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(54) CUTLERY RACK, DISHWASHER AND METHOD FOR WASHING CUTLERY

(57) A cutlery rack (8) for washing cutlery comprising a support structure (9) defining a receiving space (20) for receiving the cutlery, and a spraying device (10) configured to spray a fluid at the cutlery. The spraying device (10) comprises a fluid supply channel (11) for providing the fluid, a nozzle (12) for ejecting the provided fluid and a deflector (13) for deflecting the fluid after being ejected out of the nozzle (12).

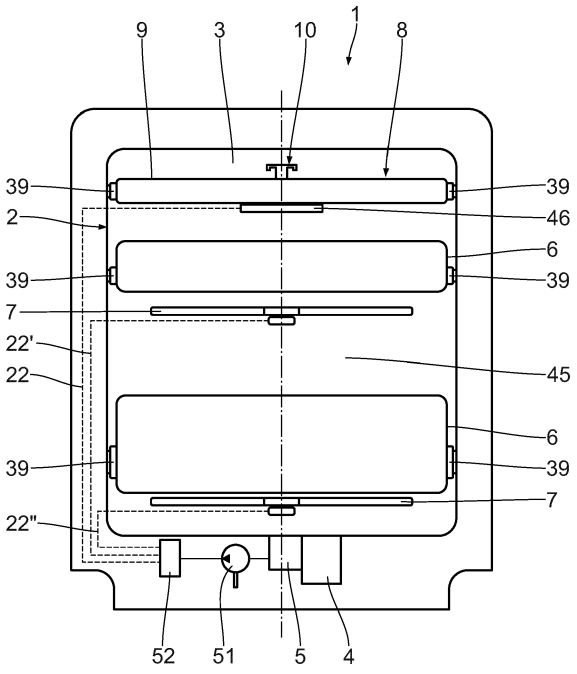

Fig. 1

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Description

[0001] The present invention relates to a cutlery rack for washing cutlery. The present invention further relates to a dishwasher as well as a method for washing cutlery.

[0002] Dishwashers having a cutlery rack are generally known from the prior art, especially from US 10,123,678 B1. These dishwashers comprise amongst others a cutlery rack having a fluid supply channel with nozzles and an upper spray assembly, wherein the upper spray assembly is arranged within the wash chamber and serves to spray wash fluid to the cutlery rack from above, wherein the nozzles arranged within the cutlery rack serve to spray fluid from the cutlery rack.

[0003] An object of the present invention is to provide a cutlery rack, which enables a simple and effective cleaning of cutlery.

[0004] This object is achieved in accordance with the invention by a cutlery rack having the features set out in claim 1. According to the present invention it was recognized that the cutlery racks and their respective nozzles and dedicated spray assemblies known from the prior art are complicated in their installation and therefore do not provide a simple and effective way to wash cutlery. It was found that a cutlery rack comprising a spraying device having deflector for deflecting the fluid after being ejected out of the nozzle can replace the function of an additional spray assembly exclusively designed and used for the cutlery rack. Therefore, with the cutlery rack according to the invention the need of an additional spray assembly mounted within the wash chamber exclusively for the cutlery rack is not given. The cutlery rack has the advantage, that the spraying device is fully incorporated within the cutlery rack.

[0005] Preferably, the cutlery rack comprises a docking port. The docking port can be arranged at the support structure. Preferably, the docking port is arranged at one end of the fluid supply channel.

[0006] The support structure defines a receiving space for receiving the cutlery. Preferably the support structure is designed as a frame structure having a rectangular shape defining the outer structure of the cutlery rack. Advantageously the support structure comprises two first frame elements having a first length L_1 and two second frame elements having a second length L_2 defining the rectangular shape of the cutlery rack.

[0007] Preferably, the support structure also comprises a middle frame element being attached to the two first frame elements. This middle frame element increases the stability and therefore enhances the sturdiness of the support structure. The respective middle frame element is preferably arranged between the first frame elements, especially at a point mid-way of their respective length L_1. With such an arranged middle frame element the support structure is divided into two separate support segments, each having the same area and both defining a separate receiving space. It is also possible that the support structure comprises several of said middle frame elements, wherein the support structure is divided into several separate support segments, each having the same area and each defining a separate receiving space.

[0008] In a preferred embodiment, the support structure further comprises a cutlery insert which serves to receive the cutlery to be washed. Preferably the cutlery insert is a grid structure defining a framework, in which the cutlery is placed horizontally, whereby the cutlery is located within the cutlery insert and thus located within the receiving space of the support structure and does not project from them. Preferably the cutlery insert is detachably connected to the frame structure.

[0009] In case that the support structure comprises a respective middle frame element dividing the support structure into two separate support segments, the support structure can comprise two cutlery inserts. Advantageously the amount of separate support segments and the amount of cutlery inserts are the same.

[0010] Advantageously the cutlery insert has respective sidewalls and a bottom side and an open top side. The open top side enables the placement of cutlery within the cutlery insert. The bottom side of the cutlery insert defines the lower limitation of the receiving space, wherein the sidewalls define the lateral limitation of the receiving space and the open top side defines the upper limitations of the receiving space. The open top side further defines a spray area on which the fluid is deflected on to wash the cutlery. In other words, the spray area can also be seen as the upper limitation of the receiving space. Preferably, the cutlery inserted into the cutlery inserts and therefore into the receiving space are not placed on the nozzle.

[0011] Preferably, the cutlery insert is attached to the frame elements. Preferably the cutlery insert is removable attached to said frame elements. In a preferred embodiment, the frame elements comprise a groove, wherein the cutlery insert comprises a tongue, so that the cutlery insert is attachable to the frame elements via said groove and tongue connection. Preferably, the tongue is attached to the sidewalls of the cutlery insert where the sidewalls and the open top side converge.

[0012] However, it is also possible to use any other form-locked connection or force-fit connection to attach the cutlery insert at the frame elements. In another a preferred embodiment, the frame elements comprise at least one resting element, wherein the cutlery insert comprises at least one recess for receiving the at least one resting element, so that the cutlery insert is attachable to the frame elements.

[0013] Preferably, the fluid supply channel and the nozzle are in direct fluid connection, so that the provided fluid is ejected out of the nozzle. The fluid ejected out of the nozzle is ejected in a first spray direction S_1. Preferably, the first spray direction S_1 extends in a vertical direction origination from the spray area away from the nozzle. To ensure a simple and efficient deflection of the fluid ejected out of the nozzle in the first spray direction S_1, the deflector is arranged directly within the path of the spray

direction S_1 and therefore directly above the nozzle and the ejected fluid. The deflector deflects the fluid in at least one spray direction which is different to the spray direction S_1.

[0014] In a preferred embodiment, the deflector is integrally formed with the support structure, especially with the middle frame element. In this case, the deflector is preferably positioned at the middle frame element in such a way, that it is positioned directly above the nozzle, so that the fluid ejected out of the nozzle in the first spray direction S_1 is deflected.

[0015] A cutlery rack as claimed in claim 2 enables a simple and effective cleaning of cutlery. Preferably, the deflector is attached to corresponding mounting areas via the mount. These mounting areas can either be arranged at the fluid supply channel or at the support structure. In any case, the deflector is preferably attached directly above the nozzle, so that the fluid ejected out of the nozzle in the first spray direction S_1 is deflected. Therefore, the corresponding mounting areas are preferably arranged around the nozzle. The mount can be a separate element attachable and detachable to the deflector. However, it is also possible, that the deflector and the mount are made in one part. Preferably, the mount comprises two clipping elements, which serve to attach the mount to the corresponding mounting areas. Each of the clipping elements is preferably bendable and comprises a hook which encompasses the fluid supply channel at the mounting areas to mount the deflector directly above the nozzle. Because of said clipping elements, the deflector is attached detachable to the mounting areas. It is also possible, that the mount is attached to the mounting areas in non-detachable manner.

[0016] A cutlery rack as claimed in claim 3 enables an effective cleaning of cutlery. In a preferred embodiment, the deflector element is designed as a deflector plate to deflect the ejected fluid. The deflector plate defines a level and/or plain deflector surface for deflecting the ejected fluid, wherein said deflector surface is parallel to the spray area. Other designs of the deflector surface, especially rounded or angled deflector surfaces, are also possible. Preferably, the deflector element deflects the fluid via the deflector surface in a second spray direction S_2 in the direction of the spray area, wherein the first spray direction S_1 and the second spray direction S_2 enclose a deflector angle α, wherein $40° \leq \alpha \leq 160°$, especially $70° \leq \alpha \leq 130°$, preferably $90° \leq \alpha \leq 110°$, in particular $\alpha = 100°$.

[0017] In case the cutlery rack comprises several separate support segments, the deflector element is preferably designed to deflect the fluid in several spray directions S_2, S_3, ..., S_n, wherein n designates the number of spray directions. Preferably, the deflector element is designed in such a way, that it deflects the fluid in said several spray directions S_2, S_3, ..., S_n simultaneously. This enables a very efficient washing of the cutlery.

[0018] A cutlery rack as claimed in claim 4 enables an effective cleaning of cutlery. Preferably, the mount and the deflector element are made in one part connected via at least one connection element. However, the mount can be a separate element attachable and detachable to the deflector element via said at least one connection element. Advantageously, the at least one connection element connecting the mount and the deflector element is arranged such that it does not interfere with the paths of the several spray directions S_2, S_3, ..., S_n of the deflected fluid. In other words, the at least one connection element is advantageously arranged along the longitudinal direction of the fluid supply channel, thus not coming in contact with the deflected fluid.

[0019] A cutlery rack as claimed in claim 5 enables a very effective cleaning of cutlery. Preferably, the diffusor is attached to the deflector element via a bearing pin, wherein said bearing pin comprises at least one clipping element. Preferably, the bearing pin comprises two clipping elements, which serve to attach the diffusor to the deflector element. Therefore, each of the clipping elements is preferably bendable and comprises a hook which encompasses a mounting hole at the deflector element to attach the diffusor. Preferably, the diffusor and the deflector element are made in one part. However, a diffusor base body can be a separate element attachable and detachable to the deflector element via said bearing pin.

[0020] Advantageously, the diffusor comprises a cavity which serves to receive the deflector element in its entirety, especially in such a way, that a plain and flat deflector surface is formed between the deflector element and the diffusor when the deflector element is placed within the cavity. This enables a very effective deflection of the ejected fluid.

[0021] However, it is also possible to attach the diffusor to the deflector element via said bearing pin, wherein the deflector element and the diffusor comprise a slot-protrusion-connection to form a form-locked connection between the diffusor and the deflector element. Preferably, the diffusor comprises a slot and the deflector element comprises a protrusion. It is understood that it is also possible, that the diffusor can comprise the protrusion, wherein the deflector element comprises the slot to attach the deflector to the diffusor. In particular, the protrusion as well as the slot are formed integrally as well as circumferentially with the respective component, namely the deflector element and/or the diffusor. Advantageously, the slot is arranged at sidewall of the cavity of the diffusor. The slot-protrusion-connection serves to connect the diffusor to the deflector in a detachable manner via form-lock. However, it is also possible to provide any other kind of form-locked connection or force-fit connection to attach the diffusor to the deflector.

[0022] Preferably, the fluid is diffused after the fluid is deflected and redirected via the deflector element. To diffuse the deflected fluid, the diffusor interferes with at least one path of at least one spray direction S_2, S_3, ..., S_n. In other words, the diffusor is advantageously arranged such that it comes in contact with the deflected

fluid. Therefore, the diffusor extends at least partially into the paths of the spray directions S_2, S_3, ..., S_n. This means, in cross sectional view the diffusor has a larger minimum width W_{min} than a maximum width W_{max} of the deflector element in cross sectional view. Preferably, the diffusion element diffuses the deflected fluid into a diffusion area, wherein the diffusion area is in particular parallel to the spray area and the angular range of the diffusion area is defined by diffusion angle β, wherein $50° \leq \beta \leq 150°$, especially $60° \leq \beta \leq 140°$, preferably $70° \leq \beta \leq 130°$, in particular $80° \leq \beta \leq 120°$.

[0023] A cutlery rack as claimed in claim 6 enables a very simple and effective cleaning of cutlery. Preferably, a diffusor base body and the diffusor element are made in one part. Advantageously, merely the diffusor element extends at least partially into the paths of the spray directions S_2, S_3, ..., S_n. Preferably, the diffusor comprises several, especially 3 to 10, in particular 5 diffusor elements, wherein the several diffusor elements are preferably evenly spaced apart circumferentially along the diffusor base body leaving open gaps along the circumference where no diffusor element is arranged. Advantageously, the amount of diffusor elements equals the amount of deflected fluid spray directions S_2, S_3, ..., S_n. Preferably, the diffusor element comprises a diffusor surface, which extends at least partially into the spray directions S_2, S_3, ..., S_n and contacts the deflected fluid to diffuse said deflected fluid. In other words, the deflected fluid sprayed in the spray directions S_2, S_3, ..., S_n impacts the diffusor surface to be diffused. The diffusor enables a comprehensive distribution of the fluid to the spray area and therefore a comprehensive distribution of the fluid to the cutlery.

[0024] A cutlery rack as claimed in claim 7 enables a very effective cleaning of cutlery, since the rotation of the diffusor enables a selective diffusion of the deflected fluid. Because of the rotation of the diffusor, the deflected fluid is not diffused at all times, since the fluid deflected merely becomes diffused by the diffusor when the diffusor element is rotated through the paths of the spray directions S_2, S_3, ..., S_n or in other words through the deflected fluid. If a gap between adjacent diffusor elements rotates through the deflected fluid or in other words through the respective paths of the spray directions S_2, S_3, ..., S_n, the deflected fluid is not diffused. Preferably, the diffusor is rotated by the force of the deflected fluid impacting the diffusor surface. In case of the preferred embodiment, wherein the deflector element and the diffusor comprise a slot-protrusion-connection to form a form-locked connection between the diffusor and the deflector, the slot as well as the protrusion are designed such that they enable a rotation of the diffusor.

[0025] A cutlery rack as claimed in claim 8 enables a simple cleaning of cutlery. Due to the fact, that the fluid supply channel is formed integrally with the support structure, the need to provide an additional element defining the fluid supply channel is not given. The fluid supply channel is defined by a channel integrated within the support structure.

[0026] A cutlery rack as claimed in claim 9 enables a very simple cleaning of cutlery. With the fluid supply channel being a separate component, the fluid supply channel is defined by a separate fluid supply tube. The fluid supply tube can be attached, in particular be removable attached to the support structure and its respective frame elements. This enables an easy detachment of the fluid supply tube and therefore of the fluid supply channel. The support structure may preferably comprise a recess for receiving the fluid supply tube and therefore the fluid supply channel. In a preferred embodiment, the recess is formed within the middle frame element of the support structure. Preferably, the recess within the support structure is designed in such a way, that the fluid supply tube is fully incorporated within the recess, wherein the nozzle and the deflector are positioned above the recess and therefore above the support frame and therefore are not incorporated within the recess. However, it is also possible that the recess merely incorporates a part of the fluid supply tube. It is also possible that the cutlery rack comprises a plurality of fluid supply channels and that the support structure comprises a plurality of recesses, wherein the amount of fluid supply channels and recesses are the same. Advantageously, the nozzle is embedded within the fluid supply tube establishing a direct fluid communication between the nozzle and the fluid supply channel.

[0027] In a preferred embodiment, where the recess of the support structure merely incorporates a part of the separate fluid supply tube, the fluid supply tube can comprise the at least one resting element at its laid open part, which serves to position the cutlery insert and to arrange the cutlery insert at the fluid supply tube and respectively at the support structure.

[0028] A cutlery rack as claimed in claim 10 enables a very effective cleaning of cutlery. Preferably the spraying device comprises 3 to 9 nozzles, in particular 3 to 7 nozzles, especially 5 to 7 nozzles. In addition to that, the spraying device comprises 3 to 9 deflectors, in particular 3 to 7 deflectors, especially 5 to 7 deflectors.

[0029] Advantageously the amount of nozzles and the amount of deflectors are the same, wherein each deflector is dedicated to a nozzle and is positioned directly above this corresponding nozzle. The plurality of nozzles and deflectors are arranged along a longitudinal direction of the fluid supply channel. Advantageously, the nozzles and deflectors are spaced evenly apart from each other. This enables a very effective cleaning of the cutlery. In addition to that, a foremost nozzle and a furthermost nozzle along the axis of the fluid supply channel and their respective deflectors can advantageously serve to distribute fluid to the corners of the receiving space enabling a distribution of the fluid to the receiving space to the full extent.

[0030] A cutlery rack as claimed in claim 11 enables a very effective cleaning of cutlery. Preferably, the deflector element is arranged in a distance d originating from the

spray area in direction of the first spray direction S_1, wherein 2 mm ≤ d ≤ 10 mm, especially 4 mm ≤ d ≤ 8 mm, in particular d = 6 mm.

[0031] Since the spray area is the upper limitation of the receiving space, the fluid is deflected onto the cutlery from above.

[0032] Advantageously, the deflector element deflects the ejected fluid in different sectors of deflector angle α onto the cutlery and therefore onto the spray area from above. Preferably, for a first sector applies $40° \leq \alpha \leq 100°$, wherein for a second sector applies $100° \leq \alpha \leq 160°$.

[0033] For example, a sector serves to deflect the fluid in the direction of a region of the spray area extending from the beginning of the spray area adjacent to the longitudinal axis of the fluid supply channel to the thought centre line of the spray area being parallel to the longitudinal axis of the fluid supply channel. A further sector serves to deflect the fluid in the direction of a region of the spray area, which extends on the thought centre line of the spray area being parallel to the longitudinal axis of the fluid supply channel away from the longitudinal axis of the fluid supply channel.

[0034] In a further embodiment, the deflector element deflects the fluid in a third sector of deflector angle α, wherein the third sector serves to deflect the fluid in the direction of a region of the spray area being positioned within the regions of a first and a second sector of the deflector angle α dividing the spray area in three regions, whereby $40° \leq \alpha \leq 80°$ for the first sector, $80° \leq \alpha \leq 120°$ for the second sector and $120° \leq \alpha \leq 160°$ for the third sector.

[0035] These different sectors of the deflector angle α enable a selective and specific cleaning of the cutlery by deflecting the ejected fluid onto the cutlery from above, since the fluid is systematically directed to defined regions of the spray area. Besides the deflection of deflector angle α in different sectors the distance and the fanning and therefore the systematically direction of the fluid to defined regions of the spray area depends on the revolutions per minute (rpm) of a used pump.

[0036] A cutlery rack as claimed in claim 12 enables a very simple and effective cleaning of cutlery. Advantageously, the support structure, especially the middle frame element and/or a separate component, especially a fluid supply tube, comprises at least one protector for protecting the deflector and/or the diffusor, e.g. when placing the cutlery within the receiving space. Preferably, the at least one protector comprises at its highest point in direction of spray direction S_1 a protection element, whose upper surface is placed in the same horizontal plane as an upper side of the deflector and/or the diffusor, wherein in particular said horizontal plane is parallel to the spray area. It is also possible, that the protection element and therefore its upper surface is placed in a higher horizontal plane in direction of spray direction S_1 than the upper side of the deflector and/or the diffusor. In this case, the upper surface of the protection element projects above the upper side of the deflector and/or the diffusor.

[0037] Another object of the present invention is to provide dishwasher, which enables a simple and effective cleaning of cutlery.

[0038] This object is achieved in accordance with the invention by a dishwasher having the features set out in claim 13. In particular, the dishwasher according to the invention can also be further improved with the features of claims 1 to 12. Preferably, the dishwasher further comprises, a sump which is arranged on the bottom of the wash tub and a fluid supply device for providing the wash tub with fluid. Preferably, the fluid is a wash fluid and/or air for drying. In addition to the cutlery rack, the dishwasher can comprise at least one dish rack for carrying dishes. Preferably, below the at least one dish rack a respective spraying arm for spraying fluid at the dishes is positioned. The fluid supply device is arranged for conveying fluid to the spraying arm of the at least one dish rack and to the fluid supply channel of the cutlery rack. Preferably, the spraying arm of the at least one dish rack and the fluid supply channel of the cutlery rack are supplied through different conveyor channels. In other words, the fluid supply device comprises a separate conveyor channel for the fluid supply channel and a separate conveyor channel for the spraying arms of the dish racks. This results in a selective fluid supply enabling independent fluid supply to the dish racks and the cutlery rack. Preferably, the at least one dish rack and the cutlery rack are adapted for a movement between an extended loading position, in which the racks are substantially positioned outside the wash chamber and a retracted position, in which the racks are located inside the wash chamber. The position change is advantageously facilitated by a sliding mechanism. A dishwasher with a cutlery rack according to the present invention does not have the disadvantages of a dishwasher known to the prior art, since an additional spray assembly exclusively for the respective cutlery rack is obsolete. Therefore a dishwasher according to the present invention has a simpler structure and is therefore easier to produce and to maintain.

[0039] A dishwasher as claimed in claim 14 enables a simple and effective cleaning of cutlery. The wash chamber comprises a docking station to seat the docking port of the cutlery rack. Preferably the docking station is attached to the end of the conveyor channel conveying fluid to the fluid supply channel of the dish rack. Preferably, the docking port and the docking station enable a direct fluid communication between the fluid supply channel of the cutlery rack and the conveyor channel of the fluid supply device when the cutlery rack is positioned in the retracted position within the wash chamber.

[0040] Another object of the present invention is to provide a method, which enables a simple and effective cleaning of cutlery.

[0041] This object is achieved in accordance with the invention by a method comprising the steps set out in claim 15. In particular, the method according to the invention can also be further improved with the features of claims 1 to 14.

[0042] Further features, advantages and details of the invention merge from the ensuing description of exemplary embodiments. In the drawings:

Fig. 1 shows a schematic front view of a dishwasher comprising dish racks, a cutlery rack, a wash tub and a fluid supply device;

Fig. 2 shows a perspective view of the cutlery rack in fig. 1 according to a first embodiment comprising a support structure and a spraying device;

Fig. 3 shows a perspective view of the spraying device in fig. 2 comprising a fluid supply channel, nozzles and deflectors;

Fig. 4 shows a schematic front view of one of the deflectors of fig. 3 with a detached diffusor;

Fig. 5 shows a schematic side view of the deflector element and the mount of the deflector of fig. 4;

Fig. 6 shows a perspective view of the diffusor of fig. 4;

Fig. 7 shows a sectional view of a support structure comprising a middle support element and two cutlery inserts according to a second embodiment;

Fig. 8 shows a perspective view of a middle frame element and a fluid supply tube according to a third embodiment;

Fig. 9 shows a schematic view from below of the middle frame element of fig. 9;

Fig. 10 shows a perspective view of the fluid supply tube of fig. 8 with a cutlery insert attached to said fluid supply tube;

Fig. 11 shows a sectional front view of a deflector with an attached diffusor according to a fourth embodiment.

[0043] The dishwasher 1 as shown in fig. 1 comprises a wash tub 2 defining a wash chamber 3, a sump 5 that is arranged on the bottom of the wash tub 2 and a fluid supply device 4 for providing the wash tub 2 with fluid via a pump 51, namely wash fluid and/or drying air.

[0044] In the wash chamber 3 two dish racks 6 for carrying dishes and a cutlery rack 8 for carrying cutlery are arranged. Below each of the dish racks 6 a spraying arm 7 for dispensing fluid to the dishes within the dish racks 6 is positioned. The fluid supply device 4 serves to convey fluid to the spraying arms 7 and the cutlery rack 8 via the conveyor channels 22, 22' and 22". A distribution device 52 arranged between the pump 51 and the conveyor channels 22, 22' and 22" serves to convey fluid to each of the conveyor channels 22, 22' and 22" individually.

[0045] The dish racks 6 and the cutlery rack 8 are adapted for a movement between an extended loading position, in which the racks are substantially positioned outside the wash chamber 3 and a retracted position, in which the racks are located inside the wash chamber 3. The position change is facilitated by sliding mechanisms 39. At one end of the conveyor channel 22 supplying the cutlery rack 8 and at a rear wall 45 of the wash chamber 3 a docking station 46 is arranged.

[0046] Fig. 2 shows a perspective view of the cutlery rack 8 according to a first embodiment. The cutlery rack 8 comprises a support structure 9 and a spraying device 10 configured to spray a fluid at the cutlery.

[0047] The support structure 9 is designed as a frame 23 having a rectangular shape defining the outer structure of the cutlery rack 8. For defining the rectangular shape, the frame 23 comprises two longer frame elements 24 having a same first length L_1 and two shorter frame elements 25 having a same second length L_2. The frame 23 further comprises a middle frame element 26 supporting the frame structure by connecting the two longer frame elements 24 with each other. According to the shown embodiment, the middle frame element 26 is attached at the two longer frame elements 24 on a point M mid-way of the length L_1 of the longer frame elements 24 and therefore dividing the support structure 9 into two equally spaced support segments 27. The longer frame elements 24, the shorter frame elements 25 and the middle frame element 24 are formed from one piece. The middle frame element 26 serves to increase the stability and the sturdiness of the support structure 9.

[0048] The support structure 9 further comprises two cutlery inserts 18 which serve to receive the cutlery to be washed. The cutlery inserts 18 are a grid structure defining a framework, in which the cutlery is placed horizontally. Each insert 18 is defined by respective sidewalls 30 and a bottom 31 and an open top 42. The bottom 31 of each insert 18 defines the lower limitation of the receiving space 20, wherein the sidewalls 30 define the lateral limitation of the receiving space 20 and the open top 42 defines the upper limitation of the receiving space 20. The cutlery inserts 18 are designed in such a way, that these inserts 18 each fit into one of the two support segments 27 defining two separate receiving spaces 20.

[0049] The cutlery inserts 18 are arranged at the frame elements 24, 25 and 26. The inner sides of the frame elements 24, 25 and 26 comprise a groove 28, wherein the cutlery inserts 18 comprise a tongue 29, so that the cutlery inserts 18 can be arranged at the frame 23 via said groove and tongue connection. The tongue 29 is attached to the sidewalls 30. This groove tongue connection can especially be seen in fig. 7.

[0050] The spraying device 10 serves to spray fluid at the cutlery. For supplying wash fluid from the fluid supply device 4 to the cutlery rack 8, the spraying device 10

comprises a fluid supply channel 11 for providing the fluid. According to the shown embodiment, the fluid supply channel 11 is defined by a separate fluid supply tube 44. The middle frame element 26 comprises a recess 32 for receiving the fluid supply tube 44 and therefore the fluid supply channel 11. The fluid supply tube 44 is attached to the support structure 9, e.g. via corresponding fasteners. The recess 32 is designed in such a way, that the fluid supply tube 44 and therefore the fluid supply channel 11 is fully incorporated within the recess 32.

[0051] Fig. 3 shows a perspective view of the spraying device comprising the fluid supply tube 44 defining the fluid supply channel 11 and several nozzles 12 and several deflectors 13. The fluid supply channel 11 comprises a docking port 19. As it can be seen from the shown embodiment, the spraying device 10 comprises five nozzles 12 and five deflectors 13. The nozzles 12 are arranged at the fluid supply tube 44 in such a way, that the nozzles 12 spray the fluid in a first spray direction S_1 vertical to the top side 42 of the inserts 18. The deflectors 13 are arranged directly above the respective nozzles 12 within the path of the spray direction S_1. The nozzles 12 serve to eject the provided fluid. The nozzles 12 and therefore the deflectors 13 are equally spaced apart from each other along the length of the fluid supply channel 11 and therefore of the fluid supply tube 44 to ensure that all cutlery placed within the inserts 18 can be sprayed with fluid.

[0052] Each deflector 13 comprises a mount 14 for mounting the deflector 13 to the fluid supply tube 44. Therefore, the fluid supply tube 44 comprises mounting areas 33 to which the mounts 14 can be attached to, wherein the amount of mounting areas 33 and the deflectors 13 and therefore the nozzles 12 are the same. As it can be seen in the shown embodiment, the mounting areas 33 are formed at the fluid supply tube 44 next to each nozzle 12, so that each deflector 13 can be attached to the fluid supply tube 44 directly above a corresponding nozzle 12.

[0053] According to the shown embodiment each mount 14 comprises two clipping elements 34, which serve to attach the mounts 14 to the mounting areas 33 of the fluid supply tube 44. Each of the clipping elements 34 is bendable and comprises a hook 35 which encompasses the fluid supply tube 44 at the respective mounting areas 33 to secure the respective mount 14 and therefore the respective deflector 13 to the fluid supply tube 44 directly above the respective nozzle 12. Because of said clipping elements 34, the deflectors 13 are attached detachable to the mounting areas 33.

[0054] As it can be seen from fig. 4 and 5, each deflector 13 comprises a deflector element 15 to deflect the ejected fluid. According to the shown embodiment, the mount 14 and the deflector element 15 are made as one piece. This means, that the mount 14 and the deflector element 15 are inseparable.

[0055] In the shown embodiment, the deflector element 15 is designed as a deflector plate. This means, that the deflector plate defines a level and plain deflector surface 21 for deflecting the ejected fluid in a deflector angle α, wherein $\alpha \approx 90°$, wherein the deflector angle α is the angle between the first spray direction S_1 and the second spray direction S_2 as well as the first spray direction S_1 and the third spray direction S_3. Further, the paths of said second spray direction S_2 and said third spray direction S_3 are parallel to the top 41 of the inserts 18 and therefore to spray areas 41 covering the upper limitations of each of the receiving spaces 20. In other words, via the deflector element 15, the ejected fluid is redirected from the first spray direction S_1 to a second spray direction S_2 and simultaneously to a third spray direction S_3 each redirections having a deflector angle α, wherein $\alpha \approx 90°$.

[0056] The deflector element 15 and the mount 14 are connected to each other via two connection elements 36. The two connection elements 36 define two fluid outlets 37 out of which the deflected fluid is sprayed after its deflection along the spray directions S_2 and S_3. The connection elements 36 are attached to the mount 14 and the deflector element 15 in such a way that the fluid outlets 37 are arranged above the clipping elements 34 of the mount 14. Therefore, the deflected and redirected fluid is sprayed out of the fluid outlets 37 along the spray directions S_2 and S_3 in direction of the spray areas 41 and therefore on the cutlery placed within the receiving spaces 20.

[0057] The deflector element 15 is arranged in a distance d originating from the spray areas 41 in direction of the first spray direction S_1, wherein d = 6 mm. Since the deflector element 15 is arranged at distance d from the spray areas 41, the ejected fluid is deflected onto the spray areas 41 and therefore onto the cutlery from above.

[0058] As it can especially be seen in fig. 4, the spraying device 10 comprises a diffusor 16 for diffusing the fluid after being sprayed out of the outlets 37. According to the shown embodiment, the diffusor 16 is rotatably attached to the deflector element 15 via a bearing pin 38, wherein said bearing pin 38 comprises two clipping elements 34', which serve to attach the diffusor 16 to the deflector element 15. Each of the clipping elements 34' is bendable and comprises a hook 35' which encompasses a mounting hole 50 at the deflector element 15 to attach the diffusor 16. The diffusor 16 traverses the deflector element 15 and the mount 14. In other words, in cross sectional view, the diffuser 16 has a larger minimum width W_{min} than a maximum width W_{max} of the deflector element 15.

[0059] Fig. 6 shows a perspective view of the diffusor of fig. 4. For diffusing the fluid after it is sprayed out of the fluid outlets 37 and before being sprayed on the spray areas 41, the diffusor 16 comprises four diffusor elements 17 arranged on a diffusor base body 17'. Each diffusor element 17 has a diffusor surface 40 for diffusing the fluid. The diffusor elements 17 extend from the diffusor base body 17' parallel to spraying direction S_1 in direction of the spray areas 41 so that the diffusor elements 17

intersect with deflected fluid sprayed in spray direction S_2. The diffusor surface 40 also serves to rotate the diffusor 16 via the impact force of the fluid.

[0060] The diffusor 16 comprises a cavity 56 which serves to receive the deflector element 15 in its entirety.

[0061] The diffusor elements 17 diffuse the deflected fluid into diffusion areas 57, wherein the diffusion area 57 is parallel to the spray area 41 and defined by a diffusion angle β, wherein in the shown embodiment $80° \leq \beta \leq 120°$. The diffusion area 57 as well as the diffusion angle β can be seen in fig. 2, wherein for the sake of clarity merely one diffusion area 57 and one respective diffusion angle β are shown.

[0062] Fig. 7 shows a sectional view of a middle frame element 26 of a support structure 9 and a fluid supply channel 11 according to a second embodiment, wherein the fluid supply channel 11 is formed integrally with the support structure 9. Constructively identical components have the same reference number as in the previous figs. 1 to 6. For reasons of clarity, fig. 7 does not show a respective deflector 13 and its components.

[0063] The method for washing cutlery with a cutlery rack 8 according to the invention and a dishwasher 1 according to the invention is as follows:

First cutlery is positioned horizontally within the receiving spaces 20 of cutlery inserts 18. In doing so, the cutlery rack 8 is in an extended loading position, in which the cutlery rack 8 is substantially positioned outside the wash chamber 3. After positioning of the cutlery, the cutlery rack 8 is retracted into a retracted position, in which the cutlery rack 8 is positioned within the wash chamber 3. In this retracted position, the docking port 19 establishes a fluid communication between the fluid supply channel 11 and a fluid supply device 4 via connecting to the docking station 46 at the rear wall 45 of the wash chamber 3.

[0064] After establishing a fluid connection, the fluid supply device 4 supplies fluid to the fluid supply channel 11 and therefore to the nozzles 12. The fluid is ejected out of the nozzles 12 in spray direction S_1. After being ejected out of the nozzles 12 the fluid is deflected via the deflection elements 15 at a deflector angle α, wherein $\alpha \approx 90°$ out of the fluid outlets 37 along the paths of the spray directions S_2 and S_3. After being sprayed out of the spray outlets 37, the deflected fluid is diffused via the diffusors 16.

[0065] To diffuse the deflected fluid, the diffusor 16 interferes with the paths of the spray directions S_2 and S_3 by the diffusor elements 17, which extend into the paths of the spray directions S_2 and S_3. Therefore, the diffusor elements 17 are evenly spaced apart circumferentially along the diffusor 16 leaving open gaps along the circumference where no diffusor element 17 is arranged. Each diffusor element 17 has a diffusor surface 40, which contacts the deflected fluid to diffuse said deflected fluid. In other words, the deflected fluid sprayed in the spray directions S_2 and S_3 impacts the diffusor surface 40 to be diffused. Thus, the diffusor 16 enables a comprehensive distribution of the fluid to the spray areas 41 and therefore a comprehensive distribution of the fluid to wash the cutlery.

[0066] Fig. 8 to fig. 10 show a perspective view of a middle frame 26 element and a fluid supply tube 44 according to a third embodiment. Constructively identical components have the same reference number as in the previous figs. 1 to 7. According to this third embodiment, the fluid supply channel 11 is at least partially formed by the fluid supply tube 44 in combination with the middle frame element 26, when the fluid supply tube 44 is attached at the middle frame element. Therefore, the middle frame element 26 comprises a notch 58. The entire fluid supply channel 11 is formed via attaching the fluid supply tube 44 to the middle frame element 26 via corresponding fastening elements. Said notch 58 can be seen in fig. 9. To form the entire fluid supply channel 11, the fluid supply tube 44 comprises an upper surface 59 serving as a cover for the notch 58 of the middle frame element.

[0067] Furthermore, the fluid supply tube 44 comprises resting elements 48 to attach a cutlery insert 18, wherein the cutlery insert 18 comprises corresponding recesses 49 for receiving the resting elements 48. This can be seen in fig. 10. Furthermore, the deflectors 13 are integrally formed with the middle frame element 26. In addition to that, the middle frame element 26 comprises several protectors 43 for protecting the diffusors 16 and especially its diffusor base body 17', e.g. when placing the cutlery within the receiving space 20. Each protector 43 comprises at its highest point in direction of spray direction S_1 a protection surface 47, which is placed in the same horizontal plane as an upper side of the diffusor base body 17'.

[0068] Fig. 11 shows a sectional front view of a deflector 13 with an attached diffusor 16 according to a fourth embodiment. Constructively identical components have the same reference number as in the previous figs. 1 to 10. The deflector 13 comprises a deflector element 15 to deflect the ejected fluid. The diffusor 16 comprises a cavity 56 which serves to receive the deflector element 15 in its entirety, especially in such a way, that a plain and flat deflector surface 21 is formed between the deflector element 15 and the diffusor 16 when the deflector element 15 is placed within the cavity 56.

[0069] According to the shown embodiment, the deflector element 15 comprises a circumferential protrusion 54, which is formed integrally with the deflector element 15. The circumferential protrusion 54 serves to receive a circumferential slot 55, wherein said circumferential slot 55 is integrally formed with the diffusor 16 at an inner side at the cavity 56. The connection between the slot 55 and the protrusion 54 serves to connect the diffusor 16 to the deflector 13 in a detachable manner. Furthermore, the deflector 13 comprises mount 14 having a connector 53 to attach the mount at a respective nozzle 12 and/or a respective middle frame element 26. For reasons of clarity, fig. 10 does not show the nozzle 12 and the middle frame element 26.

Claims

1. A cutlery rack (8) for washing cutlery comprising

   - a support structure (9) defining a receiving space (20) for receiving the cutlery, and
   - a spraying device (10) configured to spray a fluid at the cutlery comprising

     - a fluid supply channel (11) for providing the fluid,
     - a nozzle (12) for ejecting the provided fluid, and
     - a deflector (15) for deflecting the fluid after being ejected out of the nozzle (12).

2. Cutlery rack (8) according to claim 1, **characterised in that** the deflector (13) comprises a mount (14) for mounting the deflector (13).

3. Cutlery rack (8) according to claim 1 or 2, **characterised in that** the deflector (13) comprises a deflector element (15), in particular a deflector plate, for deflecting the ejected fluid.

4. Cutlery rack (8) according to claims 2 and 3, **characterised in that** the deflector element (15) is attached to the mount (14).

5. Cutlery rack (8) according to one of the claims 1 to 4, **characterised in that** the spraying device (10) comprises a diffusor (16) for diffusing the deflected fluid.

6. Cutlery rack (8) according to claim 5, **characterised in that** the diffusor (16) comprises at least one diffusion element (17) for diffusing the fluid.

7. Cutlery rack (8) according to claim 5 or 6, **characterised in that** the diffusor (16) is rotatable attached to the deflector element (13).

8. Cutlery rack (8) according to one of the claims 1 to 7, **characterised in that** the fluid supply channel (11) is formed integrally with the support structure (9).

9. Cutlery rack (8) according to one of the claims 1 to 7, **characterised in that** the fluid supply channel (11) is formed by a separate component, in particular by a tube attached at the support structure (9).

10. Cutlery rack (8) according to one of the claims 1 to 9, **characterised by** a plurality of nozzles (12) and a plurality of deflectors (13).

11. Cutlery rack (8) according to one of the claims 1 to 10, **characterized in that** the deflector element (15) is positioned such that the ejected fluid is deflected onto the cutlery from above.

12. Cutlery rack (8) according to one of the claims 1 to 11, **characterized by** at least one protector (43) for protecting the deflector (15) and/or a diffusor (16).

13. A dishwasher (1) comprising

    - a wash tub (2) defining a wash chamber (3), and
    - a cutlery rack (8) according to one of the claims 1 to 12 slidably positioned within the wash chamber (3).

14. Dishwasher (1) according to claim 13, **characterised by** a docking station (46) providing a fluid communication between the fluid supply channel (11) and a fluid supply device (4) when the cutlery rack (8) is positioned within the wash chamber (3).

15. Method for washing cutlery comprising the following steps:

    - providing a cutlery rack (8) according to one of the claims 1 to 12,
    - deflecting the fluid after being ejected out of the nozzle (12) for washing the cutlery.

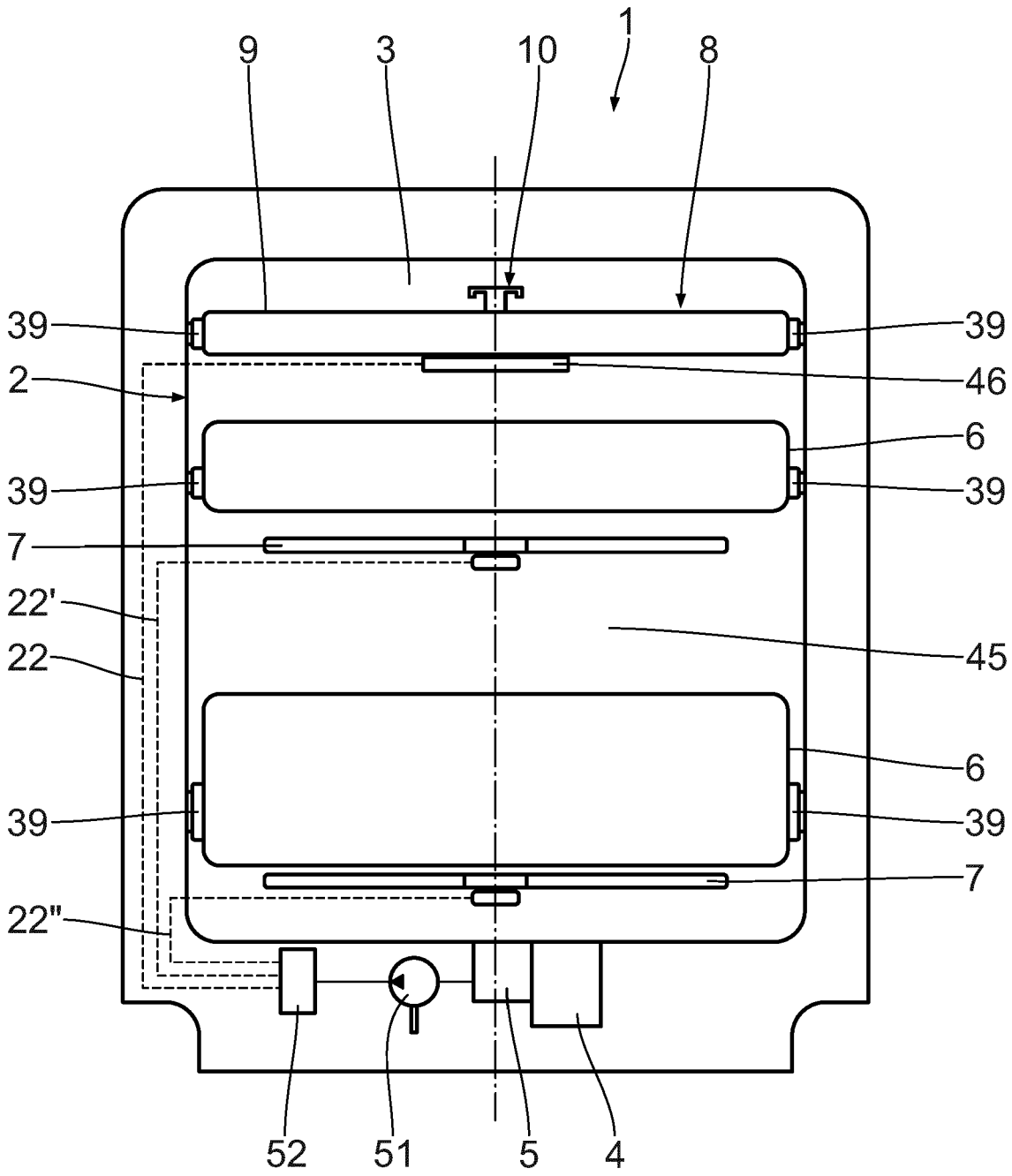


Fig. 1

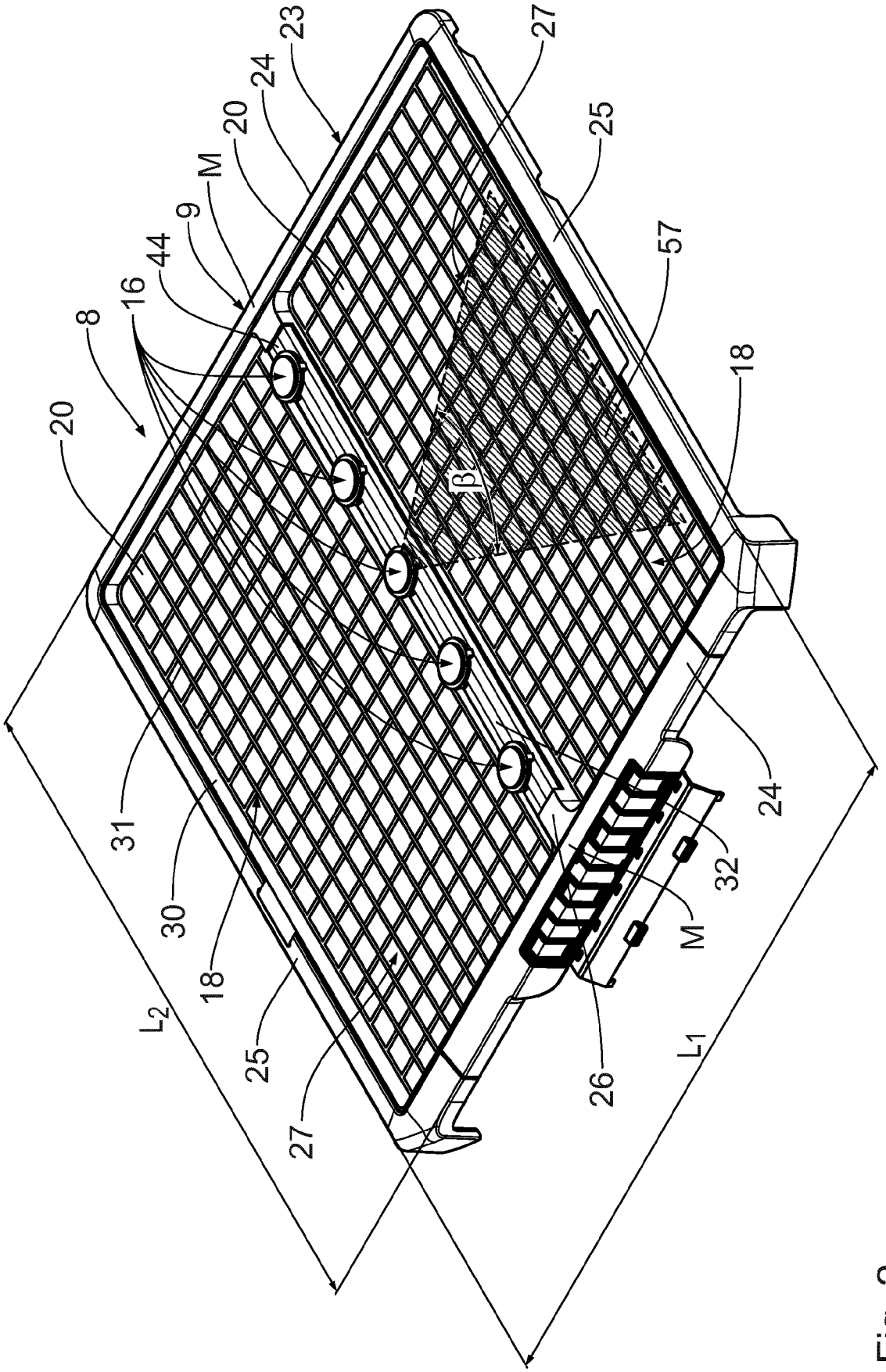


Fig. 2

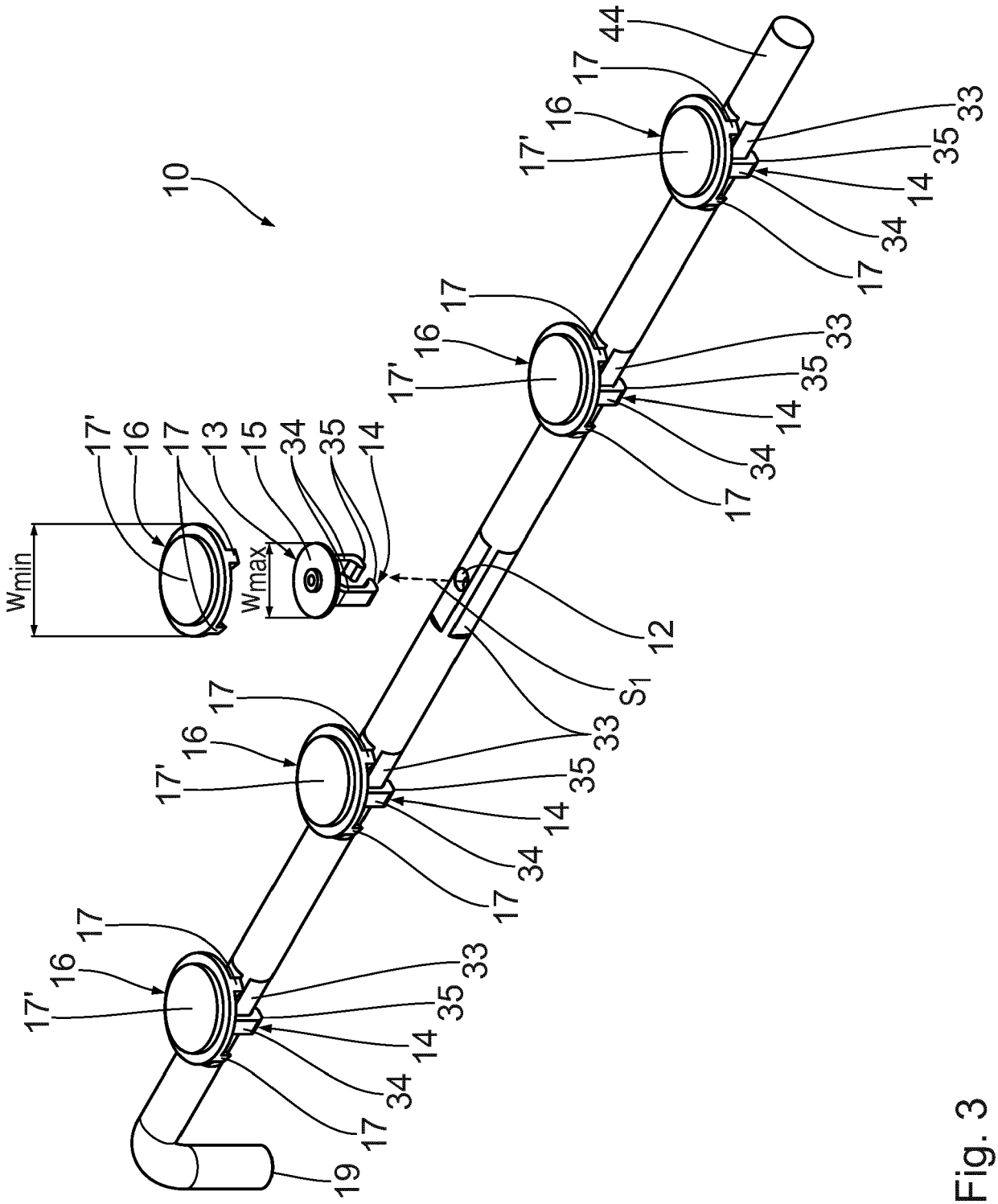
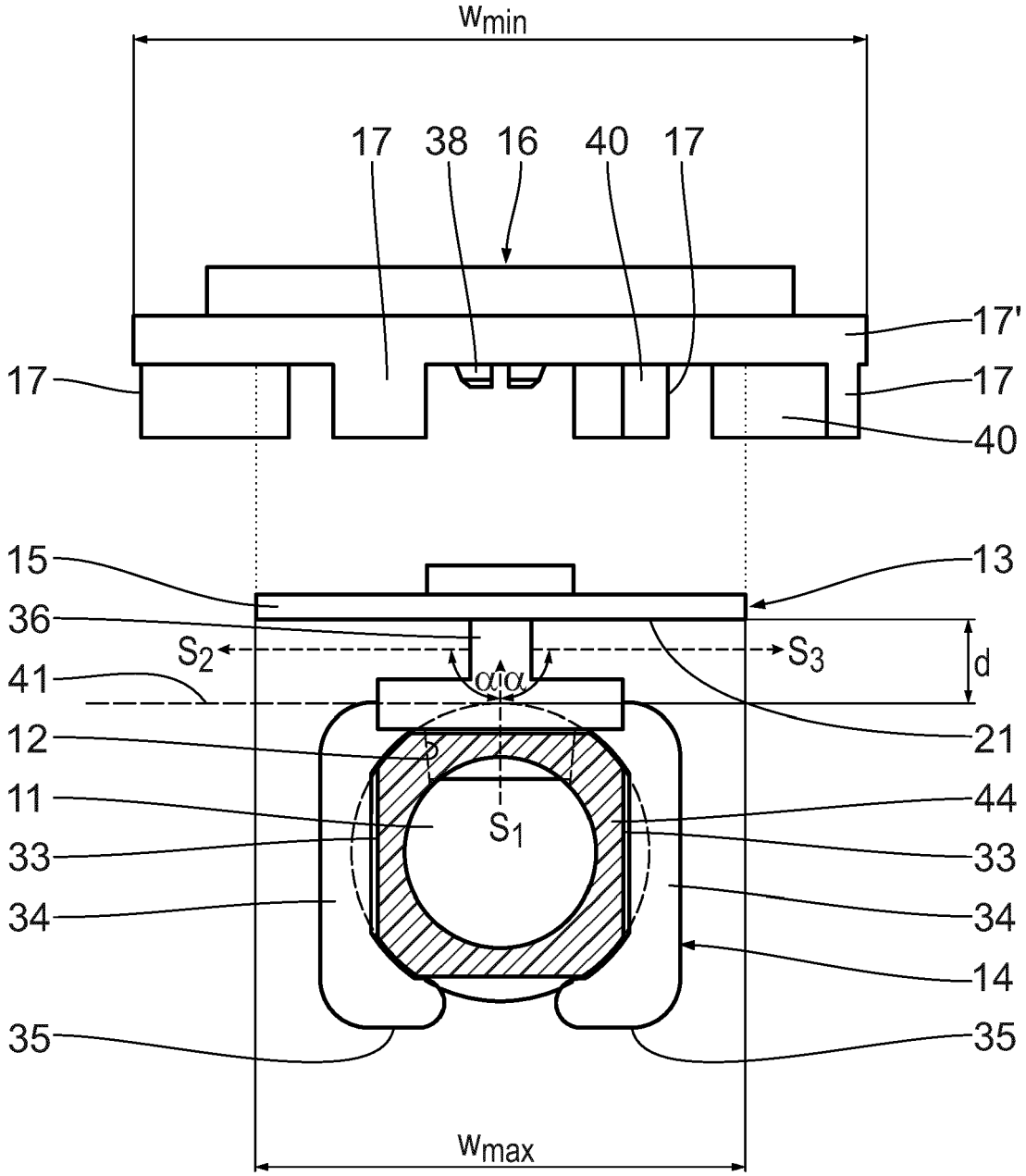


Fig. 3


wmin
17
38
16
40
17
17'
17
17
40
15
13
36
S2
S3
d
41
α
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33
33
34
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14
35
35
wmax

Fig. 4

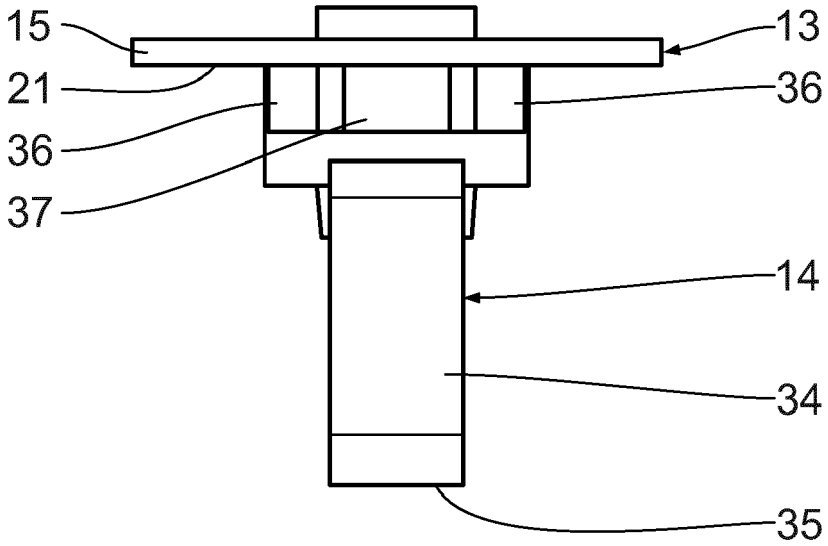

Fig. 5

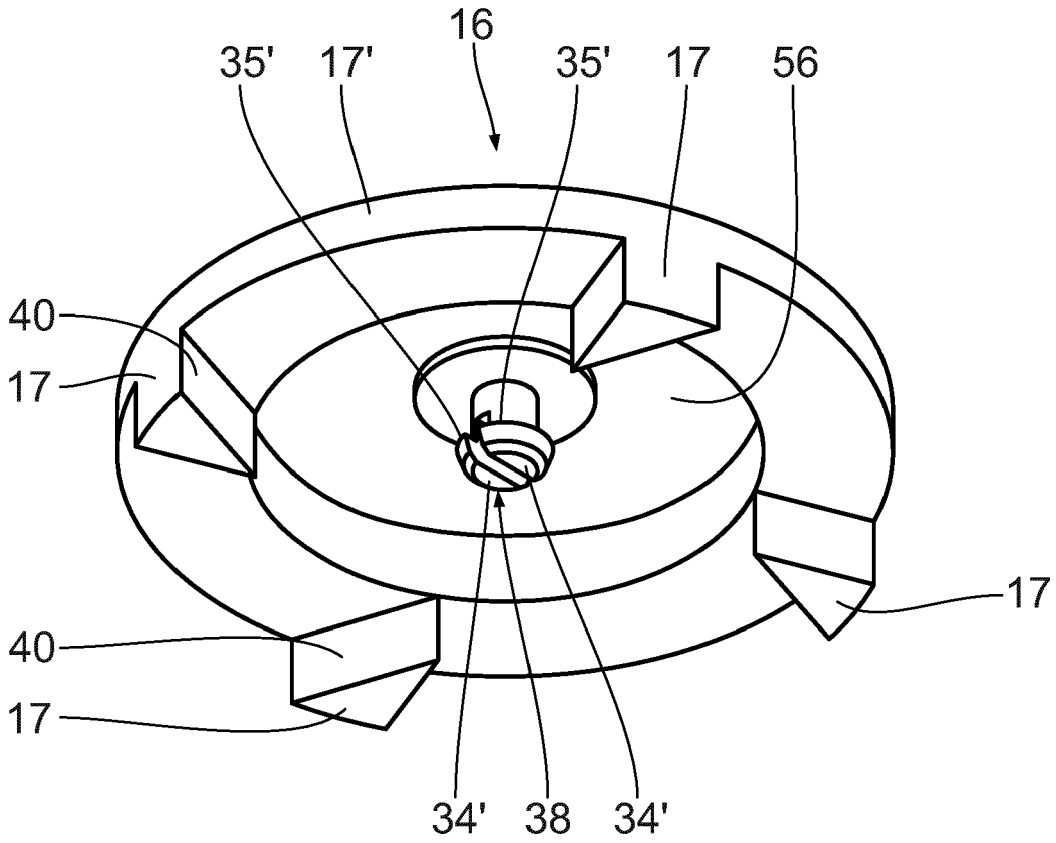

Fig. 6

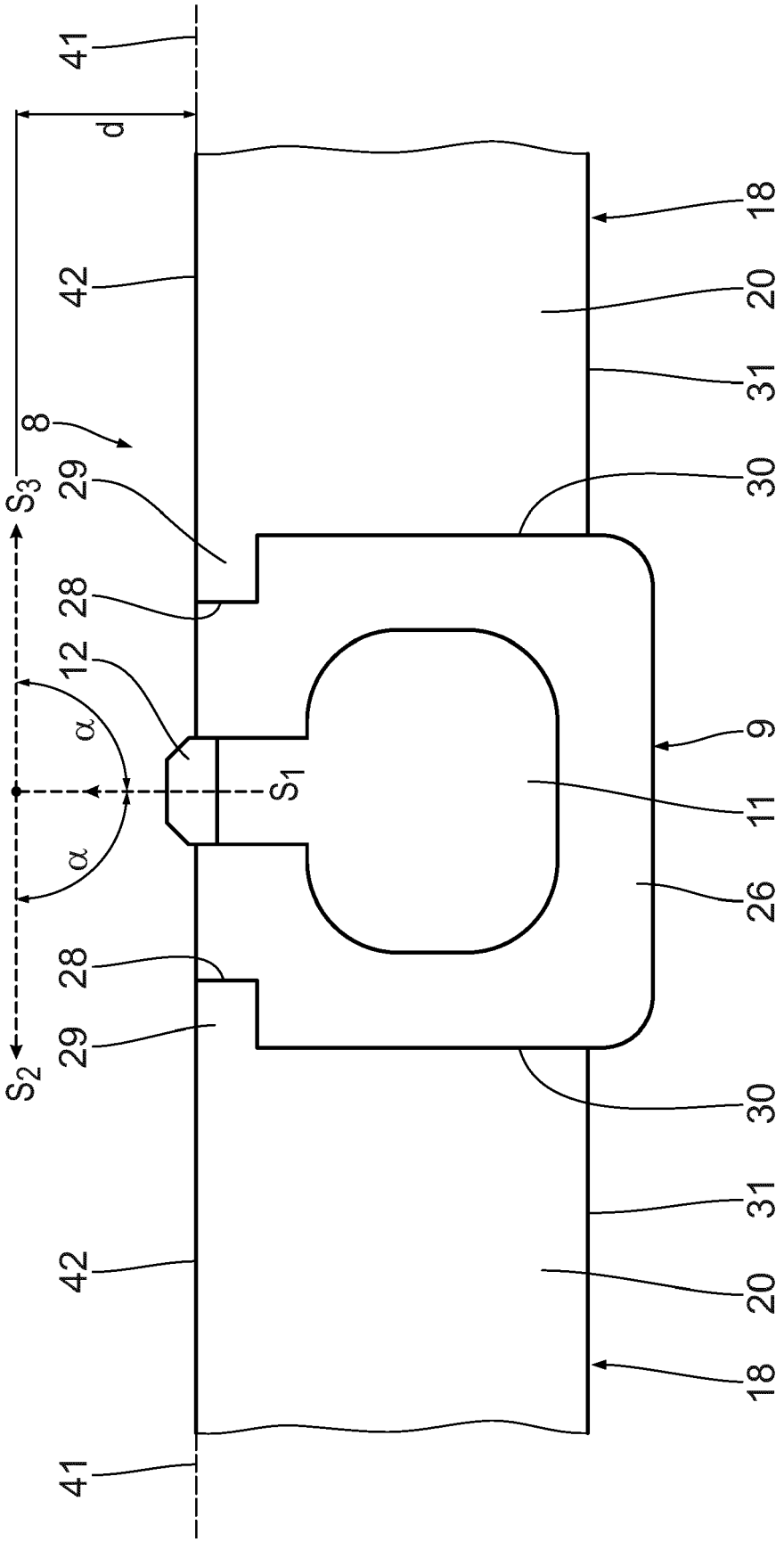

Fig. 7

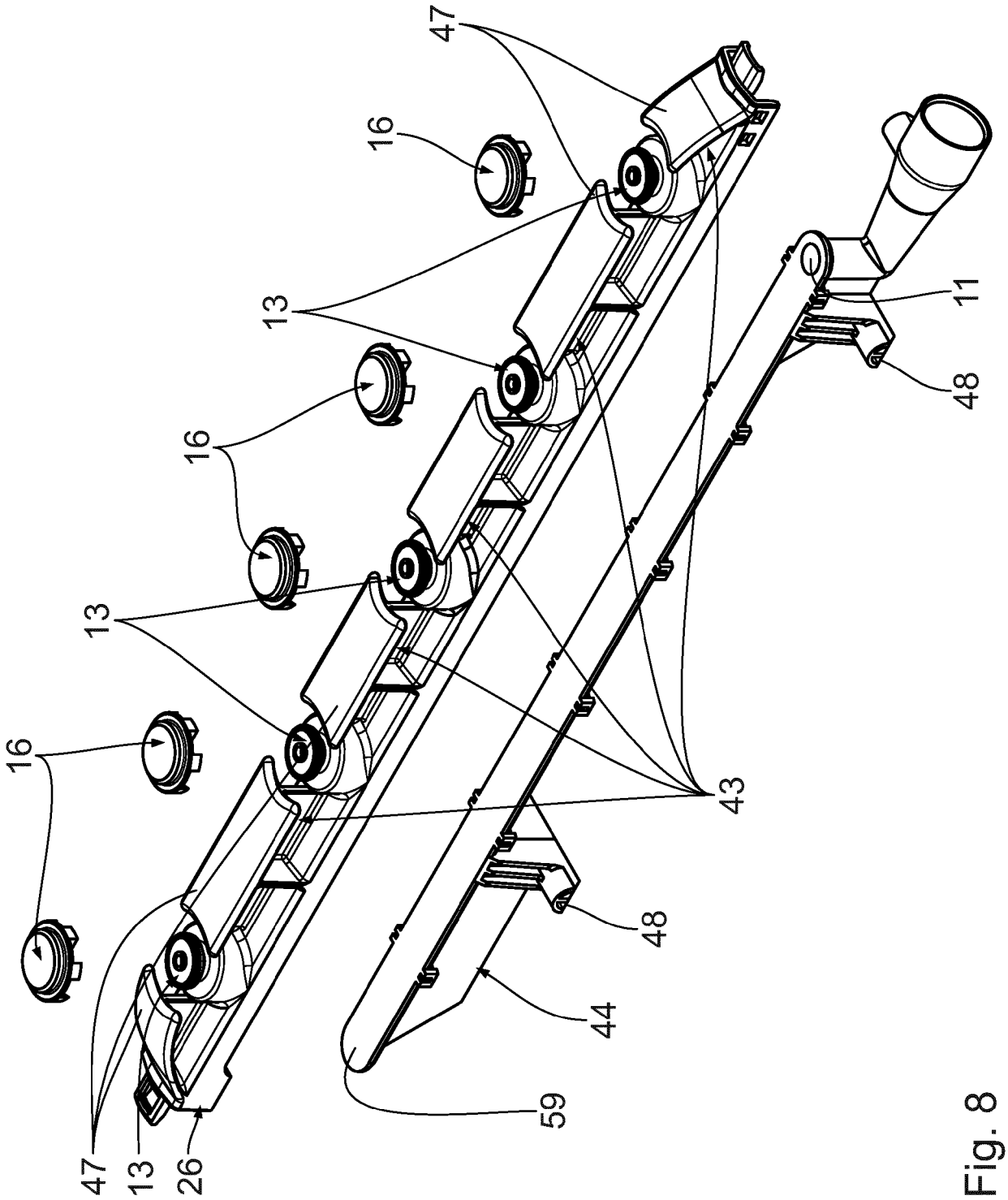

Fig. 8

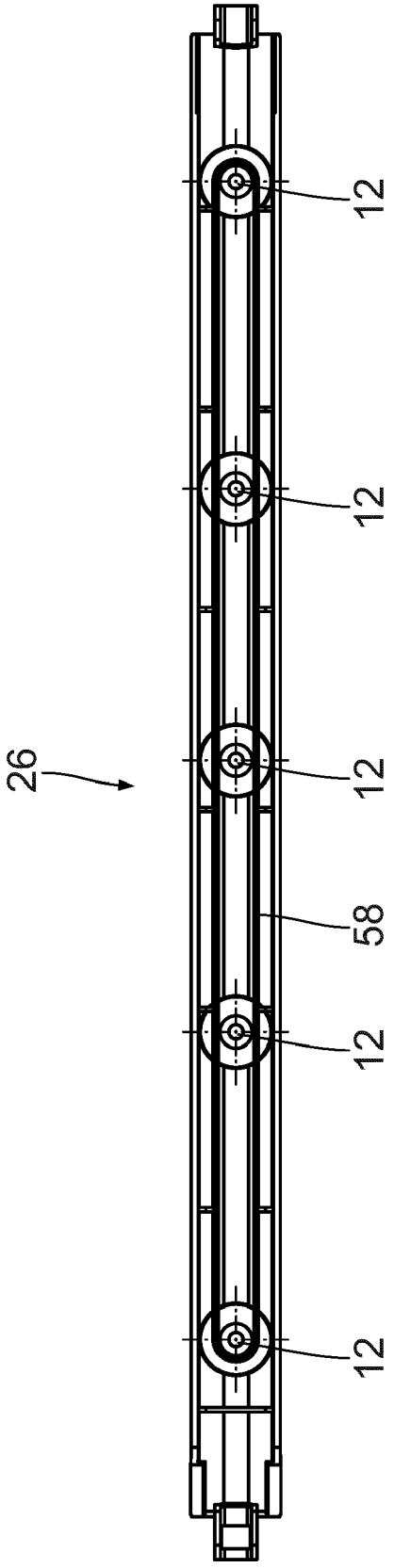

Fig. 9

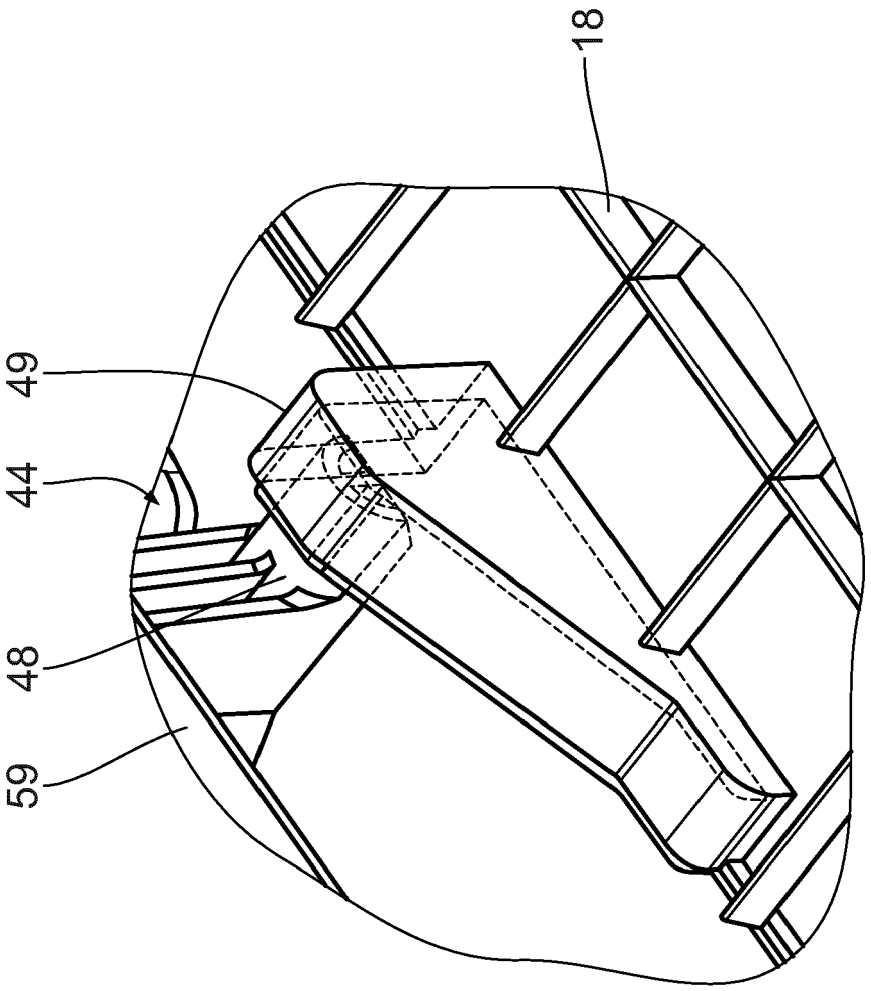

Fig. 10

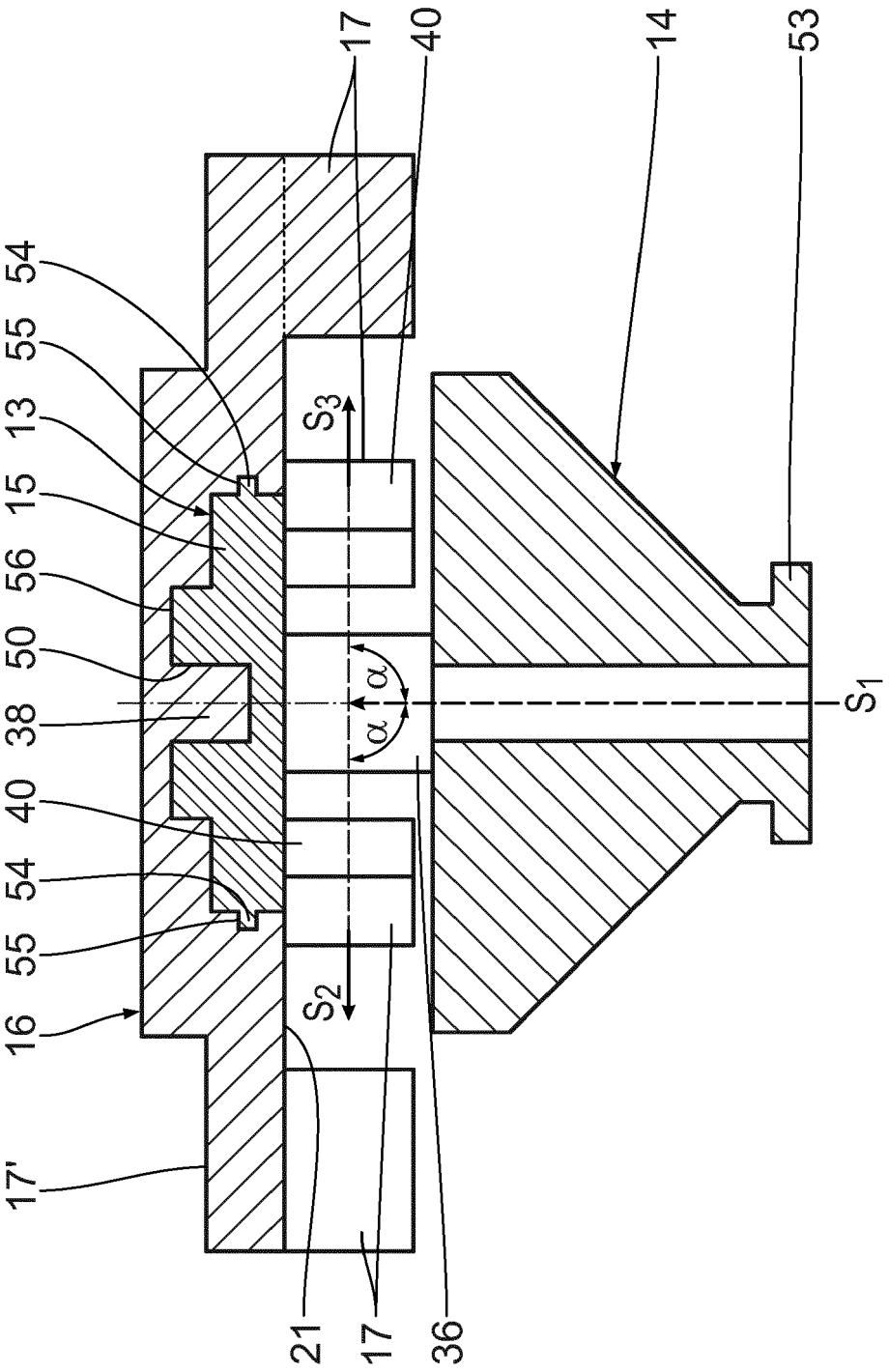

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 2556

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 April 2020	Kising, Axel

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