(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 334 417 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89200590.1**

(51) Int. Cl.[4]: **A47C 20/04**

(22) Date of filing: **08.03.89**

(30) Priority: **25.03.88 NL 8800759**

(43) Date of publication of application:
27.09.89 Bulletin 89/39

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

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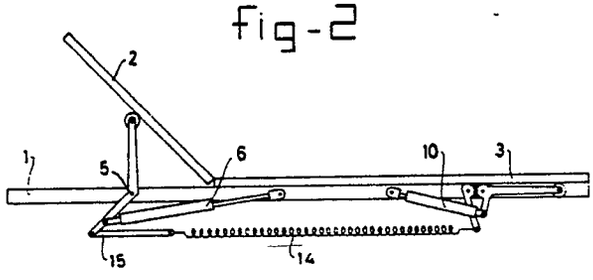
(54) Adjustable reclining or sitting unit.

(57) Reclining or sitting unit such as a bed, having a frame (1) with an adjustable head (2) and an adjustable foot (3), each provided with an adjustment device comprising a lever (16, 7), which is pivotably secured to the frame (1) and engages with one end the head or foot respectively and with the other end cooperates with a lockable gasspring (6, 10). Said unit having an energy-buffer (14, 19) into which energy can be fed and accumulated by moving the head, which accumulated energy supports the adjustment device of the foot. Said energy-buffer can be a spring (14), with or without a lostmotion-connection (15), which spring by means of a reversing gear (11, 12) acts on the foot lever (7) or by switching past its pivot point acts like a flip-flop. The energy-buffer can also be formed by a pneumatic connection between the two gas springs (6, 10).

Fig-2



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Adjustable reclining or sitting unit.

The present invention relates to a reclining or sitting unit with a head and foot which are adjustable relative to a fixed frame, and each of which has its own adjustment device.

It is known to provide such a reclining or sitting unit, for example an adjustable bed, with an adjustment device in the form of a lockable spring mechanism. The head in this case can be moved downwards easily under the influence of the weight of the person lying on the bed and by the force exerted with his back against the spring force. On the other hand, the spring mechanism can provide sufficient energy to move the head up again after the locking device is released.

The problem with these known reclining or sitting units is that the weight of the part of the body supported by the foot of the bed is not sufficient to press the foot downwards against a spring mechanism. It is also not easy to exert a downward force on the foot with the legs, so that the person lying on the bed cannot move the foot down himself. If he still wants to move the foot into the desired position, he has to get off the bed, which is rather inconvenient.

Another known adjustable bed is one in which head and foot are operated by an electric motor. In the case of such a bed both the head and the foot are adjusted by the person lying on the bed. The disadvantage of such an adjustable bed is that the adjustment device is expensive and complex.

The object of the invention is therefore to produce a reclining or sitting unit of the type mentioned in the preamble, in which both the head and the foot are easily operable by the person lying on the bed, without an electric drive being necessary for the purpose.

This is achieved according to the invention in that the reclining or sitting unit has an energy buffer which is coupled to the head and the foot in such a way that when the head is being adjusted by the adjustment device of the head energy is fed to the energy buffer, and when the foot is being moved upwards adjustment energy is fed from the energy buffer to the adjustment device of the foot. As already mentioned, it is fairly simple for the person lying on the bed to move the head down, in view of the weight of the part of his body supported by the head, and in view of the possibility which he has of exerting downward force with his back. It is no problem with the reclining or sitting unit according to the invention that, apart from the force for adjusting the adjustment device of the head, an additional force has to be exerted to store additional energy. This stored energy can subsequently be used to adjust the foot upwards. The adjustment device for the foot itself can therefore have a fairly weak spring mechanism, so that when the head is flat, i.e. the buffer is unloaded, and after unlocking the foot can easily be moved downwards by the weight of the part of the body lying on the foot, or by the slight re-adjusting force which can be exerted on the foot with the legs.

The reclining or sitting unit according to the invention can be designed in various ways.

If according to the invention both the adjustment device for the head and that for the foot are provided with a lockable gas spring, provision can then be made according to a first embodiment for the gas chambers of both gas springs to be connected to each other by a line. When the head is now pressed downwards, energy is supplied to the gas spring for the head. This energy is used partly to expand the gas spring for the foot, so that the foot can be moved upwards. It must be remembered here that the gas spring for the head still retains enough energy to move the head upwards. When the head has been moved upwards, only slight force is needed to move the foot downwards again. In this reclining or sitting unit the head must therefore always be in the upward position in order to make it easy to press the foot downwards.

According to another embodiment, in which the adjustment device of the head is provided with a lockable spring and a lever which is hingedly connected to the fixed frame and the first end of which rests against the head, while the end situated at the other side of the hinge is connected to the corresponding spring, the design can be such that the adjustment device of the foot is also provided with a lockable spring which engages with the second end of a lever which is mounted in the frame and the first end of which engages with the foot, while the second end of the lever for the head is connected by means of a tension spring to the first end of the lever for the foot, and the tension spring runs in such a way that it intersects the plane through the hinge pins of the levers at a point lying between said hinge pins.

According to another, preferred embodiment, in which the adjustment device of the head is provided with a lockable spring and a lever which is hingedly connected to the fixed frame, and one end of which rests against the head, while the end situated at the other side of the hinge is connected to the corresponding spring, according to the invention the design can be such that the adjustment device of the foot is also provided with a lockable spring which engages with a lever which is hingedly mounted in the frame and one end of which engages with the foot, and the lever for the foot

has a gear sector which is disposed concentrically relative to its hinge point and mates with a gear sector on a third lever which is also hingedly connected to the frame, and whose free end lies at the same side of the plane through the hinge pins of said lever and the lever for the head as the second end of the lever for the head, said ends being connected by a tension spring.

An advantage of these embodiments is that the output of a resilient element is higher than that of a pneumatic element such as a gas spring. This means that the proportion of the energy supplied to the buffer designed as a spring and the energy obtained therefrom is higher than it is in the case of a buffer designed as a pneumatic element.

This device works in such a way that when the head moves upwards through the expansion of the spring, energy is also fed from said spring to the tension spring, so that the latter is tensioned. The foot can then be adjusted upwards, energy being supplied from the tension spring to the adjustment device for the foot. Such an adjustment sequence, i.e. first adjusting the head and only then the foot, is generally found to be convenient and logical.

In the two last-mentioned embodiments provision can be made for the tension spring to be connected by means of a free stroke mechanism to the second end of the lever for the head, in such a way that if the head is swung down, the free stroke mechanism always goes into one or other of its end positions when the foot is in its swung-down or swung-up end position. The advantage of this design is that when the head has already been moved down the foot can be moved down with very little force, since the resilient element here is not tensioned due to the displacement of the free stroke mechanism from its one end position to its other end position, and only the relatively weak spring for the foot need be depressed.

The invention will now be explained in greater detail below with reference to a number of examples of embodiments.

Fig. 1 shows a first embodiment of the invention, in which head and foot are swung down.

Fig. 2 shows the same embodiment with the head in the swung-up position and the energy buffer loaded.

Fig. 3 shows the same embodiment with both the head and the foot in the swung-up position and the energy buffer unloaded.

Fig. 4 shows the same embodiment with only the foot in the swung-up position and the energy buffer unloaded.

Fig. 5 shows a second embodiment of the invention in the swung-down position.

Fig. 6 shows the embodiment of Fig. 5 in the swung- up position.

Figs. 7 to 10 show positions corresponding to those of Figs. 1 to 4 of another embodiment.

The bed shown in Fig. 1 has a fixed frame 1, provided with a flip-up head 2 and a flip-up foot 3. The head is provided with a lever 16 which rests via a roller 4 against the head 2, and which at the other side relative to its hinge suspension 5 mates with a lockable gas spring 6. The foot 3 is also provided with a lever 7 which rests by means of a roller 8 on the foot 3, and which at its end situated at the other side of its hinge point 9 mates with a lockable gas spring 10. Concentrically relative to its hinge point 9, lever 7 is provided with a gear sector 11, which engages with a corresponding gear sector 12 of a lever 13. A spring 14 is ten sioned between the end of lever 13 and the corresponding end of lever 16, a free stroke mechanism 15 being disposed between the end of spring 14 and lever 16.

In the position shown in Fig. 2 the head 2 has been moved up by the spring force of gas spring 6, spring 14 being tensioned. Since the foot is not yet unlocked, it remains in the swung-down position.

Fig. 3 shows the position after gas spring 10 unlocks the foot. Under the influence of the spring force of gas spring 10 and the force exerted by spring 14 via the gear racks 11, 12, the foot 3 is moved upwards.

In the position shown in Fig. 4 the head has been moved down again, for example under the influence of the weight of the person lying thereon. The end of the lever 16 connected to the spring now makes a free stroke relative to the free stroke mechanism 15, so that on the subsequent downward movement of the foot 3 as a result of the movement of the lever 7, the gear sectors 11, 12 and the lever 13, the spring 14 and the free stroke mechanism 15 can be drawn freely to the right. This means that on further movement downwards of the foot 3 it is only necessary to depress the gas spring 10, which exerts only a relatively low spring force. On account of the coupling of lever 16 and spring 14 to the free stroke mechanism, the spring 14 need not be tensioned, so that the force for moving foot 3 downwards can remain small. After foot 3 has been pressed downwards the position of Fig. 1 is reached again, following which the next cycle of adjusting the bed can be commenced.

The spring 14 thus acts here as an energy accumulator. It is tensioned by the gas spring for the head, and is thereby able to help the gas spring for the foot in lifting the foot. When the head is pressed down again, the accumulator releases, with the result that the force for pressing down the foot is only slight now.

Figs. 5 and 6 show a second embodiment of

the invention. The gas chambers of the lockable gas springs 6 and 10 are interconnected here by a gas line, made up of two hoses 17, 18, and a line 19. When the head 2 is moved down the gas in the gas chamber of gas spring 6 is compressed, this pressure being transmitted via the line 17, 18, 19 to the gas chamber of the gas spring 10. When the foot 3 is unlocked this pressure produces the desired spring action for gas spring 10, so that it can move the foot 3 up. If the head 2 is now moved up, the pressure in the gas springs 6 and 10 reaches a minimum. This means that the foot 3 can be moved easily downwards. The head 2 can then be pressed downwards by the back, following which the initial position is reached again, with relatively high pressure in the gas springs 6, 10. The sequence of operation is different here, namely first the foot and only then the head.

Figs. 7 to 10 show a bed in which the positions correspond in each case to those of Figs. 1 to 4. In this embodiment the tension spring 14 is connected to the free stroke mechanism between the second end of lever 16 and the first end of lever 7. In the position shown in Fig. 7 tension spring 14 is released, while in the position shown in Fig. 8 it is tensioned due to the fact that the head 2 has moved up. After unlocking of gas spring 10, the tension spring then makes a contribution to the upward movement of foot 3 (Fig. 9). In Fig. 10 the head 2 has been moved down again. The distance between the end of the spring 6 connected to the spring 14 and the connection point of the spring 14 to the lever 7 is shorter now than in the swung-down position of the two parts shown in Fig. 7. The spring 14 is thus released and therefore allows the foot to be swung down. The free stroke mechanism 15 can be an advantage here to move the foot easily downwards against the spring force of gas spring 10.

Claims

1. Reclining or sitting unit provided with a head (2) and foot (3) which are adjustable relative to a fixed frame (1), and each of which has its own adjustment device (6, 16; 10, 7) with its own control, characterized in that it has an energy buffer (14, 19) which is coupled to the head (2) and the foot (3) in such a way that when the head (2) is being adjusted by the adjustment device (6, 16) energy is fed to the energy buffer (14), and when the foot (3) is being moved upwards adjustment energy is fed from the energy buffer (14) to the adjustment device (7-13)of the foot (3).

2. Reclining or sitting unit according to Claim 1, in which the adjustment device of the head is provided with a lockable gas spring (6), characterized in that the adjustment device of the foot (3) is also provided with a lockable gas spring (10) and the gas chambers of the two gas springs (6, 10) are connected by a line (19) (Figs. 5, 6).

3. Reclining or sitting unit according to Claim 1, in which the adjustment device of the head is provided with a lockable gas spring (6) and a lever (16) which is hingedly connected to the frame (1), the first end (4) of which rests against the head (2), while the second end situated at the other side of the hinge (5) is connected to the corresponding gas spring (6), characterized in that the adjustment device of the foot is also provided with a lockable spring (10) which engages with the second end of a lever (7) which is mounted in the frame (1) and the first end (8) of which engages with the foot (3), while the second end of the lever (16) for the head is connected by means of a tension spring (14) to the first end of the lever (7) for the foot (3), and the tension spring (14) runs in such a way that it intersects the plane through the hinge pins of the levers at a point lying between said hinge pins.

4. Reclining or sitting unit according to Claim 1, in which the adjustment device of the head is provided with a lockable gas spring (6) and a lever (16) which is hingedly connected to the frame (1), the first end (4) of which rests against the head (2) and the second end situated at the other side of the hinge (5) is connected to the corresponding spring (6), characterized in that the adjustment device of the foot (3) is also provided with a lockable spring (10) engaging with a lever (7) hingedly mounted in the frame (1), one end of which engages with the foot (3), and the lever (7) for the foot has a gear sector (11) which is disposed concentrically relative to its hinge point (9), and which mates with a gear sector (12) on a third lever (13) which is also hingedly connected to the frame (1) and whose free end lies at the same side of the plane through the hinge pins (9, 15) of said lever (7) and the lever (16) for the head (2) as the second end of the lever for the head (2), said ends being connected by a tension spring (14) (Figs. 1-4).

5. Reclining or sitting unit according to Claim 3 or 4, characterized in that the tension spring (14) is connected by means of a free stroke mechanism (15) to the second end of the lever (16) for the head (2), in such a way that if the head (2) is swung down, the free stroke mechanism (15) always goes into one or other of its end positions when the foot (3) is in its swung-down or swung-up end position (Figs. 1, 4, 7 and 10).

Fig-1

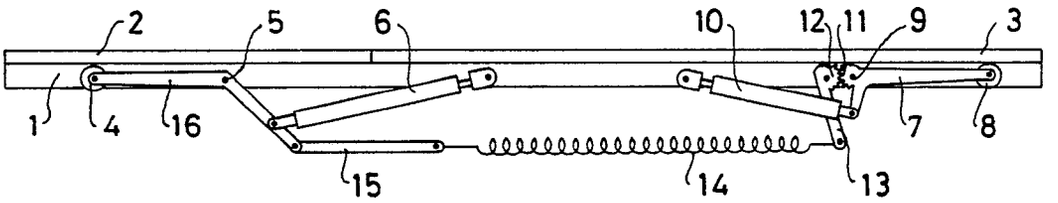


Fig-2

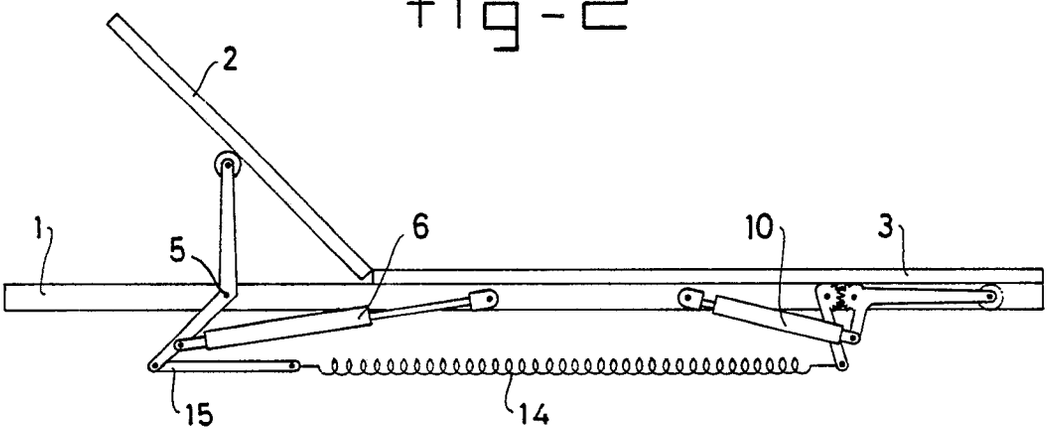


Fig-3

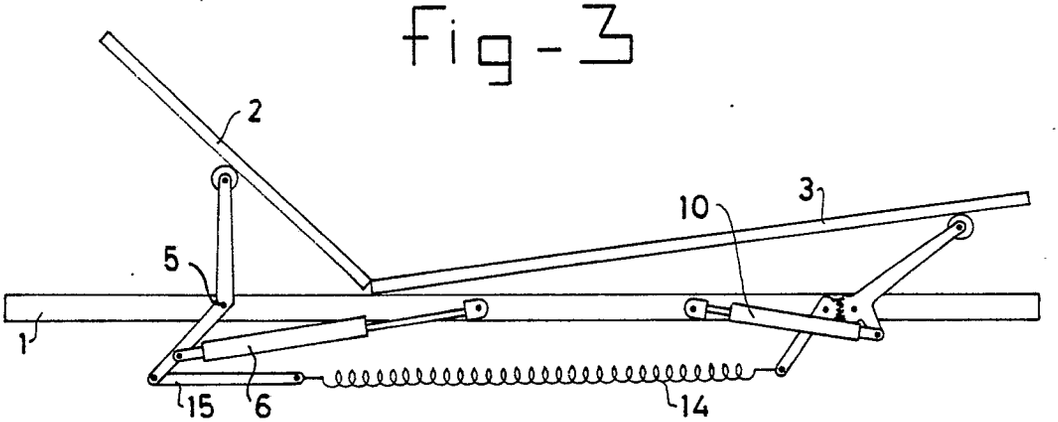


Fig-4

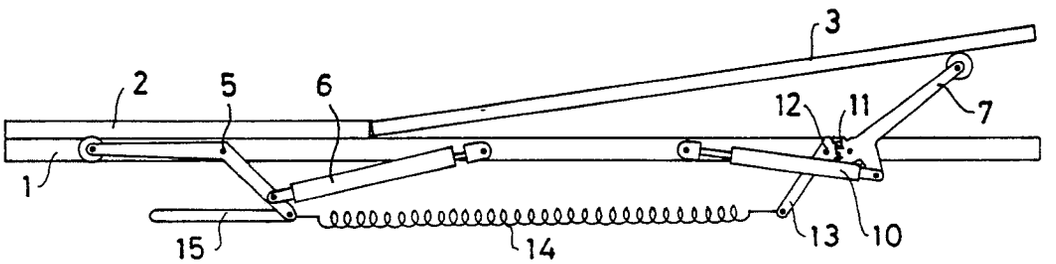


Fig-5

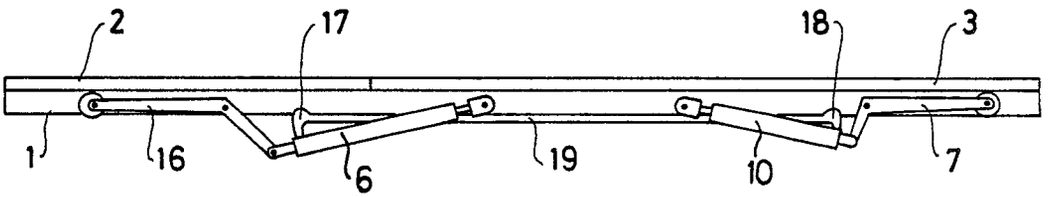


Fig-6

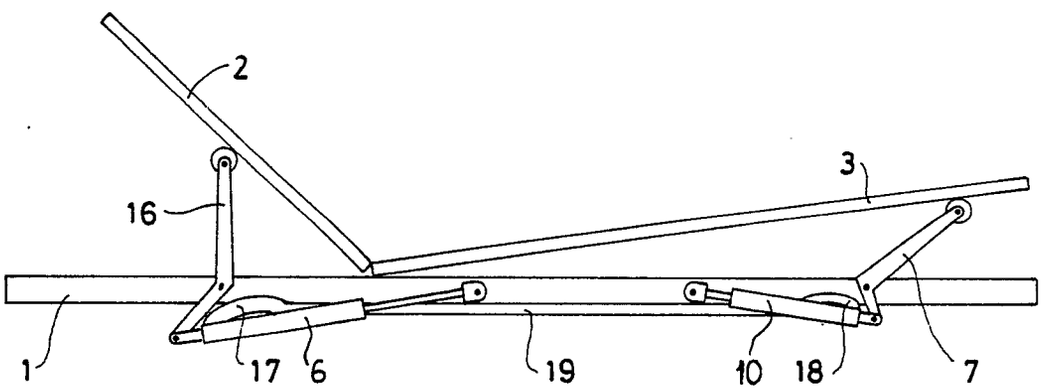


Fig - 7

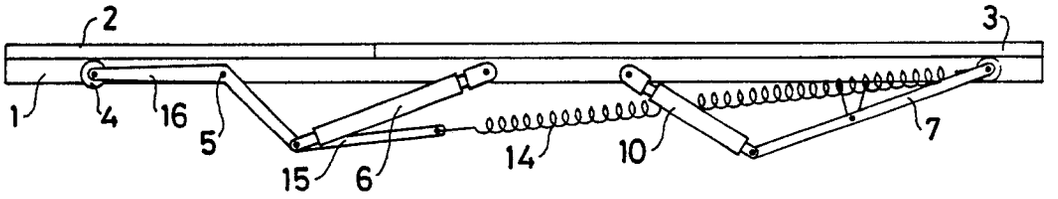


Fig - 8

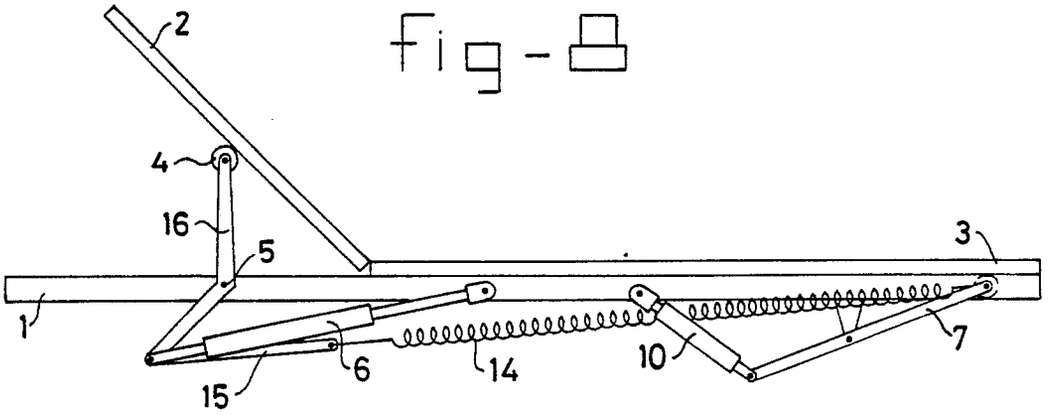


Fig - 9

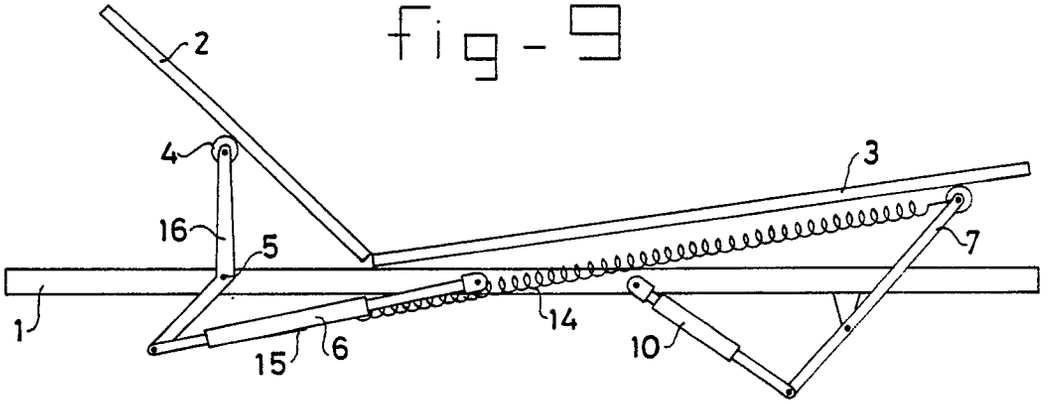
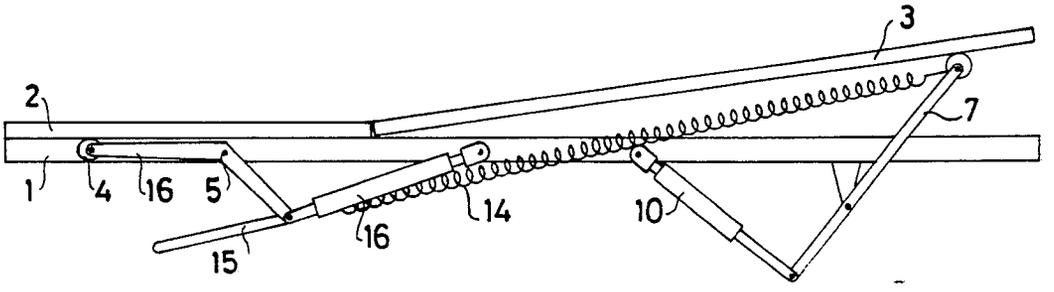


Fig - 10



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EUROPEAN SEARCH REPORT

Application Number

EP 89 20 0590

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-4 589 151 (BEHRENS) * Figure 1; column 1, lines 30-52 * ---	1,2,4	A 47 C 20/04
A	US-A-3 916 461 (KERSTHOLT) * Figures 1b,3a,5a; column 5, lines 2-10 * -----	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 47 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15-06-1989	MYSLIWETZ W.P.

CATEGORY OF CITED DOCUMENTS

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