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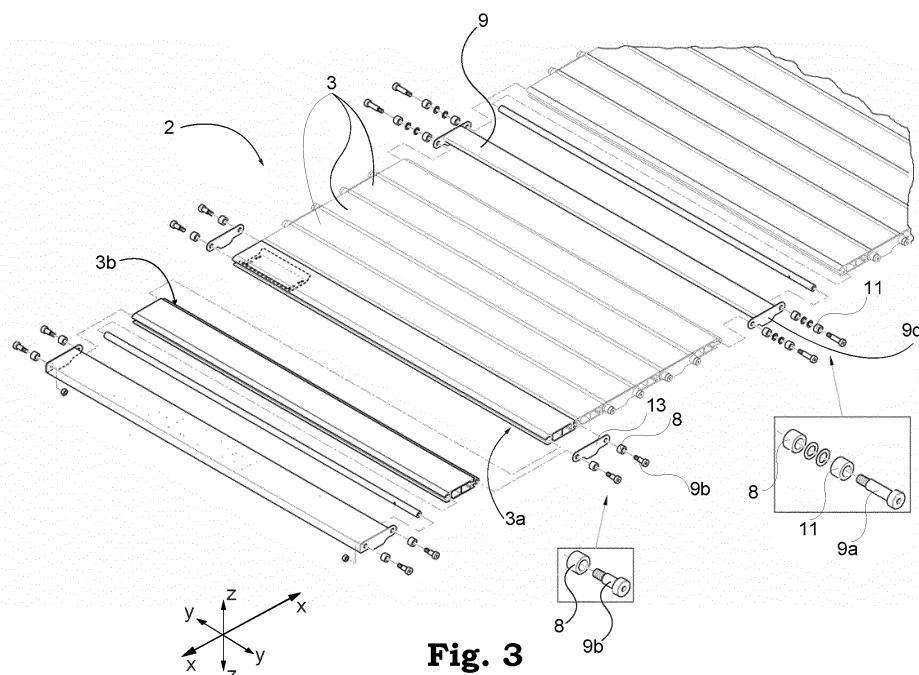
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(54) SHUTTER-LIKE COVERING SYSTEM FOR WORKSHOP PITS

(57) A covering system for pits in mechanical workshops comprises a shutter-like cover (2) configured to slide along a pit (5) between an extended position for closing the pit and a folded-up position in a storage zone (10) arranged at a longitudinal end of the pit (5). The shutter-like cover (2) comprises a plurality of first transverse bars (3) which have a profiled body with a front transverse side (3a) and rear transverse side (3b) shaped so as to provide a form coupling between first adjacent bars (3), resulting in a hinged fastening so that the first adjacent bars (3) are engaged together with a degree of freedom which allows a limited range of relative

rotation about a transverse axis. At predefined intervals along the cover (2), articulation bars (9) are positioned between first bars (3), said articulation bars being hinged with the adjacent first bars (3) by means of a pivoted connection allowing a greater relative rotation than the form coupling between the first bars (3), such that the articulation bars (9) allow at least some of the first bars (3) to be arranged in side-by-side rows when the cover is in the folded-up position in the storage zone (10).

The system further comprises transverse pivoted-connection elements (9a,9b) for connecting the first bars (3) together and to the articulation bars.

**Fig. 3****EP 4 502 318 A1**

Description

[0001] The present invention relates to a covering system for pits of mechanical workshops.

[0002] As is known, the safety regulations stipulate that the pits of mechanical workshops or the like should be provided with a covering element which may be slid along the pit between an extended position, where it covers the pit, and a folded-up position inside a storage zone, where the pit is open and accessible.

[0003] Patent application EP 1,849,935 A2 describes a solution which involves the use of a shutter-like cover which is operated by motor means and is formed by a plurality of transverse bars which slide inside guides positioned on the longitudinal edges of the pit.

[0004] At predetermined intervals, some of the bars have engaging rollers which project from the plane of the bars and which engage with auxiliary guides arranged in the storage zone so as to allow the storage of the shutter by arranging the bars in vertical side-by-side layers so to open the pit.

[0005] Patent application EP 2,258,913 A2 describes, instead, a covering element for pits of mechanical workshops or the like comprising a shutter-like cover formed by a plurality of transverse bars arranged side-by-side and supported by respective brackets from which there project pins on which sliding rollers are mounted. The pins are connected by links and counter-links of a chain which connects the bars together.

[0006] In this case also the covering element is slidably guided in longitudinal guides which are arranged along the longitudinal edges of the pit. At regular intervals, the bars have connected thereto elongated pins which support respective support rollers which are also slidable in the longitudinal guides. In order to perform the storage of the bars in vertical side-by-side layers, the storage zone of the pit is provided, at the end of the longitudinal guides facing the storage zone, with support guides with which solely the support rollers are able to engage.

[0007] Basically, the support guides have a smaller width than the longitudinal guides, so that they do not provide support for the sliding rollers so as to allow the respective bars to fall downwards and thus allow storage of the shutter-like cover in vertical side-by-side layers.

[0008] This constructional solution has proved to be practical and efficient to use and install on already existing pits. However, the method for storing the shutter in layers reduces, in some cases excessively, the working length of the pit.

[0009] EP 2,878,746 A1 describes a covering element similar to that described in EP 2,258,913 A2 in which, in order to exploit better the storage space at the bottom end of the pit, the lateral sliding guides are provided at their ends with respective substantially vertical guide sections which are open at the bottom; in this configuration the closing element has a pair of storage guides which are arranged along the lateral flanks of the storage zone

underneath the open ends of the substantially vertical guide sections and extend substantially parallel to the longitudinal ends of the lateral sliding guides. The ends of the storage guides facing the respective vertical guide section are provided with an upwardly folded receiving section for engagement with the storage members during the retraction of the shutter-like cover.

[0010] A common problem of all the known covers of the shutter type which perform the storage of the bars in side-by-side layers in the storage zone is that they require a chain-type connection between the transverse ends of the bars, said chain being required both to allow the cover to follow the various transition curves when it passes from the longitudinal sliding guides to the storage zone, and to form the side-by-side layers in the storage position. The chain connection makes such arrangements easy, but, on the other hand, results in an inherent structural weakness of the cover which must be compensated for by providing bars and connection and support elements that are extremely solid, i.e. made using a large amount of material, in order to give the extended cover sufficient rigidity needed to achieve the load-bearing capacities prescribed by the regulations or required by the particular conditions of use.

[0011] Therefore, the covers are heavy to move, with the consequent need for motor means for the movement thereof which are more powerful, as well as being more costly and complex.

[0012] The technical problem posed, therefore, is that of providing a covering system for pits of mechanical workshops able to solve or at least partially overcome the problems described above.

[0013] In connection with this task one object of the invention is to provide a covering system for pits of mechanical workshops which is practical, efficient and easy to install.

[0014] A particular object of the present invention is to reduce the weight and the complexity of the cover, while maintaining a structural rigidity which complies with the load-bearing requirements prescribed by safety standards.

[0015] Another object of the present invention is to provide a covering element which, owing to its particular constructional features, is able to provide the best guarantee in terms of reliability and safety during use.

[0016] Last but not least, an object of the invention is to provide a covering element which is able to achieve an optimum longitudinal working extension in the open condition of the pit.

[0017] The aforementioned task, as well the objects mentioned and other objects which will emerge more clearly below, are achieved by a covering system according to Claim 1. Preferred embodiments are described in the dependent claims which are cited by way of reference.

[0018] Further characteristic features and advantages will emerge more clearly from the description of preferred, but non-exclusive, embodiments of a covering

system for pits of mechanical workshops or the like, illustrated by way of a non-limiting example with the aid of the attached drawings in which:

Figure 1: shows a perspective view of a pit with a cover extended to close the top of the pit;

Figure 2: shows a view of the pit according to Figure 1 in the open condition, with the cover folded up in the storage position in the storage zone;

Figure 3: is a partially exploded perspective view of a first embodiment of a shutter-like cover of the covering system according to the invention;

Figure 4: is a partial view in greater detail of the cover according to Fig. 3;

Figure 5: is a cross-sectional view along a vertical plane indicated by V-V in Fig. 4;

Figure 6: is a perspective view of the cover according to Fig. 3 in the folded-up position in the storage zone;

Figure 7: is a cross-sectional view along a vertical plane of the cover according to Fig. 6;

Figure 8: is a vertically sectioned view of the storage zone of a variation of embodiment of the covering system according to the invention, with the cover in the folded-up position;

Figure 9: is a perspective view of a detail of a storage guide according to a third embodiment of the covering system;

Figure 10: is partially exploded perspective view of the shutter-like cover of the covering system according to Fig. 9; and

Figure 11: is a view of a detail of an articulation bar provided with storage rollers of the cover according to Fig. 10.

[0019] With reference to the said figures, the present invention relates to a covering system 1 for pits 5 of mechanical workshops or the like.

[0020] Figure 1 shows a pre-constructed pit 5 in which a first example of embodiment of the covering system 1 according to the present invention is installed. As will emerge more clearly below, the covering system according to the present invention can be advantageously installed easily both on a newly constructed pit 5 and on pre-existing pits.

[0021] Assuming a set of three reference axes, i.e. a longitudinal axis X-X, parallel to the length of the pit and the extended cover, transverse axis Y-Y, parallel to the width in the transverse direction of the cover, and vertical direction Z-Z, parallel to the height/depth of the pit and height/thickness of the extended cover, the covering system 1 comprises a shutter-like cover - denoted overall by the reference number 2 - which can be positioned in a storage zone 10 (Fig. 2) in a folded-up arrangement.

[0022] The storage zone 10 is in particular arranged at a longitudinal end of the pit 5.

[0023] With reference to Figs. 3-5, the shutter-like cover 2 comprises a plurality of first bars or transverse

slats 3, which have a profiled body with a greater dimension extending in the transverse widthwise direction Y-Y, a front transverse side 3a and rear transverse side 3b opposite to each other in the longitudinal lengthwise direction X-X and a vertical height comprised between a top surface 3c, which in use is an outer walkable surface, and a bottom surface 3d, which during use is inner.

[0024] In Figures 4 and 5, the first bars 3 are shown in an aligned relative position which in use corresponds to the extended cover position. In this position, as shown, the first bars 3 provide a substantially continuous walkable surface owing to the joining together of their top surfaces 3c.

[0025] The front and rear transverse sides 3a, 3b of the first bars 3 are advantageously shaped to provide a form coupling between first adjacent bars 3; the coupling provides a hinged fastening such that the first bars are engaged together with a limited range of relative rotation of adjacent bars about a transverse axis. The hinged fastening is preferably configured to allow different ranges of relative rotation of first adjacent bars with respect to the aligned position thereof, when they move upwards and downwards. In other words, a minimum possible angle between the bottom surfaces 3d of first adjacent bars 3 is always smaller than a minimum possible angle between the top surfaces 3c. In preferred embodiments, the minimum possible angle between bottom surfaces 3d is less than or equal to 140° and/or greater than or equal to 130°, preferably equal to 135°. The minimum possible angle between the top surfaces 3c is preferably greater than or equal to 175° and less than or equal to 180°.

[0026] With further reference to the cross-section shown in Fig. 5, a particularly preferred embodiment of the first bars 3 has a bar body with a transverse side 3a configured with an open female cavity 3m which is substantially cylindrical.

[0027] In particular, the (front or rear, depending on the use) transverse side has a C-shaped form in cross-section.

[0028] Preferably, the female cavity 3m is delimited by edges, i.e. asymmetrical top edge and bottom edge of the transverse side 3a, which makes it possible to achieve different ranges of relative rotation of first adjacent bars, with respect to the aligned position, in the two different directions of upward/downward rotation about the transverse axis. In the preferred example shown, the top edge which defines the C extends in the longitudinal direction beyond the bottom edge, which allows a rotation in a downward direction of adjacent bars within a first range of rotation (for example 35°), while the relative rotation in the upward direction beyond the aligned position is substantially prevented or in any case allowed only in a second range which is smaller (generally at the most 5°).

[0029] The other (front or rear, depending on the use) transverse side 3b of each first bar 3 is formed with a male element 3g projecting longitudinally from the body of the bar 3.

[0030] Preferably, the male element is in the form of a, preferably cylindrical and hollow, transverse rod projecting from the bar body to which it is connected by means of a transverse shank and with dimensions such that it may be stably seated in the female cavity 3m of the adjacent bar. The transverse flank of the bar body from which the male element projects is advantageously configured with a concave surface having dimensions suitable for cooperating with the outer surface of the female side of the adjacent first bar 3.

[0031] As can be seen in Fig. 5, the shank and the concave surface act as elements for limiting the relative rotation of the bars, making contact in the manner of end-of-travel stops against the respective top and bottom free edges of the female side 3a.

[0032] Advantageously, the female cavity and the male element may be extended over the entire transverse dimension of the first bar 3 so that the coupling between first adjacent bars is extremely solid and the cover has an improved rigidity and load-bearing capacity when it is extended to cover the pit with the first bars aligned.

[0033] It is clear to the person skilled in the art that it is not necessary for all the bars to have both the male element and the female element, it being possible to alternate for example bars having two male sides with bars having two female sides. However, the configuration proposed with both a male side and a female side is preferred because it allows the production of the profiled bars to be standardized.

[0034] As shown in Figs. 3 and 4, at predefined intervals along the cover 2, articulation bars 9 are arranged.

[0035] The articulation bars 9 are hinged with the adjacent first bars 3 by means of pivoted-connection elements, for example pins 9a,9b or screws. Compared to the form coupling between the first bars 3, the pivoted connection allows a greater relative rotation, for example such as to allow the articulation bar 9 to be arranged substantially at right angles to each of the first bars 3 coupled thereto.

[0036] In the preferred example of embodiment shown, the articulation bars 9 have a profiled transverse central body with vertical flanges 9d at the transverse end, projecting laterally in the longitudinal direction and provided with holes designed to receive the pivoted-connection means 9a,9b for articulated coupling to the first bars 3; the pins 9a,9b may in particular pass through the flange 9d so as to engage inside the cavity of the male rod 3g on the transverse side 3b of the bar 3. The profiled body of the articulation bar has preferably a transverse dimension smaller than the transverse dimension of the first bars 3.

[0037] A spacing between the holes of the flange 9d corresponds preferably to a spacing between the hole of the male rod 3g and the female cavity on the front side and rear side 3a,3b of the bars 3.

[0038] Preferably for each articulation bar 9, the pivoted-connection means also comprise a respective transverse rod 9c which is preferably cylindrical and

designed to be seated in the female cavity of the transverse side 3a of an adjacent first bar 3 and provided with female threads for receiving the threading of the connection pins 9a,9b.

[0039] As shown in Figs. 3 and 4, in order to assemble the cover 2, each female seat of a first bar 3 receives, inserted therein in the transverse direction Y-Y, the male element 3g of an adjacent first bar 3 or the transverse rod 9c for articulated coupling to an adjacent articulation bar 9. The pins 9a,9b are then screwed into the female threads of the male elements 3g, or the rod 9d, in order to fasten together the bars 3,9. The transverse rod 9c is therefore housed stably, but free to rotate, inside the female cavity.

[0040] With this configuration, the shutter-like cover has a plurality of semi-rigid panels formed by the first transverse bars and articulated together by means of the articulation bars arranged between successive panels.

[0041] The semi-rigid panels advantageously have the capacity to curve owing to the limited degree of freedom provided by the form coupling between the first bars 3, with a minimum radius of curvature, which is advantageously greater in one direction, generally corresponding to the direction of upwards deformation due to the load acting on the cover extending so as to close the pit and smaller in the opposite direction, generally corresponding to the direction of deformation for following a curved path in order to access the storage zone 10.

[0042] The bars 3, 9 which form the cover 2 are slidable, suitably at their transverse ends, along a pair of lateral sliding guides 4 arranged at the longitudinal edges of the pit 5.

[0043] The cover may therefore be moved along the pit 5 between an extended position for closing the pit (Fig. 1) and a position folded-up in the storage zone 10 (Fig. 2,6-7).

[0044] The system for guiding the cover comprises, in addition to the longitudinal sliding guides 4 which extend along the pit, a pair of storage guides 7 positioned in the storage zone 10. The storage guides are arranged and configured so that only some predefined articulation bars 9 engage with the storage guides, whereas at least some of the first bars 3 are arranged in adjacent rows, with the associated panels arranged side-by-side.

[0045] When the cover is moved between the extended position and the position folded-up inside the storage zone, the articulation bars 9, which are arranged at predetermined intervals, allow at least some of the semi-rigid panels to be arranged parallel to each other in the storage zone 10, with the first bars 3 arranged in side-by-side rows and/or to follow more or less complex curved paths between the extended position and the folded-up position, despite the limited degree of possible relative rotation of the first connected bars 3.

[0046] With reference to Figs. 4-8, a preferred embodiment of the covering system comprises a storage zone 10 formed by a casing 110 with a substantially parallelepiped frame, along the vertical side walls of which a terminal

section of a respective longitudinal lateral sliding guide 4 extends. Respective substantially vertical guide sections 6, which are open at the bottom, are arranged at the ends 4a of the lateral sliding guides 4. Each substantially vertical guide is connected to the longitudinal guide by means of a respective curved connecting section 6a.

[0047] The covering system 1 has a pair of storage guides 7 which are arranged in the storage zones 10 underneath the open ends of the substantially vertical guide sections 6. The storage guides 7 extend substantially parallel to the vertical direction, as a continuation of the vertical ends of lateral sliding guides 4.

[0048] As shown, preferably, the vertical sections 6 of the sliding guides and the storage guides 7 are preferably inclined from the top downwards and from the inside towards the longitudinal end of the storage zone 10.

[0049] The angle of inclination with respect to the vertical is preferably between 5° and 10°.

[0050] The shutter-like cover 2 further comprises a plurality of storage members 11 which are coupled to a predetermined number of articulation bars 9 and spaced from each other along the longitudinal extension of the shutter-like cover 2.

[0051] The system is configured so that only the selected articulation bars 9, to which the storage members 11 are attached, are guided along the storage guides 7, when they reach the open end of the vertical sliding guides 6 in the storage zone.

[0052] The storage guides 7 in particular can be engaged only by the storage members 11.

[0053] Preferably, at least the first bars 3 and the articulation bars 9 which are not associated with the storage members 11 have support members 8 for sliding along the lateral sliding guides 4. More preferably, all the bars 3,9 have said sliding members 8.

[0054] According to a preferred embodiment, the sliding members 8 and the storage members 11 comprise, respectively, sliding bearings or rollers and storage bearings or rollers.

[0055] The sliding rollers 8 are mounted on transverse pins 9a,9b which are screwed into the cavity of the hollow male element of the first bars 3 and/or of the rod 9c in the case of the articulation bars.

[0056] In the example shown, the storage members 11 are mounted on elongated pins 9a so that the storage rollers 11 are arranged in a position transversely more outer-lying than the sliding members 8.

[0057] The connection pins 9a,9b pass through the flange of the articulation bars and engage with the first bar 3 and the cylindrical rod 9c adjacent to the articulation bar.

[0058] Preferably, the selected articulation bars which carry the storage rollers 11 have, on same long pins 9a, also the sliding rollers 8.

[0059] Preferably, at predetermined intervals, some of the first bars 3 are provided with longitudinal transverse end plates, arranged between the body of the first bar and the sliding members 8 and provided with through-holes in

the transverse direction for insertion of the connection pins 9b.

[0060] Advantageously, the plates 13 have a tooth 13a projecting in the vertical direction beyond the bottom surface of the bar body 3 and designed to keep the bar properly aligned during sliding in the guides 4. In the example shown, every other bar 3 is provided with these plates, although other arrangements are possible. The plates also provide the cover 2 with greater rigidity and stability, preventing relative movements of the bars in the transverse direction.

[0061] With reference to the embodiment shown in Figures 6 and 7, the covering element 1 comprises motor means 12 for moving the shutter-like cover 2. By way of example, the motor means comprise a motor 12 which drives a pair of crown wheels 12a meshing with the sliding rollers 8.

[0062] Therefore, preferably the sliding rollers 8 are arranged at constant intervals in order to facilitate meshing with the crown wheels 12a.

[0063] According to preferred embodiments of the invention, the distance between the free edges of the opposite lateral sliding guides 4 is smaller than the distance between the free edges of the opposite storage guides 7.

[0064] Basically, the storage guides 7 have a smaller width than the longitudinal sliding guides 4 so that they do not offer support for the sliding rollers 8 arranged in a more inner position in the transverse direction, so that the first bars 3 and the articulation bars 9 which do not have the storage members 11 fall downwards without engaging with the storage guides 7, when they enter the storage zone 10, in particular in the region of the storage guides 7. As shown in Figs. 6 and 7, in the preferred embodiment shown, the storage zone is configured with substantially vertically descending storage guides 7 inclined with the bottom end 7a further away in the longitudinal direction than the top end, so that in the folded-up position the cover is arranged with rows of first bars 3 arranged substantially horizontal side-by-side, owing to the articulation bars which allow the semi-rigid panels to be arranged stacked on a bottom surface and arranged in substantially parallel longitudinal/transverse planes.

[0065] Ramps 7b inclined from the top downwards and from the outside towards the inside of the pit are arranged downstream of the top end of the storage guides 7 and are designed to act on the sliding rollers 8 during opening of the cover, acting as a guide surface for correctly routing the bars 3,9 without storage rollers towards the sliding guides 6.

[0066] Fig. 8 shows the folded-up position in the storage zone of a variation of embodiment of the covering system shown in Figs. 3-7, in which a second toothed wheel 19 is arranged at the terminal end of the longitudinal sliding guides 4 and is configured to transport the articulation bars 9 provided with storage members 11 along a curved bending path as far as storage guides 17 arranged sub-horizontally with a lower level at the end

17a opposite to the second toothed wheel 19. Preferably, said terminal end 4a of the lateral sliding guides 4 is open and the toothed wheel is configured with counter-pressure means 16 designed to act solely on the storage members 11 so that the bars 3,9 without storage members 11 are transported by the wheel 19 only as far as substantially vertical position at a halfway point on the bending curve, where they fall downwards towards the storage zone 10.

[0067] These counter-pressure means may for example be curved partitions arranged semi-circumferentially around the bend, outside the wheel 19 and projecting from the side walls of the storage zone over a distance such as to act on the storage rollers 11 but not on the sliding rollers 8. Advantageously, in this embodiment, only the articulation bars 9 provided with storage members 11 reach the storage guides 17, so that that the storage guides 17 may have a width which is the same as that of the sliding guides 4; therefore, the components are further standardized.

[0068] The second toothed wheel 19 may be an idle wheel which, meshing with the sliding rollers 8, rotates so as to accompany the cover 2 moved by the motor means 12 of the first crown wheel 12a. In alternative embodiments, the second toothed wheel 19 may be operated by a respective motorized drive system or via a transmission chain by the motor means 12 of the first toothed wheel 12a.

[0069] As shown in Figs. 9-11, in variation of embodiments, the storage members may be storage rollers 14 arranged outside the plane of the bars 9 and supported by pins 14a mounted on a bracket 15 which projects vertically from the bottom surface of the body of the selected articulation bars 9. In greater detail, as can be seen in Fig. 11, the end flange 13 of the predetermined articulation bars 9 has a bottom edge 13a folded underneath the bottom surface of the bar body 9 from which there extends the vertical/longitudinal bracket 15 with transverse holes 15a inside which the pins 14a which carry the storage rollers 14, fixed to the bracket 15 by means of nuts 15b, are inserted.

[0070] In this embodiment, the storage guides 27 may be open towards the outside in the transverse direction.

[0071] As shown in Fig. 9, preferably, each of the storage guides 27 has the cross-sectional shape of a C open towards the side wall of the storage zone, from which it extends projecting towards the inside of the storage zone. The storage method may be similar to that described in EP 1,849,935 A2 and is not described in further detail.

[0072] Preferably, all the first transverse bars 3 and the articulation bars 9 are provided with sliding rollers 8.

[0073] These rollers allow the cover to slide along longitudinal guides 4 positioned along the pit and to mesh with the crown wheel 12a of the drive motor 12, with a constant pitch.

[0074] With the system according to the invention, the first transverse bars 3 push and pull each other owing to

the form coupling and the rigidity of the assembly.

[0075] The cover is therefore easier to operate and is moreover more rigid in the extended position. Furthermore, and differently from the known covers in which the bars are articulated only at the transverse ends, the cover according to the invention is less subject to misalignment and deformation during the movement.

[0076] The use of this improved shutter-like cover offers various advantages including a greater rigidity and solidity when extended, a smaller thickness which results in reduced use of material and therefore a lower final cost, as well as a smaller amount of space occupied in the storage zone.

[0077] The covering system offers a high degree of versatility during configuration of the storage system depending on the dimensions and configuration of the final storage zone.

[0078] The articulation bars 9 may be positioned at regular intervals, namely a same number of first bars 3 is arranged between successive articulation bars 9.

[0079] According to preferred embodiments, the articulation bars 9 are positioned at irregular intervals so as to make better use of the space in the storage zone 10, in particular in the case of inclined storage guides.

[0080] Preferably, the articulation bars provided with storage members are arranged alternately with articulation bars without storage members.

[0081] With the cover according to the present invention it is possible, moreover, to make the individual components such as the longitudinal sliding guides 4,6, the storage guides 7,17, the motor means 12, and the first bars 3 and the articulation bars 9 in a modular manner, so that they may be easily combined also with ready existing pits 5 having different transverse and longitudinal dimensions.

[0082] The invention thus conceived is subject to numerous modifications and variations. Moreover, all the details may be replaced by other technically equivalent elements. Basically, the materials used, provided they are compatible with the specific use, as well as the dimensions and the relevant shapes may be any according to requirements.

[0083] Although described in connection with a number of embodiments and a number of preferred examples of implementation of the invention, it is understood that the scope of protection of the present patent is determined solely by the claims below.

Claims

1. Covering system for pits (5) of mechanical workshops, comprising a casing (110) defining a storage zone (10) arranged at a longitudinal end of a pit (5), a shutter-like cover (2) configured to slide along a pit (5) between an extended position for closing the pit and a folded-up position contained in said casing of the storage zone (10), the shutter-like cover (2)

comprising a plurality of first transverse bars (3), which have a profiled body extending in a transverse widthwise direction (Y-Y), a front transverse side (3a) and a rear transverse side (3b) opposite to each other in a longitudinal lengthwise direction (X-X) and a vertical height comprised between a top surface (3c), which in use is an outer walkable surface, and a bottom surface (3d), which is inner during use,

wherein the front and rear transverse sides (3a,3b) of the first bars (3) are shaped to provide a form coupling between first adjacent bars (3), providing a hinged fastening such that the first adjacent bars (3) are engaged together with a degree of freedom which allows a limited range of relative rotation about a transverse axis; and wherein, at predefined intervals along the cover (2), articulation bars (9) are positioned between first bars (3), said articulation bars being hinged with the adjacent first bars (3) by means of a pivoted connection allowing a greater relative rotation than the form coupling between the first bars (3), such that the articulation bars (9) allow at least some of the first bars (3) to be arranged in side-by-side rows when the cover is in the folded-up position in the storage zone (10); the system further comprising transverse pivoted-connection elements (9a,9b) for coupling the first bars (3) together and to the articulation bars.

2. Covering system according to Claim 1, wherein the articulation bars (9) are hinged with the adjacent first bars (3) by means of a pivoted connection which allows the articulation bars (9) to be arranged at right angles to the adjacent first bars (3) connected to them.
3. Covering system according to one of the preceding claims, wherein the form coupling between first adjacent bars (3) provides a hinged fastening configured to allow different ranges of rotation of first adjacent bars, relative to an aligned position thereof, when they move respectively in an upward direction and downward direction away from the aligned position; wherein, preferably, a minimum possible angle between the bottom surfaces (3d) of first adjacent bars (3) is always smaller than a minimum possible angle between the top surfaces (3c).
4. Covering system according to the preceding claim, wherein the minimum possible angle between the bottom surfaces (3d) of first adjacent bars (3) is greater than or equal to 130° and less than or equal to 140°; and/or wherein the minimum possible angle between top surfaces (3c) of first adjacent bars (3) is greater than or equal to 175° and less than or equal to

180°.

5. Covering system according to one of the preceding claims, wherein the shutter-like cover has a plurality of semi-rigid panels formed by first transverse bars which are adjacent and articulated together by means of the articulation bars (9) arranged between successive panels, the semi-rigid panels having the capacity to curve owing to the limited degree of freedom for relative rotation provided by the form coupling between the first bars (3).
6. Covering system according to one of the preceding claims, wherein, in the folded-up position in the storage zone, at least some of the panels are arranged in substantially parallel planes, preferably substantially horizontal or vertical planes.
7. Covering system according to one of the preceding claims, wherein the semi-rigid panels may curve with a minimum radius of curvature, which is greater in a first deformation direction, preferably corresponding to an upward deformation direction due to the load acting on the cover when extended so as to close the pit, and smaller in a second direction, preferably corresponding to the deformation direction for following a curved path in order to access the storage zone (10).
8. Covering system according to one of the preceding claims, wherein the first bars (3) have a bar body with a transverse side (3a) configured with a female cavity (3m) which is open and/or with a transverse side (3b) shaped with a male element (3g) projecting longitudinally from the body of the bar (3).
9. Covering system according to the preceding claim, wherein the female cavity is substantially cylindrical and/or wherein the transverse side has a C-shaped cross-sectional form.
10. Covering system according to the preceding claim, wherein the female cavity (3m) is delimited by asymmetrical edges, i.e. top edge (3e) and bottom edge (3f), of the transverse side (3a), so as to allow different ranges of rotation of first adjacent bars about the transverse axis, in two different directions of rotation, i.e. upward direction and downward direction, with respect to the aligned position, wherein preferably the top edge extends in the longitudinal direction beyond the bottom edge, so as to allow rotation of adjacent bars in the downward direction within a first rotation range, while the relative rotation in the upward direction beyond the aligned position is substantially prevented or allowed only within a second smaller range.
11. System according to one of the preceding Claims

- 8-10, wherein the male element is in the form of a transverse rod, preferably cylindrical, projecting in the longitudinal direction from the bar body to which it is connected by means of a transverse shank and with dimensions such as to be stably seated inside the female cavity of an adjacent first bar (3).
12. System according to the preceding claim, wherein the transverse side of the bar body from which the male element projects is configured with a concave surface (3i), having dimensions such as to cooperate with an external surface of the female side (3a) of an adjacent first bar (3), so that the shank and the concave surface act as limiting elements for limiting relative rotation of the first adjacent bars (3).
13. Covering system according to one of Claims 8-12, wherein the female cavity and/or the male element extend(s) over the entire transverse dimension of the first bar (3).
14. Covering system according to one of the preceding claims, wherein the articulation bars (9) have a profiled, transverse, central body and vertical flanges (9d) situated at the transverse ends, projecting laterally in the longitudinal direction from the central body and provided with holes for receiving the transverse pivoted-connection elements (9a,9b) for articulated coupling to the first bars (3), wherein preferably, the central body of the articulation bar has a transverse dimension smaller than the transverse dimension of the first bars (3) and/or wherein a spacing between the holes of the flange (9d) corresponds to a distance between the transverse axes of relative rotation of adjacent first bars (3).
15. Covering system according to one of the preceding claims, comprising a plurality of transverse rods, each rotationally housed in the front or rear transverse side of a respective first bar (3), in particular inside said female cavity, and connected by means of said pivoted-connection elements (9a,9b) to a respective articulation bar (9).
16. Covering system according to one of the preceding claims, comprising a pair of lateral sliding guides (4) designed to be fixed along the longitudinal edges of the pit (5), wherein the bars (3,9) which form the shutter-like cover (2) are slidable, at their transverse ends, along said lateral sliding guides.
17. Covering system according to one of the preceding claims, **characterized in that** it comprises a plurality of storage members (11), attached to a certain predetermined number of the articulation bars (9) and spaced from each other along the longitudinal extension of the shutter-like cover (2), and storage guides (7) positioned in the storage zone (10); and **in that** the storage members and the storage guides are arranged and configured so that only the predetermined articulation bars (9) provided with the storage members (11,14) are guided by the storage guides, when the cover (2) is moved between the extended position and the storage zone so as to be arranged in said folded-up position.
18. Covering system according to the preceding claim, wherein two storage guides (7) are arranged in the storage zone (10), extending substantially parallel to the vertical direction and inclined from the top downwards and from the inside towards the longitudinal end of the storage zone (10), preferably with an angle of inclination with respect to the vertical of between 5° and 10°.
19. Covering system according to one of the preceding Claims 17 and 18, wherein at least the first bars (3) and the articulation bars (9) which are not associated with storage members (11) and preferably all the bars (3,9) which form the cover (2) have sliding members (8) for sliding along the lateral sliding guides (4); the sliding members (8) preferably comprising sliding rollers or bearings supported by the pivoted-connection elements (9a,9b).
20. Covering system according to one of Claims 17-19, wherein the storage members (11), in particular the storage rollers, are mounted on elongated pins (9a) so that the storage members (11) are arranged in a position transversely further outer-lying than the sliding members (8); or wherein the storage members, in particular the storage rollers (14), are arranged outside of the plane of the bars (3), supported by a bracket (15) which projects vertically from the bottom surface of the body of the selected articulation bars (9).
21. System according to one of the preceding claims, wherein the pivoted-connection elements include transverse connection pins (9a,9b) which are inserted through the holes in the flanges of the articulation bars (9) and are engaged with a first bar (3) and with a transverse rod (9c) which are adjacent to the articulation bar.

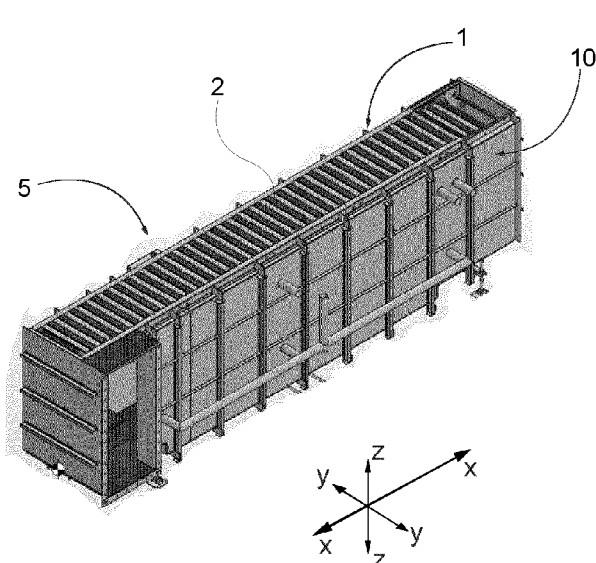


Fig. 1

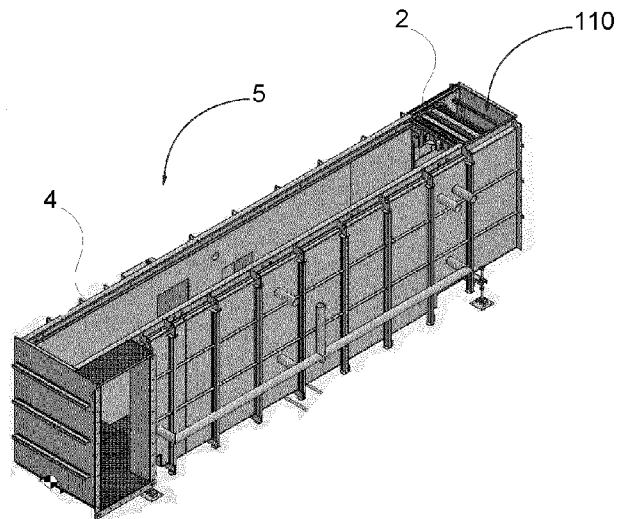


Fig. 2

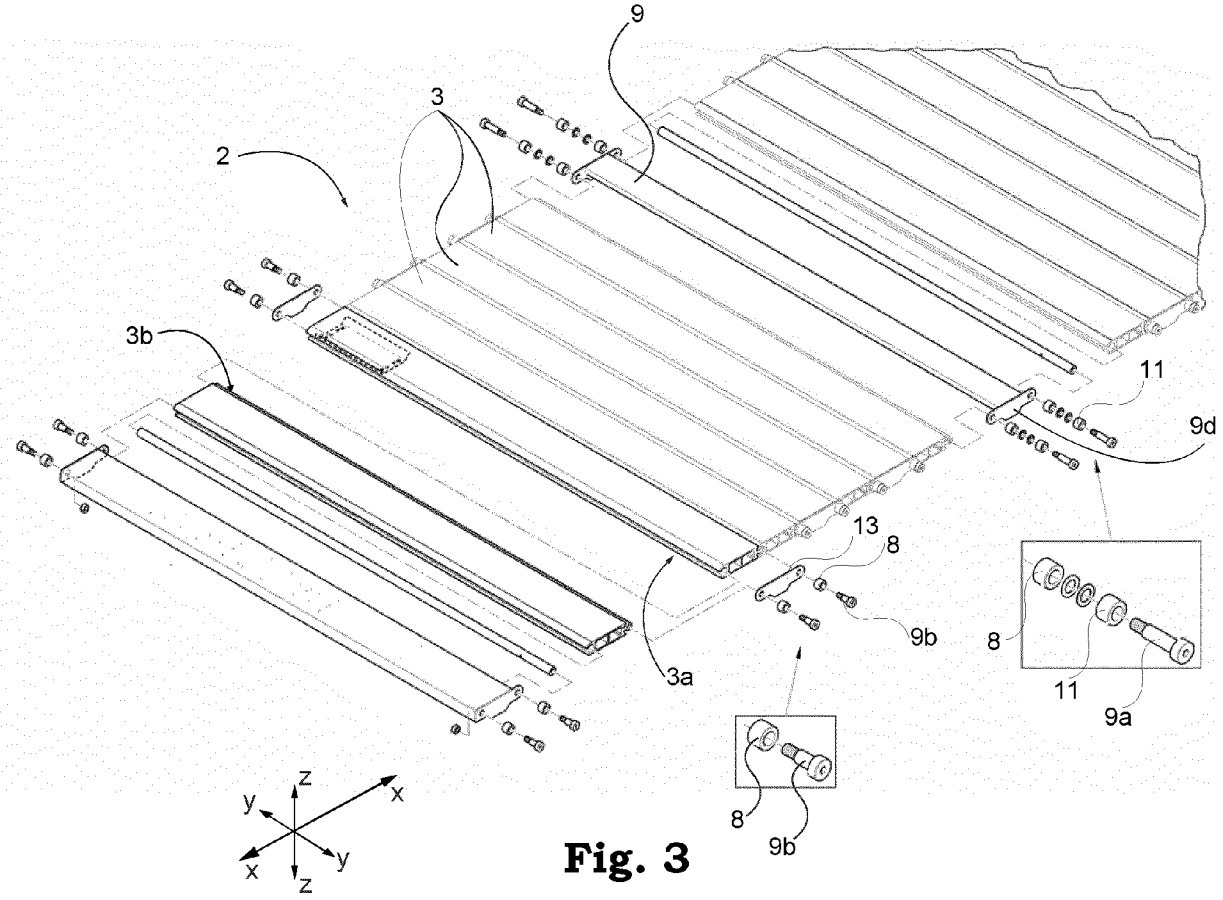


Fig. 3

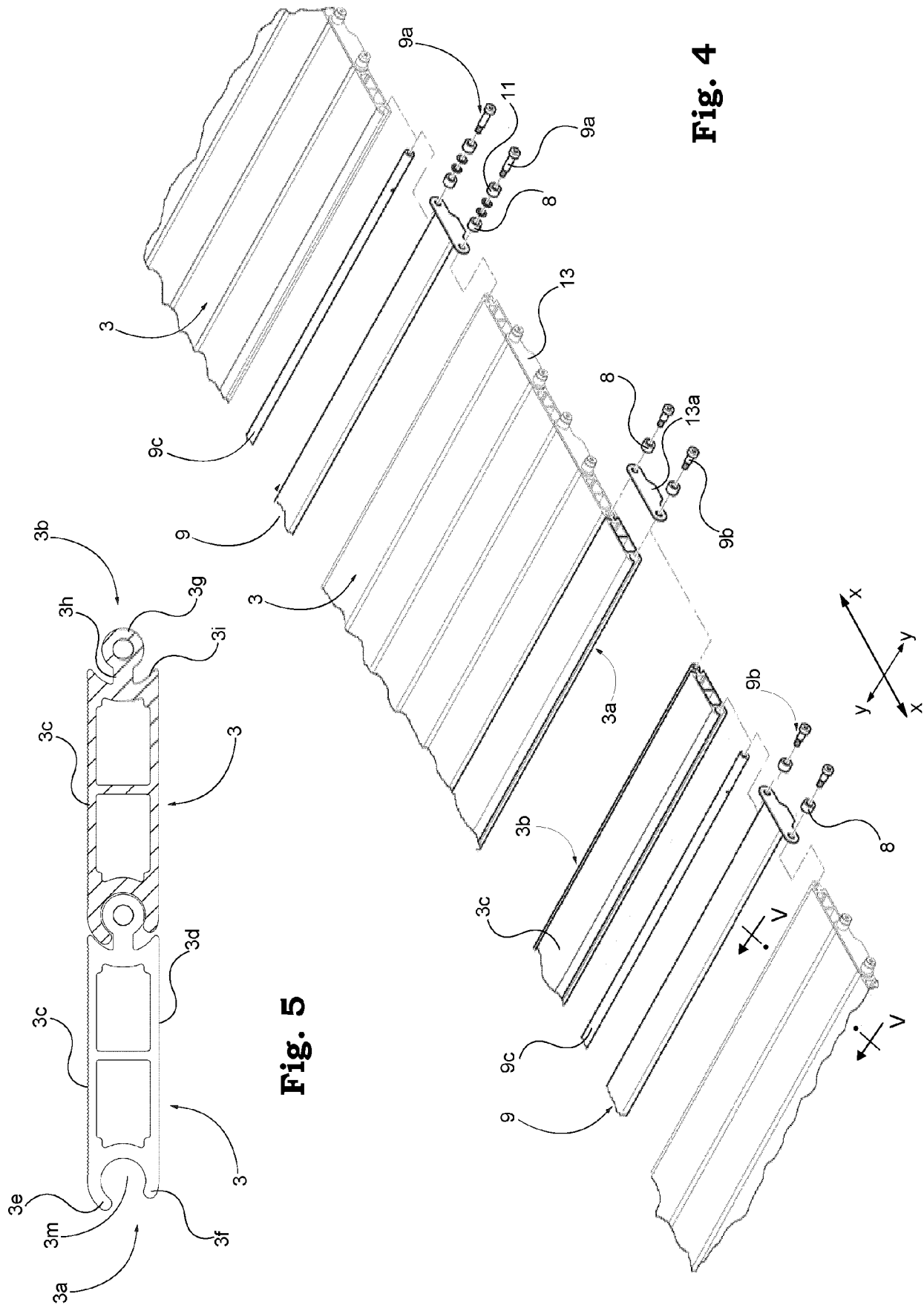


Fig. 4

Fig. 5

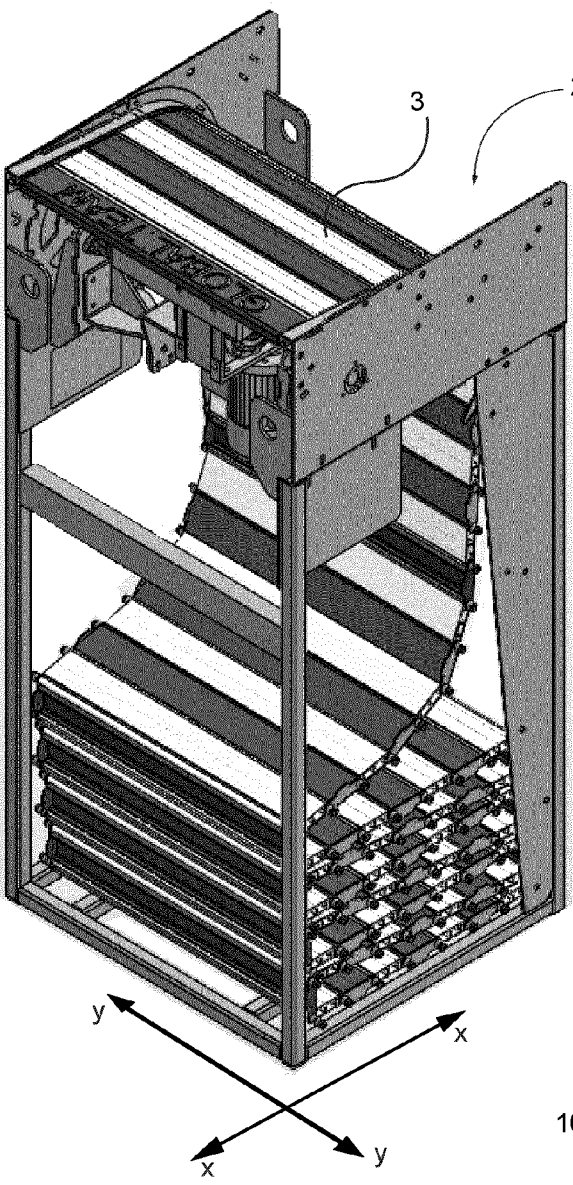


Fig. 6

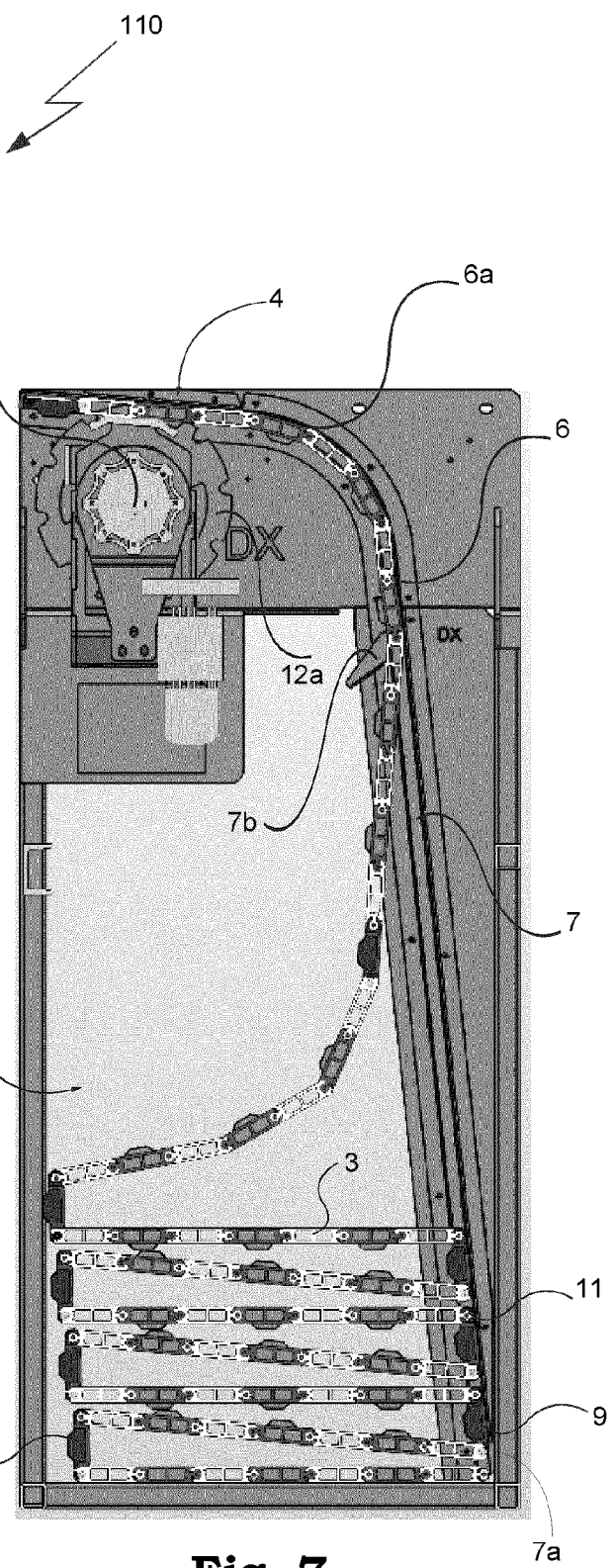
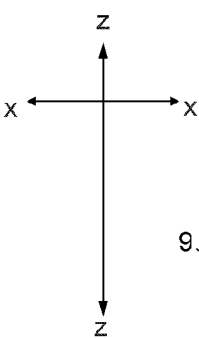


Fig. 7

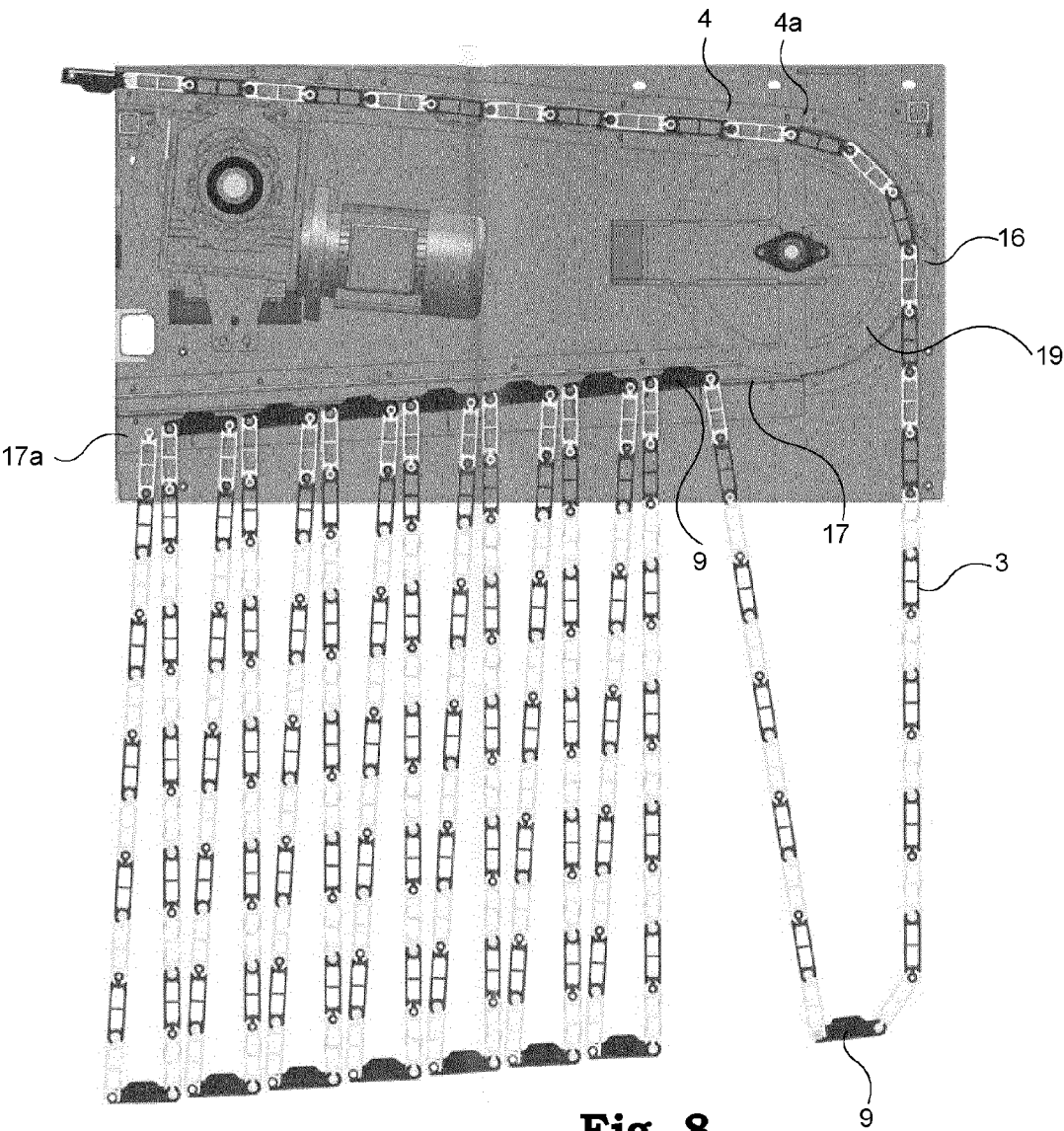


Fig. 8

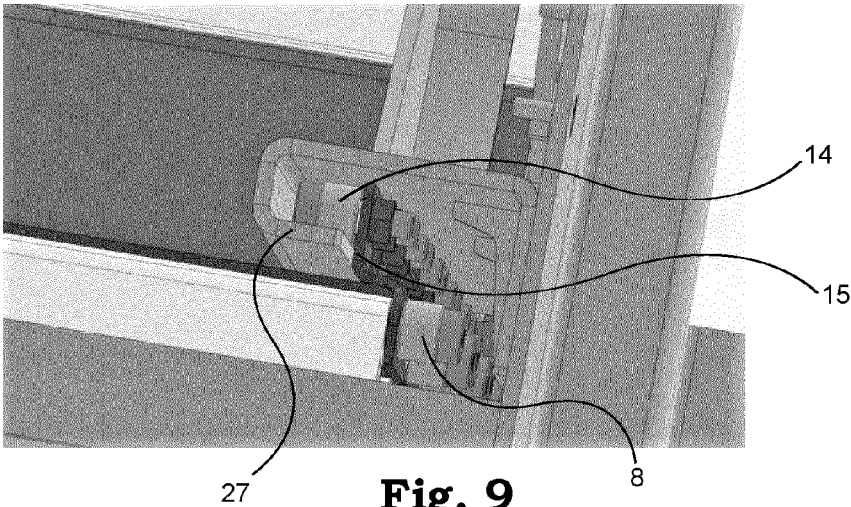


Fig. 9

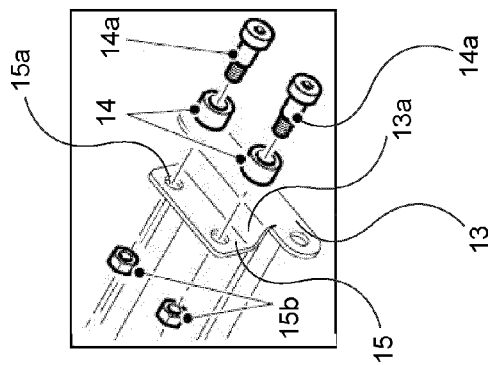


Fig. 11

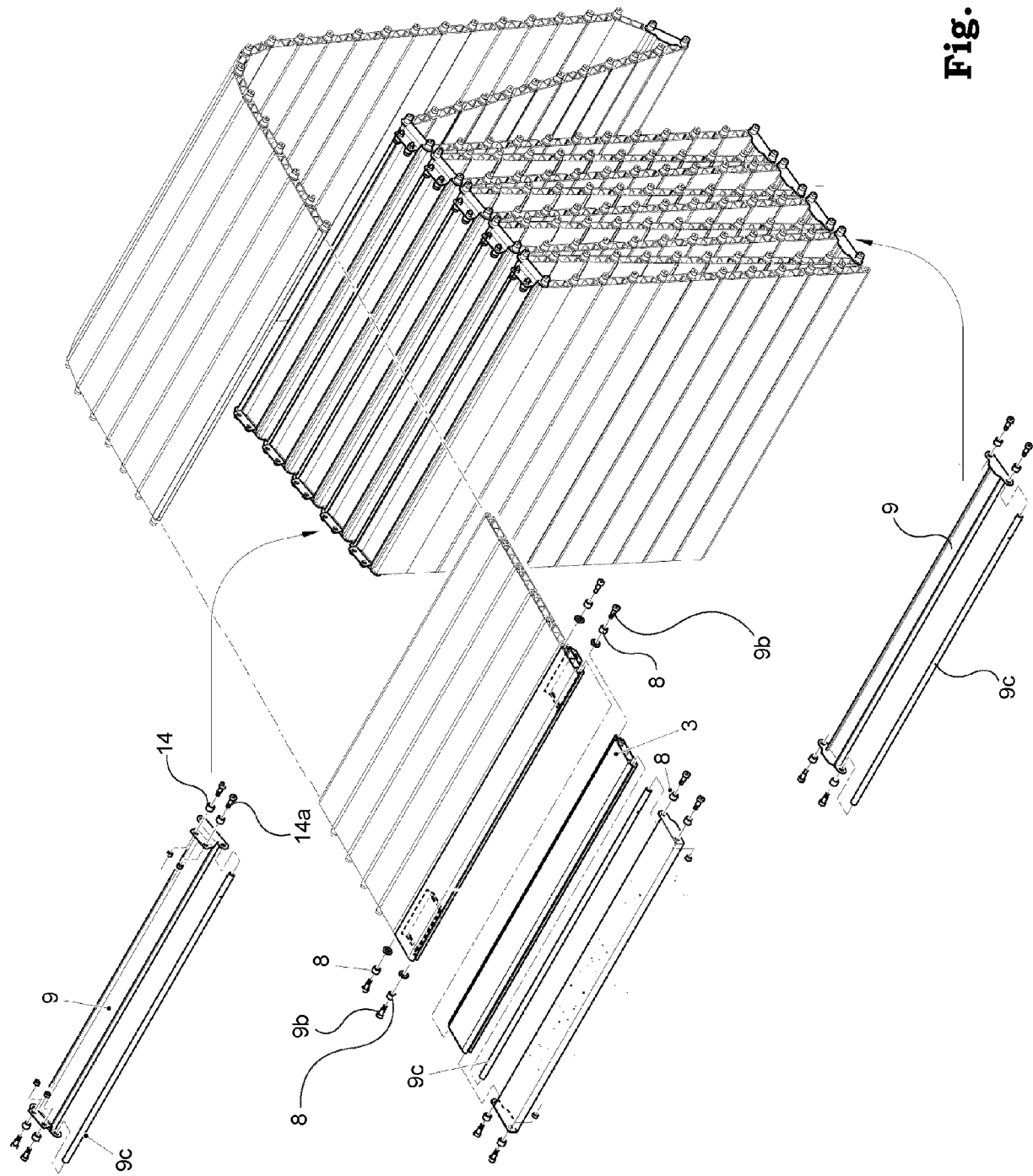


Fig. 10



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Application Number

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Place of search		Date of completion of the search	Examiner
Munich		11 December 2024	Brucksch, Carola
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