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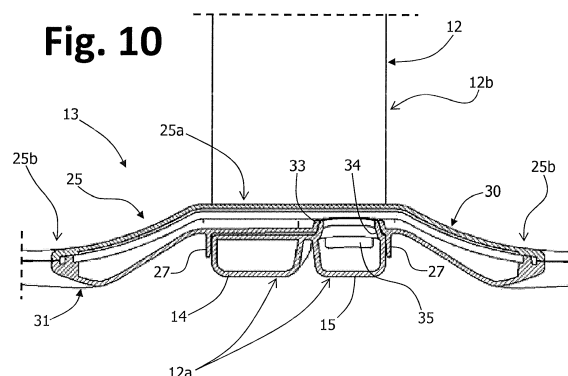
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(54) **HOUSEHOLD DISH-WASHING MACHINE**

(57) A dish-washing machine has a washtub, in which there can be housed at least one lower dish rack and one upper dish rack, and a sprinkler system, which comprises a lower sprinkler device configured for spraying water upwards, towards the lower rack, and at least one of an intermediate sprinkler device, configured for spraying water upwards, towards the upper rack, and an upper sprinkler device, configured for spraying water downwards, towards the lower rack. The lower sprinkler device and the at least one of the intermediate sprinkler device and the upper sprinkler device comprise respective rotary sprinklers, the at least one of the intermediate sprinkler device and the upper sprinkler device being supplied via a canalization (12) having at least one first portion (12a) and one second portion (12b), and possibly one third portion, which extend substantially at a lower wall, a rear wall and an upper wall of the tub, respectively. The sprinkler system comprises at least one further stationary sprinkler device (13) within the tub, configured for spraying water towards one of the lower rack and the upper rack, in fluid communication with a duct (14, 15) of the canalization (12).

The further stationary sprinkler device (13) has a hollow body (25) with a coupling portion (25a) having, on a rear side thereof facing the canalization (12), at least one of mechanical-coupling means (27) and hydraulic-coupling means (33) for coupling to the canalization (12), which are configured for quick coupling with respect to corresponding mechanical-coupling means (32) and hydraulic-coupling means (34) provided in a corresponding

coupling portion of the canalization (12). The coupling portions of the canalization (12) and of the hollow body preferably have both the respective mechanical-coupling means (27, 32) and the respective hydraulic-coupling means (33, 34).



Description

Field of the invention

[0001] The present invention relates to a dish-washing machine according to the preamble of Claim 1.

Prior art

[0002] Household dish-washers usually comprise a washtub, housed within which at least two dish racks can be housed in such a way that they can be pulled out, and a sprinkler system, which includes a first rotary sprinkler and a second rotary sprinkler, which are usually located underneath the lower rack and underneath the upper rack, respectively. Some dish-washers also include a third sprinkler, set above the upper dish rack, for example a substantially shower-type sprinkler, mounted on the upper wall of the washtub. Some machines provided with the aforesaid third sprinkler also have a tray for carrying further tableware, typically cutlery, set inside the washtub in a position generally comprised between the upper dish rack and the third sprinkler.

[0003] Known from EP-A-1488730, on which the preamble of Claim 1 is based, is a dish-washer the sprinkler system of which comprises, in addition to the aforesaid three rotary sprinkler members, also a stationary sprinkler member, set along a duct that supplies jointly the second and third sprinklers. The above stationary member is constituted by a manifold oriented vertically, configured so as to have two opposite halves positioned on opposite sides of the duct for supply of the second and third sprinklers. Each half of the manifold has an inlet branch, generally horizontal, in fluid communication with the respective side of the aforesaid supply duct, from which there branch off vertically distribution branches, on the distal ends of which sprinkler openings are provided. Associated to the manifold is a controllable valve, for diverting selectively the flow of water directed towards the second and third sprinklers from the supply duct to the manifold itself. The valve includes two spherical bodies, pre-arranged for opening or closing the two opposed inlet branches of the manifold, the position of which can be magnetically controlled, thus diverting into the manifold the flow of water directed to the second and third sprinklers.

[0004] The solution according to EP-A-1488730 makes it possible to provide a further area of intensified washing or to reach with a jet of water areas of the washtub that are hard to reach via the rotary sprinklers. This solution, however, is complicated, cumbersome, costly, and not altogether efficient.

Object and summary of the invention

[0005] In view of what has been set forth above, the aim of the present invention is basically to provide a dish-washer of the type indicated at the start, equipped with

a sprinkler system including rotary sprinklers and at least one additional sprinkler, preferably stationary, that is simple to produce, compact and inexpensive, as well as efficient in operation.

[0006] The above aim is achieved, according to the present invention, by a dish-washing machine having the characteristics specified in Claim 1. Preferred characteristics of the invention are specified in the dependent claims. The claims form an integral part of the technical teaching provided herein in relation to the invention.

Brief description of the drawings

[0007] Further aims, characteristics, and advantages of the invention will emerge clearly from the ensuing detailed description of an embodiment provided purely by way of explanatory and non-limiting example, with reference to the annexed drawings, wherein:

- Figure 1 is a partial and schematic perspective view of a dish-washing machine according to a possible embodiment of the invention;
- Figure 2 is a schematic perspective view of a washtub of a machine according to a possible embodiment of the invention;
- Figures 3 and 4 are schematic representations, respectively in side elevation and in perspective view, of a sprinkler system of a machine according to a possible embodiment of the invention;
- Figure 5 is a rear elevation of a supply duct forming part of a sprinkler system of a machine according to one embodiment of the invention, together with some blocks representing further functional elements of the same machine;
- Figure 6 is a schematic perspective view of a valve device for control of supply of sprinkler members of a sprinkler system of a machine according to a possible embodiment of the invention;
- Figure 7 is a schematic perspective view of a stationary sprinkler member forming part of a sprinkler system of a machine according to one embodiment of the invention;
- Figure 8 is an exploded schematic view of the sprinkler member of Figure 7;
- Figure 9 is a partial and schematic partially exploded view of a part of a sprinkler system of a machine according to one embodiment of the invention;
- Figure 10 is a schematic cross-sectional view of a part of a sprinkler system of a machine according to one embodiment of the invention; and
- Figure 11 is a partial and schematic top plan view, aimed at exemplifying a possible relative positioning between a bottom rotary sprinkler and an additional stationary sprinkler of a sprinkler system of a machine according to one embodiment of the invention.

Description of preferred embodiments of the invention

[0008] Reference to "*an embodiment*" or "*one embodiment*" in the framework of this description is meant to indicate that a particular configuration, structure, or characteristic described in relation to the embodiment is comprised in at least one embodiment. Hence, phrases such as "*in an embodiment*", "*in one embodiment*", and the like, that may be present in various points of the present description do not necessarily all refer to one and the same embodiment. Moreover, the particular configurations, structures, or characteristics may be combined in any adequate way in one or more embodiments. The references used in what follows are provided merely for convenience and do not define the sphere of protection or the scope of the embodiments.

[0009] It is moreover pointed out that in the sequel of the present description only the elements useful for an understanding of the invention will be described, it being taken for granted, for example, that the machine according to the invention comprises all the elements in themselves known for operation of a dish-washing machine, including a possible external cabinet, a user interface, a control system, pumps, level sensors, heating elements, a system for spraying the dishes, etc.

[0010] Figure 1 represents in a schematic way a dish-washing machine 1 according to the invention. The machine 1 is illustrated limitedly to the parts of immediate interest for an understanding of the present invention.

[0011] The machine 1 has a load-bearing structure, which comprises a base 2 which supports a washtub, designated as a whole by 3 in Figure 2. The base 2, made for example of injection-moulded thermoplastic material, defines a housing space positioned in which are various functional components of the machine 1, amongst which, for example, a washing pump, a discharge pump, a pressure switch, a sump for collection of the washing liquid, a valve device for alternating supply of sprinkler members, etc.

[0012] The washtub 3, visible in isolation in Figure 2, is of a conception as a whole known and hence comprises an upper wall 3a, a lower wall 3b, and four side walls. Visible in Figure 2 are only the stationary side walls of the washtub 3, i.e., the rear wall 3c and the right and left walls, designated by 3d. The fourth side wall of the washtub 3, i.e., its front wall, is constituted by an inner shell of the door 4, which is articulated to the load-bearing structure of the machine, for example to its base 2.

[0013] The machine 1 has a sprinkler system, designated as a whole by 5 in Figure 2. As may be seen in particular in Figures 3 and 4, the sprinkler system 5 includes a lower sprinkler device 6, an intermediate sprinkler device 7 and an upper sprinkler device 8, which are termed for simplicity hereinafter also as "sprinklers". The sprinklers 6 and 7 are rotary sprinklers, of a type in itself known, configured for spraying water upwards, i.e., towards a lower dish rack and an dish rack, respectively, which are represented only schematically in Figure 3

where they are designated by 9 and 10. The upper sprinkler device 8 may be indifferently a stationary sprinkler or else a rotary sprinkler and is preferably a shower sprinkler, in any case configured for spraying water downwards, i.e., towards the upper dish rack 10. Purely by way of example, the device 8 may implement the teachings of the patent application No. WO 2014/102738 A filed in the name of the present applicant.

[0014] In various embodiments, the machine according to the invention comprises an additional dish tray, in particular a cutlery tray, represented only schematically in Figure 3, where it is designated by 11. In these embodiments, the upper sprinkler 8 is advantageously exploited for spraying the aforesaid tray 11 with water from above, in addition to contributing to spraying water on the upper rack 10.

[0015] The lower sprinkler 6 is supported in a rotary way and is supplied via a respective stationary duct 6a, visible only in Figure 3, which rises vertically from the bottom of the tub 3. The intermediate sprinkler 7 and the upper sprinkler 8 are, instead, supplied via a canalization or ducting system, designated as a whole by 12, which comprises an initial portion 12a, an intermediate portion 12b and a final portion 12c, which extend substantially at the bottom wall 3b, the rear wall 3c and the upper wall 3d, respectively, of the tub 3. The intermediate sprinkler 7 is located in an intermediate region of the portion 12b, whereas the upper sprinkler 8 is located in a terminal region of the portion 12c.

[0016] The sprinkler system 5 comprises at least one additional sprinkler device, which is mounted stationary within the washtub 3, in fluid communication with the canalization 12 and is configured for spraying an additional flow of water towards one of the lower rack 9 and the upper rack 10. In one embodiment, such as the one exemplified in the figures, the additional sprinkler, designated as a whole by 13, is mounted at the initial portion 12a of the canalization 12 and is configured for spraying water upwards, towards the lower dish rack 9.

[0017] In a preferred embodiment, the canalization 12 comprises a first duct and a second duct, for supplying the intermediate sprinkler 7 independently of the upper sprinkler 8, and the additional sprinkler 13 is constantly connected in fluid communication with one of the aforesaid first and second ducts so as to be supplied together with the intermediate sprinkler 7 or with the upper sprinkler 8, respectively.

[0018] With reference to the embodiment represented in Figure 5, the first duct and the second duct are designated, respectively, by 14 and 15, and each have an inlet 14a, 15a generally oriented vertically in a position corresponding to the proximal end of the initial portion 12a of the canalization 12 (see also Figure 9). The ducts 14 and 15 extend at least in part in positions generally parallel or set alongside one another, along the development of the canalization 12.

[0019] Preferably, the ducts 14 and 15 belong to a body made of a single piece of plastic material, preferably a

mouldable plastic material. The aforesaid single body, i.e., the canalization 12 defining the two ducts 14 and 15, may be obtained with techniques in themselves known. In one embodiment, for example, the canalization 12 is constituted by a single body obtained via moulding of plastic material, for example via blow-moulding. In other embodiments, the canalization may be made up of two or more parts joined together. For example, at least two half-shells of plastic material may be injection-moulded separately, in such a way that each of them will define a respective half of both of the ducts 14, 15, and are then joined together, for example by hot-blade welding or by vibration welding along the respective perimeters. In other embodiments a number of longitudinal stretches of the canalization 12, each defining respective longitudinal portions of the ducts 14, 15, are obtained via blow-moulding and then joined together via hot-blade welding or vibration welding at respective ends.

[0020] In a preferred embodiment, such as the one represented, the duct 14 and the duct 15 have different sections of passage, and the additional sprinkler 13 is connected in fluid communication with the duct that has the smaller section of passage. In the embodiment exemplified, for example, the duct 14 is pre-arranged for supplying the intermediate sprinkler 7 and preferably has a greater section of passage. The duct 15, preferably having a smaller section of passage, is instead pre-arranged for supplying the upper sprinkler 8 and the additional sprinkler 13 is connected in fluid communication therewith.

[0021] Preferentially, at least one of the ducts of the canalization 12, preferably both of the ducts 14 and 15, has/have at least one portion having a substantially quadrangular cross section (see, for example, Figure 10). Very preferably, in a portion designed for coupling between the canalization 12 and the sprinkler 13, both of the ducts 14 and 15 have a quadrangular cross section in such a way that an outer lateral part of each duct defines at least one portion of a respective side face of the canalization 12.

[0022] In a preferred embodiment, the duct 14 extends along the portion 12a of the canalization 12 and as far as an intermediate part of the portion 12b, whereas the duct 15 extends along the three portions 12a, 12b and 12c of the canalization 12.

[0023] Preferably, the duct 14 has at least one outlet, opposite to the corresponding inlet 14a, which is in an intermediate position of the portion 12b of the canalization 12 and can be connected in fluid communication with a generally horizontal tubular arm 7a, configured for rotatably supporting and supplying the intermediate sprinkler 7. In a preferred embodiment, the duct 14 has two outlets at different heights, along the portion 12b of the canalization 12, each of which can be selectively connected to the arm 7a in order to enable variation of the position in height of the intermediate sprinkler 7 within the washtub 3. In this case, in alternative solutions, the duct has a single outlet, and it is the arm 7a that has two

inlets at different heights, each of which can be selectively connected to the aforesaid outlet. Solutions of this type may be implemented, for example, in the case of machines 1 where the upper rack 10 can be supported within the washtub 3 in at least two different positions in height, which can be selected by the user of the machine. In an embodiment of this type, selective connection of the inlet (or inlets) of the arm 7a to one of the outlets (or the single outlet) of the duct 14 may be obtained via a switchable connection device, designated as a whole by 16 in Figures 2-4, having a stationary part associated to the duct 14, i.e., to the canalization 12, and a displaceable part associated to the tubular arm 7a. Switchable connection devices of this type are in themselves well known in the field (examples of embodiment of such a device are described, for example, in WO 2008/029222 A, EP 0829221 A, EP 0401767 A, and WO 83/01892 A).

[0024] According to a technique in itself known, the lower wall 3b of the washtub 3 has a central opening 3b' (see Figure 2), mounted on which is a collection sump, associated to which are a system of filters, a washing pump, and a discharge pump, all according to a technique in itself known in the field. One of the aforesaid filters, with coarser mesh, is partially visible in Figures 3-4, where it is designated by 17. In one embodiment, located substantially at the aforesaid sump are the inlets of the ducts 6a, 14, and 15 (see, for example, Figure 2), which are connected to a valve arrangement used for selective supply of the sprinklers 6, 7, and 8. As has been said, in the case of the embodiment exemplified herein, the additional stationary sprinkler 13 is supplied together with the top sprinkler 8.

[0025] Figure 5 also represents schematically the aforesaid collection sump, designated by 20, connected to an outlet of which is the intake branch of an electric washing pump, which is also represented schematically and designated by 21. The delivery branch of the pump is connected to an inlet of the aforesaid valve arrangement, which, in a preferred embodiment, includes a device for alternating supply of the sprinklers, designated by 22, a possible implementation of which is shown in Figure 6.

[0026] The device 22, like similar devices according to the known art, has a casing 23 provided with an inlet 23a, designed for connection with the delivery branch of the pump 21, and two main outlets 23b and 23c, connected respectively to the inlet of the duct 6a for supply of the lower sprinkler 6 and to the inlet 14a of the duct 14 for supply of the intermediate sprinkler 7, the outlet 23b preferably having a larger section of passage than the outlet 23c. The device 22 is configured in such a way that the casing 23 will additionally define a further outlet, designated by 23d, designed for connection with the inlet 15a of the duct for supply of the upper sprinkler 8. The outlet 23d preferably has a smaller section of passage than the outlets 23b and 23c. The preferential dimensions indicated for the outlets 23b, 23c and 23d, which are different from one another, are dictated by fluid-dynamic require-

ments, for example for the reason that the branch for supply of the upper sprinkler 8 is distinguished by higher head losses than the branch for supply of the intermediate sprinkler 7, which is in turn distinguished by higher head losses than the branch for supply of the lower sprinkler 6, as well as by requirements corresponding to the type of the load of dishes, in so far as the upper rack 10, which is sprayed by the intermediate sprinkler 7 and the upper sprinkler 8, is suitable for housing more delicate items (glasses, stem glasses, coffee cups, etc.) as compared to the lower rack 9, which is sprayed by the lower sprinkler 6 and usually houses sturdier items (such as saucepans, frying pans, or plates and dishes): it is consequently expedient for the washing liquid to reach the upper rack 10 at a lower speed and/or pressure as compared to the lower rack 9.

[0027] Displaceably mounted within the casing 23 of the device 22 is an open/close member or distributor, which can be operated by a corresponding actuator isolated from the washing liquid and controlled by the control system of the machine, represented schematically by the block CS of Figure 5. The distributor member may be operated to assume a plurality of positions, preferably at least one first position, for opening the outlet 23b and closing the outlets 23c and 23d, and a second position, for opening the outlets 23b and 23d and closing of the outlet 23c. In addition or as an alternative to the aforesaid second position, there may be envisaged a third position of the distributor member, where the outlets 23c and 23d are open and the outlet 23b is closed. Very preferably, a fourth position of the distributor member is also envisaged, where the outlet 23d is open and the outlets 23b and 23c are closed. There may also be envisaged one or more positions additional to the ones mentioned, for example a position where the outlet 23c is open and the outlets 23b and 23c are closed and/or a position where the outlets 23b and 23c are open and the outlet 23d is closed. The aforesaid distributor member may, for example, be shaped like a disk or circular sector, with a plurality of through holes, and be displaceably mounted in front of the outlets 23a, 23b and 23c, for example by means of a cam mechanism such as the one described and represented in WO 2014/155333 A.

[0028] Figure 7 represents in isolation an additional sprinkler 13 in a possible embodiment of the invention.

[0029] The sprinkler 13 has a hollow body 25 having a portion 25a configured for mechanical and fluidic coupling with the canalization 12. As has been said, in the embodiment exemplified in the figures, the sprinkler 13 is connected in fluid communication with the duct 15 of the canalization 12 and is mounted on the initial portion 12a of the canalization 12 itself. In possible variant embodiments, on the other hand, the sprinkler 13 may be mounted on the portion 12b of the canalization 12, for example in a position facing the front of the lower rack 9 or just above it, or again in a position facing the front of the upper rack 9 or just above it, in order to spray at least part of the contents of the rack in question.

[0030] In the case exemplified, the aforesaid portion 25a configured for coupling to the canalization 12 is a central portion of the body 25 of the sprinkler 13, branching off from which are two longitudinally extensive lateral arms or portions 25b, preferably substantially the same as one another, which hence project laterally with respect to the canalization 12. Consequently, in a preferred version, the body 25 of the sprinkler 13 has a shape substantially symmetrical with respect to an intermediate portion thereof for coupling to the canalization 12. On the other hand, not excluded from the scope of the invention are the cases of a sprinkler 13 having a single side portion 25b or of a sprinkler 13 having two side portions 25b different from one another.

[0031] The side portion 25b, or each side portion 25b, comprises a distal end region having a spraying area 26, provided with a plurality of holes or nozzles, not represented, for example from five to nine holes or nozzles. The spraying area is preferably provided on the face of the body 25 opposite to the one designed for coupling with the canalization 12. In one embodiment, the side portion 25b, or each side portion 25b, extends in a direction generally inclined with respect to the direction of extension of the coupling portion 25a. Such a preferential characteristic is visible in Figure 4 and, even more clearly, in Figure 11, from which it may be clearly appreciated how the side portions 25b extend longitudinally backwards, with respect to the corresponding intermediate portion and with a certain inclination with respect to the latter. This measure proves useful, in particular when the sprinkler 13 is mounted in the initial portion 12a of the canalization, to be able to provide the spraying areas 26 of the sprinkler 13 in points that enable sprinkling of areas that are hard to reach via the jets produced by the bottom sprinkler 6. This measure proves particularly useful in the case where the washtub 3 has a rectangular cross section instead of a square one (as is the case, for example, of dish-washing machines of the so-called "45 cm" type), since in these machines the corner regions are even more difficult to reach with the spray of the bottom sprinkler 6.

[0032] Preferably, the body 25 has a generally elongated and flattened, i.e., thin, shape so as to define a relatively restricted section of passage for the water. Very preferably, moreover, each side portion 25b has at least one curved stretch, between the coupling portion 25a and the corresponding spraying area 26. This embodiment proves efficient from the fluid-dynamic standpoint, for example because it prevents significant losses of head and guarantees a sufficiently high speed of the flow at outlet from the sprinkler 13.

[0033] In a preferred embodiment, the hollow body 25 of the additional sprinkler 13 is made up of a number of distinct parts rendered fixed with respect to one another, even though production thereof in a piece single is not excluded. In Figure 8, for example, it is represented as being made of a number of parts, which comprise two half-shells 30 and 31 of plastic material, which can be

obtained, for instance, by moulding. In the example, each half-shell 30 and 31 has a bottom wall and a perimetral wall and is shaped so as to define respective central portions 30a, 31 a and side portions 30b, 31 b. In the example, at least the rear half-shell 31 has a double perimetral wall (see also Figure 10) in order to facilitate coupling between the half-shells and their mutual fixing in a fluid-tight way. Preferably, the two half-shells are welded together, for example via vibration welding.

[0034] The front half-shell 30 defines, at the distal ends of its side portions 30b, two annular housings or seats 30c, here having a circular profile, where corresponding closing lids are fixed, which present holes or nozzles that provide the aforementioned spraying areas 26. Preferably, but not necessarily, the lids 26 are shaped substantially like a spherical cap in such a way that the jets of water at outlet from the sprinkler 13 can be oriented in different directions, simply by providing the corresponding holes or nozzles in appropriate positions on each lid. The lids 26 may be engaged by snap action in the corresponding seats 30c, preferably but not necessarily with interposition of an annular sealing gasket, or else be welded on the seats 30c, for example via vibration welding, in which case the presence of a gasket is not necessary. It may moreover be envisaged that the lids 26 are mounted in a removable and/or rotatable way with respect to the front half-shell 30 so as to enable the user to choose the lid most suited to the type of load on the lower rack to be sprayed (here the rack 9) and/or to orient it as well as possible considering the arrangement of the load on the lower rack 9. In other variant embodiments (not illustrated) the lids 26 could include a part that rotates under the thrust of the water in order to vary in an autonomous and continuous way the direction of the jets at outlet, and/or have associated small rotary sprinkler arms.

[0035] The embodiment exemplified in Figure 8, with the hollow body 25 formed in two half-shells, may be used also in the case of an additional sprinkler 13 having a single side portion, and hence a single spraying area, in which case also a single lid 26 will be provided.

[0036] According to the invention, the coupling portion 25a of the body of the sprinkler 13 has, on its side facing the canalization 12 (hereinafter referred to for simplicity also as "rear side"), at least one of mechanical-coupling means and hydraulic-coupling means for coupling to the canalization itself, preferably means designed for quick coupling to corresponding means provided on the canalization 12. In one embodiment, such as the one represented, the rear side of the body of the sprinkler has both mechanical-coupling means and hydraulic-coupling means. Preferably, both the mechanical-coupling means and the hydraulic-coupling means are designed for quick coupling with corresponding means provided in the canalization 12.

[0037] In a particularly advantageous embodiment, the mechanical-coupling means operative between the canalization 12 and the sprinkler 13 are snap-action cou-

pling means. In a particularly advantageous embodiment, the hydraulic-coupling means operative between the canalization 12 and the sprinkler 13 are quick-fit coupling means.

[0038] In a preferred embodiment, the portion of the canalization 12 on which the sprinkler 13 is mounted has two generally parallel side faces, as may be clearly seen, for example, in Figure 10, and the mechanical-coupling means comprise at least two walls that project from the rear side of the body of the sprinkler 13, designated by 27 in Figures 7, 9, and 10, which face one another and are preferably generally parallel. In the example shown, the walls 27 are defined integrally in the body of the sprinkler 13 and in particular in its bottom half-shell 31, as is clearly visible in Figure 7.

[0039] During assembly, the coupling portion 25a of the sprinkler 13 is fitted on the canalization 12 - here on its initial portion 12a - in such a way that the walls 27 are set up against the side faces of the canalization (see Figure 10), preferably with a certain elastic interference, allowed by the elasticity proper to the walls 27. This arrangement facilitates positioning and centring of the coupling portion 25a of the additional sprinkler 13 with respect to the canalization 12. For this purpose, the walls 27 may also extend substantially throughout the width of the sprinkler 13.

[0040] In a preferred embodiment, the walls 27 are provided, on the respective facing sides, with one or more engagement seats (not visible in the figures), which are designed for engagement with respective engagement projections or teeth defined on each of the two side faces of the canalization. Two of these engagement teeth are visible in Figure 9, where they are designated by 32, on a side face of the initial portion 12a of the canalization. A pair of similar teeth is provided on the opposite side face of the canalization. Of course, a reverse arrangement is possible, with the engagement teeth provided in the walls 27 and the corresponding seats provided in the side faces of the canalization 12, even though this preferably entails a greater thickness of the walls of the canalization that correspond to the aforesaid side faces.

[0041] As may be appreciated, coupling between the teeth and the seats is substantially a snap-action coupling, which is obtained exploiting the elasticity of the walls 27.

[0042] In one embodiment, the hydraulic-coupling means comprise an inlet, defined on the rear side of the body of the sprinkler 13, and a corresponding outlet, defined on a front face of the canalization 12. Preferably, the aforesaid inlet and outlet have a substantially tubular shape.

[0043] An example of embodiment of the aforesaid tubular inlet is visible in Figures 8 and 10, where the inlet is designated by 33 and extends towards the inside of the hollow body of the additional sprinkler 13. An example of embodiment of the aforesaid tubular outlet is visible in Figures 9 and 10, where the outlet is designated by 34 and projects outwards from the front face - which here is

an upper face - of the initial portion 12a of the canalization 12. In the example of embodiment illustrated, the tubular outlet 34 is an intermediate outlet of the duct 15 for supply of the upper sprinkler 8, but in variant embodiments it could be an intermediate outlet of the duct 14. The tubular inlet 33 is hence preferably in a generally lateral position with respect to the centre of the coupling portion 25a of the body of the sprinkler 13.

[0044] The tubular inlet 33 and the tubular outlet 34 preferably have a substantially circular profile, and very preferably, a generally frustoconical shape in order to facilitate mutual coupling and fluid-tightness, as well as improve the fluid-dynamic behaviour. In a preferred embodiment, the tubular outlet 34 is sized so as to be fitted into the tubular inlet 33, as is clearly visible in Figure 10, with possible interposition of an annular sealing gasket. Preferably, coupling occurs with at least slight interference in order to improve the characteristics of fluid-tightness. As may be appreciated, when the coupling portion 25a of the body of the sprinkler 13 is fitted on the corresponding coupling portion of the canalization 12 - here represented by the stretch of the initial portion 12a in which the teeth 32 and the tubular outlet 34 are comprised - there is carried out coupling of the outlet 34 in the inlet 33 and engagement between the teeth 32 and the corresponding seats of the walls 27.

[0045] It is preferable, as in the case exemplified, for the inlet 33 to project towards the inside of the hollow body of the sprinkler 13 and for the outlet 34 to project towards the outside of the corresponding face of the canalization 12, so that it can be fitted into the inlet 33. On the other hand, in a variant embodiment that is less advantageous from the standpoint of fluid-dynamics and of the characteristics of fluid-tightness, the tubular inlet 33 could project from the rear side of the sprinkler 13 and the tubular outlet 34 could extend towards the inside of the canalization 12 (here towards the inside of the duct 14) in such a way that the former can be fitted into the latter.

[0046] In a preferred embodiment, at least one of the additional sprinkler 13 and the duct of the canalization 12 that is in fluid communication with the sprinkler 13 - here the duct 15 - has deflector means for diverting part of the flow of liquid that flows in the duct itself towards the inside of the sprinkler 13, i.e., towards its inlet and/or towards the corresponding intermediate outlet of the duct in question. Preferably, the deflector means are in a fixed, i.e., non switchable, position.

[0047] In the case exemplified, the aforesaid deflector means comprise a deflector wall, which projects from the rear side of the body of the sprinkler 13, in a position slightly set behind (with respect to the direction of the flow) the inlet 33 and extends in a generally transverse direction with respect to the corresponding duct of the canalization, here the duct 15. One such deflector wall is partially visible in Figure 10, where it is designated by 35.

[0048] On the other side, the canalization 12, which is

here set in a position corresponding to the duct 15, has, slightly downstream of the outlet 34, a slit or passage designed to receive the deflector wall 35. One such slit is partially visible in Figure 9, where it is designated by 36.

[0049] As may be appreciated, the relative position of the inlet 33, the outlet 34, the wall 35, and the slit 36 is such that, following upon assembly of the additional sprinkler 13 on the canalization 12, the deflector wall penetrates through the slit. Preferably, between the rear side of the sprinkler 13 and the front face of the canalization 12 sealing means are provided, which circumscribe a region of the aforesaid front face where the slit 36 is present. These sealing means may comprise, for example, a gasket, possibly made of a single piece with the gasket that may be set between the inlet 33 and the outlet 34.

[0050] As is clearly visible in Figure 10, in the assembled condition, the deflector wall 35 projects towards the inside of the corresponding duct - here the duct 15 -, just downstream of the inlet 33 and of the outlet 34 which are coupled together, and extends in the duct itself prevalently in a transverse direction of development. The dimensions in height and width of the wall 35 are such that it does not obstruct the duct 15 completely, but instead brings about a relatively modest reduction of its section of passage, in any case a reduction not greater than half of this section, very preferably not greater than one third of this section. Preferably, as in the case exemplified, the wall 35 has a height such as to occupy not more than half of the height of the duct 15, preferably not more than one third of the height of the duct, and preferably a width slightly smaller than the width of the duct 15. The limited extension of the wall 35 within the duct is chosen so as not to give rise to excessive head losses in the forced flow in the duct 15 and at the same time facilitate entry of a sufficient part of this flow into the sprinkler 13. The wall 35 basically has the function of generating, upstream thereof, and hence in the area of the duct 15 to which the sprinkler 13 is connected, a region of stagnation designed to reduce the speed of the water and consequently favour passage of the flow from the duct 15 to the sprinkler 13. Consequently, by sizing the wall 35 it is possible to calibrate appropriately the part of the flow that reaches the sprinkler 13 with respect to the part that will reach instead the further sprinkler (here the upper sprinkler 8) supplied via the duct 15.

[0051] In an embodiment that is preferred from the fluid-dynamic standpoint, the deflector wall 35 has a shape that is at least in part arched, i.e., curved between its opposite side edges, with the corresponding concavity facing the inlet 33 and the outlet 34.

[0052] Figure 11 represents schematically a possible relative arrangement of the lower sprinkler 6, the additional stationary sprinkler 13, and the lower dish rack 9, in the case of a dish-washing machine with reduced lateral encumbrance, in particular a machine of the so-called "45 cm" type. It should be noted that in this figure the intermediate sprinkler 7 and the upper dish rack 10

(and the possible tray 11) have not been represented for reasons of clarity.

[0053] Application of the invention to the type of machines exemplified in Figure 11 proves particularly advantageous since, given a width of the washtub and of the racks decidedly smaller than their depth, rotary sprinklers cannot have a length such as to be able to cover practically completely the area subtended by the corresponding rack. This circumstance may, for example, be clearly appreciated from Figure 11, where it may be noted how at least the area subtended by a front portion of the rack 9 cannot be covered by the sprinkler 6. For this reason, the spray nozzles of the sprinklers - in particular the end nozzles - must be inclined or in any case oriented so as to enable spraying of the entire area of the corresponding rack. This compromise solution has, however, as a consequence that certain portions of the rack - in the example the rear portion of the rack 9 - are sprayed in a more limited way than other portions.

[0054] Use of the stationary sprinkler 13 hence enables definition of washing areas additional to those determined by the other sprinklers 6, 7, and 8 provided by the sprinkler system of the machine 1, thus also enabling spraying of those portions of rack that are penalized on account of the aforesaid orientation of the nozzles of the rotary sprinklers. It will be appreciated, for example, in the case of Figure 10, how the sprinkler 13, and namely its spraying areas 26, will determine additional washing areas corresponding to the rear portion of the rack 9. For this purpose, in the embodiment of Figure 11 where the sprinkler is located on the initial portion of the canalization 12, also advantageous is the preferential arrangement illustrated of the side portions 25b of the sprinkler, which extend longitudinally backwards, with respect to the corresponding intermediate portion, with a certain inclination with respect to the latter.

[0055] From the above description the characteristics and advantages of the present invention emerge clearly, which are mainly represented by the simple, inexpensive, and compact structure of the extractor system described.

[0056] It is clear that numerous variations may be made by the person skilled in the art to the dish-washing machine described by way of example, without thereby departing from the scope of the invention as defined in the ensuing claims.

[0057] The invention has been described with particular reference to a dish-washer the sprinkler system of which comprises, in addition to the further sprinkler device 13, a lower sprinkler 6, an intermediate sprinkler 8 and an upper sprinkler 8. The invention may, however, be used also in the case of dish-washers that comprise, in addition to a lower sprinkler, just one between an intermediate sprinkler and an upper sprinkler. In this case, the canalization 12 will include a single duct for supply of the intermediate sprinkler or else of the upper sprinkler, to which the additional sprinkler 13 will be connected. In the case of absence of the upper sprinkler, the canalization 12 may also be without the respective final portion

12c.

[0058] The invention may moreover be applied to the case of machines with a canalization 12 that includes a duct dedicated to exclusive supply of the additional sprinkler 13, for example in addition to the duct for supplying the intermediate sprinkler and/or to the duct for supplying the upper sprinkler. In such a variant, the valve device 22 may be modified accordingly in order to provide a corresponding outlet that connects selectively the inlet of the dedicated duct provided for supply of the additional sprinkler 13.

[0059] The deflector wall 35, instead of being made of a single piece with the body of the sprinkler 13, could form part of a distinct insert, which can be coupled to the slit 36, or else be defined directly by the body of the canalization 12, in the latter case it not being necessary to provide the slit 36.

Claims

1. A dish-washing machine having:

a washtub (3), in which there can be housed at least one lower dish rack (9) and one upper dish rack (10); and

a sprinkler system (5), which comprises a lower sprinkler device (6) configured for spraying water upwards, towards the lower rack (9), and at least one of an intermediate sprinkler device (7), configured for spraying water upwards, towards the upper rack (10), and an upper sprinkler device (8), configured for spraying water downwards, towards the upper rack (10),

the lower sprinkler device (6) and the at least one of the intermediate sprinkler device (7) and the upper sprinkler device (8) comprising respective rotary sprinklers, the at least one of the intermediate sprinkler device (7) and the upper sprinkler device (8) being supplied via a canalization (12) having at least one first portion (12a) and one second portion (12b), and possibly one third portion (12c), which extend substantially at a lower wall (3b), a rear wall (3c), and an upper wall (3a) of the tub (3), respectively,

wherein the sprinkler system (5) comprises at least one further stationary sprinkler device (13) within the tub (3), configured for spraying water towards one of the lower rack (9) and the upper rack (10), in fluid communication with a duct (14, 15) of the canalization (12),

the dish-washing machine (1) being **characterized in that** the further stationary sprinkler device (13) has a hollow body (25) with a coupling portion (25a) having, on a rear side thereof facing the canalization (12), at least one of mechanical-coupling means (27) and hydraulic-coupling means (33) for coupling with the canalization

- (12), which are configured for quick coupling to corresponding mechanical-coupling means (32) and hydraulic-coupling means (34) provided in a corresponding coupling portion of the canalization (12), the coupling portions (25a) of the canalization (12) and of the hollow body (25) preferably having both the respective mechanical-coupling means (27, 32) and the respective hydraulic-coupling means (33, 34).
2. The dish-washing machine according to Claim 1, wherein:

the sprinkler system (5) comprises the intermediate sprinkler device (7) and the upper sprinkler device (8);

the canalization (12) comprises a first duct (14) and a second duct (15), for supplying the intermediate sprinkler device (7) and the upper sprinkler device (8), respectively, independently of one another; and

the at least one further stationary sprinkler device (13) is connected in fluid communication with one of the first duct (14) and the second duct (15) so as to be supplied together with the intermediate sprinkler device (7) or the upper sprinkler device (8), respectively, wherein preferably the first duct (14) and the second duct (15) have different sections of passage, the further stationary sprinkler device (13) being in fluid communication with the duct (15) that has the smaller section of passage.
 3. The dish-washing machine according to Claim 2, wherein the first duct (14) is provided for supplying the intermediate sprinkler device (7), the second duct (15) is provided for supplying the upper sprinkler device (8), and the further stationary sprinkler device (13) is in constant fluid communication with the second duct (15).
 4. The dish-washing machine according to any one of the preceding claims, wherein the mechanical-coupling means (27, 32) are snap-action coupling means and/or the hydraulic-coupling means (33, 34) are quick-fit coupling means.
 5. The dish-washing machine according to any one of the preceding claims, wherein the coupling portion of the canalization (12) has two generally parallel side faces, and the mechanical-coupling means (27, 32) comprise at least two walls (27) projecting from the rear side of the hollow body (25) of the further stationary sprinkler device (13), the two projecting walls (27) facing one another, preferably generally parallel to one another, so as to be set up against the aforesaid side faces of the coupling portion of the canalization (12), the projecting walls being preferably deformable or flexible in an elastic way.
 6. The dish-washing machine according to Claim 5, wherein the projecting walls (27) have, on respective facing sides, at least one between one or more engagement seats and one or more engagement projections, respectively, and the side faces of the coupling portion of the canalization (12) have at least one between one or more engagement projections (32) and one or more engagement seats, respectively.
 7. The dish-washing machine according to any one of the preceding claims, wherein the hydraulic-coupling means (33, 34) comprise an inlet (33), which is defined on the rear side of the hollow body (25) of the further stationary sprinkler device (13), and an outlet (34) of the duct (15) of the canalization (12) that is in fluid communication with said sprinkler (13), the outlet (34) being defined on a front face of the coupling portion of the canalization (12).
 8. The dish-washing machine according to Claim 7, wherein:

the inlet (33) and the outlet (34) have a substantially tubular shape, preferably with a substantially frustoconical profile;

the inlet (33) extends towards the inside of the hollow body (25) of the further stationary sprinkler device (13), starting from its rear side, and

the outlet (34) projects from the front face of the coupling portion of the canalization (12); and

the outlet (34) is fitted into the inlet (33).
 9. The dish-washing machine according to any one of the preceding claims, wherein at least one of the further stationary sprinkler device (13) and the duct (15) of the canalization (12) that is in fluid communication with said sprinkler (13) has deflector means (35, 36) in a fixed position, for deflecting part of the flow of liquid that flows in said duct (15) towards the inside of the hollow body (25) of the further stationary sprinkler device (13), i.e., towards a respective inlet (33) and/or towards a corresponding outlet (34) of said duct (15).
 10. The dish-washing machine according to any one of the preceding claims, wherein, branching off from the coupling portion (25a) of the hollow body (25) is at least one side portion (25b), having a distal end region provided with a spraying area (26) having one or more holes or nozzles, where in particular the coupling portion (25a) is a central portion of the hollow body (25) from which there branch off two said side portions (25b), which are preferably substantially the same as one another.

11. The dish-washing machine according to any one of the preceding claims, wherein the hollow body (25) of the further stationary sprinkler device (13) is made up of a number of distinct parts (30, 31) rendered fixed with respect to one another, which comprise a front half-shell (30) and a rear half-shell (31) of plastic material sealingly coupled to one another, in particular via welding. 5
12. The dish-washing machine according to Claim 11, wherein the front half-shell (30) defines, in at least one longitudinal end region thereof, a seat (30) where a corresponding closing lid (26) is fixed, which is provided with holes or nozzles, the lid or each lid (26) being preferably shaped at least in part like a spherical cap. 10 15
13. The dish-washing machine according to Claim 2 or Claim 3, wherein the first duct (14) and the second duct (15) are made of a single piece of plastic material. 20
14. The dish-washing machine according to any one of the preceding claims, wherein the coupling portion of the canalization (12) is in the corresponding first portion (12a), and the further stationary sprinkler device (13) is configured for spraying water upwards, towards the lower rack (9). 25
15. The dish-washing machine according to any one of Claims 2-14, wherein: 30

associated to the lower wall (3b) of the tub (3) is a sump (20) for collecting the water, having an outlet connected to which is an intake section of a washing pump (21), the pump (21) having a delivery branch that is connected to an inlet (23) of a casing (23) of a switchable valve device (22); 35

the casing (23) of the valve device (22) has at least one first outlet (23b), one second outlet (23c) and one third outlet (23c), which are connected, respectively, to the inlet of a duct (6a) for supply of the lower sprinkler device (6), to an inlet (14a) of the first duct (14) and to an inlet (15a) of the second duct (15), there being displaceably mounted within the casing (23) of the valve device (22) a distributor member, which can be operated by a corresponding actuator; 40 45

the distributor member can be operated for assuming a plurality of positions, which comprise one or more of the following positions: 50

a position of opening of the first outlet (23b) and of simultaneous closing of the second and third outlets (23c, 23d); 55

a position of opening of the first and third outlets (23b, 23d) and of simultaneous closing

ing of the second outlet (23c);
a position of opening of the second and third outlets (23c, 23d) and of simultaneous closing of the first outlet (23b);
a position of opening of the third outlet (23d) and of simultaneous closing of the first and second outlets (23b, 23c);
a position of opening of the second outlet (23c) and of simultaneous closing of the first and third outlets (23b, 23c); and
a position of opening of the first and second outlets (23b, 23c) and of simultaneous closing of the third outlet (23d).

Fig. 1

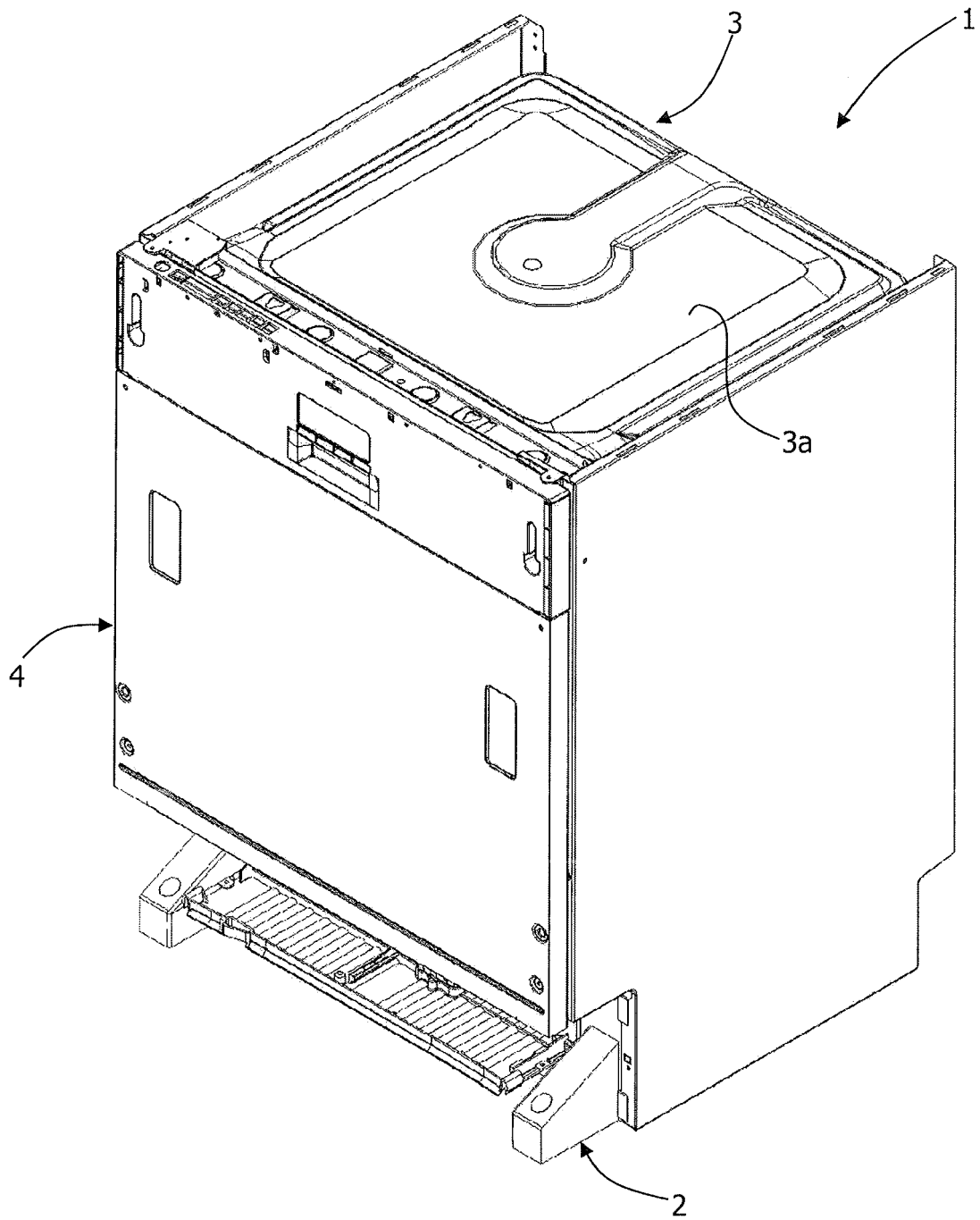


Fig. 2

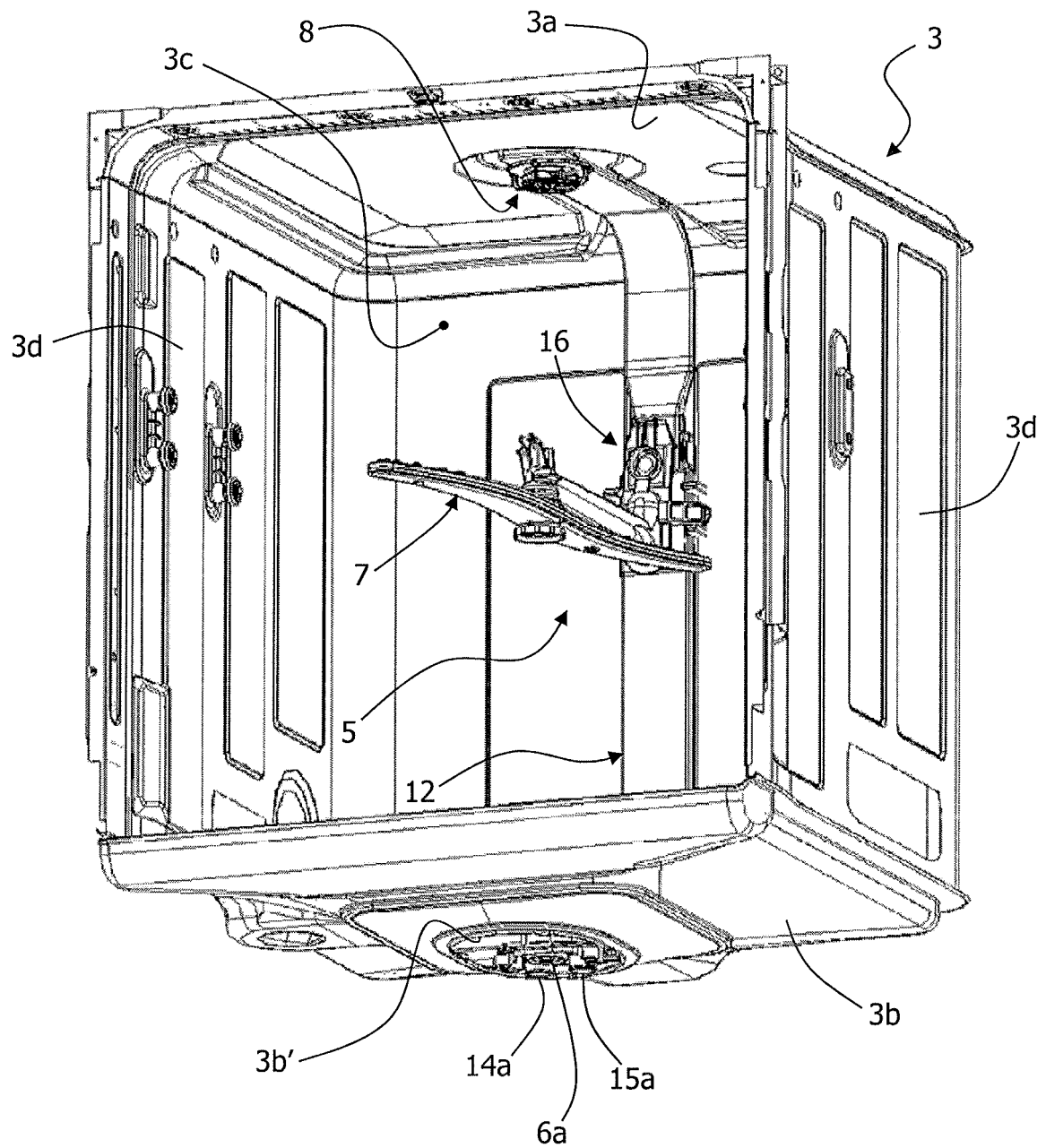
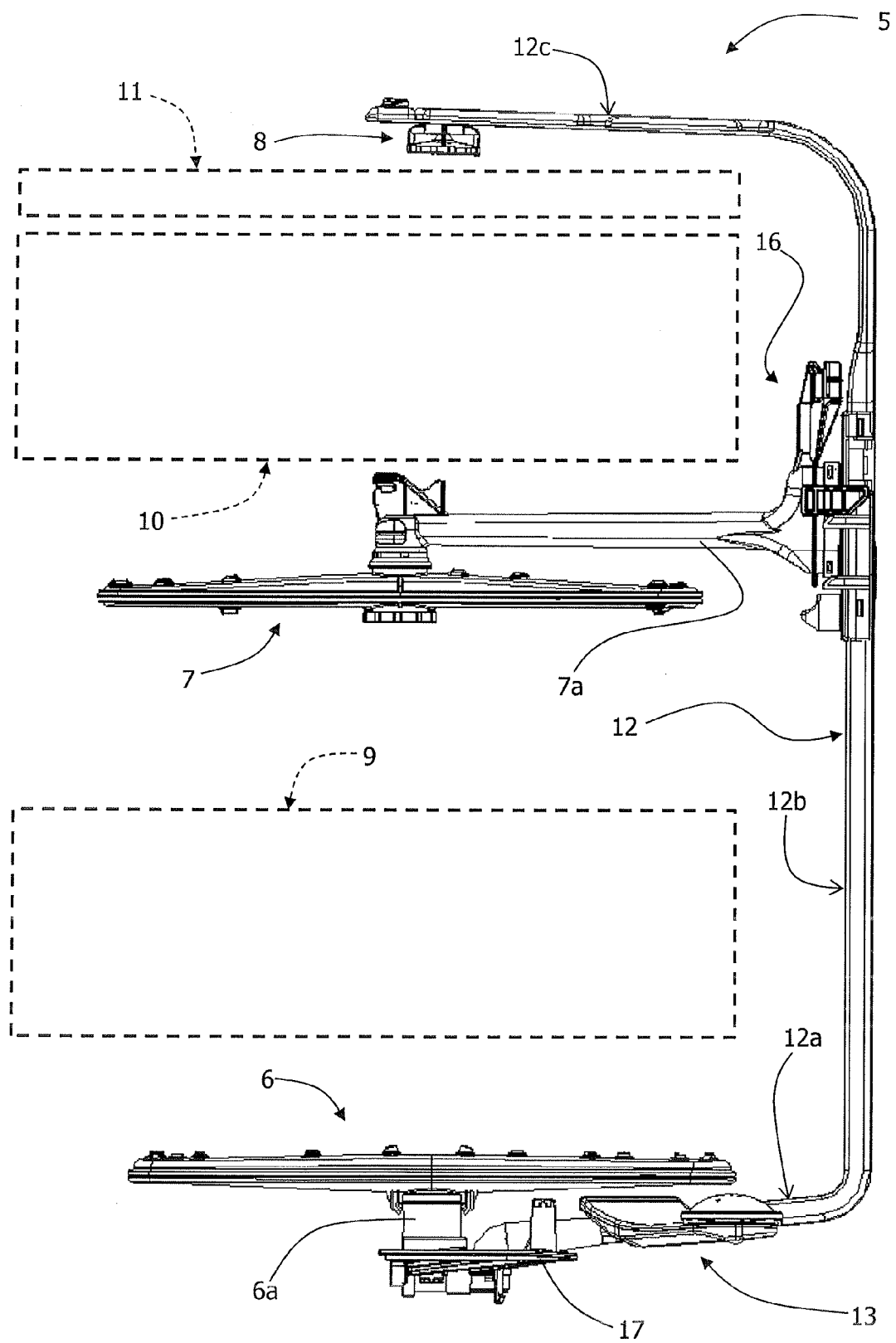


Fig. 3



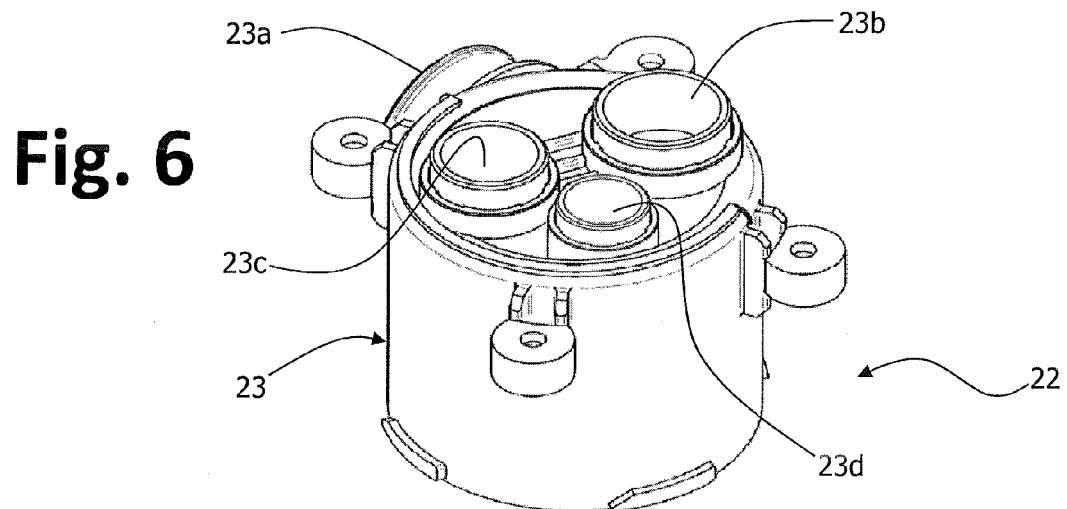
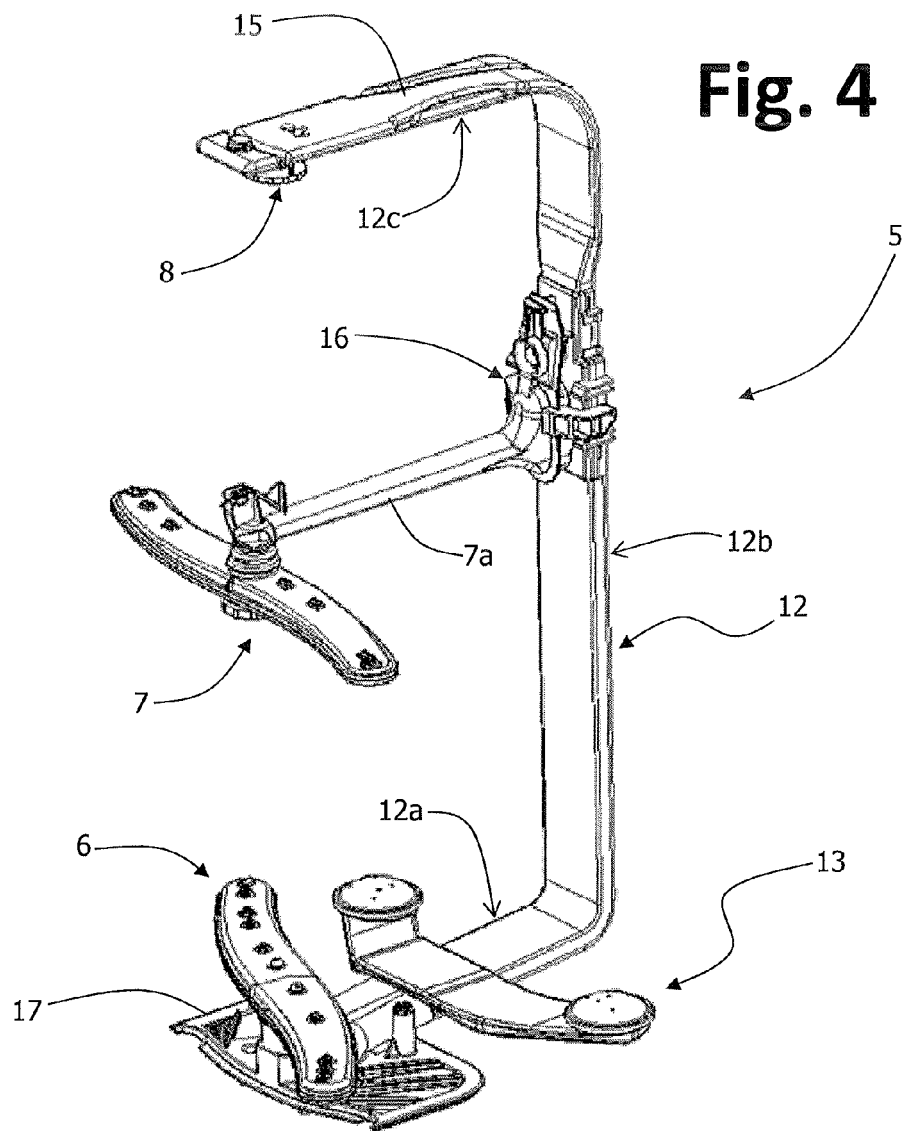


Fig. 5

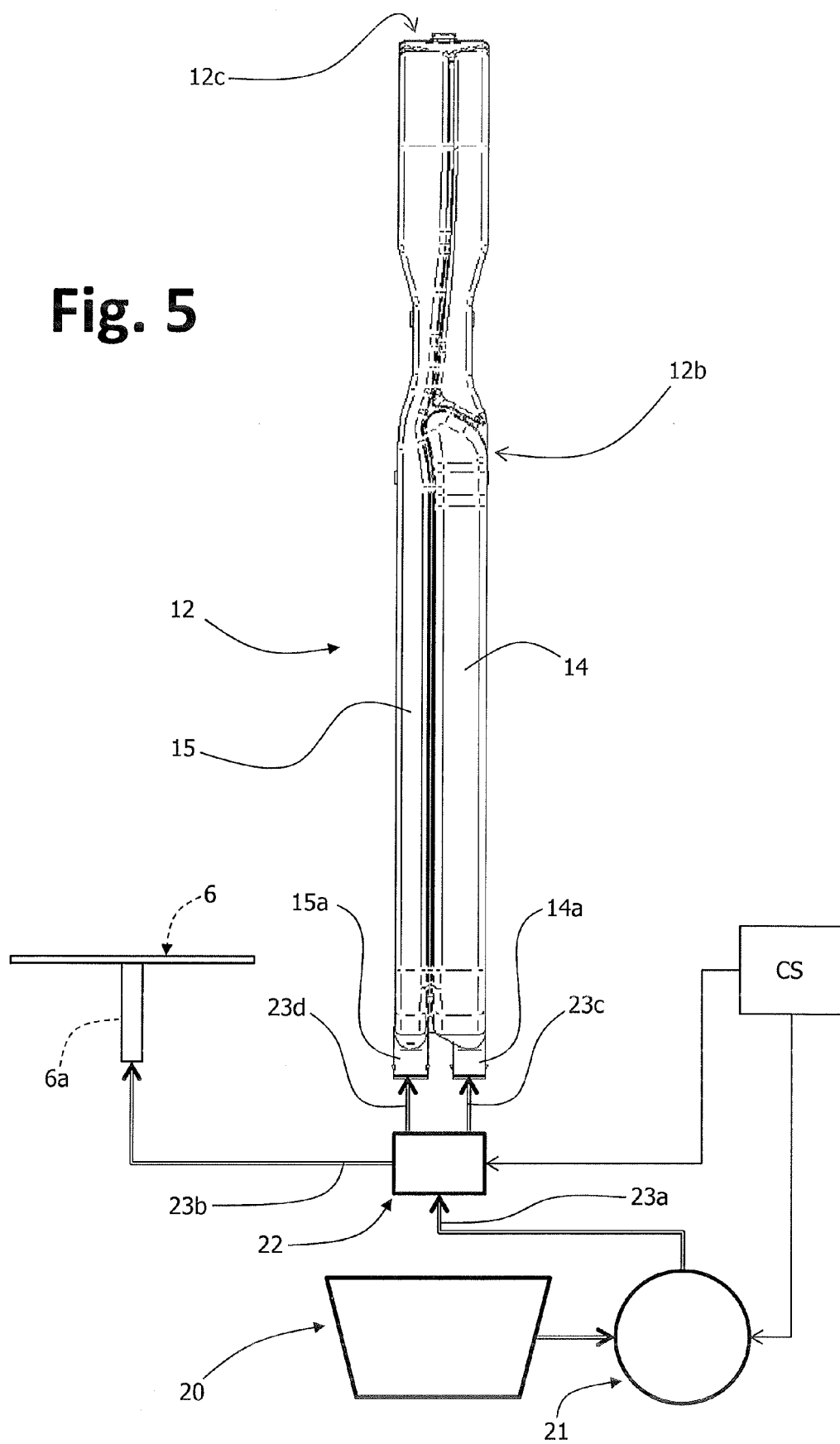


Fig. 7

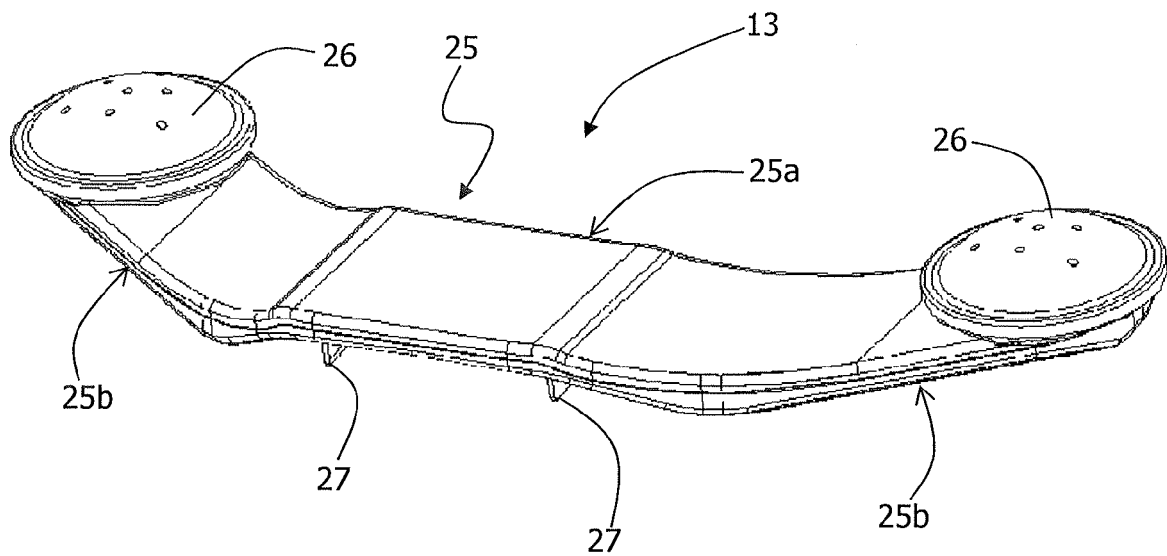


Fig. 8

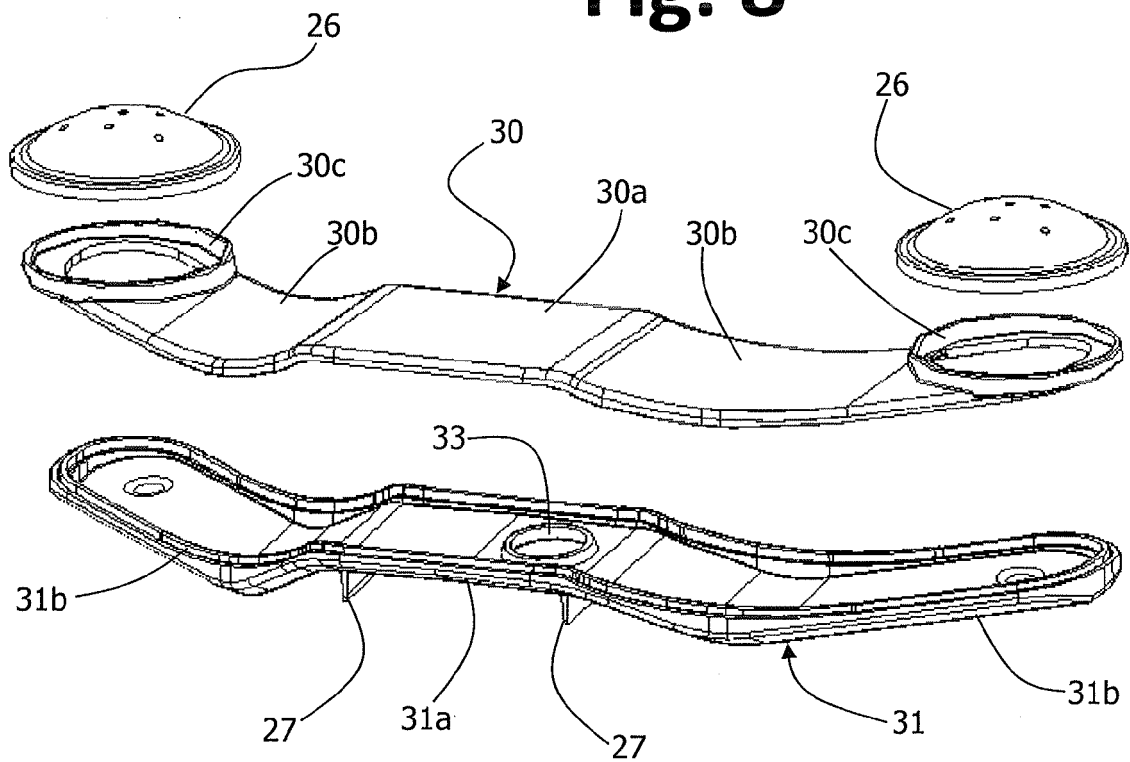


Fig. 9

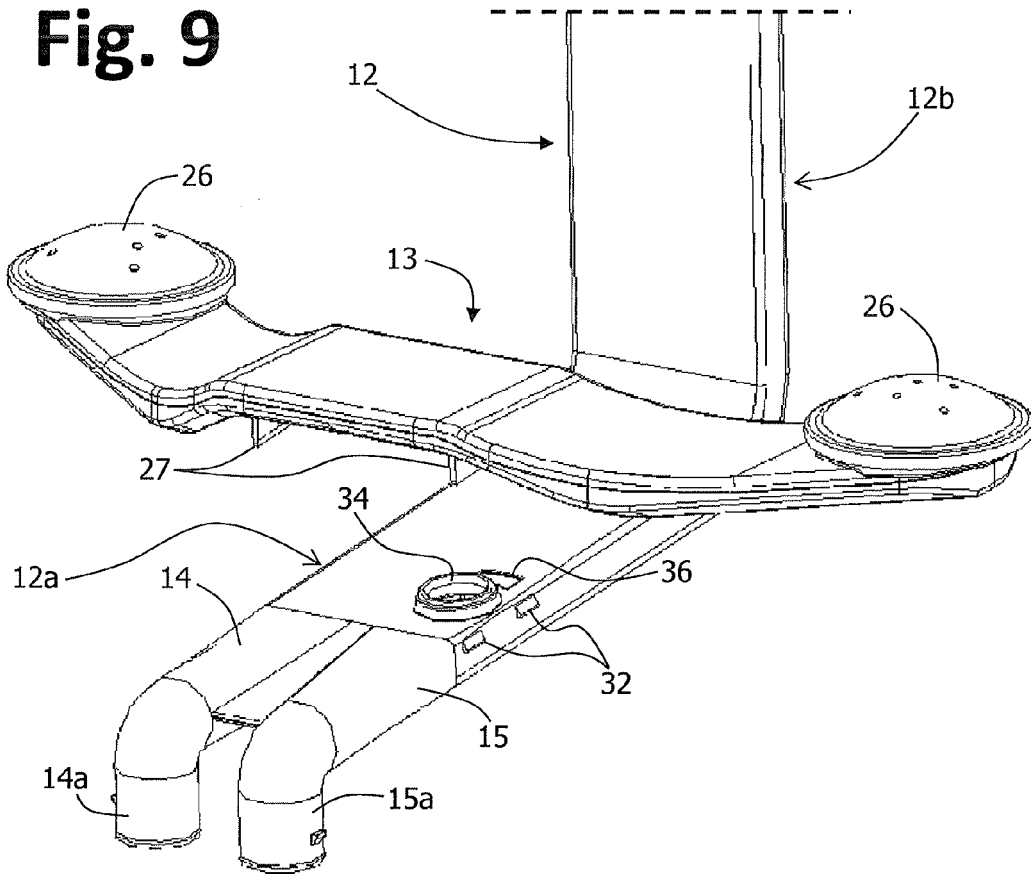


Fig. 10

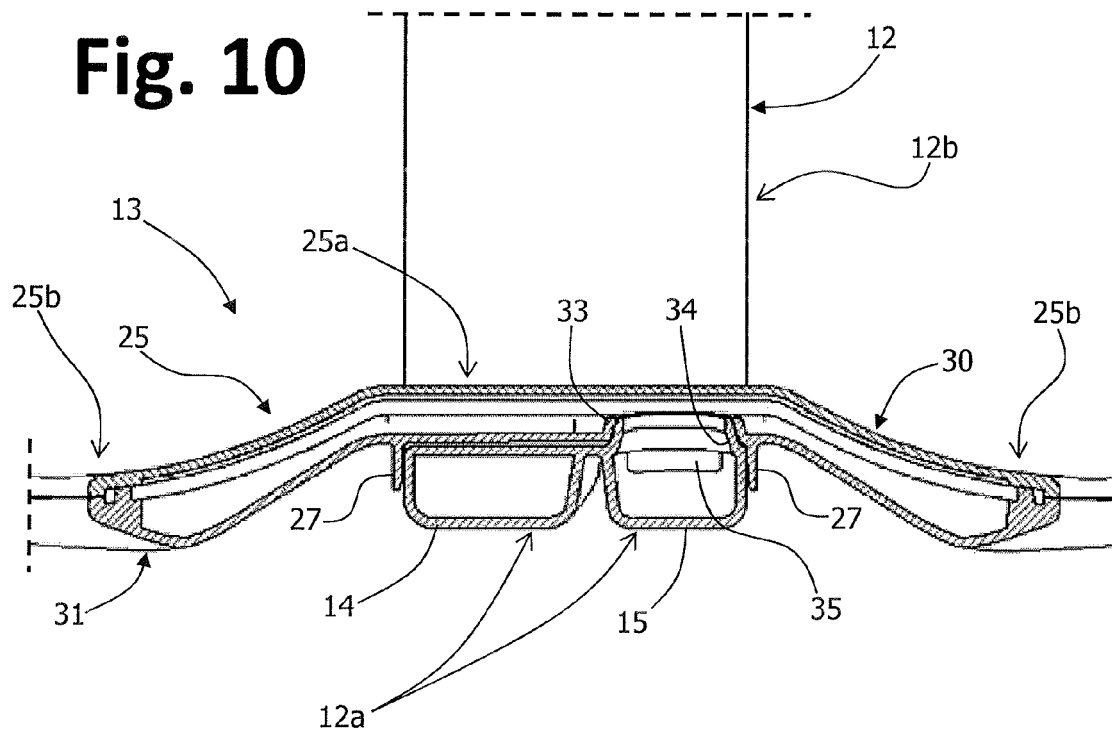
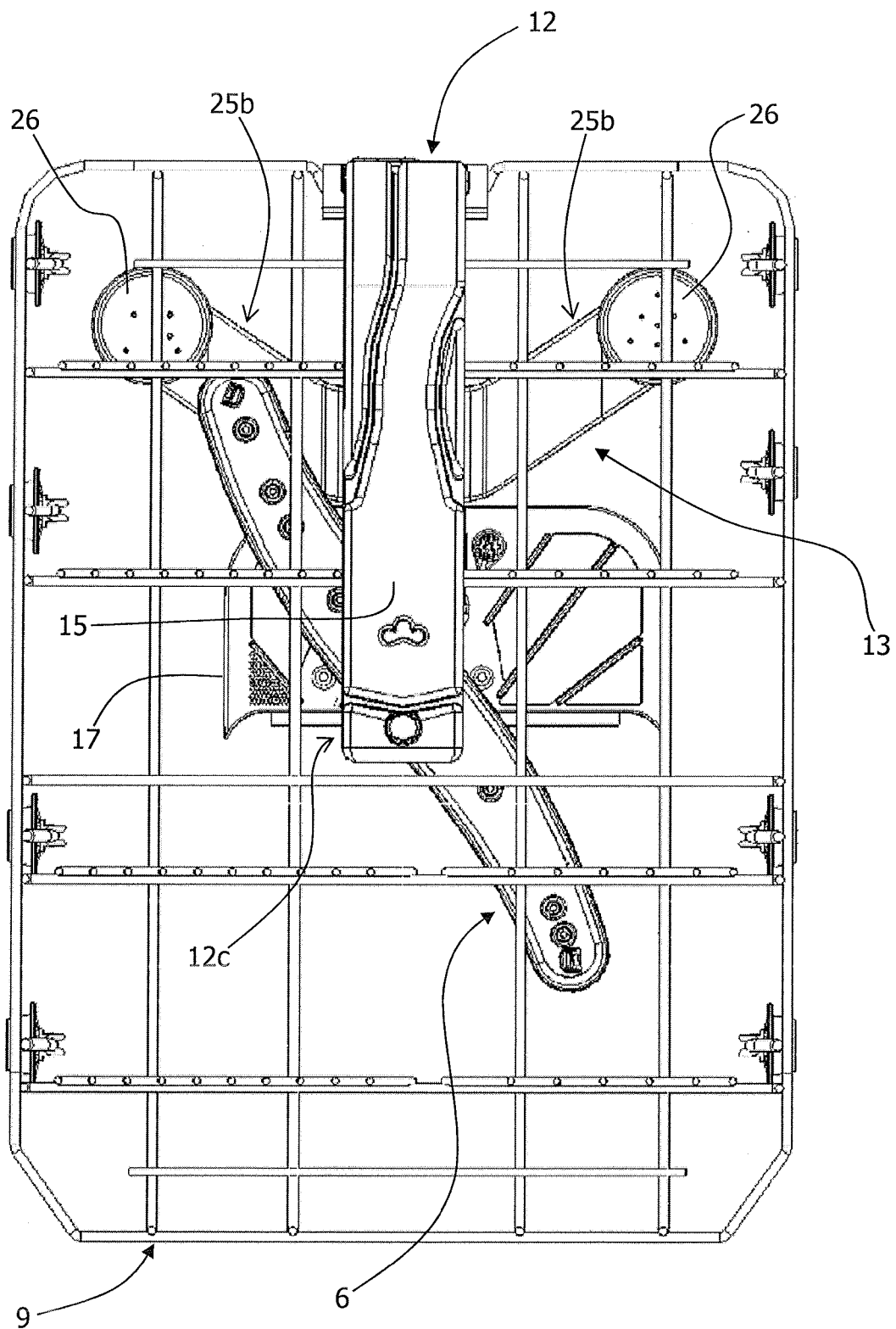


Fig. 11





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Place of search Munich		Date of completion of the search 19 April 2016	Examiner Beckman, Anja
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