



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.12.2012 Bulletin 2012/50

(51) Int Cl.:
A47C 3/12 (2006.01) **A47C 1/12 (2006.01)**
A47C 3/04 (2006.01) **A47C 4/04 (2006.01)**

(21) Application number: **12250029.1**

(22) Date of filing: **13.02.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **15.02.2011 GR 2011100086**

(27) Previously filed application:
15.02.2011 GR 2011100086

(54) **Deployable seating system**

(57) An expanding seating system relates to seating for professional use, mainly seating set up at gatherings or events where a large number of seats are required as well as the facility to move and store such seats in another area, and which consists of an expandable assembly of two or more seats in a row, more specifically, the shells (2) of the seats being the back and base of the seats and the frame (1) of the system which includes the legs of the seats (11) and the system's folding mechanism.

The system could be described as a horizontally stacking seating unit which eliminates the need for handlers to lift weights in the form of seats and place them and remove them from the meeting area. Owing to its horizontal deployment and folding, the system is a convenient height for its handler. Because the system consists of more than one seat, the time both for preparing and for clearing the hall is significantly reduced since the need to move seats individually is eliminated. During use, to deploy the expanding seating system according to the invention, the handler opens the geometry of the scissor-like structure (d) and then, one by one, rotates and secures the shells (2) of the seats that make up the system so as to bring about its fully open, fully deployed, configuration (a). The reverse procedure is followed in order to fold the deployed seating system to its full closed, fully folded, configuration (c).

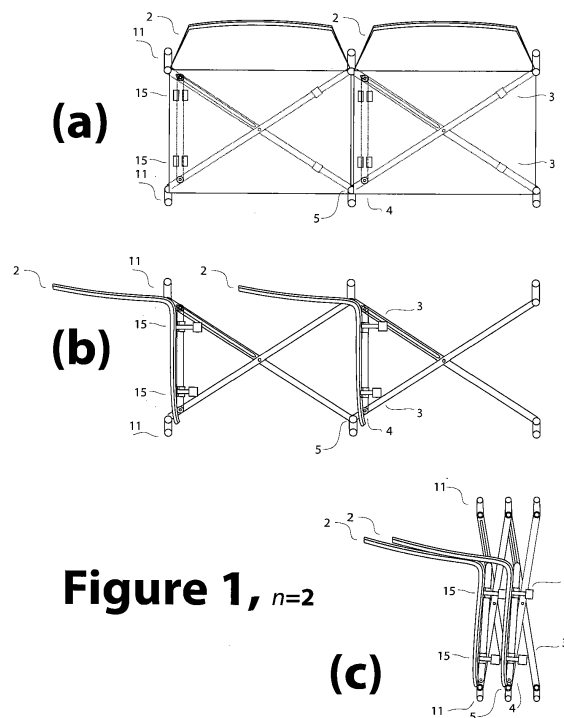


Figure 1, $n=2$

Description

[0001] This invention relates to professional-style seating, more specifically, to seating for use in conference rooms, classrooms or other areas that require a large number of seats as well as the facility to move and store such seating in another area so the room can be used differently or for other events that require free space but do not need seating.

[0002] Conferences and other types of events or mass gatherings require the presence and use of a large number of individual, stackable seats that can be stacked vertically, one on top of the other, or individual, folding seats that can also be stacked vertically, one on top of the other, thereby creating large, tall stacks enabling both efficient storage and the saving of space.

[0003] In both cases, the preparation and clearing of event halls is a particularly arduous and time-consuming process and requires the moving of stacks of seats which are heavy and, on account of their height, hard to balance, and the placing of individual seats, one by one, in the correct position. Due to regulations on upright arrangement, straightening of the seating is often also required, using additional tools such as a plumb line (Kravaritis N K, 1992 Professional Tourism: Conference Organisation in Hotels, Interbooks, Athens, Greece). This causes additional delays.

[0004] In view of the above, this invention aims to create an expanding seating system, arranged in straight lines and stacking horizontally, for use at conference-type events with an emphasis on the rapid and easy installation, removal and transport of the system by its handlers. 'Handler' here describes the person who is responsible for installing, removing and transporting the system to and from the event hall.

[0005] The present invention relates to an expanding seating system consisting of an expandable assembly of two or more seats in line, specifically, to the shell of the seating consisting of the back and base of the seats and the frame of the system that includes the legs of the seats and the system's folding mechanism.

[0006] Operation of the system is based on its folding mechanism, consisting of a single linear, scissor-like structure. Revolving bars are attached to this structure which rotate on it according to its movement, the shells being attached to these bars. The shells have the facility to rotate round the revolving bars. Together, the scissor-like structure can change its geometry from open to closed in such a way as to carry with it the entire assembly and can change from one geometry to the other in a synchronised, smooth, linear movement. The system can be secured (locked) in the two extreme geometries of the scissor-like structure i.e. the open and closed geometry.

[0007] The system may be described as having three configurations. These are the fully open, deployed configuration, during which the scissor-like structure has an open geometry and the shells are turned such that the plane of the base of the seat is parallel to the plane of

the floor and is secured in this position; the fully closed, folded configuration, during which the scissor-like structure has a closed geometry and the shells are turned such that the plane of the base of the seat is perpendicular to the plane of the floor and the intermediate configuration during which the scissor-like structure has an open geometry and the shells are turned such that the plane of the base of the seat is perpendicular to the plane of the floor.

[0008] Care must be taken not to confuse the open geometry of the scissor-like structure with the fully open, fully deployed, configuration of the system.

[0009] When in use, in order to deploy the expanding seating system according to the invention, the handler opens the geometry of the scissor-like structure and then turns and secures, one by one, the shells of the seats that make up the system so as to bring it to its fully open, fully deployed, configuration. The opposite procedure is followed in order to fold the expanding seating system into its fully closed, fully folded, configuration.

[0010] In its fully open, fully expanded, configuration the system forms a completely straight row of seats which can support the weight of those seated. In its fully closed, fully folded, configuration, the system is capable of stacking horizontally or vertically.

[0011] Taken as a whole, the system could be described as total horizontally stacking seating that obviates the need for handlers to lift heavy weights in the form of seats when laying them out and removing them from the conference area. Due to its horizontal deployment and folding, the system remains at a convenient height for its handler. Since the system consists of more than one seat, the time for preparing and for clearing the hall is significantly reduced since the need to move the seats one by one is eliminated.

[0012] According to the invention, a system consisting of no more than ten seats at most is proposed otherwise its weight would exceed forty kg when, as a result, its lifting by a single individual would be considered dangerous on the basis of ergonomic restrictions. Ideally a system consisting of five seats is proposed, a size considered to achieve the optimum balance between utility, ease of use and safety.

[0013] An advantage of this invention is that it comprises a mobile seating system which has the capability of simultaneous and synchronised deployment and positioning in a straight line together with the facility to fold and store more than one seat, in a simple fashion, with few movements, without the need for the handler to lift heavy weights and without the need for complex movements or use of additional tools for in-line positioning. As a result the work required is less taxing and the time needed is reduced.

[0014] The invention is described below with the help of an example and with reference to the attached drawings:

Figure 1 shows a plan view of the deployed seating

system according to the present invention in its three different configurations viz. the fully open, fully deployed, configuration (a), the fully closed, fully folded configuration (c) and the intermediate configuration (b).

Figure 2 shows a plan view of the common scissor-like structure (d) and one of the several scissor-like elements (e) that are used in the present invention also showing the attachment of the revolving bar (4).

Figure 3 shows a side view (f) and the front view (g) of an assembled seat.

Figure 4 gives a perspective view of an end leg and its joint to a straight bar (A) at the nodal point (5). Since this point is an end, the scissor-like element to which the straight bar A (9) belongs is not connected to another scissor-like element. This also shows the support function of the spacer (14).

[0015] A single seat assembly ($n=1$) consists of the shell (2) of the seat and the frame (1) of the seat. The frame (1) is made up of a scissor-like element (e), a revolving bar (4), four legs (11), four spacers (14), two pivoting joints (15) and two snap-fit catches (3).

[0016] To assemble a system of n seats, n shells (2), n scissor-like elements (e), n revolving bars (4), $2n+2$ seat legs, four spacers (14), $2n$ pivoting joints (15) and $2n$ snap-fit catches (3) are required.

[0017] Each scissor-like element (e) consists of two straight bars of different shape. Straight bar B (10) has a round hole at one end, the point of connection (12) which is used to attach the revolving bar (4). Straight bar A (9) has an oblong hole which is also a guide for movement of the revolving bar. All the scissor-like elements in the system are known collectively as the 'scissor-like structure' (d) and can simultaneously open and close, linearly and smoothly.

[0018] It is clear that this linkage provides the capability to assemble not just a single seat but also any number of seats, without restriction. It is however proposed five seats be connected on considerations mainly relating to the weight of the structure. Connection of less than five seats along with the seating units may be useful in cases where extension of the rows in a room's arrangement by less than five seats is required. At the other extreme, use of two systems of five seats rather than one system of ten is proposed.

[0019] Assembly can be easily done by following the steps below:

1. Join straight bars A (9) and B (10) into scissor-like elements.
2. Attach two pivoting joints (15) and two snap-fit catches (3) to each shell (2).
3. Place the ready-assembled shells on the revolving bars (4) in such a way that the revolving bar (4) is

secured within the pivoting joint (15) so that the shell (2) can rotate around the revolving bar (4).

4. Connect the revolving bars (4), together with the shells (2) assembled on them, to the scissor-like elements (e) so that the revolving bar (4) is connected to bar B (10) and can revolve around an imaginary axis at the point of connection (12) and is joined to and can travel in a straight line along the straight bar A (9).

5. Connect the scissor-like elements (e) to the legs (11) of the system's seats.

6. The use of spacers (14) on the end seats (i.e. the first and last seats) of the system is needed in order for the structure to remain straight.

Claims

1. An expanding seating system consisting of n linked deployable seats which include n shells (2) consisting of the base and back of the seat to each of which are attached two snap-fit catches (3), and each of which is connected to a revolving bar (4) the ends of which are connected near the node points (5) of a single straight scissor-like structure (d) which consists of $2n$ straight bars (9), (10) which form n scissor-like elements (e) and of $n+2$ seat legs (11) which connect to it at the nodal points (5) of the scissor-like structure (d) and **characterised by** each shell (2) being able to rotate around its revolving bar (4) and by each end of each revolving bar being connected to a scissor-like element (e) and, in particular, one end of the revolving bar (4) to one end of one of the two straight bars (10) in such a way that it can rotate about an imaginary axis at the point of connection (12) and the other end of the revolving bar with the end of the other straight bar (9) of the scissor-like element, in such a way that it can move linearly along the straight bar (9) in a direction parallel to that of the bar and by the scissor-like structure (d) being able to open and close, making a linear, smooth, movement with simultaneous opening and closing of all the individual scissor-like elements (e) of which it consists.
2. An expanding seating system, according to claim 1, **characterised by** the snap-fit catch connectors (3) being attached to the shells (2) of the seats in the part under the base of the seats in such an arrangement so that they can be secured to the straight bars (9), (10) that make up the scissor elements (e) when the system is in its fully open, fully deployed, configuration (a).
3. An expanding seating system, according to claim 2, **characterised by** the scissor-like structure (d), which it includes, being made up of n scissor-like elements (e) consisting of $2n$ straight bars (9), (10)

and, more specifically, of n straight bars A (9) and n straight bars B (10), which are connected in pairs forming scissor-like elements (e) in such a way that each scissor-like element consists of one straight bar A (9) and one straight bar B (10) and such that the revolving bar (4) is connected and can rotate around an imaginary axis at a point of connection (12) with bar B (10) and is connected to and can move linearly on straight bar A (9).

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4. An expanding seating system, according to claim 3, **characterised by** the straight bar A (9) having a shape such as to allow the linear movement of the revolving bar (4) along its length up to point C (13) and to prevent it moving at point C (13) or beyond, such that when the revolving bar (4) reaches point C (13) its movement is checked and deployment of the entire structure (d) is interrupted and stops.

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5. An expanding seating system, according to claim 4, **characterised by** the system being an assembly of bars (4), (9), (10), legs (11), snap-fit catches (3), spacers (14), pivoting joints (15) and shells (2) and by a single seat having the capability of being assembled from a shell (2) and two snap-fit catches (3) and four spacers (14) and two pivoting joints (15) and four legs (11) and one revolving bar (4) and of two straight bars, i.e. one straight bar A (9) and one straight bar B (10).

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6. An expanding seating system, according to claim 5, **characterised by** the system consisting of an assembly of an indeterminate number of seats, where n seats require the assembly of n shells (2) and $2n$ snap-fit catches (3) and n revolving bars (4) and $2n+2$ seat legs (11) and n straight bars A (9) and n straight bars B (10) and four spacers with the exception of the case where $n=1$ when the combination of elements as described in claim 5 is to be followed.

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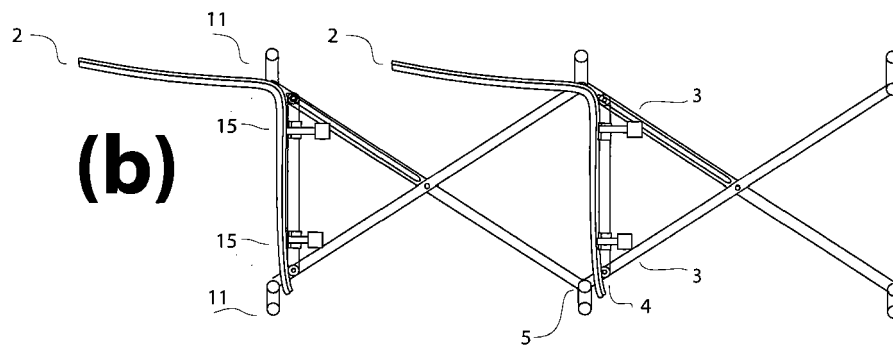
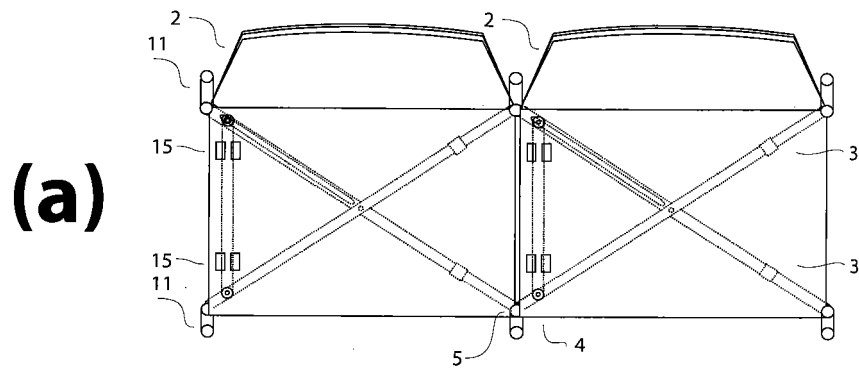
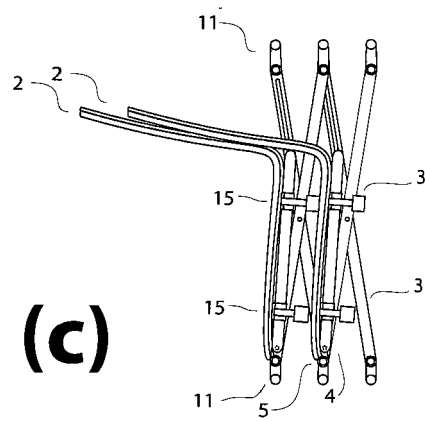


Figure 1, $n=2$



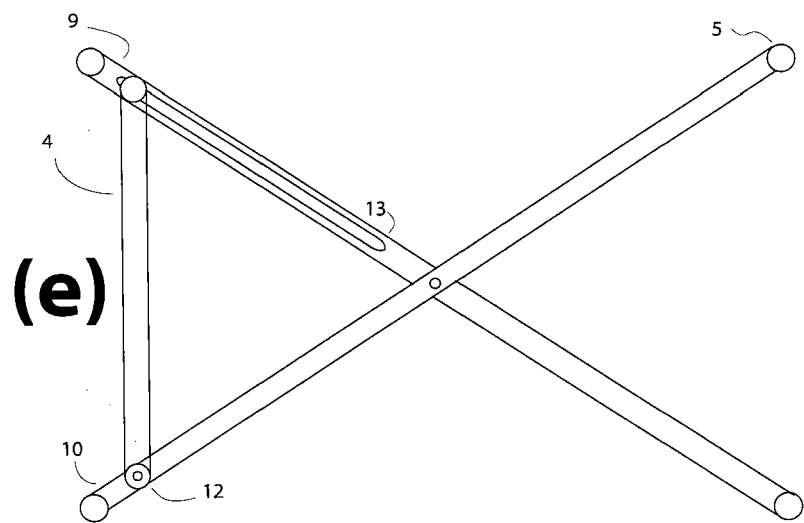
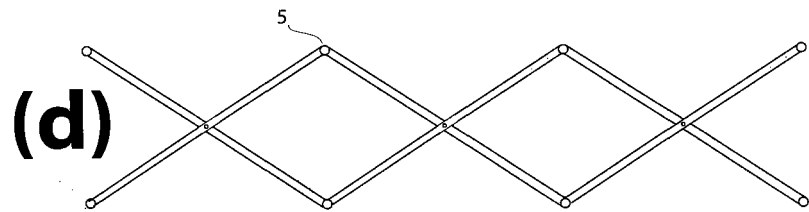


Figure 2

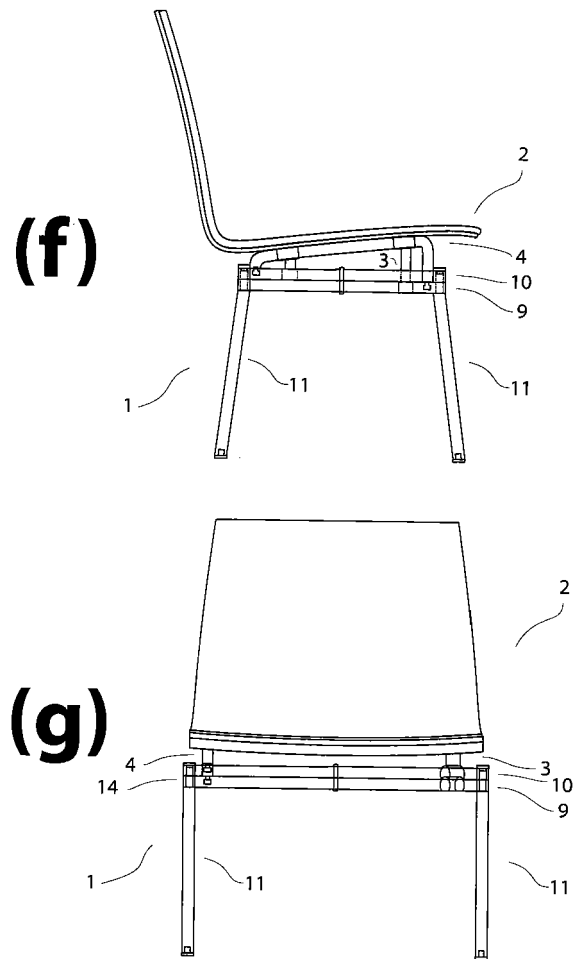
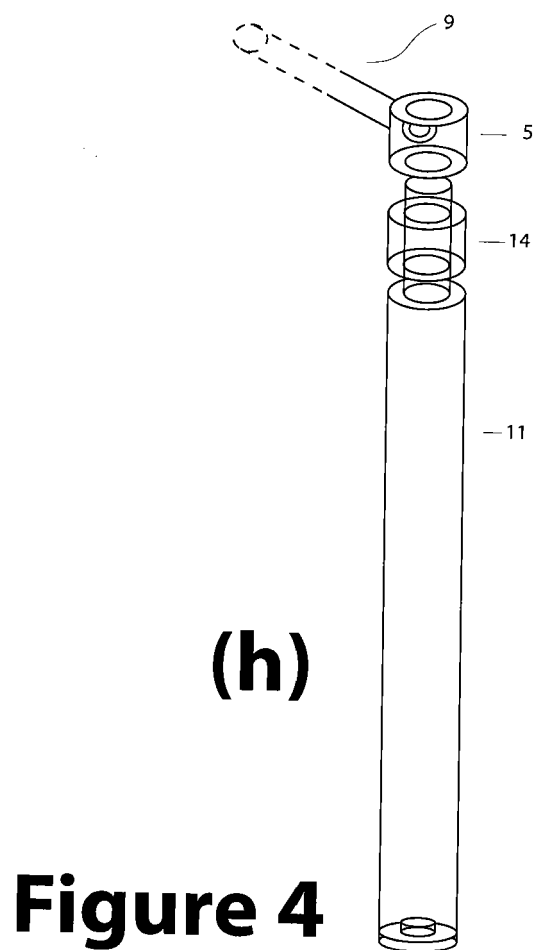


Figure 3





EUROPEAN SEARCH REPORT

Application Number
EP 12 25 0029

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 November 2012	Examiner Kis, Pál
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 25 0029

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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