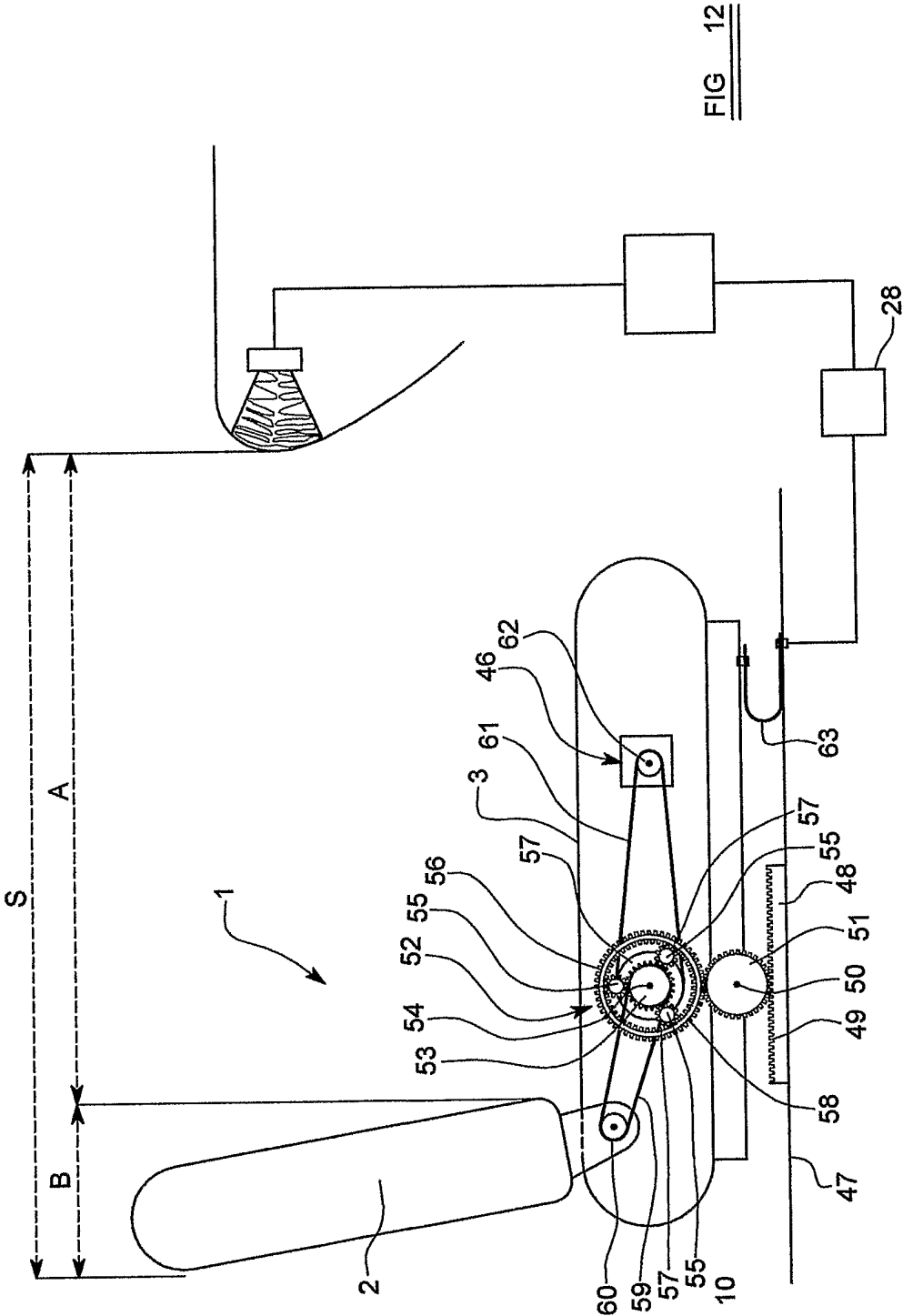






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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2006/000432

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 29-31
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

They do not precise in a clear and concise way what protection is being sought for (Art. 6 PCT).

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2006/000432

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B60R, B60N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20030001368 A1 (BREED ET AL), 2 January 2003 (02.01.2003), figure 6, abstract, paragraph (0073)-(0074) --	1-28
A	US 5967549 A (ALLEN ET AL), 19 October 1999 (19.10.1999), figures 1,3, abstract --	1-28
A	US 5670853 A (BAUER), 23 Sept 1997 (23.09.1997), abstract --	1-28
A	US 6255790 B1 (POPP ET AL), 3 July 2001 (03.07.2001) --	1-28

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

17 July 2006

Date of mailing of the international search report

18-07-2006

Name and mailing address of the ISA/

Swedish Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2006/000432

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0030925 A1 (S.I.R.P. STUDI INDUSTRIALI REALIZZAZIONE PROTOTIPI S.P.A.), 24 June 1981 (24.06.1981), page 3, figures 1-2 --	1-3,6-8,15, 24-25,28
A	US 20010025214 A1 (ISONGA ET AL), 27 Sept 2001 (27.09.2001) --	1-28
A	US 6401351 B1 (PINKOS ET AL), 11 June 2002 (11.06.2002) -- -----	1-28

International patent classification (IPC)**B60R 21/015** (2006.01)**B60N 2/06** (2006.01)**B60N 2/16** (2006.01)**B60N 2/22** (2006.01)**Download your patent documents at www.prv.se**

The cited patent documents can be downloaded at www.prv.se by following the links:

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Use the application number as username.

The password is **JOAMOCXQOI**.

Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/SE2006/000432

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Information on patent family members

International application No.

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