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### ITEM OF FURNITURE PROVIDED WITH A DEVICE FOR ROTATABLY DEPLOYING A MOVABLE ELEMENT

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#### Abstract

The invention relates to an item of furniture, in particular for an aircraft seat, comprising: a frame, a movable element, a pivot connection for rotating the movable element relative to the frame between a folded position and a deployed position, a locking finger, a cam provided with a locking recess and an elastic member for biasing, when it is under tension, the locking finger inside the locking recess when the movable element is in the folded position, such that pressure on the movable element causes the elastic member to rotate the movable element and release the locking finger from the locking recess to enable the movable element to rotate towards the deployed position in a second direction of rotation.

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**Background/Summary**

[0001] The present invention relates to an item of furniture provided with a device for rotationally deploying a movable element. The invention finds a particularly advantageous, but not exclusive, application with meal tray tables installed on aircraft seat units of the “business class” and “first class” type.

[0002] In a manner known per se, a deployment system of the “push-pull” type permits to facilitate the opening of a movable element of an item of furniture, such as for example a drawer, a furniture door, or a shelf. To this end, the user applies a pressure force to the movable element with the effect of activating an elastic member which moves the movable element away from its closed position. It is then possible for the user to pull the movable element towards its open position.

[0003] However, existing devices are bulky and generally operate according to translational kinematics. There is therefore a need for a deployment system of push-pull type for rotating movable elements.

[0004] The objective of the invention is to effectively meet this need by proposing an item of furniture, in particular for an airplane seat, comprising: [0005] a frame, [0006] a movable element, [0007] a pivot connection between the movable element and the frame for rotating the movable element relative to the frame between a stored position and a deployed position, [0008] said item of furniture further comprising: [0009] a locking finger, [0010] a cam provided with a locking recess, and [0011] an elastic member for biasing, when it is under tension, the locking finger inside the locking recess when the movable element is in the stored position, [0012] such that pressing on the movable element causes the movable element to rotate in a first direction of rotation and release the locking finger from the locking recess by means of the elastic member so that the movable element rotates towards the deployed position in a second direction of rotation, the first direction of rotation and the second direction of rotation being opposite to each other.

[0013] The invention thus permits to integrate a system for deploying a movable element of the “push-pull” type about a pivot connection. The invention is also simple and robust in its implementation because the different functional shapes can be machined on the movable element. The invention also has an aesthetic character, insofar as the push-pull system is not visible to the user from outside the item of furniture.

[0014] According to one embodiment of the invention, said item of furniture comprises a return spring which can be compressed when pressing on the movable element and then decompressed so as to eject the movable element from the frame.

[0015] According to one embodiment of the invention, said item of furniture comprises a spring blade for cooperating with a limit stop when the movable element is in the deployed position.

[0016] According to one embodiment of the invention, the limit stop comprises a projecting portion constituting a hard point and a portion for receiving the spring blade.

[0017] According to one embodiment of the invention, the limit stop has an S shape.

[0018] According to one embodiment of the invention, the movable element integrates the cam and the limit stop, such that the movable element, the cam, and the limit stop form a single piece.

[0019] According to one embodiment of the invention, an angle between the limit stop and the locking recess of the cam is of the order of 270 degrees.

[0020] According to one embodiment of the invention, the cam comprises at least one lateral slope for guiding the locking finger towards the locking recess while compressing the elastic member

when the movable element moves from the deployed position to the stored position.

[0021] According to one embodiment of the invention, the movable element is a tray table.

[0022] The invention also relates to an aircraft seat unit comprising an item of furniture as previously defined.

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## Description

[0023] The invention will be better understood and other characteristics and advantages will appear by reading the following detailed description, which includes embodiments given for illustrative purposes with reference to the accompanying figures, presented as way of non-limiting examples, which may serve to complete the understanding of the present invention and the description of its implementation and eventually contribute to its definition, wherein:

[0024] FIG. 1 is a perspective view of a seating unit having a tray table according to the present invention;

[0025] FIG. 2 is a perspective view of a tray table according to the invention in the stored position;

[0026] FIG. 3 is a perspective view of the internal structure of a frame containing a tray table according to the invention;

[0027] FIG. 4 is a side view illustrating the positioning of the locking finger inside the locking recess of the cam when the tray table is in a stored position;

[0028] FIG. 5 is a top view illustrating the relative positioning of the locking finger with respect to the limit stop of the tray table according to the invention;

[0029] FIG. 6 is a side view illustrating the release of the locking finger from the locking recess of the cam after applying a pushing force to the tray table according to the invention;

[0030] FIG. 7 is a perspective view showing a positioning of the tray table according to the invention after its ejection by the return spring;

[0031] FIG. 8 is a side view illustrating the trajectory of the locking finger when the tray table according to the invention is ejected by means of the return spring;

[0032] FIG. 9 is a perspective view of a tray table according to the invention in the deployed position;

[0033] FIGS. 10a and 10b are detailed perspective views illustrating the positioning of the stop blade respectively before and after the hard point of the limit stop;

[0034] FIG. 11 is a perspective view illustrating a trajectory of the locking finger along a slope of the locking cam as the tray table moves from the deployed position to the stored position so as to tension the elastic member;

[0035] FIG. 12 is a side view illustrating the guidance of the locking finger toward the locking recess of the cam as the tray table moves from the deployed position to the stored position.

[0036] It should be noted that the structural and/or functional elements common to the different embodiments have the same references. Thus, unless otherwise stated, such elements have identical structural, dimensional and material properties.

[0037] Furthermore, in the remainder of the description, the relative terms of the type “lower”, “upper”, “left”, “right”, “horizontal”, “vertical” are understood by reference to the common meaning that a passenger in a seat with which an item of furniture according to the invention is associated would give them.

[0038] FIG. 1 shows a seat unit 10 comprising a seat 12 associated with a side console 13 extending along one side of the seat 12.

[0039] More specifically, the seat 12 comprises a seating pan 12.1 and a backrest 12.2. The seat 12 has an extension axis X1 defined by the intersection between a horizontal plane and a vertical median plane of the seat 12 corresponding to a plane of symmetry of the seat 12. The extension axis X1 of the seat 12 may form a non-zero angle with respect to a direction parallel to or

coincident with a central axis of the aircraft X2. In this case, the seat **12** is turned in the direction of the axis X2. Alternatively, the seat **12** may be turned in a direction opposite to the axis X2 or extend parallel to the axis X2.

[0040] The seat **12** is advantageously provided with kinematics allowing it to be movable between a “seating” position, in which the seat **12** is configured to define a seating position of a passenger, and a “reclined” position, in which the seating pan **12.1** and the backrest **12.2** define a sleeping surface for the passenger, advantageously substantially horizontal. Intermediate comfort positions are also proposed, such as the “relax” position in which a backrest of the seat **12** is strongly inclined.

[0041] A privacy shell **14** extends at least partly around the seat **12** so as to delimit a space around the passenger. The privacy shell **14** is made for example from a composite material. Such a configuration allows to guarantee the privacy of the passenger in the seat **12**.

[0042] A video screen **16** of a multimedia system or IFE (for “Inflight Entertainment System”) can be installed on a rear part of the privacy shell **14** so as to be usable by a rear passenger.

[0043] The console **13** may comprise an upper wall **17** forming a table on which the passenger can place objects as well as a storage space **18** comprising one or more elements from a literature pocket, a bottle holder, or a minibar. The choice of storage equipments is configurable according to the wishes of the airline. The console **13** may also comprise a reading light **19** towards the seat **12**.

[0044] A cavity **21** is located under the upper wall **17**. The cavity **21** is laterally open towards the seat **12**. In addition, a horizontal face **22** of the console **13** has in particular an armrest function. For this purpose, the horizontal face **22** may locally have a curved cuff shape **23** matching the shape of a portion of the passenger's arm.

[0045] The console **13** also includes a control unit **25** for the seat **12** and its additional components (called a “PCU” for “Passenger Control Unit”). The control unit **25** allows the passenger in particular to control the selection of a position of the seat **12** as well as the additional components, such as a video system, a heating device, a lighting ambiance system or any other additional component that can be integrated into the seat **12**.

[0046] In order to allow the passenger to lie down, the console **13** may include a hollow space **27** in a phantom view in FIG. **1** in which an ottoman **28** is arranged. The ottoman **28** includes a horizontal face forming a footrest on which a rear passenger can place her/his feet when the seat **12** is in the “lying” position.

[0047] The seat unit **10** also includes a tray table **26** which can be used by a passenger for placing objects, in particular a meal tray, drinks, a computer, or any type of personal objects which the passenger would like to have available during her/his trip.

[0048] As can be seen in FIG. **2**, the tray table **26** belongs to an item of furniture **30** comprising a frame **31** delimiting a housing **33**. As shown in FIG. **3**, a pivot connection **34** of axis X3 is arranged between the tray table **26** and the frame **31**. The pivot connection **34** allows to rotate the tray table **26** relative to the frame **31** between a stored position in which the tray table **26** is inside the housing **33** in the frame **31** and a deployed position in which the tray table **26** is outside the housing **33** in the frame **31**, as shown in FIG. **9**.

[0049] The tray table **26** extends in a horizontal plane. The tray table **26** includes a handle **36** projecting from the body of the tray table **26**. As it is explained below, this handle **36** can be grasped by the passenger after the ejection of the tray table **26** in order to move the tray table **26** to the deployed position.

[0050] Furthermore, as it is illustrated in particular in FIGS. **3**, **5**, and **6**, a fixed arm **37** relative to the frame **31** carries a locking finger **38**. The locking finger **38** is constituted by a stud projecting from one end of the arm **37**. The locking finger **38** extends in a horizontal longitudinal direction of elongation. The arm **37** comprises at least one portion constituted by an elastic member **40**. The elastic member **40** may for example be constituted by one or more flexible metal blades above one another.

[0051] A cam **43**, clearly visible in FIG. **4**, is provided with a locking recess **44** for receiving the locking finger **38** when the tray table **26** is in the stored position. As a matter of fact, as it is explained in more detail below, the elastic member **40**, when it is under tension, biases the locking finger **38** into the locking recess **44** when the locking tray table **26** is in the stored position. The locking recess **44** has a shape complementary to that of the locking finger **38**. In a side view, the locking recess **44** has, for example, an arc-shaped form. Any other shape of the locking recess **44** adapted to the shape of the locking finger **38** is conceivable.

[0052] The cam **43** has a rounded tip **47** at one end. The locking recess **44** is located on the opposite side relative to the rounded tip **47**.

[0053] The cam **43** further comprises an upper lateral slope **48** and a lower lateral slope **49**. Each lateral slope **48**, **49** extends between the rounded tip **47** and the locking recess **44**. The two lateral slopes **48**, **49** form a non-zero angle with respect to each other.

[0054] The upper lateral slope **48** aims to guide the locking finger **38** towards the locking recess **44** while tensioning the elastic member **40** when the tray table **26** passes from the deployed position to the stored position.

[0055] The cam **43** may be associated with a guiding stop **45**. The guiding stop **45** aims to ensure that the locking finger **38** engages into the locking recess **44** during a vertical movement of the locking finger **38**. The guiding stop **45** laterally guides the locking finger **38** towards the locking recess **44** during this vertical movement. The guiding stop **45** may have a beveled face facilitating the guiding of the locking finger **38** towards the locking recess **44**.

[0056] Furthermore, as it can be seen in FIGS. **5**, **10a** and **10b**, a spring blade **50** aims to cooperate with a limit stop **51** when the tray table **26** is in the deployed position. The spring blade **50** is fixed relative to the frame **31**. The spring blade **50** preferably has a U shape. The limit stop **51** is mechanically connected to the tray table **26**.

[0057] More specifically, the limit stop **51** comprises a projecting portion **53** constituting a hard point and a receiving portion **54** of the spring blade **50**. The receiving portion **54** has a shape complementary to that of the spring blade **50**. The hard point **53** corresponds to a zone which is close to the deployed position of the tray table **26** and in which the deployment of the tray table **26** will require more effort from the passenger than in the remainder of the deployment travel from the stored position to the deployed position. For this purpose, the projecting portion **53** of the limit stop **51** is configured to cause a deformation of the spring blade **50** before the latter slides into the receiving portion **54**. The limit stop **51** has an S shape, a curved portion of the S forming the hard point **53** and a hollow portion of the S forming the receiving portion **54** of the spring blade **50**.

[0058] Advantageously, the tray table **26** integrates the cam **43** and the limit stop **51**, so that the tray table **26**, the cam **43**, and the limit stop **51** form a single piece. The cam **43** and the limit stop **51** may be molded with the tray table **26**. The tray table **26** may be made for example from a plastic material or a composite material.

[0059] As it can be seen in FIG. **5**, an angle **A1** between the limit stop **51** and the locking recess **44** of the cam **43** corresponds to the deployment angle of the tray table **26**. The angle **A1** is measured in the second direction of rotation **R2**. The angle **A1** is measured in a top view in a counterclockwise direction from the locking recess **44**. In this case, the angle **A1** is of the order of 270 degrees. By “of the order of” it is meant a possible variation of plus or minus 10% relative to the indicated value. Alternatively, this angle **A1** is of the order of 90 degrees, 180 degrees, or any other angle suitable for the application to allow deployment of the tray table **26**. Preferably, the limit stop **51** and the locking finger **38** are located along the same circumference relative to the axis **X3** of the pivot connection **34**.

[0060] A return spring **56** visible in FIGS. **3**, **7**, and **9**, is fixed to the frame **31**. The return spring **56** can be compressed when pressing on the tray table **26** and then decompressed to eject the tray table **26** from the frame **31**. The return spring **56** has the shape of a curved blade.

[0061] The operation of the “push-pull” system for moving the tray table **26** from the stored

position to the deployed position is described below.

[0062] When the tray table **26** is in the stored position inside the housing **33** in the frame **31**, the elastic member **40** under tension biases the locking finger **38** into the locking recess **44** (cf. FIG. 4). The spring blade **50** is in the free state, that is to say it is disengaged from the limit stop **51**, as shown in FIG. 3.

[0063] In order to move the tray table **26** into the deployed position, the user presses on the tray table **26**, which causes the tray table **26** to rotate inside the frame **31** in a first direction of rotation **R1** about the axis **X3**. In order to allow this rotation, the frame **31** may include a clearance **57** (see FIG. 3) in which the handle **36** moves when a force is applied thereon along the arrow **F1** towards the internal housing **33** in the frame **31**.

[0064] The locking finger **38** is then released from the locking recess **44** by means of the elastic member **40** which exerts along the arrow **F2** a downward force from the locking recess **44**, as shown in FIG. 6. The return spring **56** is also compressed and applies a force towards the outside of the housing **33** in the frame **31**.

[0065] When the user releases the force applied to the tray table **26**, said tray table is ejected towards the outside of the housing **33** due to the decompression of the return spring **56**, as shown in FIG. 7. During its ejection, the tray table **26** rotates about the axis of the pivot connection **34** in a second direction of rotation **R2** opposite to the first direction of rotation **R1**. The locking finger **38** moves along the lower lateral slope **49** of the cam **43** along the trajectory of the arrow **F3** shown in FIG. 8.

[0066] By pulling on the handle **36**, the user can then continue the rotation of the tray table **26** to the deployed position in the second direction of rotation **R2**. The user can thus manually pivot the tray table **26** to the hard point **53**. The spring blade **50** deforms at the hard point **53**, as shown in FIG. 10a, then slides on the limit stop **51** until it cooperates with the receiving portion **54** of the limit stop **51**, as shown in FIG. 10b. The tray table **26** is then in the deployed position as shown in FIG. 9.

[0067] In order to return the tray table **26** to the stored position, the user pulls on the handle **36** so as to deform the spring blade **50** so as to make it come out of the receiving portion **54** and pass the hard point **53**. The user can then manually pivot the tray table **26** into the housing **33** in the first direction of rotation **R1**.

[0068] As it is illustrated in FIG. 11, the locking finger **38** then comes into contact with the cam **43** at the rounded tip **47**. The locking finger **38** then rises along the upper lateral slope **48** of the cam **43** (see arrow **F4**), which has the effect of bending and therefore putting the elastic member **40** under tension. Under the action of the elastic member **40** under tension, the locking finger **38** undergoes a vertical force downwards in the direction of the locking recess **44**. When the locking finger **38** comes into contact with the guiding stop **45**, the latter laterally guides the locking finger **38** so that said locking finger **38** is inserted into the locking recess **44**, as shown in FIG. 12.

[0069] The tray table **26** is then in the stored position. The return spring **56** is slightly compressed.

[0070] The invention has been described for a tray table **26** of an airplane seat. However, the previously described device for deploying the tray table **26** comprising the assembly “locking finger **38**-cam **43**-elastic member **40**” can be integrated without difficulty in any item of furniture comprising a rotating movable element, such as for example a furniture door or a rotating movable shelf.

[0071] Of course, the different characteristics, variants and/or embodiments of the present invention may be associated with each other in various combinations insofar as they are not incompatible with or exclusive of one another.

[0072] Furthermore, the invention is not limited to the embodiments described above and provided solely by way of example. It encompasses various modifications, alternative forms and other variants which a person skilled in the art may envisage in the context of the present invention and

in particular any combination of the various operating modes described above may be taken separately or in combination.

## Claims

1. An item of furniture for an airplane seat comprising: a frame; a movable element; and a pivot connection between the movable element and the frame for rotating the movable element relative to the frame between a stored position and a deployed position, wherein the item of furniture-further comprises: a fixed arm relative to the frame, said arm carrying a locking finger; a cam provided with a locking recess; and said arm comprising at least one portion constituted by an elastic member biasing, when it is under tension, the locking finger into the locking recess when the movable element is in the stored position, such that pressing the movable element causes the movable element to rotate in a first direction of rotation and release the locking finger from the locking recess by means of the elastic member so as to allow a rotation of the movable element towards the deployed position in a second direction of rotation, the first direction of rotation and the second direction of rotation being opposite to each other.
  2. The item of furniture according to claim 1, further comprising a return spring which can be compressed when pressing on the movable element and then decompressed so as to eject the movable element from the frame.
  3. The item of furniture according to claim 1, further comprising a spring blade for cooperating with a limit stop when the movable element is in the deployed position.
  4. The item of furniture according to claim 3, wherein the limit stop comprises a projecting portion constituting a hard point and a receiving portion of the spring blade.
  5. The item of furniture according to claim 4, wherein the limit stop has an S shape.
  6. The item of furniture according to claim 4, wherein the movable element integrates the cam and the limit stop, so that the movable element, the cam, and the limit stop form a single piece.
  7. The item of furniture according to claim 3, wherein an angle between the limit stop and the locking recess of the cam is of the order of 270 degrees.
  8. The item of furniture according to claim 1, wherein the cam comprises at least one lateral slope for guiding the locking finger towards the locking recess while compressing the elastic member when the movable element passes from the deployed position to the stored position.
  9. The item of furniture according to claim 1, wherein the movable element is a tray table.
  10. An aircraft seat unit comprising an item of furniture defined according to claim 1.
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