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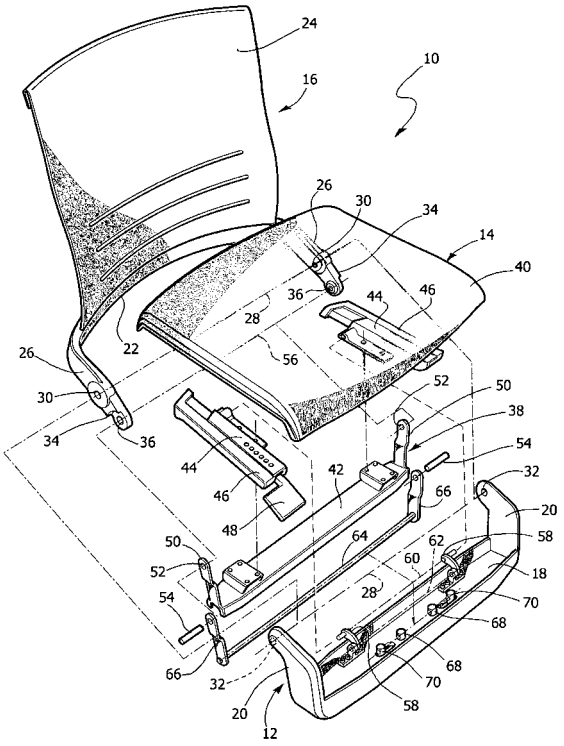
(54) Chair with seat and backrest with synchronized movement

(57) Chair comprising:
- a support base (12),
- a seat (14) including a support structure (38) that is movable relative to the support base (12) between a lowered position and a raised position, and a backrest (16) having a support structure (22) articulated to the support base (12) around a transverse axis (28) and oscillating around said axis between a position of maximum forward inclination and a position of maximum backward inclination,

in which the seat (14) and the backrest (16) are mutually connected in such a way that when the backrest is in the position of maximum forward inclination the seat is in the lowered position and when the backrest is in the position of maximum backward inclination the seat is in the raised position.

The support structure of the seat (38) is connected to the support base (12) by means of at least one rocking lever (58) articulated to the support base (12) and to the support structure of the backrest (38) around two mutually parallel transverse axes (60, 62). The support structure of the backrest (22) comprises two lateral sections (26) each of which has a connecting portion (34) that extends beyond the axis of articulation (28) of the backrest (16) to the support base (12), the connecting portions (34) being articulated to the support structure of the seat (38) around a transverse axis (56) displaced forward relative to the axis of articulation (28) of the backrest (16).

FIG. 2



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Description

[0001] The present invention relates to a chair with seat and backrest with synchronised movement.

[0002] More specifically, the invention relates to a chair comprising a support base, a seat that is movable relative to the support base between a lowered position and a raised position, and a backrest articulated to the support base around a transverse axis and oscillating around said axis between a position of maximum forward inclination and a position of maximum backward inclination, and in which the seat and the backrest are mutually connected in such a way that when the backrest is in the position of maximum forward inclination, the seat is in lowered position and when the backrest is in the position of maximum backward inclination, the seat is in the raised position.

[0003] Chairs of the type defined above are known in the field as "weight-activated chairs". The weight of the user tends to push the seat downward and tends to maintain the backrest in the position of maximum forward inclination. When the user bears the weight backwards on the backrest, the backward thrust is contrasted by the weight of the user bearing down on the seat. Chairs of this kind are normally provided with an elastic device which tends to thrust the seat towards the lowered position and the backrest towards the position of maximum forward inclination, so the backwards thrust on the backrest has to overcome both the weight bearing down on the seat and the elastic force which tends to maintain the backrest in the position of maximum forward inclination.

[0004] The object of the present invention is to provide a chair of the type indicated above having a simpler, more economical and more compact structure than prior art chairs.

[0005] According to the present invention, said object is achieved by a chair having the characteristics set out in claim 1.

[0006] The chair according to the present invention shall now be described in detail with reference to the accompanying drawings, provided purely by way of non limiting example, in which:

- Figure 1 is a partial perspective view of a chair according to the present invention,
- Figure 2 is an exploded perspective view of the part of chair shown in Figure 1,
- Figures 3 and 4 are longitudinal sections according to the line III-III of Figure 1, showing the chair according to the invention in two positions,
- Figure 5 is a partial cross section according to the line V-V of Figure 1, and
- Figures 6 and 7 are bottom plan views of the chair according to the invention.

[0007] With reference to Figures 1 and 2, the reference number 10 designates a chair according to the present invention. The chair 10 comprises a fixed support base 12, a seat 14 and a backrest 16.

[0008] The support base 12 comprises a transverse element 18 with a channel shape, provided at its lateral ends with two flanges 20 extending upwards. The base 12 is connected to a vertical central upright (not shown) with adjustable height, projecting upwards from a support formed by a plurality of radial arms provided at their outer ends with casters, according to an arrangement that is widely known in the office chair industry.

[0009] The backrest 16 comprises a support structure 22 that bears a shaped panel 24 to support the occupant's back. The support structure 22 of the backrest 16 has two lateral sections 26 that extend in the longitudinal direction. The two lateral sections 26 are articulated to the flanges 20 of the support base 12 around a transverse horizontal axis 28. The two lateral sections 26 of the backrest 16 are provided with transverse holes 30 with mutually aligned axes, which are connected by means of trunnions (not shown) to corresponding holes 32 provided at the top ends of the flanges 20 of the support base 12. The two lateral sections 26 of the backrest 16 are provided with respective connecting portions 34 which extend forward relative to the articulation axis 28. The connecting portions 34 are provided at their front ends with transverse holes 36 with mutually aligned axes.

[0010] With reference still to Figures 1 and 2, the backrest 14 comprises a support structure 38 and a panel 40. The support structure 38 in turn comprises a transverse element 42 and two longitudinal elements 44 fastened to the transverse element 42. The two longitudinal elements 44 have respective longitudinal guides engaged by blocks 46 fastened to the lower part of the panel 40. This arrangement enables to adjust the position of the panel 40 in the longitudinal direction relative to the support structure 38. One of the two blocks 46 is provided with an arresting device that allows to lock the panel 40 in a pre-selected position, disengageable by means of a lever 48.

[0011] The transverse element 42 of the support structure of the backrest 38 is provided at its lateral ends with two vertical arms 50 that are fixed relative to the transverse element 42. The two arms 50 are provided with respective holes with transverse axis 52. The vertical arms 50 of the transverse element 42 are articulated to the connecting portions 34 of the backrest 16 by means of two pivot pins 54, each of which engages two aligned holes 36, 52. The pivot pins 54 achieve an articulated connection between the transverse element 42 of the support structure of the backrest 38 and the support structure of the backrest 22, around an axis designated with the reference 56. The articulation axis 56 is parallel and displaced forward relative to the articulation axis 28 between the backrest 16 and the support base 12.

[0012] The support structure of the backrest 38 is connected to the support base 12 by means of two rocking levers 58. Each rocking lever 58 has a first end articulated to the support base 12 and a second end articulated to the support structure of the backrest 38. More specifical-

ly, the second end of each lever 58 is articulated to a respective longitudinal element 44 of the support structure of the backrest 38. The axes of articulation of the levers 58 are respectively designated by the references 60 and 62. Said axes are mutually parallel and they are parallel to the axes of articulation 28 and 56 defined previously. In the example shown in the figures, two levers 58 are provided, but a single lever 58 could also be sufficient to achieve the same result.

[0013] With reference to the Figures 2 and 5, the support base 12 bears an elastic element constituted by a flexing bar 64. The flexing bar 64 extends in the transverse direction, parallel to the axes of articulation 28, 56. The ends of the flexing bar 64 extend in the transverse direction beyond the transverse element 42 of the support structure of the seat 38. Said ends engage respective holes of two vertical levers 66. The top ends of the vertical levers 66 are articulated to the connecting portions 34 of the backrest 16. In the embodiment illustrated in the figures, the top ends of the levers 66 are articulated to the connecting portions 34 by means of the same pivot pins 54 that connect in articulated fashion the connecting portions 34 of the backrest 16 to the vertical flanges 50 of the support structure of the backrest 38. The flexing bar 34 can be constituted by a metal rod with any cross section, e.g. circular, square, rectangular, etc. The flexing bar 64 could also be formed as a leaf spring, with a plurality of mutually fastened superposed strips. A central part of the flexing bar 64 is fastened to the support base 12 whilst the lateral portions of the flexing bar 64 can deform elastically relative to the fixed central portion.

[0014] With reference to Figures 2 and 5, the support base 12 comprises two fixed pivot pins 68 and two movable pivot pins 70. The pivot pins 68, 70 are provided with through holes with transverse axis through which extends the flexing bar 64. The holes of the pivot pins 68, 70 are mutually aligned and the movable pivot pins 70 are positioned exteriorly in the transverse direction relative to the fixed pivot pins 68. The movable pivot pins 70 extend through respective transverse slots 72 of the support base 12. The movable pivot pins 70 engage with play the flexing bar 64 and can be displaced relative to the support base 12 by means of an adjustment mechanism that enables to move the pivot pins 70 jointly. The displacement of the pivot pins 70 varies the free inflexion length of the lateral ends of the bar 64. Consequently, displacing the movable pivot pins 70 varies the stiffness of the flexing bar 64.

[0015] Figures 6 and 7 show an example of the adjustment mechanism that controls the movement of the movable pivot pins 70. Each movable pivot pin 70 is fastened to a respective adjustment rod 74. The two rods 74 are positioned on the lower surface of the support base 12 and have respective racks 76 that mesh with a same gearwheel 78 freely rotatable around a vertical axis. One of the two adjustment rods 74 is provided with an actuation grip 80. If the grip 80 is moved in the transverse direction, the two rods 74 are jointly moved in the direction indicated by the arrows 82 in Figures 6 and 7. Figure 6 shows the condition in which the pivot pins 70 are in the outermost position, which corresponds to the maximum stiffness of the flexing bar 64. Figure 7 shows the condition in which the pivot pins 70 are in the innermost position, which corresponds to the maximum flexibility (or minimum stiffness) of the flexing bar 74.

[0016] Figures 3 and 4 show the two extreme positions of the chair according to the present invention. In the configuration shown in Figure 3, the flexing bar 64 is in non-deformed position. The backrest 16 is in the position of maximum forward inclination and the seat 14 is in its fully lowered position. The chair assumes this configuration when it is not occupied by a user or when the user sits on the seat 14 but exerts no backwards force on the backrest 16.

[0017] Figure 4 shows the backrest 16 in the configuration of maximum backward inclination. The flexing bar 64 is in the condition of maximum inflexion and the seat 14 is in the fully raised position. This is the configuration assumed by the chair when the user bears backwards on the backrest with all his/her weight. The rearward thrust imparted by the user is contrasted by the weight of the user on the seat 14 and by the return force of the flexing bar 64.

[0018] The connection between the seat 14 and the support base 12 is achieved by means of the rocking levers 58 and by means of the connecting portions 34. The geometry of this connection is such that the seat moves forward during its motion from the lowered position to the raised position and, simultaneously, it changes its inclination relative to a horizontal plane. This movement of the backrest enables to obtain ideal conditions from the ergonomic viewpoint in any position of the chair.

[0019] The use of a flexing bar 64 as an elastic element to return the backrest 16 in the position of maximum forward inclination enables considerably to reduce the dimensions of the support base 12. With an elastic organ constituted by a flexing bar, the mechanism for adjusting the stiffness of the elastic organ also becomes particularly simple.

[0020] In a possible variant, the ends of the flexing bar can be connected to downward extensions of the vertical arms 50.

Claims

1. Chair comprising:

- a support base (12),
- a seat (14) including a support structure (38) that is movable relative to the support base (12) between a lowered position and a raised position, and
- a backrest (16) having support structure (22) articulated to the support base (12) around a transverse axis (28) and oscillating around said

axis between a position of maximum forward inclination and a position of maximum backward inclination,

in which the seat (14) and the backrest (16) are mutually connected in such a way that when the backrest is in the position of maximum forward inclination the seat is in the lowered position and when the backrest is in the position of maximum backward inclination the seat is in the raised position,
characterised in that:

- the support structure of the seat (38) is connected to the support base (12) by means of at least one rocking lever (58) articulated to the support base (12) and to the support structure of the backrest (38) around two mutually parallel transverse axes (60, 62),
- the support structure of the backrest (22) comprises two lateral sections (26) each of which has a connecting portion (34) that extends beyond the axis of articulation (28) of the backrest (16) to the support base (12), the connecting portions (34) being articulated to the support structure of the seat (38) around a transverse axis (56) displaced forward relative to the axis of articulation (28) of the backrest (16).

2. Chair as claimed in claim 1, **characterised in that** it comprises an elastic device tending to thrust the backrest (16) towards its position of maximum forward inclination and the seat (14) towards the lowered position, the elastic device comprising a transverse flexing bar (64) having a central portion that is fixed relative to the support base (12) and two ends connected to said connecting portions (34) of the backrest (16).

3. Chair as claimed in claim 2, **characterised in that** the flexing bar (64) is connected to the connecting portions (34) of the backrest (16) by means of two vertical levers (66).

4. Chair as claimed in claim 2, **characterised in that** it comprises a device for adjusting the stiffness of the flexing bar (64) including two movable pivot pins (70) having respective transverse holes, mutually aligned, through which the flexing bar (64) extends.

5. Chair as claimed in claim 4, **characterised in that** the adjustment device comprises two rods (74) fastened to the respective movable pivot pins (70) and provided with respective racks (76) meshing with a same gearwheel (78).

6. Chair as claimed in claim 1, **characterised in that** the support base (12) comprises two lateral flanges extending upward (20) whereto are articulated said lateral sections (26) of the support structure (22) of the backrest (16).

7. Chair as claimed in claim 6, **characterised in that** the support structure of the backrest (38) comprises a transverse element (42) provided with two lateral vertical arms (50) whose top ends are articulated to said connecting portions (34) of the backrest (16).

FIG. 1

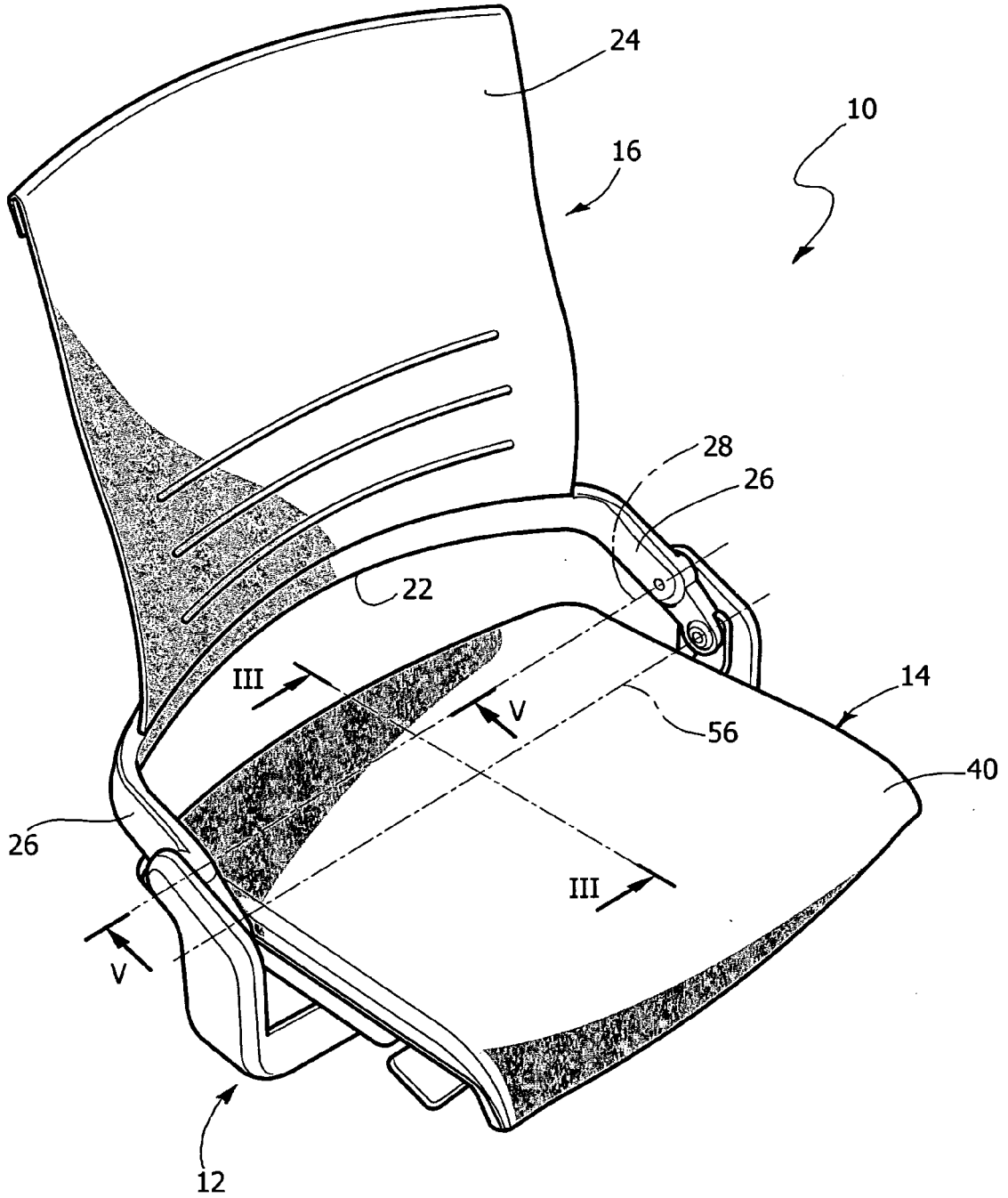

FIG. 2

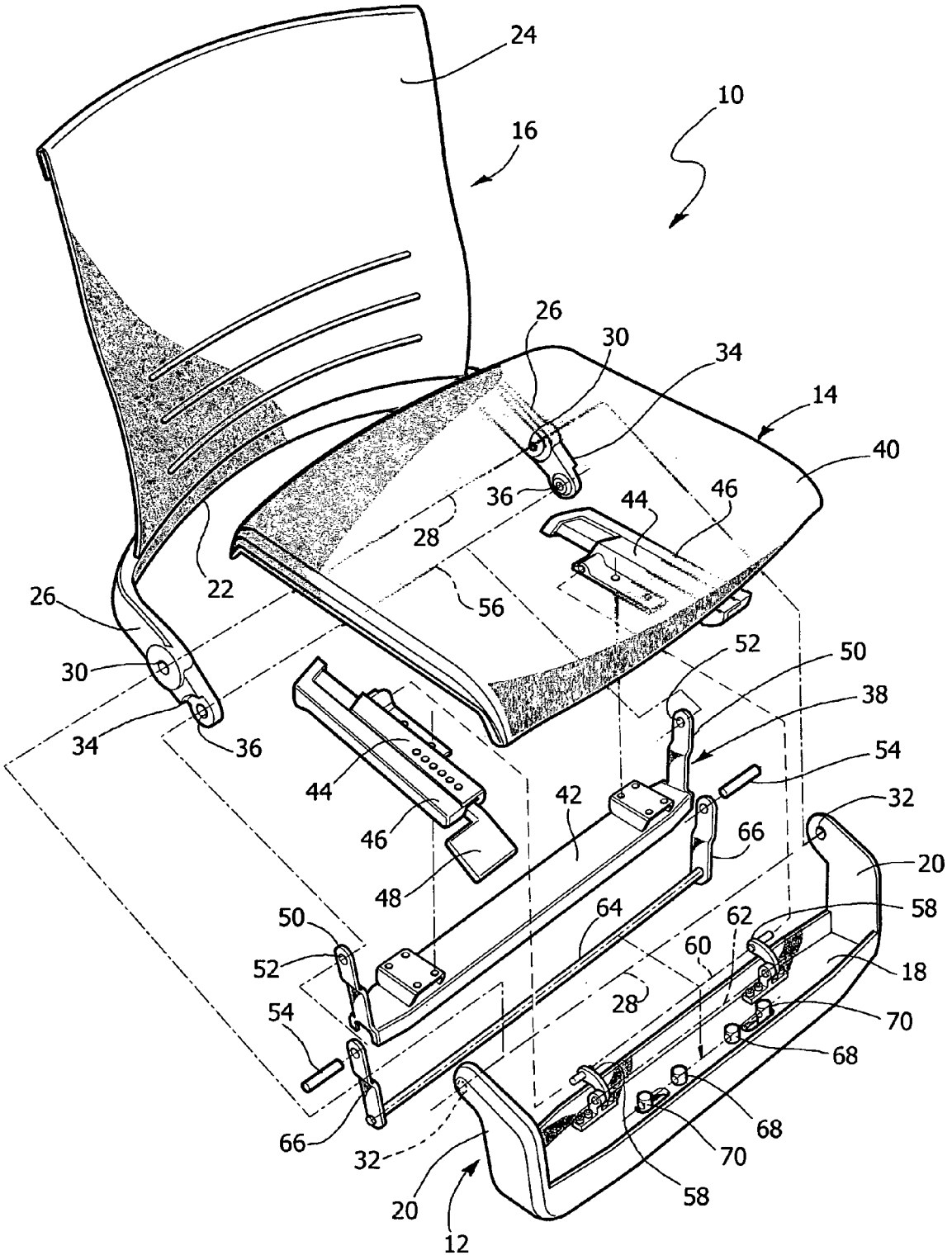
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FIG. 3

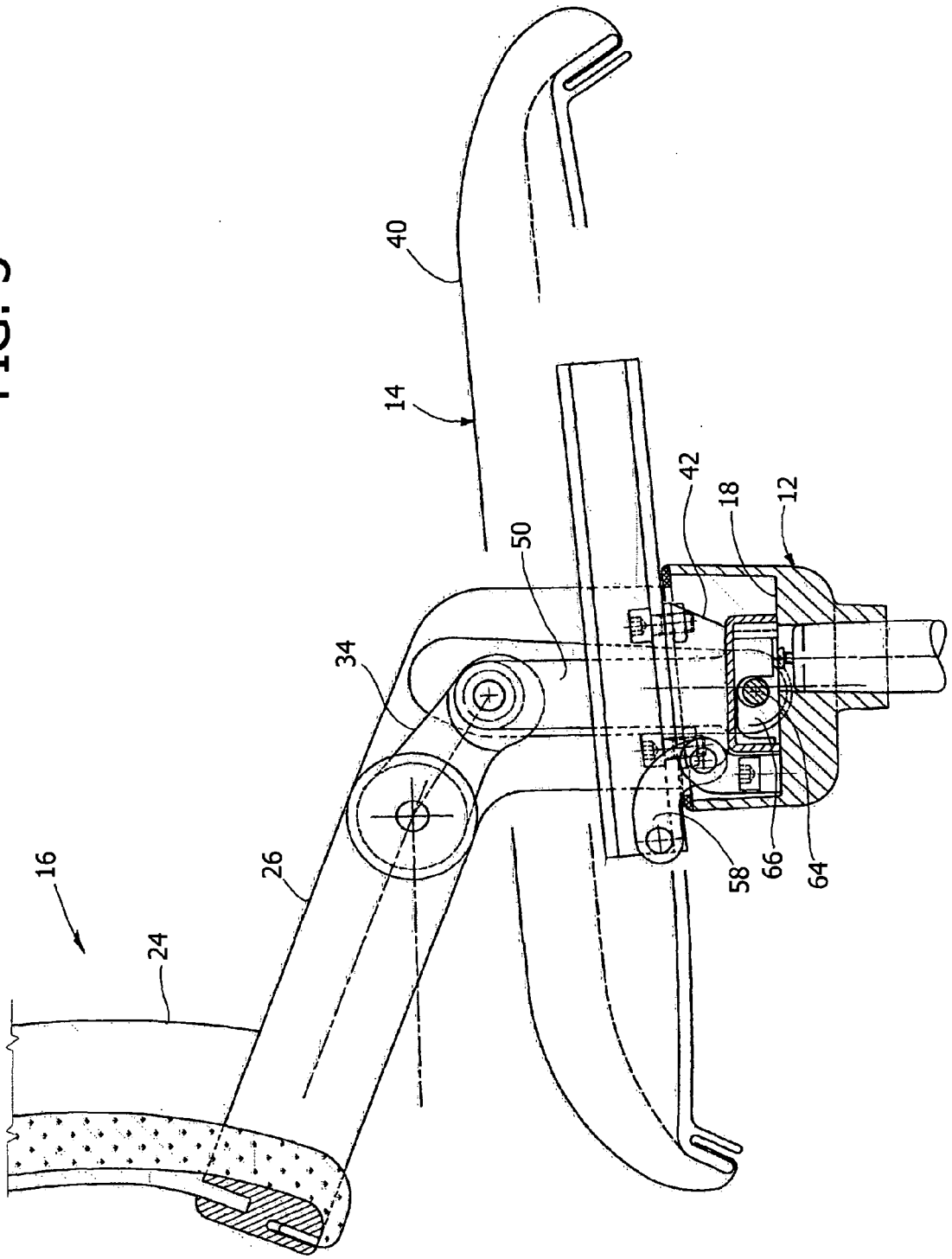

FIG. 4

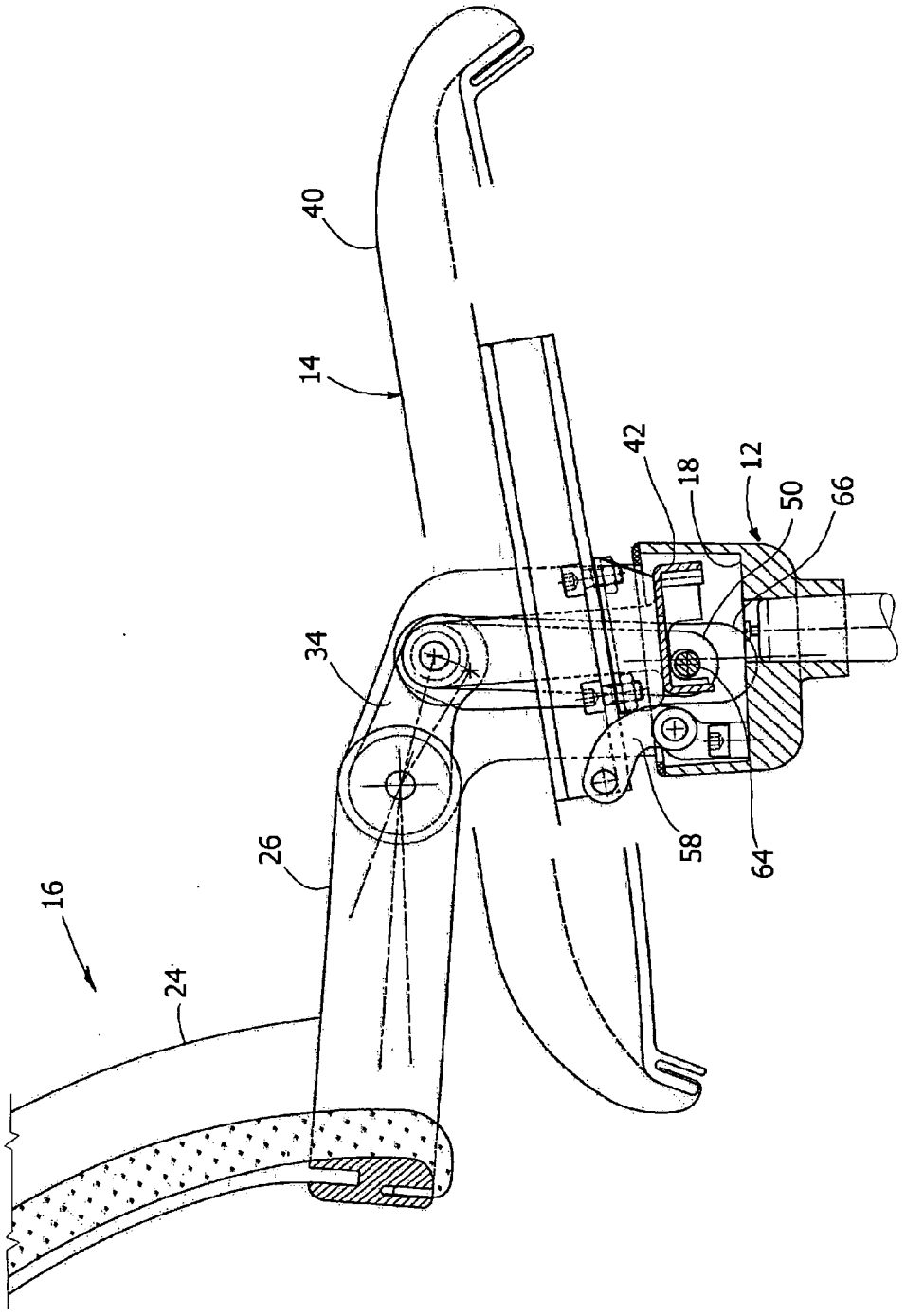

FIG. 5

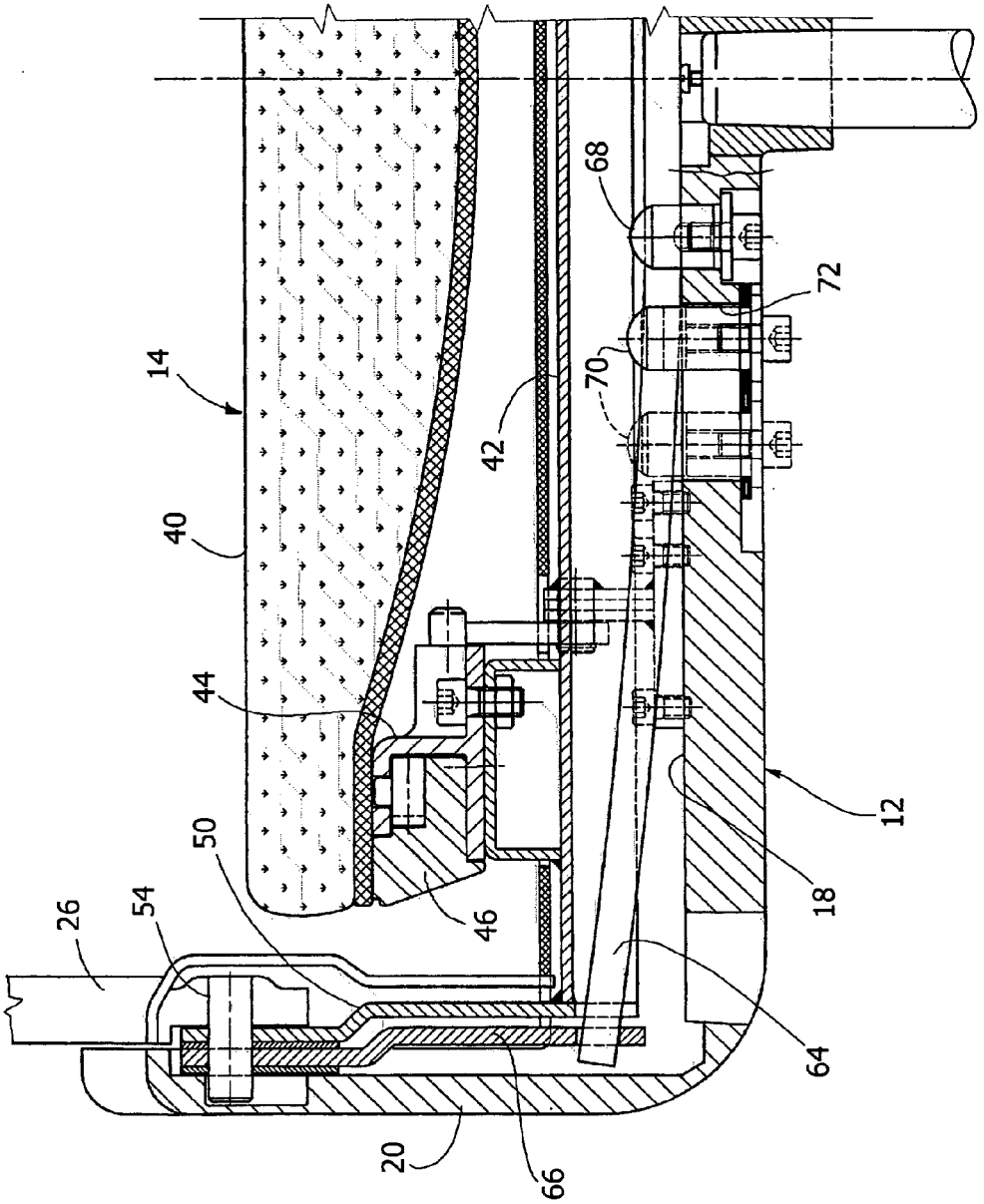

FIG. 6

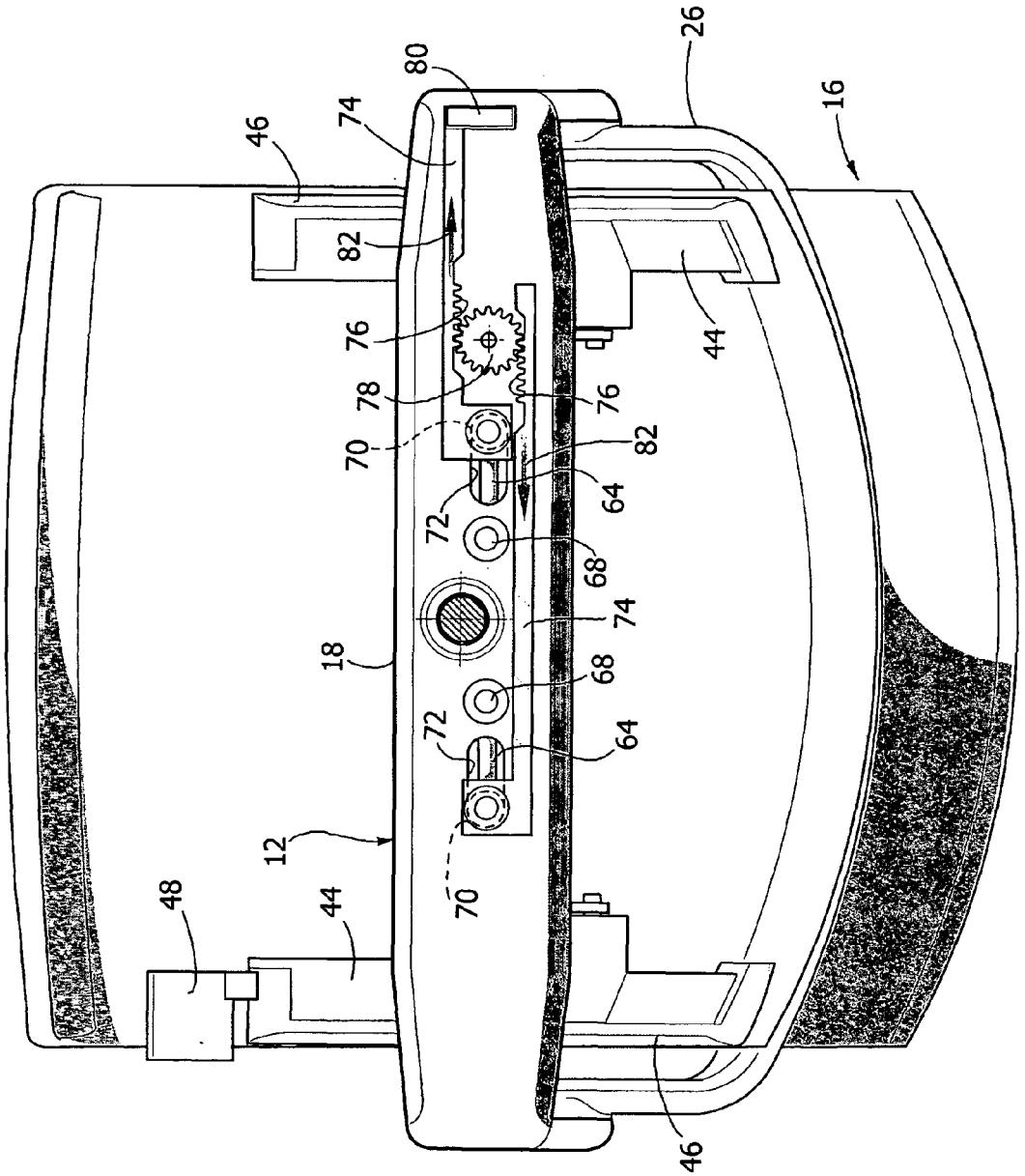
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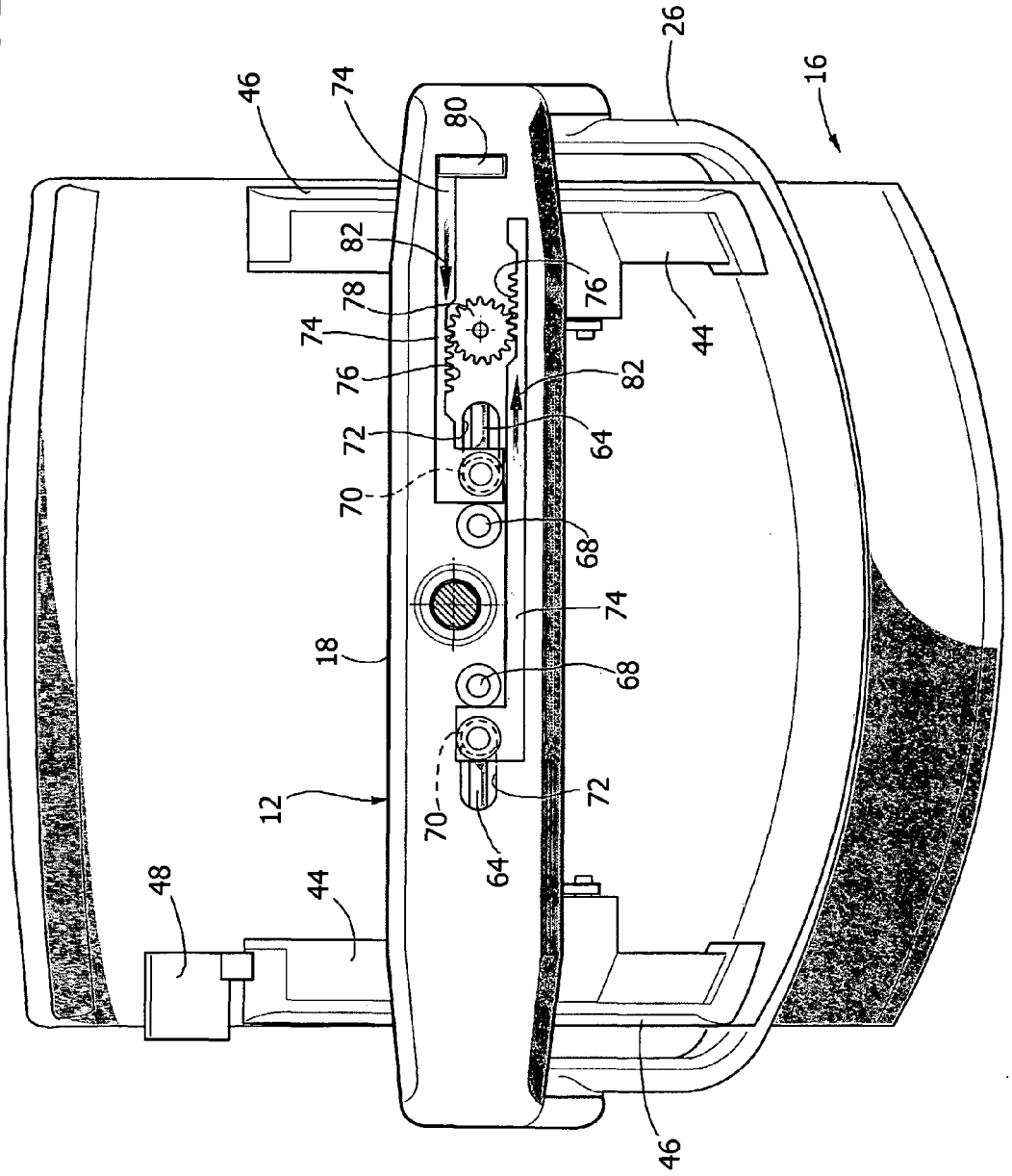
FIG. 7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EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5482

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A		2-7	

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			A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 December 2006	MacCormick, Duncan

CATEGORY OF CITED DOCUMENTS

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