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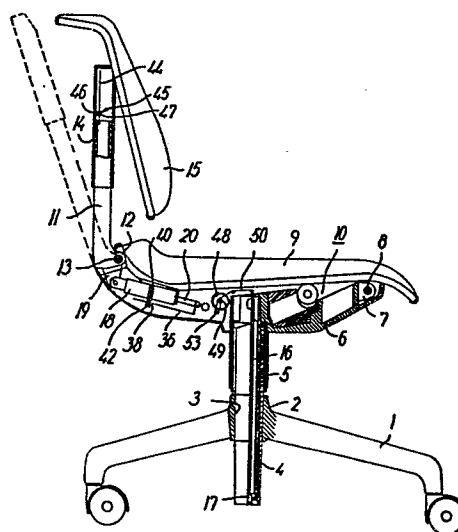
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54 Adjustable office chair or working chair with position indicator.

57 In an adjustable chair with means for regulating the mutual positions of seat (9), back (15) and underframe (1-4) to control at least one of the functions seat height in relation to floor, back height in relation to seat, seat depth and seat inclination in relation to the horizontal the position indication of the actual value of a functional adjustment is obtained in that an information carrier (36,44,48) is connected with one chair part and a reading device (38, 39, 45, 53) cooperating therewith is connected to the other chair part. In an electronic embodiment a common indicator (31) can be used for several functional adjustments. The information carriers can be constituted by oblong plane tapes (36, 37, 44) or pivotal discs (48) with position information in Gray-code.

FIG. 1



Adjustable Office Chair or Working Chair with Position Indicator.

This invention relates to an adjustable office or working chair with interconnected chair parts, comprising a seat, a back and an underframe and having means for controlling the mutual positions of at least
5 two of said chair parts to control at least one of the functions, seat height above floor, back height above seat, seat depth and seat inclination in relation to the horizontal within a given range of variation.

With a view to adaptation to user's physical
10 measurements in an ergonomically correct manner such office and working chairs are often provided with position control means for effecting said four functional adjustments. As regards particularly chairs that are employed by various persons changes of said func-
15 tional adjustments may occur comparatively frequently, and it is often difficult and time consuming for the individual user when he himself comparatively often, after others have used the chair, has to regulate said functional adjustments back to the values correspond-
20 ing to the working position he prefers.

As to adjustable chairs of a more advanced design and for professional use, for instance a dental patient's chair where the adjustment of position is made by the dentist and where the range of variation
25 of the individual adjustments must generally be quite considerable in view of the dentist's working position, it is known from US-PS No. 3,984,146 to supplement the position adjustment with a proper servo-regulating arrangement that is rather extensive as to electronics.
30 At each pair of reciprocally movable parts said known chair comprises sensing means in the form of potentiometers, the adjustable tappings of which are connected

with comparator means to which, in addition to the potentiometer signals, desired value signals are supplied which are set by means of control buttons on a control box, the comparator means producing control
5 signals for magnet valves to actuate the position control means. To operate said control buttons correctly it is necessary beforehand to know the control values to be set, and a chair with feed-back-controlled functional adjustments of the kind concerned is there-
10 fore mainly suited for the professional use only where the control mechanism is operated by the same person.

By means of the invention the above mentioned operational drawbacks relating to simpler office and working chairs where the position adjustment shall be
15 made by the user himself, are reduced so that the adjustment is considerably facilitated, in that one of said two chair parts is connected with an information carrier provided with discrete position information for the range of variation concerned, while the other
20 chair part is connected with a reading device cooperating with said information carrier, a visual position indicator readable to a person sitting on the chair being connected with said reading device.

This provides for obtaining an accurate
25 position indication for any of said functional adjustments whereby to cause a quick adjustment to the experientially best value of the functional adjustment within the given range of variation.

In a very simple embodiment the information
30 carrier and the reading device may comprise a scale secured to said one part of the chair and an indicator that is stationary relative to said other part of the chair. However, if the position indication shall

comprise several of said functional adjustments, this will cause reading at different positions on the chair.

A preferred embodiment of the invention is therefore characterised in that the position indicator
5 is common to a number of functional adjustments with associated reading devices and information carriers, and that a selector to select only one functional adjustment at a time for indication is associated with the indicator. This provides for reading the position indic-
10 ation of several functional adjustments at the same position on the chair.

In this embodiment an electronic position indication is particularly advantageous which can be obtained by providing the information carrier with coded position
15 information and by designing the reading device to convert the read-out codes of position information into electrical signals, said indicator being constituted by a digital display to which the electrical signals are supplied via decoding means. Such coded information
20 may for instance be optically readable and correspondingly a photo-electric reading device may be used.

In the following the invention is explained in more detail with reference to the schematical drawings, in which

25 Fig. 1 illustrates an embodiment of an adjustable chair according to the invention, in side elevation and partially in sectional view,

Fig. 2 illustrates a part of the seat support of the chair,

30 Fig. 3 illustrates the chair, viewed from above,

Fig. 4 illustrates an example of an information carrier with position information for a functional adjustment and

Fig. 5 is a block diagram of the position
35 indicator circuit arrangement.

The underframe of the chair illustrated as an example in Fig. 1 comprises four or five legs 1 with wheels and assembled in a central socket 2 having a slightly conical bore 3 in which an outer tube 4 of the supporting column of the chair is secured, an inner tube 5 being axially displaceable within the interior of said tube 4.

A forwardly directed web plate 6 is secured to the inner tube 5 and carries bearings 7 at its foremost end for a transversal shaft 8 connected with a seat frame 10 located below the chair seat 9.

A back frame 11 is pivotally connected with the rearmost end of the seat frame 10, in that its lowermost portion comprises bearing fittings 12 for a transversal shaft 12 connected with the seat frame 10. A fitting 14 for the chair back 15 is vertically displaceably mounted on the back frame 11.

A gas operated cylinder 16 positioned in the inner tube 5 of the support column serves to adjust the height of the chair seat 9 in relation to the floor, the uppermost end of said cylinder 16 being connected with the web plate 6 while a piston 17 at the lowermost end of the cylinder is connected with the outer tube 4.

Correspondingly, Fig. 1 illustrates a gas operated cylinder 18 for regulating the angular position of the back frame 11 in relation to the seat frame 10. At one end, the cylinder 18 is connected with a fitting 19 secured to the lowermost part of the back frame 11 at the bearing fitting 12 and has, at its other end, an axially displaceable piston 20 pivotally connected with the seat frame 10.

The height control of the chair back 15 in relation to the back frame 11 is carried out in a manner not specifically shown, by means of a rack and pawl mechanism allowing the adjustment of the height of the chair back 15 in a number of discrete steps.

Thus, Fig. 1 illustrates prima facie three different functional adjustments for the chair, namely adjustment of the seat height in relation to floor, adjustment of the chair back height in relation to the seat and adjustment of the angular position between back frame 11 and seat frame 10, thus providing for adjusting the seat depth. There is a predetermined range of variation for each of said functional adjustments. Fig. 1 illustrates the range of variation for the two latter adjustments between the position shown in full-drawn lines and a position shown in dotted lines of the back frame 11.

A fourth functional adjustment consists in regulating the inclination of the seat 9 in relation to the horizontal by pivoting seat frame 11 in relation to web plate 6 in bearings 7. A control device serving said purpose is illustrated in Fig. 2 and comprises a gas operated cylinder 21 which is provided, at one end, with a piston 22 pivotally connected with the rearmost portion of seat frame 10, while cylinder 21 at its opposite, foremost end is connected with one arm of a lever 23 which by means of a pin 24 is pivotally located on seat frame 10, and the other arm of which engages with a pin 25 into an oblique mortise 26 in seat frame 10.

By means of said position regulating mechanism the function of which is explained in detail in the specification of Applicant's European patent application No. 80304292.8, seat frame 10 can be pivoted in rela-

tion to web plate 6 within a range of variation of appropriate size.

In Fig. 3 where the chair is viewed from above, control arms for said three gas cylinders 16, 18 and 21 are shown at 27, 28 and 29, respectively, while 30 designates a box for a position indicator panel mentioned more specifically in the following and assuming during normal use an inserted position entirely below seat 9, but which can be pulled horizontally out therefrom to the reading position shown in the figure. The panel comprises a digital display 31 and four pushbuttons 32 to 35 pertaining to respective ones of the four above mentioned functional adjustments.

In the illustrated embodiment there is attached a position indicator to each respective one of said functional adjustments which may be performed individually by controlling the mutual position of the two chair parts, in that an information carrier with discrete position information is connected to one chair part, while a reading device cooperating with the information carrier is attached to the other chair part.

Thus, in the illustrated embodiment an information carrier 36 and 37, respectively, in the form of an oblong plane tape is secured to the pistons 20 and 22 in each of the gas operated cylinders 18 and 21, respectively, said tapes extending parallel to the cylinder axis outside the respective gas operated cylinder 18 and 21, resp., and being provided in this case, as shown in Fig. 4, with optically readable position information formed in Gray-code which is particularly suitable for this purpose because it offers an unambiguous information

in discrete steps, in which one figure of the code changes from one position step to the following. As it appears from Fig. 4, the coded information tape 36 or 37 appears in this case as a pattern of black and transparent square fields. The code comprises a number of figures determined by the desired number of information steps within the range of variation for the functional adjustment concerned, in the present case five figures corresponding to 32 position steps.

10 In the case concerned, photoelectric reading devices 38 and 39, resp., cooperate with the information tapes 36 and 37, said reading devices being secured to the individual gas operated cylinders 18 and 21, resp., and comprising each a number of juxtaposed light sources 40 and 41, resp., corresponding to the number of code figures, and opposing photodetectors 42 and 43, resp.

For the vertical adjustment of the chair back 15 use is made of a similar arrangement comprising an information carrier in the form of an oblong plane tape 20 44 secured to the back frame 11 and a photoelectric reading device with light sources 46 and photodetectors 47 secured to the back chair fitting 14.

For the vertical adjustment of the seat the 25 illustrated embodiment makes use of an alternative design. of the position indicator elements, as the information carrier comprises a circular disc 48 rotatably connected with the seat frame 10 and coupled with a bobbin 49 forming a spring loaded winding element for a cord 30 drive having a cord 50 which is guided over pivotal discs through the inner tube 5 and past the gas operated cylinder 16 to be connected with the lowermost end of the outer tube 4.

The coupling between disc 48 and bobbin 49

is carried out so that disc 48 rotates less than a full revolution within the entire range of variation of the vertical adjustment of the seat. A reading device 53 with light sources 54 and photodetectors 55 (not shown in Fig. 1) cooperate with disc 48 which in the same manner as tapes 36, 37 and 44 carries position information in an optically readable Gray-code.

As it appears from the electric block diagram in Fig. 5 the illustrated embodiment provides for obtaining a simple and easy reading of position by use of the digital display 31 as a common indicator for said four functional adjustments in connection with a selector that is composed, in the present case, of said four pushbu-tons 32 to 35 to select only one functional adjustment at a time for indication.

Pushbuttons 32 to 35 are arranged to operate switches 56 to 59 capable of connecting each respective of the light source arrangements 40, 41, 46 and 54 to a battery 60, switches 56 to 59 being mechanically coupled so that only one switch is closed at a time, meaning that operation of one of pushbuttons 32 to 35 will cause opening of the switch associated with the pushbutton activated immediately before. A switch 61 which is closed by pulling out the box 30 to the reading position is connected in series between the battery 60 and the parallel connected switches 56 to 59. A timing relay (not shown) may further be mounted for automatic cut-off of the battery current after a certain time.

The four sets of photodetectors 42, 43, 47 and 55 are connected in parallel to the digital display 31 via decoders 62 and 63 for conversion from Gray-code to binary code and from binary code to BCD-code, resp., and a BCD-driver stage 64.

The coding of the information carrier and the calibration of the indicator is preferably carried out so that four functional adjustments expressed by measure of length as for instance seat height, back
5 height and seat depth, the reading occurs directly in cms, and for an angular position as for instance the seat inclination in relation to the horizontal the reading occurs in degrees.

However, the position indication suggested
10 in accordance with the invention is not restricted to the above described and illustrated design of the position indicator elements and the electronic execution of the position indication. The position indication may as well be obtained mechanically by means of an appro-
15 priate scale and an associated indicator for the functional adjustment. However, the electronic execution is preferred because it makes it possible in a particularly simple manner to read a number of functional adjustments by means of a common indicator so that the reading
20 can be made at one place which as shown in Fig. 3 is located so that reading can be made in a sitting posture, whereby all functional adjustments can be made while the user is sitting on the chair.

PATENT CLAIMS

1. An adjustable office or working chair with interconnected chair parts, comprising a seat (9), a back (15) and an underframe (1-4) and having means for controlling the mutual position of at least two of
5 said chair parts to control at least one of the functions, seat height above floor, back height above seat, seat depth and seat inclination in relation to the horizontal within a given range of variation, characterised in that one of said two chair parts is
10 connected with an information carrier (36, 37, 44, 48) provided with discrete position information for the range of variation concerned, while the other chair part is connected with a reading device (38, 39, 45, 53) cooperating with said information carrier, a visual
15 position indicator (31) readable to a person sitting on the chair being connected with said reading device.
2. An office or working chair according to claim 1, characterised in that the position indicator (31) is common to a number of functional adjustments
20 with associated reading devices and information carriers, and that a selector (32-35) to select only one functional adjustment at a time for indication is associated with the indicator (31).
3. An office or working chair according to
25 claim 2, characterised in that the information carrier (36, 37, 44, 48) is provided with coded position information and that the reading device (38, 39, 45, 53) is adapted to convert the read-out codes of position
information into electrical signals, said indicator
30 (31) being constituted by a digital display to which the electrical signals are fed via decoding means (62, 63).

4. An office or working chair according to claim 3, characterised in that the position information code is optically readable and that the reading device is photoelectric.

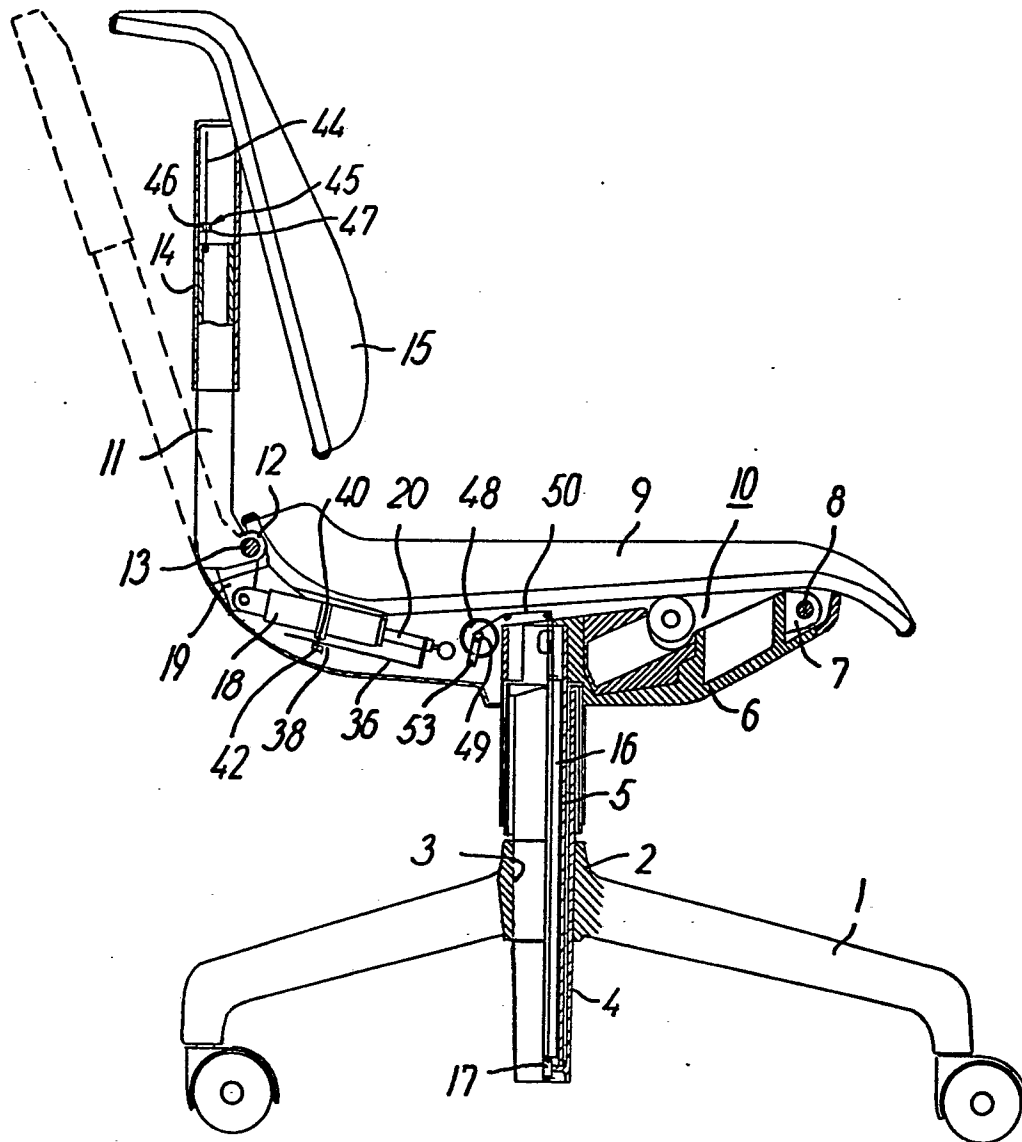
5 5. An office or working chair according to any one of the preceding claims, characterised in that the information carrier is formed as an oblong plane tape (36, 37, 44) and that the information carrier and the reading device (38, 39, 45) are movably synchronized
10 with each respective of said two chair parts in such a manner as to move relative to one another in the longitudinal direction of the tape when subjected to position adjustment.

6. An office or working chair according to claim 5,
15 in which a position regulating member for two chair parts comprises a gas cylinder (18, 21) connected with one part and a piston (20, 22) connected with the other part and axially movable in the cylinder, characterised in that the strip-shaped information carrier (36, 37)
20 is connected with piston (20, 22) and extends parallel to the cylinder axis outside the cylinder (18, 21) while the reading device (38, 39) is secured to the cylinder.

7. An office or working chair according to any of claims 1 to 4, characterised in that the information
25 carrier is designed as a circular disc (48) that is rotatable about an axis stationary in relation to the reading device (53) and is coupled to said one chair part in a manner so as to turn less than 360° through the entire range of variation of the functional adjust-
30 ment concerned.

8. An office or working chair according to claim 2, 3 or 4, characterised in that the indicator (31) is located within a box (30) which is arranged for extension from a normally hidden position beneath the
35 chair seat (9).

FIG. 1



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FIG. 2

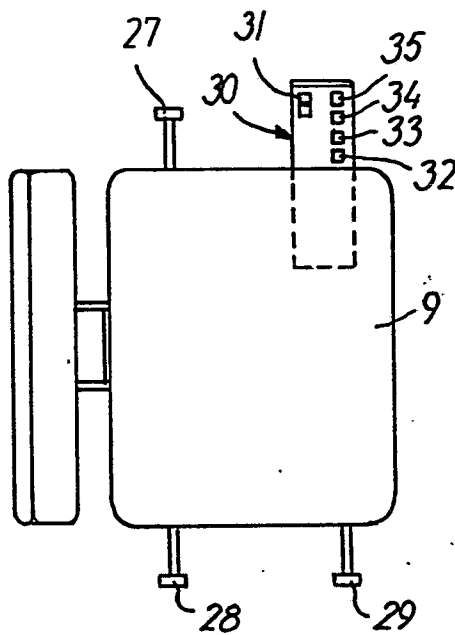
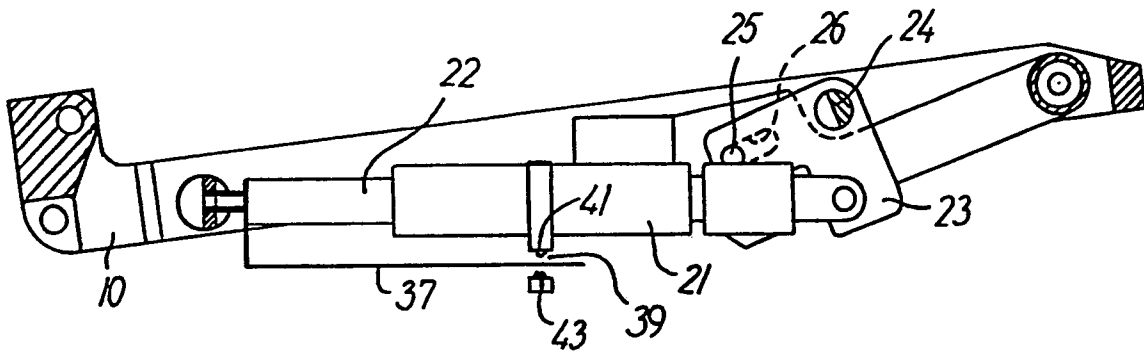


FIG. 3

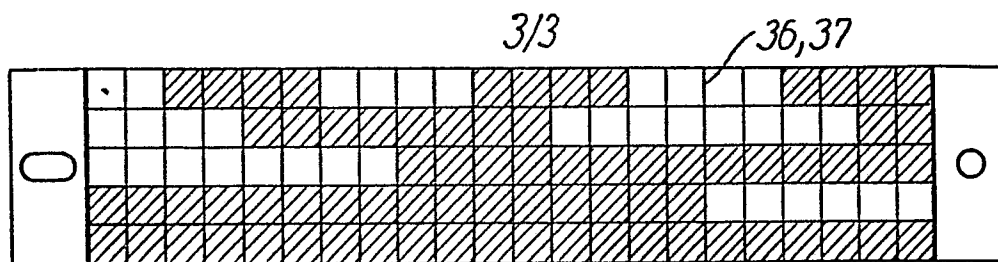


FIG. 4

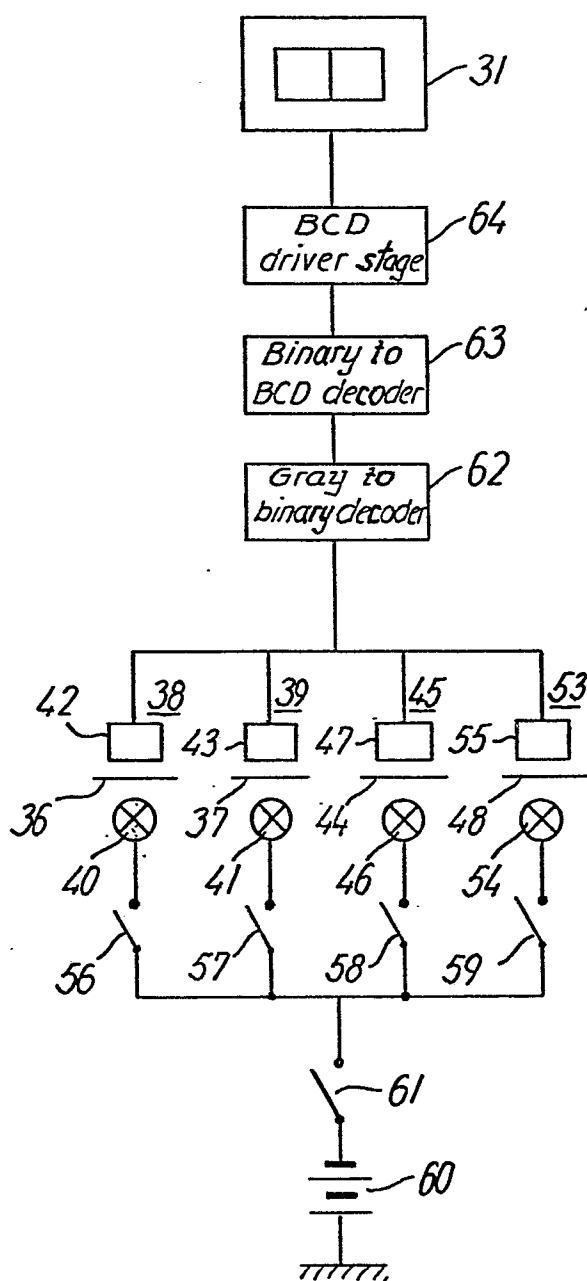


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

0043242

Application number

EP 81 30 2865

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
P	<u>GB - A - 2 051 568 (EVANS)</u> * Abstract; figures *	1	A 47 C 31/12 9/02
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	<u>US - A - 2 932 968 (SCOVILLE)</u> * Claims 1, 15-21, 54-59, 65-69; figure 1 *	1	
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	<u>DE - C - 410 119 (CIECIERSKI)</u> * Page 1, lines 15-38; figures *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
	----		A 47 C
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30-09-1981	Examiner VANDEVONDELE