

Panel for closing a shelf compartment

Technical field

The invention relates to a panel for closing shelf compartments, which can be mounted quickly
5 and without tools by means of magnets, is easy to pivot and can be arranged as desired on a
shelf compartment and/or can be displaced along a shelf compartment. The present invention
furthermore also relates to a shelf with at least one such panel and a holder for a magnet, which
is preferably used in such a panel.

Prior art

10 In the prior art, different shelves and shelf systems are known, which consist of different
materials, in particular of wood, composite materials or metal. In order to close individual shelf
compartments, for example in order to protect objects, such as books, documents, etc.,
arranged in the shelf compartments from sight or dust, shelves can include openable doors or
panels. Such doors or panels are usually connected by means of hinges to transverse struts
15 and/or to side surfaces of the shelf compartments. In this case, the hinges are generally fastened
to the transverse struts and/or side surfaces by means of screws.

For shelves and shelf systems which are constructed from magnetic or magnetizable metallic
materials hinges which allow a panel or a door to be opened or pivoted by means of a magnet
arrangement are also known in the prior art.

20 For example, U.S. Pat. No. 8,196,260 B2 (P. Danko) discloses a magnetic hinge, for example for
covers of shelves, boxes or other coverable cavities. The hinge comprises a frame and a cover
which are connected to one another in the region of an edge. The cover can be pivoted relative
to the frame without a structural connection between the cover and the frame. For this purpose,

the frame has a first magnet and the cover has a second magnet which are arranged adjacent to one another and attract one another. The magnets can be integrated in the frame or in the cover.

5 CN 214 386 688 U (Quian Yuanyuan) describes a book shelf in which books can be protected from dust. For this purpose, the book shelf has a dust protection element which includes a base area of the same size as the shelf compartments and which can be attached by means of a magnetic tape at a first side edge to a magnetic tape fastened to the shelf compartments. At a second side edge which lies opposite the first side edge, the dust protection element is pivotably connected to a shelf compartment by means of a rod. The dust protection element is preferably
10 manufactured from a transparent material.

JP 3219925 U discloses a shelf compartment which can be closed with a cover, wherein the cover is fastened to the shelf compartment by means of magnets. The shelf compartment has a magnet or magnetizable element in the region of its opening, wherein the cover likewise has a magnetizable element or a magnet, so that the cover can be held on the opening of the shelf
15 compartment by means of magnetic force. Furthermore, the shelf compartment includes concave or convex elements on a front side thereof, which interact with counter elements of the cover in the sense of a form fit in order to align the latter relative to the shelf compartment and to prevent its displacement.

U.S. Pat. No. 10,330,134 B2 (P. J. Danko) discloses panels which are connected to one another
20 at their edges by means of a magnetic connection. The magnets are arranged along side edges of the panels and align their polarity in accordance with the polarity of the magnets of an adjacent panel. For this purpose, the magnets are arranged rotatably about an axis which lies parallel to the side edge of the panel. As a result, a magnetic hinge is formed between the panels. Such magnetic hinges can also be used in systems with frames, doors and panels which are in
25 each case releasably connected to one another by means of a magnetic hinge. The magnets are preferably incorporated into the side edges during the production of the panels or are adhesively bonded thereto. The magnets are preferably neodymium magnets which are of cylindrical configuration. The magnets can be held within tubular elements. The magnetic hinges can also be used for shelf doors. In the case of doors, a magnet pair can comprise rectangular

magnets which are not rotatable, so that an automatic door closing can be achieved with this magnet pair.

JP 3822062 B2 (M. Nagaoka) describes a magnetic connection structure. This magnetic connection structure allows a connection between parts at any desired angles, wherein this connection structure is preferably used in toys, teaching materials or rehabilitation tools. The magnetic connection is preferably arranged in a frame of non-magnetic material, wherein the axis of the magnets of the connection structure lies along a side edge of the frame. The magnetic connection comprises a cylindrical magnet with a radial magnetization, which is mounted rotatably along its longitudinal axis. As a result, magnets in two frames to be connected to one another can always automatically align their polarity with respect to one another. The magnetic connection structure comprises a holder with a receptacle, in which the magnet is rotatably arranged. In one embodiment, the magnetic connection structure can be used as a hinge, for example in the case of a lid of a box.

Summary of the invention

The object of the invention is to provide a panel for closing a shelf compartment, which can be mounted quickly and without tools, is easy to pivot and can be arranged as desired on a shelf compartment and/or can be displaced along a shelf compartment.

The solution of the problem is defined by the features of claim 1. According to the invention, the panel comprises a rectangular main body and at least two magnets. At least one of these magnets is arranged on a first side edge of the main body and at least one further of these magnets is arranged on a second side edge of the main body which lies opposite the first side edge. The magnets are rod magnets with a diametrical magnetization direction, which are each arranged in a holder in such a way that the magnets lie centrally relative to the thickness of the main body and are mounted rotatably along their longitudinal axis within a cavity of the holder. The longitudinal axis of the magnets lies parallel to a direction of extent of the first side edge or of the second side edge. The holders comprise an outer surface which runs parallel to the respective side edge. The holders are configured in such a way that a shell surface of the magnet located in the cavity has a distance of 0.5 to 2 mm from the outer surface.

The rotatability of the magnets about their longitudinal axis and their diametrical magnetization ensures that, when the panel is attached to a shelf compartment which is framed by magnetizable or magnetic struts, is delimited by magnetizable or magnetic surface elements and/or comprises magnetic or magnetizable contact elements on the end face, the magnets
 5 always rotate about their longitudinal axis in such a way that a magnetic attraction force arises between the magnets and the struts, side surfaces and/or contact elements, i.e. that the magnets automatically align in such a way that the pole opposite the magnetization of the strut, the surface element and/or the contact element points towards the strut, the surface element and/or the contact element. The arrangement of the magnets at the defined distance from the
 10 outer surface of the holders ensures that the magnetic attraction is high enough to hold the panel securely on the shelf compartment, but the magnets can nevertheless be easily detached manually from the shelf compartment, for example in order to detach the first and/or second side edge from a strut, a surface element and/or a contact element.

The provision of at least one magnet on the mutually opposite side edges ensures that the shelf
 15 compartment can be closed well by the panel and the latter lies flush in the opening of the shelf compartment.

The rotatability of the magnets also allows the panel to be detached from the shelf compartment on one side at a side edge and to be pivoted about the at least one magnet of the opposite side edge, for example in order to gain access to the shelf compartment.

20 The panel is rectangular, i.e. it comprises four side edges, wherein each side edge is connected at its ends to a further side edge at a right angle. The four side edges can all have the same length, so that the panel has the shape of a square, but preferably the panel comprises two longer side edges opposite each other and two shorter side edges opposite each other. The base body further comprises two parallel side surfaces which extend between the four side edges. A
 25 distance between the two parallel side surfaces of the base body corresponds to the thickness of the base body. The thickness of the base body is preferably from 15 mm to 30 mm, particularly preferably 20 mm.

A shelf compartment in the sense of the present application comprises at least one lower surface element, which represents a shelf bottom, and an upper surface element, which is arranged at

a defined distance from the lower surface element and which represents a shelf ceiling. In order to keep the lower surface element and the upper surface element at a defined distance from one another, either struts extending between the surface elements at all four corners thereof, or lateral surface elements which extend between the surface elements at two opposite side edges thereof are provided. A person skilled in the art understands that the struts or the lateral surface elements can have a greater length than the defined distance at which the lower and upper surface elements are spaced apart from one another, for example in order to fasten more than two surface elements one above the other, so that a plurality of shelf compartments can be arranged one above the other. In this case, the individual surface elements, which each form a shelf bottom and/or a shelf ceiling, are fastened to the struts or the lateral surface elements by means of suitable holders, such as shelf bottom holders, for example. Alternatively, it is also possible to provide transverse struts which are arranged at least at the end face, that is to say on the side from which the shelf compartment is accessible, in front of the surface elements which each form a shelf bottom and/or a shelf ceiling. In this case, it is possible to fasten the surface elements to these transverse struts. In this case, the struts arranged at the end face frame the shelf compartment. The shelf compartment can furthermore comprise a further surface element as a rear wall on the rear side, i.e. the side opposite the end face.

The length of the side edges is preferably selected such that the panel can be attached to shelf compartments having specific dimensions, for example to shelf compartments of a specific shelf system, in particular of a modular shelf system. In the case of modular shelf systems, struts and/or surface elements of different dimensions can usually be flexibly combined, so that shelves with shelf compartments having different lengths, heights and depths can be formed. Accordingly, for such a modular shelf system, panels having different edge lengths can be made available in a manner matching the sizes of the shelf compartments which can be formed with this shelf system.

A prerequisite for fastening a panel according to the invention to a shelf is that magnetic or magnetizable contact elements are arranged at the end face on the shelf compartment. The contact elements comprise, for example, of a ferromagnetic or paramagnetic material, such as steel or an alloy, and can be attached at the end face to struts and/or surface elements of the shelf compartment or can be arranged within struts or surface elements thereof. Preferably,

however, the shelf compartment is framed at the end face by magnetic or magnetizable struts, that is to say that the opening is delimited circumferentially by magnetic or magnetizable struts. These struts preferably comprise a ferromagnetic or paramagnetic material, in particular a metal, such as, for example, steel or an alloy. The struts can have any desired cross section, but
 5 are preferably present in the form of tubes. Such tubular struts can be connected to one another in a modular manner via node elements, for example in the form of cubes or spheres. Surface elements for forming shelf bottoms or shelf walls can be fastened to the node elements and/or to the struts. A suitable furniture system is, for example, the USM—Haller system from the applicant. Alternatively or additionally, however, the shelf compartment can also be formed
 10 from magnetic or magnetizable surface elements or comprise such surface elements which are produced, for example, from a ferromagnetic or paramagnetic material, such as steel or an alloy.

The magnets are rod magnets and are accordingly of cylindrical configuration. They have a diametrical magnetization, i.e. the polarization of the magnets runs along the longitudinal axis of the magnets. The magnets preferably have a length of 20 mm with a diameter of preferably
 15 10 mm. Depending on the application, however, magnets having other dimensions can also be used. All magnets of the panel preferably have the same dimensions and physical properties. In individual cases, however, the magnets can also have different dimensions and physical properties, for example if the number of magnets at the first side edge is different from the number of magnets at the second side edge.

20 The panel preferably comprises neodymium magnets, in particular magnets composed of NdFeB. The magnets preferably have a grade of N45.

The holders include a cavity in which one magnet is mounted rotatably along its longitudinal axis. It can thus be ensured that the magnets can always rotate into a position which gives rise to a maximum attraction force on a strut, a surface element or a contact element of the shelf
 25 compartment which is composed of magnetic or magnetizable material. The holders particularly enable a free rotation of the magnets about their longitudinal axis within the cavity. In this case, the longitudinal axis of the magnets corresponds to the longitudinal center axis of the cylindrical magnets. The holders are further configured in such a way that the longitudinal axis of the magnets lies parallel to a direction of extent of the first or second side edge.

The holders are further configured in such a way that the magnets are held centrally relative to the thickness of the main body. This means that the longitudinal axis of the magnets lies in a plane which is parallel to the side surfaces of the main body and lies centrally between these side surfaces.

- 5 The outer surface of the holders runs parallel to the side edge and accordingly lies at a right angle to the two side surfaces of the main body. The outer surface preferably has a shape which is complementary to the shape of the struts, side surfaces or contact elements with which a magnetic connection is intended to be made. The outer surface is preferably of planar configuration. If the panel is intended to be fastened to struts which frame the shelf
10 compartment, the outer surface can, however, also comprise a concave groove or a convex projection — depending on the shape of the struts.

- The distance of 0.5 mm to 2.0 mm corresponds to the minimum distance between the outer surface and that region of the shell surface of the magnet which lies closest to it. A person skilled in the art understands that, owing to the cylindrical configuration of the magnet and at most the
15 shape of the outer surface, there are also regions on the shell surface of the magnet which have a greater distance from the outer surface.

In order to be able to pivot the panel easily about the first or second side edge or to be able to displace it along the shelf compartment, the panel preferably comprises at least one grip element. The at least one grip element can be a knob, a fabric flap, a cord or a loop.

- 20 The magnets preferably have a remanence of 1.32 to 1.37 Tesla. The coercive field strength bH_c of the magnets is preferably from 860 to 995 kA/m. The coercive field strength iH_c of the magnets is further preferably more than 955 kA/m.

- Preferably, at least two magnets are arranged on the first side edge, wherein the outermost of the at least two magnets of the first side edge are arranged at a distance of 1.2 to 3.8 times the
25 diameter of the respective magnet from a corner of the main body, preferably at a distance of 12 mm to 38 mm.

This means that the two outermost magnets of the at least two magnets of the first side edge are spaced apart from the two ends of the first side edge at a distance of 1.2 to 3.8 times the diameter of the respective magnet.

- 5 Preferably, the second side edge also comprises at least two magnets, wherein the outermost of the at least two magnets of the second side edge are arranged at a distance of 1.2 to 3.8 times the diameter of the respective magnet from a corner of the main body, preferably at a distance of 12 mm to 38 mm.

This ensures that the panel is always aligned parallel to the shelf compartment even when pivoted about the first side edge or about the second side edge.

- 10 The first side edge and the second side edge particularly preferably each comprise two magnets.

Preferably, the cavity of each holder is delimited in the direction of the longitudinal axis of the respective magnet by two end faces which are connected to one another on one side by means of the outer surface, wherein the magnet is held in the cavity between the end faces rotatably about its longitudinal axis.

- 15 The outer surface preferably lies on an elongate connecting web which connects the two end faces to one another. The movement of the magnet in the direction of the longitudinal edge is preferably delimited by an inner surface of the holder opposite the outer surface. The inner surface is preferably arranged on the side of the connecting web opposite the outer surface. In this case, the inner surface preferably comprises a concave, circular segment-shaped groove
20 which runs in the direction of extent of the longitudinal edge and has a radius which corresponds to the radius of the shell surface of the respective magnet or is slightly larger, preferably 0.1 mm to 0.5 mm larger than the radius of the shell surface of the respective magnet.

- To limit the movement of the magnet away from the side edge, the two end faces preferably each comprise a projection which projects into the cavity. The projection lies at a distance from
25 the inner surface. This distance is preferably the same size, but further preferably larger than the diameter of the respective magnet, so that the magnet can easily move toward the side edge and away from it again. As a result, the friction between the magnet and the holder can be

reduced, since it lies either on the inner surface or on the projections, so that it can rotate freely within the cavity more easily.

The distance between the two end faces of each holder is preferably also larger than the length of the respective magnet, as a result of which the magnet can easily move along the direction of
 5 extent of the respective side edge. This additionally reduces the friction between the magnet and the holder. The distance between the end faces is preferably 0.5 mm to 1 mm larger than the length of the respective magnet.

The main body preferably comprises two rectangular partial bodies which lie flat on one another and which are connected to one another at least via their side edges.

10 The two partial bodies can be manufactured from the same material or also from different materials. This has the advantage that the panel can have different optical and/or haptic properties on its side accessible from outside the shelf compartment, depending on which partial body is directed towards the interior of a shelf compartment when the panel is attached to the latter. Partial bodies of different colors can also be joined together to form a main body,
 15 such that the color of the main body which is visible from outside the shelf compartment can be varied depending on how the panel is attached to the shelf compartment.

The two-part configuration of the main body also allows the production of the panel to be simplified, since firstly the holders with the magnets can be fastened to one of the partial bodies in order to obtain an intermediate product, and subsequently the second partial body can be
 20 laid flat on this intermediate product and connected thereto.

The partial bodies can be connected to one another by adhesive bonding, welding, sewing or by means of connecting elements, depending on which material the two partial bodies comprise.

In addition to the connection along the side edges of the two partial bodies, the partial bodies can also be connected to one another via their surfaces directed towards one another, for
 25 example by means of an adhesive.

The two rectangular partial bodies preferably each comprise at least one recess on the first side edge and at least one recess on the second side edge, wherein the recesses of the two partial

bodies in the connected state of the two partial bodies each form at least one receiving opening at least for the outer surface of the holder of the at least one magnet of the first side edge and the second side edge.

As a result, the simplest and most reliable possible production of the panel is made possible.

- 5 The receiving openings are preferably dimensioned and shaped in such a way that at least the outer surface of the holder of the at least one magnet of the respective side edge is inserted therein. As a result, the outer surfaces of the holders can preferably be arranged flush with the respective outer edge or alternatively each project slightly beyond the respective outer edge, in particular by 0.1 mm to 1 mm. A groove preferably extends over a defined distance on both
10 sides of each recess in the direction of extent of the respective side edge. As a result, in the connected state of the two partial bodies, a receiving space is formed on both sides of each receiving opening, in which receiving space further parts of the respective holder can be arranged, for example in order to fasten the respective holder securely within the respective receiving opening.
- 15 In a further preferred embodiment, the two rectangular partial bodies preferably comprise a continuous groove, in particular a semicircular groove, on their surface directed towards the respective other partial body at least in the region of the first and the second side edge.

- A groove which extends over the entire length of the first or second side edge is understood as a continuous groove. The grooves of the partial bodies joined together to form the main body
20 each form a channel along the first and the second side edge, in which channel the holders of the magnets of the respective side edge are inserted.

- If the two rectangular partial bodies only comprise grooves and no recess, the two rectangular partial bodies preferably comprise at least one notch on the first and the second side edge. In the connected state of the two partial bodies, the notches each form at least one opening on
25 the first and second side edge, in which opening in each case the outer surface of the holder of the at least one magnet of the respective side edge is arranged, such that the outer surfaces lie flush with the respective outer edge or project slightly beyond the respective outer edge, in particular by 0.1 mm to 1 mm.

The holders preferably each comprise a holding body on both sides of the cavity in the direction of the longitudinal axis of the magnet arranged in the cavity, wherein the holding bodies are inserted flush into the groove or the recess of the partial bodies.

5 A particularly reliable fastening of the holders in the main body can be ensured by the provision of the holding bodies.

The holding bodies are preferably shaped and dimensioned in such a way that they are inserted flush into the groove or into the recess. By the provision of such holding bodies, the holders can be held securely in the panel without the holders additionally being fastened to the two rectangular partial bodies, for example by adhesive bonding.

10 The holding bodies preferably have a cylindrical shape. Alternatively, however, the holding bodies can also have a different shape which is complementary to the shape of the groove or recess, for example that of a cuboid or polygon.

The main body preferably comprises a felt or nonwoven material. By using these materials, the weight of the panel can be kept small. If the main body comprises two rectangular partial bodies,
15 the two rectangular partial bodies preferably comprise a felt or nonwoven material.

Alternatively, however, the main body can also comprise other materials, for example at least one polymer material, wood, wood veneer, metal sheet, woven fabric, interwaved yarns, knitted fabric, leather, composite material and/or a combination thereof.

The panel preferably has a weight of 500 g to 1500 g. By the provision of a weight in this region,
20 secure fastening of the panel to a shelf compartment by means of the magnets can be ensured. In addition, panels with this weight can be easily pivoted about the first or second side edge by a user without excessive force being required for this purpose.

The main body preferably comprises two longer and two shorter side edges, wherein the magnets are arranged on the two longer side edges of the rectangular main body. The longer
25 side edges preferably have a length of 250 mm, 350 mm, 395 mm, 500 mm or 750 mm.

The main body preferably also comprises shorter side edges with a length of 100 mm, 175 mm, 250 mm, 350 mm, 395 mm or 500 mm.

The holders are preferably manufactured from a polymer material. As a result, the holders can be produced easily, for example by means of injection molding or a 3D printing method.

- 5 A thermoplastic polymer is preferably used as polymer material, either as homopolymer or as copolymer. Suitable polymer materials are, for example, a polyoxymethylene (POM), an acrylonitrile-butadiene-styrene copolymer (ABS), a polyethylene terephthalate (PET), a polyethylene (PE), a polyvinyl chloride (PVC) or mixtures thereof.

- 10 Alternatively, the holders can also comprise a different material which, however, is not magnetic or magnetizable or is only very weakly magnetic or magnetizable, in order not to impede the free rotation of the magnets about their longitudinal axis. Therefore, the holders can comprise, for example, aluminum or a composite material.

- 15 Alternatively to injection molding or a 3D printing method, the holders can also be produced by means of a chip-removing method, for example milling, by laser cutting or, in the case of a metallic material, by die casting.

The outer surface of the holders preferably comprises a concave, circular segment-shaped groove which extends in the direction of the respective longitudinal edge.

- 20 By the provision of such a groove, the outer surface of the holders can be configured in a complementary manner to tubular struts which frame or define the opening of the shelf compartment. This is advantageous in particular when the panel according to the invention is used in modular shelf systems which are based on a basic framework of tubular struts and node elements.

- 25 The outer surface can preferably also comprise an opening, for example in order to reduce the weight of the holder. In order to ensure the required stability, such an opening can comprise one or more webs which extend in particular transversely over the opening.

The present application further relates to a shelf with at least one shelf compartment which is framed at least at the end face by struts of a magnetizable or magnetic metallic material, is delimited by surface elements of a magnetizable or magnetic metallic material and/or comprises at the end face at least one contact element of magnetic or magnetizable material, and with at
5 least one panel according to the above description. The at least one panel is held magnetically on the shelf compartment via the at least one magnet of the first side edge and the at least one magnet of the second side edge magnetically with the struts, surface elements and/or contact elements of the shelf compartment.

The panel is preferably held between mutually opposite struts and/or surface elements, that is
10 to say that the one outer surface of the panel facing away from the interior of the shelf compartment lies flush with the end face of the shelf compartment. This is in contrast to a panel which is arranged at the end face in front of the opening of the shelf compartment.

If the panel is held on the shelf compartment by means of interaction of the magnets with contact elements, the shelf compartment includes at least one contact element on each of two
15 mutually opposite sides of an opening thereof. In this case, the position of the at least one magnet of the first side edge and of the at least one magnet of the second side edge of the panel is selected such that the magnets lie opposite the contact elements when the panel is connected to the shelf compartment.

The present application also relates to a holder for a magnet, in particular for a panel according
20 to the above description. The holder comprises a cavity in which the magnet configured as a rod magnet with diametrical polarization is mounted rotatably about a longitudinal axis, and an outer surface. The holder is configured in such a way that a shell surface of the rod magnet has a distance of 0.5 mm to 2.0 mm from the outer surface.

The distance of 0.5 mm to 2.0 mm corresponds to the minimum distance between the outer
25 surface and that region on the shell surface of the magnet which lies closest to it. A person skilled in the art understands that, owing to the cylindrical configuration of the magnet and at most the shape of the outer surface, there are also regions on the shell surface of the magnet which have a greater distance from the outer surface.

Further advantageous embodiments and combinations of features of the invention emerge from the following detailed description and the entirety of the claims.

Brief description of the drawings

The drawings used to explain the exemplary embodiment show:

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| 5 | FIG. 1, 2 | an embodiment of a panel according to the invention; |
| | FIG. 3 | a cross section through the panel according to the embodiment of FIGS. 1 and 2 in the region of two magnets opposite one another; |
| | FIG. 4 | a detailed view of the cross section of FIG. 3; |
| 10 | FIGS. 5 to 7 | an embodiment of a holder which can be used in a panel according to the invention; |
| | FIG. 8 | a longitudinal section through the holder according to the embodiment of FIGS. 5 to 7; |
| | FIG. 9 | a perspective view of the situation shown in FIG. 8; |
| 15 | FIGS. 10 to 14 | a mode of operation of an embodiment of a panel according to the invention which is attached to a shelf compartment of a shelf. |

In principle, identical parts are provided with identical reference symbols in the figures.

Ways of Carrying Out the Invention

- FIG. 1 shows an embodiment of a panel 1 according to the invention in a side view, while FIG. 2 shows the same panel 1 in a perspective view. The panel 1 is of rectangular configuration and comprises a rectangular main body 2. The main body 2 comprises four side edges 3, 4, 5, 6, wherein each side edge 3, 4, 5, 6 adjoins a further side edge 3, 4, 5, 6 at its ends at a right angle. Accordingly, the main body 2 and thus the panel 1 comprises four corners at which two side edges 3, 4, 5, 6 meet one another. Two side surfaces 26.1, 26.2 which are each delimited by the

four side edges 3, 4, 5, 6 extend between the side edges 3, 4, 5, 6 on both sides of the main body. A distance between the side surfaces 26.1, 26.2 defines a thickness of the panel 1. In the embodiment shown, a first side edge 3 and a second side edge 4 which lie opposite one another are of longer configuration than a third side edge 5 and a fourth side edge 6 which likewise lie
 5 opposite one another.

In the embodiment shown, two magnets 7.1, 7.2 are arranged on the first side edge 3. Two further magnets 7.3, 7.4 are arranged on the second side edge 3. The magnets 7.1, 7.2, 7.3, 7.4 are configured as rod magnets with a diametrical polarization. Each magnet 7.1, 7.2, 7.3, 7.4 is arranged in a holder 8.1, 8.2, 8.3, 8.4 in a cavity thereof in such a way that the respective magnet
 10 7.1, 7.2, 7.3, 7.4 can rotate about a longitudinal axis, wherein the longitudinal axis of the magnets 7.1, 7.2, 7.3, 7.4 lies parallel to a direction of extent of the first side edge 3 and of the second side edge 4. The magnets 7.1, 7.2 of the first side edge 3 and the magnets 7.3, 7.4 of the second side edge are positioned along a direction of extent of the first side edge 3 and of the second side edge 4 in such a way that the magnets 7.1, 7.2 of the first side edge 3 and the
 15 magnets 7.3, 7.4 of the second side edge lie opposite one another in each case.

As can be seen from FIG. 2, the side edges 3, 4, 5, 6 have a rounding towards the side surfaces 26.1, 26.2 in order to give the panel 1 a more elegant appearance.

FIG. 3 shows a cross section through the panel 1 according to the embodiment of FIGS. 1 and 2 in the region of two magnets 7.1, 7.3 of the first side edge or of the second side edge 4 opposite one another. As can be seen from FIG. 3, the main body 2 of the panel 1 is composed of two
 20 partial bodies 9.1, 9.2 which each lie flat flush on one another and are connected to one another at least in the region of the side edges 3, 4, 5, 6, for example by means of an adhesive.

The configuration of the main body 2 by means of two partial bodies 9.1, 9.2 lying flat on one another and connected to one another simplifies the production of the panel 1, since firstly the
 25 holders 8.1, 8.2, 8.3, 8.4 with the magnets 7.1, 7.2, 7.3, 7.4 can be laid on a first partial body 9.1 in order to obtain an intermediate product, wherein subsequently the second partial body 9.2 is laid flush on the first partial body 9.1 and connected thereto.

FIG. 4 is a detailed view of the cross section of FIG. 3 in the region marked by means of a dashed circle. This detailed view shows the cross section through a holder 8.1 with a magnet 7.1 which is arranged in the cavity of the holder 8.1. As can be seen from the figure, the magnet 7.1 is held centrally within the main body 2 by the holder 8.1, which means that the longitudinal axis L of the magnet 7.1 is arranged in a plane E which is parallel to the side surfaces 26.1, 26.2 of the main body 2 and runs centrally between these. In the embodiment shown, in which the main body 2 comprises two partial bodies 9.1, 9.2, the longitudinal axis L of the magnet 7.1 also lies parallel to the surfaces of the partial bodies 9.1, 9.2 lying against one another. It can furthermore also be clearly seen in FIG. 4 that the longitudinal axis L of the magnet 7.1 runs parallel to the direction of extent of the first side edge 3.

The holder 8.1 is arranged in a receiving opening 12 of the main body 2. The receiving opening 12 is formed from a first recess which is arranged on the first side edge 3 of the first partial body 9.1 and a second recess which is arranged on the first side edge 3 of the second partial body 9.2. The receiving opening 12 is shaped and dimensioned in such a way that the holder 8.1 is received flush therein.

On one side of the cavity 14, the holder 8.1 comprises a connecting web 18 on which an outer surface 10 of the holder 8.1 is arranged. In this case, the outer surface 10 lies on a side of the connecting web 18 which faces away from the cavity 14 and thus from the magnet 7.1. In this case, the holder 8.1 is configured in such a way that the shell surface of the magnet 7.1 has a distance A of 0.5 mm to 2.0 mm from the outer surface 10. In this case, the distance A corresponds to a minimum distance of the shell surface of the magnet 7.1 from the outer surface 10. As can be seen from the figure, the outer surface 10 comprises a concave, circular groove 11. This concave, circular segment-shaped groove 11 enables the outer surface 10 to bear flush against a tubular strut which frames an opening of a shelf compartment. On the side facing the cavity 14, the connecting web 18 comprises an inner surface 15 which has a radius of curvature which corresponds to the radius of the shell surface of the magnet 7.1 or is slightly larger than the latter. On the side of the cavity 14 opposite the connecting web 18, a first projection 13.1 can be seen which delimits the movement of the magnet 7.1 in the direction directed away from the outer surface 10. The first projection 13.1 projects from a first end face of the holder 8.1 (see FIG. 5, FIG. 7 or FIG. 8). Owing to the configuration of the cavity 14, the magnet 7.1 can

rotate freely therein about its longitudinal axis L, wherein this rotation is brought about by a magnetic force, that is to say the magnetic repulsion or attraction to a strut, a surface element and/or a contact element which bears against the outer surface 10.

In conjunction with FIG. 4, only one of the holders 8.1, 8.2, 8.3, 8.4 is described. However, a person skilled in the art understands that, in principle, all holders 8.1, 8.2, 8.3, 8.4 of a panel 1 according to the invention are of identical configuration.

FIGS. 5 to 7 show an embodiment of a holder 8 which can be used in a panel 1 according to the invention. FIG. 5 shows a side view, FIG. 6 a plan view and FIG. 7 a perspective view of the holder 8. The holder 8 includes the cavity 14 in which a magnet 7 (not shown) is arranged. The cavity 14 is delimited on one side by the inner surface 15 and in the direction of extent of the respective side edge 3, 4, 5, 6 or in the direction of the longitudinal axis L of a magnet 7 (not shown) inserted in the cavity 14 on both sides by a first end face 16.1 and a second end face 16.2 opposite the latter. The inner surface 15 is arranged on one side of a connecting web 18 which extends between the two end faces 16.1, 16.2. The outer surface 10 of the holder 8 is arranged on the side of the connecting web 18 opposite the inner surface 15. The two end faces 16.1, 16.2 each include a projection 13.1, 13.2 which project into the cavity 14 on a side of the end faces 16.1, 16.2 opposite the inner surface 15. The two projections 13.1, 13.2 delimit the movement of a magnet 7 arranged within the cavity 14 in a direction which is directed away from the outer surface 10. The projections 13.1, 13.2 are spaced apart from one another, so that during the assembly of a panel 1, a magnet 7 is simply pressed into the cavity 14 and is subsequently held therein in the sense of a form fit, without, however, impairing the free rotatability of the magnet 7 about its longitudinal axis L within the cavity 14. On both sides of the cavity 14 or of the end faces 16.1, 16.2, the holder 8 includes holding bodies 17.1, 17.2 which are of cylindrical shape in the embodiment shown. The holding bodies 17.1, 17.2 extend in a direction which corresponds to the direction of extent of the longitudinal axis L of a magnet 7 arranged in the cavity 14. In the assembled main body 2, the two holding bodies 17.1, 17.2 also extend parallel to the direction of extent of the first side edge 3 and of the second side edge 4.

FIG. 8 shows a longitudinal section through the holder 8 according to the embodiment of FIGS. 5 to 7 in an embodiment of a panel 1 according to the invention which includes a main body 2

composed of two partial bodies 9.1, 9.2. For reasons of illustration, however, only the first partial body 9.1 is visible in the figure. This first partial body 9.1 comprises, in the region of the first edge 3, a groove 19 which runs in the direction of extent of the first side edge 3 and into which the holding bodies 17.1, 17.2 and the cavity 14 of the holder 8 are inserted. In this case, the shape and dimensions of the groove 19 and the shape and dimensions of the holding bodies 17.1, 17.2 are coordinated with one another such that the holding bodies 17.1, 17.2 are inserted flush into the groove 19. The second partial body 9.2 (not shown here) lies flush on the first partial body 9.1 and likewise has an analogous groove 19, so that the grooves 19 of the two partial bodies 9.1, 9.2 form a receiving space in which the holder 8 is received. On the first side edge 3, the first partial body 9.1 comprises a notch 20 in which the connecting web 18 is received, so that the outer surface 10 lies substantially flush with the first side edge 3 or projects slightly beyond it. The second partial body 9.2 likewise comprises a notch 20, so that, in the assembled main body, the two notches 20 of the partial bodies 9.1, 9.2 form an opening in which the outer side 10 of the holder 8 is inserted. It goes without saying that this arrangement is identical in all holders 8 of the panel 1.

FIG. 9 shows the same situation as that of FIG. 8, but as a perspective view, wherein only one corner region of the first partial body 9.1 can be seen. This figure clearly shows how the holder 8 is partially received in the groove 19 and how the outer surface 10 of the holder 8 is received in the notch 20. In this case, it should be noted that, in the embodiment shown, the groove 19 is of circumferential configuration, that is to say that it extends along all side edges 3, 4, 5, 6. However, only the first side edge 3 and the second side edge 4 each comprise a number of notches 20 corresponding to the number of magnets 7 or holders 8 which are inserted in the panel 1.

FIGS. 10 to 14 show a mode of operation of an embodiment of a panel 1 according to the invention which is attached to a shelf compartment 24 of a shelf 21. The shelf 21 is constructed from a modular shelf system in which tubular struts 23 are connected to form a basic framework by means of node elements and in which surface elements 22 are inserted as shelf bottoms into the frame. In this case, each surface element 22 is arranged between four struts 23. A person skilled in the art recognizes that a surface element simultaneously forms a shelf bottom for a shelf compartment 24 and a shelf ceiling for a shelf compartment 24 lying beneath it. In the

embodiment shown, the shelf 21 includes four shelf compartments 24 lying vertically one above the other. In addition to the surface elements 22, the shelf 21 shown also includes lateral surface elements 25 which delimit the shelf compartments 24 on both sides. Each shelf compartment 24 includes at the end face an opening through which access to the interior of the shelf compartment 24 is possible. In the embodiment of the shelf 21 shown, the opening of each shelf compartment 24 is framed by four struts 23. In the embodiment shown, the struts comprise steel and are accordingly magnetizable. The panel 1 comprises four magnets 7.1, 7.2, 7.3, 7.4, wherein two magnets 7.1, 7.2 are arranged on the first side edge 3 and the two further magnets 7.3, 7.4 are arranged on the second side edge 4. By means of the magnets 7.1, 7.2, 7.3, 7.4, the panel 1 is held between the struts 23 which frame the opening of the shelf compartment 24, as is shown in FIG. 10.

If the panel 1 is now to be opened, the two magnets 7.1, 7.2 of the first side edge 3 are detached by a person by pulling from a first strut 23.1. Since the magnets are rotatably arranged in their respective holders 8, the panel 1 can be pivoted about the magnets 7.3, 7.4 on the second side edge 4, which is connected to a second strut 23.2 which is arranged at a distance below the first strut 23.1 and lies opposite the latter, and the first side edge 3 can be folded downward in a pivoting movement, as can be seen in FIGS. 11 and 12 (which show a side view of the shelf 21). In this case, it should be noted that the shelf compartment 24 can be closed again by a movement of the first side edge 3 toward the first strut 23.1.

However, if the first side edge 3 is pivoted further downward, the magnets 7.1, 7.2 of the first side edge 3 can magnetically make a magnetic connection with a third strut 23.3 which is arranged at a distance below the second strut 23.2 and lies opposite the latter when the pivoting movement is completed. In this case, the magnets 7.1, 7.2 of the first edge 3 can rotate about their longitudinal axis L within their respective holders 8, so that that pole of the magnets 7.1, 7.2 which brings about a magnetic attraction force to the third strut 23.3 lies opposite the latter.

A person skilled in the art understands that a pivoting of the panel from bottom to top, that is to say in the reverse order as shown in FIGS. 10 to 14, can also take place.

Claims

1. Panel for closing a shelf compartment, comprising a rectangular main body, at least two magnets, wherein at least one magnet is arranged on a first side edge of the main body and at least one magnet is arranged on a second side edge of the main body, which is opposite the first side edge, and wherein the at least two magnets are rod magnets with a diametrical magnetization direction and are each arranged in a holder in such a way that they lie centrally relative to the thickness of the main body and are mounted rotatably along their longitudinal axis within a cavity of the holder, wherein the longitudinal axis of the at least two magnets lies parallel to a direction of extent of the first side edge or the second side edge, respectively, characterized in that the holders each comprise an outer surface which runs parallel to the respective side edge and the holders are configured in such a way that a shell surface of the magnet located in the cavity has a distance of 0.5 mm to 2.0 mm from the outer surface.
2. Panel according to claim 1, characterized in that the magnets have a remanence of 1.32 to 1.37 Tesla.
3. Panel according to one of claims 1 or 2, characterized in that at least two magnets are arranged on the first side edge, wherein the outermost of the at least two magnets of the first side edge are arranged at a distance of 1.2 to 3.8 times the diameter of the respective magnet from a corner of the main body, preferably at a distance of 12 mm to 38 mm.
4. Panel according to one of claims 1 to 3, characterized in that the cavity of each holder is delimited in the direction of the longitudinal axis of the respective magnet by two end faces which are connected to one another on one side by means of the outer surface, wherein the magnet is held in the cavity between the end faces rotatably about the longitudinal axis.
5. Panel according to one of claims 1 to 4, characterized in that the main body comprises two rectangular partial bodies which lie flat on one another and which are connected to one another at least via their side edges.

6. Panel according to claim 5, characterized in that the two rectangular partial bodies each comprise at least one recess on the first side edge and at least one recess on the second side edge, wherein the recesses of the two partial bodies in the connected state of the two partial bodies each form at least one receiving opening for the holder of the at least one magnet of the first side edge and the second side edge.
7. Panel according to one of claims 5 or 6, characterized in that the two rectangular partial bodies comprise a continuous groove, in particular a semicircular groove, on their surface directed towards the respective other partial body in the region of the first side edge and the second side edge.
8. Panel according to claim 6 or 7, characterized in that the holders each comprise a holding body, in particular a cylindrical holding body, on both sides of the cavity in the direction of the longitudinal axis of the magnet arranged in the cavity, wherein the holding bodies are inserted flush into the groove or the recess of the partial bodies.
9. Panel according to one of claims 1 to 8, characterized in that the main body comprises a felt or nonwoven material.
10. Panel according to one of claims 1 to 9, characterized in that the panel has a weight of 500 g to 1500 g.
11. Panel according to one of claims 1 to 10, characterized in that the main body comprises two longer and two shorter side edges, wherein the magnets are arranged on the two longer side edges of the rectangular main body, and wherein the longer side edges preferably have a length of 250 mm, 350 mm, 395 mm, 500 mm or 750 mm.
12. Panel according to one of claims 1 to 11, characterized in that the holders are manufactured from a polymer material.
13. Panel according to one of claims 1 to 12, characterized in that the outer surface of the holders comprises a concave, circular segment-shaped groove which extends in the direction of the respective longitudinal edge.

14. Shelf with at least one shelf compartment which is framed at least on the end face by struts of a magnetizable or magnetic metallic material, is delimited by surface elements of a magnetizable or magnetic metallic material and/or comprises at least one contact element of a magnetic or magnetizable material, and with at least one panel according to one of claims 1 to 13, characterized in that the at least one panel is held magnetically on the shelf compartment via the at least one magnet of the first side edge and the at least one magnet of the second side edge magnetically with the struts, the surface elements and/or the at least one contact element of the shelf compartment.
15. Holder for a magnet, in particular for a panel according to one of claims 1 to 13, comprising a cavity in which the magnet configured as a rod magnet with diametrical magnetization is mounted rotatably about a longitudinal axis, and an outer surface, wherein the holder is configured in such a way that a shell surface of the rod magnet has a distance of 0.5 mm to 2.0 mm from the outer surface.