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Switching Cabinet

The invention pertains to a switching cabinet with a rack having horizontal and vertical frame profiles, where the horizontal frame profiles form a lower and an upper frame and the vertical frame profiles are attached in the corner regions of the lower and the upper frame, and where the vertical frame profiles are symmetrical to the cross-sectional diagonals running across the virtual, vertical outer edges of the rack.

A switching cabinet of this kind is known from EP 0 533 555 B1.

The vertical frame profiles of this kind of switching cabinet have two inner walls directed to the interior of the rack. The inner walls are positioned at a right angle to one another to form a vertical edge. The edge protrudes from the frame profile and points to the inside. To attach fixtures, the inner walls are provided with mounting cavities. These mounting cavities are spaced with an equal division grid. In this kind of frame profile, attachment is only possible at the attachment points defined by the division grid.

It is the purpose of the invention to create a switching cabinet of the type mentioned above, which offers great variability for the attachment of fixtures.

This problem is solved in that the vertical frame profiles which are turned towards the inside of the switching cabinet are provided with an open inner cavity, that vertical assembly rails can be mounted in the inner cavity, that one profiled side

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standing perpendicular to the outside of the rack is joined to the inner walls, and that the inner walls, the assembly rails and the profiled sides can be fitted with rows of fastening cavities inserted according to a division grid.

Into the inner cavity it is possible to install an assembly rail such that the formation of its row(s) of mounting cavities can differ from the mounting cavities of the vertical frame profiles. In particular, a different division grid can also be used. Thus, attachment points can be varied at random along the frame profile.

To create additional potential for the attachment of fixtures, next to the inner walls the profile sides are also equipped with rows of attachment cavities. Thus, the formation of several assembly planes is possible. In particular, when the inner walls (standing at a right angle to one another) pass at a right angle into the profile sides, then at one side of the rack two mutually parallel assembly planes will be created. Assembly rails can be attached one after the other, in parallel, in these assembly planes. Thus, a variety of attachment potentials is obtained.

According to one preferred embodiment of the invention, the vertical frame profiles at their profile sides pass into sealing surfaces running parallel to the side surfaces of the rack. Side wall, a back wall and/or a cabinet door can be tightly positioned against these large-area profiled sections. Due to the use of such sealing surfaces, a good sealing effect can be achieved. In particular, the attachment of HF-seals will be easily possible.

The lower and the upper frame have in their corner regions, cavities that open toward the outside of the rack, and the cavities are formed by the front sides of the horizontal frame

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profiles butt-jointed at a right angle. The vertical frame profiles can be inserted into the cavities. Thus, they will rest directly against the front sides of the horizontal frame profile. The use of a separate corner is then not absolutely necessary to connect the horizontal and the vertical frame profiles. Bracing of the vertical frame profiles solely against the front sides of the horizontal frame profile will ensure a dependable attachment.

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However, it is also possible to provide corner connectors in the cavities of the lower and upper frame, such that the vertical frame profiles can be inserted horizontally into the cavities and can be securely attached to the corner connectors.

In this embodiment of a switching cabinet it is always ensured that in a final assembled rack, a vertical frame profile can be replaced, even subsequently. It need merely be loosened from the connectors and can then be pulled out horizontally from the cavity. In the same manner, the vertical frame profiles can again be inserted horizontally into the cavities. With the vertical frame profile removed, the interior space of the rack is easily accessible. In addition, two vertical frame profiles of one side of the rack can also be removed from the rack. Solely the two remaining vertical frame profiles and the lower or upper frame form a stand-alone, adjustable unit which is easily accessible for assembly purposes.

Another possible variant of the invention is characterized in that the vertical frame profiles are equipped with an outer cavity running in the profile length direction, that the outer cavity is formed by a wall which stands perpendicular to the cross-sectional diagonals running through the virtual, outer edges of the rack, and that two centering sections of the vertical frame profile are connected to the wall at an angle.

Attachments or fixtures; e.g., a door hinge, a closing system or side or back wall reinforcing units, can be attached to the wall. The centering recesses in this case will ensure that these attachment elements will always be aligned to their assigned attachment positions.

To form a separate assembly unit, it is possible to design the invention such that at least the vertical frame profiles of

one side of the rack are combined by means of connecting pieces into a separate assembly unit. This separate assembly unit can be equipped outside the rack with electronic fixtures, and then subsequently installed in the rack.

The connecting pieces can be formed as assembly rails which have an assembly surface facing the interior of the switching cabinet. The assembly surface is then preferably equipped with at least one row of attachment cavities positioned at equal spacing.

To reduce the consumption of components, the lower and upper frames can be preferably of identical design.

It is even possible to equip the upper frame with a rain trough so that the water running off from the upper side of the switching cabinet can be drained off in a controlled manner.

For a simple attachment of an assembly rail to the inner cavity of the vertical frame profile, it is possible to provide at least one profiled leg with at least one insertion cavity, by means of which it can be inserted onto an attachment element that is mounted to the vertical frame profile. In this case, the attachment element can be attached as a separate element to the vertical frame profile. If the assembly rail is inserted into the attachment element, then it will be adjustable with respect to the vertical frame profile for attachment of the assembly rails.

The invention will be explained in greater detail below, based on the design examples presented in the figures. We have:

Figure 1 A perspective, side view of a rack composed of frame profiles for a switching cabinet

Figure 2 An expanded view of a portion of a rack

Figure 3 A portion of a rack with a separate assembly unit

Figure 4 One variant for attachment of a vertical frame profile to horizontal frame profiles

Figure 5 A perspective illustration of a vertical frame profile and of an assembly rail

Figure 6 Two vertical frame profiles connected by means of horizontal assembly rails,

Figure 7 The rack according to Figure 2 with one side wall, and

Figure 8 The rack according to Figure 2 with one cabinet door.

Figure 1 shows a rack for a switching cabinet. The rack consists essentially of lower/upper frames 10 and of four vertical frame profiles 30. The vertical frame profiles 30 connect the lower frame 10 with the upper frame 10. The lower frame and the upper frame 10 are of the same design, so that they can be replaced by one another.

The lower frame and the upper frame 10 each have two horizontal frame profiles 11, 12 each running in the direction of the depth and width of the switching cabinet. These horizontal frame profiles 11, 12 are equipped with rows of attachment cavities 37 on their profiled sides facing the interior of the rack. Threaded cavities 37.1 are located between the individual attachment cavities 37. Also, the vertical frame profiles 30 are provided with attachment cavities 37 or threaded cavities 37.1 facing the interior of the rack. For example, assembly rails like those shown in detail in Figure 6 can be attached to the mounting cavities 37. The vertical frame profiles 30 are connected via connectors 14 to the lower frame or upper frame 10. The connectors 14 are located in the region of the corner cavities 20 of the lower frame or upper frame 10. The attachment of the vertical frame profiles 30 to the connectors 14 takes place, for example, by means of a weld.

Figure 2 shows one alternative attachment of the vertical frame profile 30 to the horizontal frame profiles 11, 12. The cavities 20 are formed on the butt-jointed ends of the horizontal frame profiles 11, 12. The connectors 14 are installed in the cavities 20. The connector 14 is essentially of a square design. At one of its vertical ends, however, it is equipped with a slanting surface 19 in which one or more threaded cavities 14.1 are installed. The slanting surface 19 points toward the outer side of the rack. To attach the connector 14, it is set up onto the support surface 20.1. It rests with its contact surface 16 facing the interior of the switching cabinet, against the front-side ends of the horizontal frame profiles 11, 12. In this position the connector 14 can be welded into the cavity 20. Thus, the connector 14 can be positioned precisely at a right angle to the associated horizontal frame profiles 11, 12. The front ends of the horizontal frame profiles 11, 12 and also the support surface 24 form an outward-open cavity for the front side of the vertical frame profile 30. The vertical frame profile 30 features an open inner cavity 35.1 facing the interior of the rack. This inner cavity 35.1 is bounded by two inner walls 33, 34 of the vertical frame profile 30. The inner walls 33, 34 run in the length direction of the frame profile 30. They are positioned at a right angle to one another.

With the mounted vertical frame profile 30, the inner walls 33, 34 rest against the stops 17, 18 of the connector 14. Profiled sides 31, 32 join at a right angle to the inner walls 33, 34 of the vertical frame profile 30. These profiled sides 31, 32 come to rest against the front ends of the horizontal frame profiles 11, 12. To attach the vertical frame profiles 30 in the region of their front ends there is one or more screw cavities

38. These screw cavities 38 can be positioned to align with the threaded cavities 14.1 of the connector 14. In order to attain a simplified assembly, the spacing from the front end of the frame profile 30 out to the middle of the drilled hole of the screw cavity 38 is tailored to the spacing of the support surface 24 to the threaded cavity 14.1. An attachment screw 39 can be passed through the screw cavity 38 and then screwed into the threaded cavity 19 of the connector 14. Thus the inner walls 31 [sic; 33], 34 will be tensioned against the stops 17 and 18 of the connector 14. At the same time, the vertical frame profile 30 will be pulled into the cavity 20 at the front ends of the horizontal frame profiles 11, 12. The vertical frame profile 30 is securely attached to the connector 14 in its final assembly position and is aligned precisely vertically. The illustration indicates that the vertical frame profile 30 can be installed from outside the rack into the cavity 20. The vertical frame profiles 30 can thus also be subsequently installed in or removed from the final assembled rack. The important advantage of this is that the interior space of the rack can now be easily accessible. For example, a stand-alone, adjustable unit can be constructed from the lower frame and upper frames 10 and the two rear, vertical frame profiles 30. The stand-alone, adjustable, partial rack can now be equipped with electronic fixtures or such. Next, the two front vertical frame profiles 40 [sic; 30] can be attached, so that the rack is complete.

Figure 3 shows a portion of a rack. In this case, the two vertical frame profiles 30 of one side of the rack are combined by means of connecting pieces 40 into one assembly unit. The two connecting pieces 40 are designed in this case as assembly rails. These assembly rails have a U-shaped cross section formed from an

assembly surface 41 and two adjoining side parts 42, 43. The side parts 42, 43 are parallel. The assembly surface 41 is facing the interior space of the rack. On the side there is a front attachment section 45 connected to the assembly surface 41. The attachment section 45 is designed as a gluing edge which partly covers the associated, inner wall 34 of the vertical frame profile.

As is indicated in the figure, the connecting piece 40 can be screwed via the attachment section 45 to the vertical frame profiles 30. Electronic fixtures can be attached to the connecting pieces 40. This can be done by installing attachment cavities 44a, 44b in the assembly surface 41 and the side parts 42, 43. The attachment cavities 44a, 44b are positioned in lines and have the same spacing or division grid. The division grid is tailored to the division grid of the attachment cavities 37 of the vertical frame leg.

In the assembly unit illustrated in the figure there are connecting pieces 40 located in the upper and in the lower region of the vertical frame profiles 30. However, more than two connecting pieces 40 can be used to form the assembly unit. In particular, cross struts can also be used, which are placed at a slant between the two vertical frame legs 30. For attachment of the assembly unit to the base unit 10, the base unit is inserted into the cavities 20 in the vertical position. First, the vertical frame leg 30 with its front sides 36 is set onto the support surface 24 of the base frame 10. Next, the complete assembly unit is pushed into the cavity 20 opposite the arrows shown in the figure. The inside walls 34 [sic; 33] of the vertical frame profiles 30 will thus slide along the allocated stops 18 of the corner connector 14. These stops 18 operate as

guides. The insertion motion is limited by the profiled sides 32 of the vertical frame profiles 30. They come to rest against the front sides of the horizontal frame profiles 11. At the same time, the inner wall 34 comes up against the stop 17 of the connector 14. A beveled flank 19 is provided between the two stops 17 and 18 of the corner connector 14. This flank protrudes into the inner cavity 35.1 of the vertical frame profile 30. A free space is formed between the flank 19 and the base surface of the inner cavity 35.1. This free space will ensure that the vertical frame profiles 30 always come to rest against the stops 17, 18 only with their inner walls 33, 34. Thus, the assembly unit can be aligned exactly to the base unit 10. For attachment, the assembly unit is screwed to the base frame 10. The type of screw connection for the vertical frame profile 30 with the corner connectors 40 [sic; 14] can be found in Figure 2. However, it is also possible to weld the vertical frame profiles 30 directly to the base frame 10 and the corner connector 14. In addition to the base frame 10, the upper frame 10, preferably with the same design, is used. The upper frame 10 is tied in the upper region to the vertical frame profile 30. The rack can then be completed with additional vertical frame profiles 30.

The assembly unit is located preferably on the back side of the switching cabinet. However, it is also possible to provide the assembly unit on one side of the rack. There are several possibilities for reinforcing the assembly unit. In particular, the inner walls 33, 34 can be used in pairs, or the profiled sides 31, 32 of the vertical frame profiles 30 can be used to form two mutually parallel, offset assembly planes. In the figure, the first assembly plane is partly formed by the assembly surface 41 of the connecting pieces 40. These offset assembly

planes can also be created perpendicular to the assembly unit in the rack. In this case, the reinforcing cavities 37, 37.1 of the inner walls 33 or of the profiled sides 31 are used.

In order to avoid the danger of injury, the support surfaces 24 of the cavities 20 are provided with a profiled shape 21. The profile shape 21 is adapted to the outer geometry of the vertical frame profiles 30. Thus, no edges of the base unit will protrude beyond the vertical frame profile.

Figure 4 shows a section of a base frame 10 which is composed of horizontal frame profiles 11, 12. The horizontal frame profiles 11, 12 feature the same cross sectional geometry. The entire base frame 10 is constructed from four horizontal frame profiles 11, 12, as was already anticipated in Figure 1. To produce the base frame 10, a single punched-flexible part can be used, so that the individual horizontal frame profiles 11, 12 are joined together as a single piece. The horizontal frame profiles 11, 12 have a horizontal inner wall 25, which is followed by a bend 26 angled downward at 90 deg.

The bend 26 is used to support a side wall 63 (for example, according to Figure 7) or a cabinet door 72 (for example, according to Figure 8). To ensure proper sealing, a sealing element can be installed between the side wall 63 or the cabinet door 72 and the bend 26. A horizontal web 27.1 is bent back at a right angle in front of the bend 26. This web 27.1 extends into the downward directed wall 27. A bend of the side wall 63 or of the cabinet door 72 can be held in the free space formed by the web 27.1 and the wall 27.

The wall 27 is closed off with a base unit 28. The base frame 10 can be set up on the ground with this. The horizontal frame profiles 11, 12 are provided at their front ends with a

profiling 21 at their webs 27.1. The profiling 21 is again adapted to the outer geometry of the vertical frame profile 30. In the vertical direction, at a distance from the web 27.1 there are terminal stops 22, 23 on the inner walls 25 of the vertical frame profile 30.

The connector 14 is installed in the cavity 20. The connector 14 rests upon the base part 28, in this case. Sidewise it rests against the walls 27. The horizontal frame profiles 11, 12 can be connected, for example, by welding, to the connector 14. This will reinforce the lower/upper frame 10.

The vertical frame profile 30 has an outer cavity 35.2 formed as a wall; this cavity is directed to the outside of the rack. Two hollow chambers extend on both sides of the wall. To form the hollow chambers, the sheet metal is cut and bent appropriately for the vertical frame profile. In particular, a centering section 30.1 adjoins the wall and this section passes into an angle bend 30.3 via a transition piece 30.2. The angle bend 30.3 is positioned perpendicular to the associated sides of the rack. Following the angle bends 30.3 there are the sealing surfaces 30.4 attached at a right angle. To form the profiled sides 31, 32, the sealing surfaces 30.4 are bent off at a right angle in the direction of the interior of the rack. The profiled sides 31, 32 go at a right angle into the inner walls 33, 34. The inner walls 33, 34 thus stand parallel to the allocated sides of the rack. The inner walls 33, 34 rest via curved end pieces against the wall that forms the outer cavity 35.2. Between the two inner walls 33, 34 an inner cavity 35.1 is created that is oriented toward the interior of the rack.

The vertical frame profile 30 is inserted into the outward-open cavity 20 of the base frame 10. In this case, the

profiled sides 31, 32 slide up to the stops 22, 23 of the horizontal frame profiles 11, 12. With its front end 36 the vertical frame profile 30 protrudes toward the support surface 24 of the base frame 10. In this position, the vertical frame profile 30 is aligned at its profiled sides 31, 32. Thus also, the inner walls 33, 34 are positioned toward the interior of the rack.

The precise vertical alignment of the frame profile 30 is possible by means of the profile 21. Since it is adapted to the outer geometry of the vertical frame profile 30, it can be placed flush against it.

Figure 5 shows in greater detail how an assembly rail 50 can be moved to one of the vertical frame profiles 30. Only a part of the vertical frame profile 30 is shown in the illustration according to Figure 5. The assembly rail 50 has a length corresponding to this part. This illustration makes it clear that the assembly rail 50 can be moved in sections to any particular location along the vertical frame profile.

Of course, the assembly rails 50 used in this invention can have a variable length. In particular, they can also extend over the entire axial length of the vertical frame profile 30.

The assembly rail 50 has a quadratic or square cross section. This cross section is formed by two assembly sections 52, 53 joined together at a right angle, and two profiled sections 51, 54. The profiled sections 51, 54 are angled off from the free ends of the assembly sections 52, 53. For example, a hollow profile forms which is open in the region between the profiled sections 51, 54. Assembly cavities 56, 57 have been incorporated into the assembly sections 52, 53. Attachment holes 55, 58 have been punched out on the profiled sides 51, 54. The

assembly cavities 56, 57 and the attachment holes 55, 58 are arranged with the same spacing. The attachment holes 55, 58 are arranged so that they align with the assembly cavities 56, 57 of the assembly section standing parallel to the particular profiled section. The attachment holes 55, 58 are thus accessible via the assembly cavities 56, 57. To attach the assembly rails 50 to the vertical frame profile 30, there are insertion cavities 59 incorporated into the profiled sides 51, 54. The insertion cavities 59 are of slit-like design and are open toward the free, vertical end of the profiled sections 51, 54. For each profiled section 51, 54 one insertion cavity 59 is used. To attach the assembly rail 50, first an attachment element 39.1 is screwed into a threaded cavity 37.1 of the vertical frame profile 30. It makes no difference into which of the inner walls 33, 34 of the frame profile 30 the attachment element 39.1 (hereinafter called the screw) is screwed in, and will be determined primarily by accessibility. The assembly rail 50 with its insertion cavity 59 of the profiled section 54 is placed onto the bolt section of the screw. This insertion movement is symbolized by the arrow in Figure 5. If the assembly rail 50 is installed in this manner on the frame profile 30, then it is prepositioned. Due to an assembly cavity 56 of the assembly section 52 aligned with the insertion cavity 59, the head of the screw is accessible to a manipulating tool. If the screw is screwed further into the threaded cavity 39.1, then the screw head will be tensioned onto the profiled section 51. The assembly rail 50 will be pulled into the interior cavity 35.1 of the frame profile 30. The two profiled sections 51, 54 then rest against the inner walls 33, 34. The assembly rail 50 is aligned precisely to the frame profile 30. For additional reinforcement, screws can be

introduced through individual assembly cavities 56, 57 into the attachment holes 55, 58 and then screwed into the associated threaded cavities 37.1. Depending on the type and manner of application of the load to the assembly rail 50, one or more additional attachment elements 39.1 can be used.

Figure 6 shows how assembly rails 40 can be attached to two vertical frame profiles 30. The assembly rails 40 essentially correspond to the assembly rails 40, like those shown in Figure 3. At this point we once again wish to stress how two different assembly planes aligned in parallel to each other, can be formed by the invented frame profiles 30. As already mentioned, the assembly planes are created by the assembly surfaces 41 of the assembly rails 40.

Figure 7 shows how attachment elements 60 can be attached to the outer cavity 35.2 of the vertical frame profile 30. The attachment elements 60 have two attachment points with threaded holes 61. To mount the side walls 63, screws 62 are used. These screws 62 are inserted through drilled holes of the side walls 63 and are screwed into the threaded holes 61 of the attachment elements 60. The inner side of the side wall 63 rests flush against the sealing surface 30.4 of the vertical frame profile 30. The attachment elements 60 shown in Figure 7 can be used to attach two side walls 63 (positioned at a right angle to each other) to the rack.

Figure 8 shows how hinge parts 70 can be attached to the outer cavity 35.2. To provide hinges for a cabinet door 72, additional hinge parts 76 are provided on the door. These additional hinge parts 76 can be attached to the hinge parts 70. A sealing gasket 74 is supplied on the inner wall of the cabinet door 72. The gasket 74 rests flush against the sealing surface

30.2 of the vertical frame profile 30. The illustration according to Figure 8 clearly shows that the hinge part 70 supports a threaded hole 71 on one side wall mount. Thus a side wall can be attached to the hinge part 70 at a right angle to the front side of the rack.



Claims

1. Switching cabinet with a rack having horizontal and vertical frame profiles, where the horizontal frame profiles form a lower and an upper frame and the vertical frame profiles are attached in the corner regions of the lower and the upper frame, and where the vertical frame profiles are symmetrical to cross-sectional diagonals running across the virtual, vertical outer edges of the rack, characterized in that the vertical frame profiles (30) which are turned towards the inside of the switching cabinet are provided with an open inner cavity (35.1), that vertical assembly rails (50) can be mounted in the inner cavity (35.1), that one profiled side (31, 32) standing perpendicular to the outside of the rack is joined to the inner walls (33, 34), and that the inner walls (33, 34), the assembly rails (50) and the profiled sides (31, 32) can be fitted with rows of fastening cavities (37, 37.1) inserted according to a division grid.

2. Switching cabinet according to Claim 1, characterized in that the vertical frame profiles (30) at their profile sides (31, 32) pass into sealing surfaces (30.4) running parallel to the side surfaces of the rack.

3. Switching cabinet according to Claim 1 or 2, characterized in that the lower and the upper frame (10) have in their corner regions cavities (20) open toward the outside of the rack, whereby the cavities (20) are formed by the front sides of the horizontal frame profiles butt-jointed at a right angle.

4. Switching cabinet according to Claim 3, characterized in that corner connectors (14) are installed in the cavities (20) of the lower and of the upper frame (10), and that the vertical

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frame profiles (30) can be inserted horizontally into the cavities (20) and securely attached to the corner connectors (14).

5. Switching cabinet according to one of Claims 1 to 4, characterized in that the vertical frame profiles (30) are equipped with an outer cavity (35.2) running in the profile length direction, that the outer cavity (35.2) is formed by a wall which stands perpendicular to the cross-sectional diagonals running through the virtual, outer edges of the rack, and that two centering sections (30.1) of the vertical frame profile (30) are connected to the wall at an angle.

6. Switching cabinet according to one of Claims 1 to 5, characterized in that the vertical frame profiles (30) of at least one side of the rack are combined by means of connecting pieces (40) into a separate assembly unit.

7. Switching cabinet according to Claim 6, characterized in that the connecting pieces (40) are designed as assembly rails which have an assembly surface (41) facing the interior of the switching cabinet, and that the assembly surface (41) is provided with at least one row of fastening cavities (44a, 44b) inserted at equal spacing.

8. Switching cabinet according to one of Claims 1 to 7, characterized in that the lower and the upper frames (10) are designed as the same assemblies.

9. Switching cabinet according to one of Claims 1 to 8, characterized in that the assembly rails (50) mountable in the inner cavity (35.1) of the vertical frame profile (30) have at least one profiled leg (51, 54) with at least one insertion cavity (59), by means of which it [the cavity] can be inserted onto an attachment element (39.1) that is mounted on the vertical



frame profile (30), and that the attachment element (39.1) is adjustable with respect to the vertical frame profile (30) for attachment of the assembly rails (50).

10. Switching cabinet according to one of Claims 1 to 9, characterized in that the lower frame and/or the upper frame (10) is equipped with a perimeter rain trough (12a) interrupted only in the corner regions of the rack.