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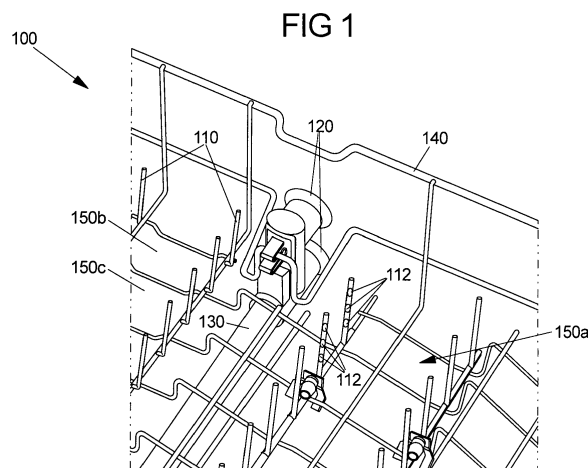
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(54) **LOAD-SENSITIVE DISHWASHER MACHINE**

(57) A dishwasher rack (100; 720) for use in a load-sensitive dishwasher machine (700) comprises a plurality of rods (110; 210, 212), which are arranged to define at least one receptacle (150a-150c; 250) for an item to be washed, and at least one inlet (120). Each of the rods (110; 210, 212) comprises a duct (240, 242) for ducting cleaning liquid in an extension direction of the rod (110; 210, 212), and at least one duct opening (112; 214, 216) adjacent to the at least one receptacle (250). The duct (240, 242) of each rod (110; 210, 212) is fluidly connected to the inlet (120) such that a fluid connection exists between the inlet (120) and the duct opening (112; 214, 216). The duct (240, 242) of each rod (110; 210, 212) is further configured for ducting light parallel to the extension direction of the rod (110; 210, 212), the duct (240, 242) being connected to the inlet (120) in a

light-conducting manner such that a light-conducting connection exists between the inlet (120) and the duct opening (112; 214, 216). The rods (110; 210, 212) comprise at least one first rod (210) and at least one second rod (212) which are arranged on different sides of the receptacle (150a-150c; 250), and the duct opening (214) of the first rod (210) faces the duct opening (216) of the second rod (212), such that a light barrier of an optical load-sensing system of the dishwasher machine is constituted in the receptacle (150a-150c; 250) between the first rod (210) and the second rod (212), when light is irradiated into the inlet by means of a light source of the load-sensing system. Further described are a load-sensing system (710), a dishwasher machine (700) and a method (800).



Description

[0001] The present disclosure relates generally to load-sensitive dishwashers. It relates particularly to a dishwasher rack for use in a load-sensitive dishwasher machine. It further relates to a system comprising such a rack, to a load-sensitive dishwasher machine and to a method of operating a load-sensitive dishwasher machine.

[0002] Conventional dishwashers are typically programmed to perform an automated sequence of washing, rinsing and drying steps. Control parameters for the different steps, such as duration, temperature or an amount of cleaning liquid dispersed during the cleaning, are normally predetermined by the manufacturer or can be controlled by a user only to a limited extent, e.g., by manually selecting between different preconfigured programs. Meanwhile, the distribution of cleaning liquid in the dishwasher chamber is mainly determined by a structure of the dishwasher.

[0003] Control parameters of conventional dishwashers are normally preconfigured so as to provide an acceptable compromise between the quality of the cleaning, usually for a fully loaded machine, and the consumption of resources, including time, energy, water and detergent, during the cleaning. However, an optimal choice of control parameters depends strongly on the type and the amount of items actually placed in the dishwasher, whereas manually selecting an appropriate program may not always be possible or convenient to a user.

[0004] To solve the problem, it is known to use optical sensing for automatically determining the presence of items placed in a dishwasher. Cleaning parameters may then be set automatically, based on a signal from the sensor.

[0005] For example, DE 100 48 081 A1 describes the use of image recognition systems arranged in a dishwasher chamber for detecting a quantity and nature of loading and also a degree of soiling. Similarly, US 7,842,137 B2 describes techniques for 3D modelling of a dishwasher's content based on a transit time of light determined by an image detection system. Possible problems with these techniques consist in the demand for rather complex lighting, imaging or data processing.

[0006] As an alternative approach, EP 1 192 893 A2 describes an arrangement of light barriers through which a basket with items to be washed is passed before washing, which results in variations in the light interruptions depending on the placed items. Possible problems with this technique consist in the demand for tracking also the movement of the basket to map the locations of the items causing the interruptions. Moreover, a user needs move the baskets in a suited way and no detection can be performed during the wash program, for example.

[0007] There is therefore a need for a technique that avoids or at least mitigates the aforementioned problems.

[0008] According to a first aspect, a dishwasher rack for use in a load-sensitive dishwasher machine is provided.

The dishwasher rack comprises a plurality of rods, which are arranged to define at least one receptacle for an item to be washed, and at least one inlet. Each of the rods comprises a duct for ducting cleaning liquid in an extension direction of the rod, and at least one duct opening adjacent to the at least one receptacle. The duct of each rod is fluidly connected to the inlet such that a fluid connection exists between the inlet and the duct opening. The duct of each rod is further configured for ducting light parallel to the extension direction of the rod, the duct being connected to the inlet in a light-conducting manner such that a light-conducting connection exists between the inlet and the duct opening. The rods comprise at least one first rod and at least one second rod which are arranged on different sides of the receptacle, and the duct opening of the first rod faces the duct opening of the second rod, such that a light barrier of an optical load-sensing system of the dishwasher machine is constituted in the receptacle between the first rod and the second rod, when light is irradiated into the inlet by means of a light source of the load-sensing system.

[0009] The first rod and the second rod may be arranged such that the light barrier is blocked when an item to be washed is placed in the receptacle.

[0010] The duct of each rod may comprise a hollow tubular core and a light-reflecting cladding, a light-guiding cladding and/or an optical fiber. The optical fiber may be arranged at least partly in the core of the rod.

[0011] The duct opening of each rod may be configured to function as a nozzle for spraying cleaning liquid from the duct towards the receptacle and as an interface for coupling light into, or out of, the duct.

[0012] The dishwasher rack may comprise multiple first rods and multiple second rods arranged on different sides of multiple receptacles of the dishwasher rack, such that at least one light barrier is constituted in each receptacle.

[0013] The dishwasher rack may further comprise at least one first canal, which extends between the multiple first rods and the inlet, wherein the duct of each of the first rods is connected fluidly and in a light-conducting manner to the inlet via the first canal. The dishwasher rack may further comprise at least one second canal, which extends between the multiple second rods and the inlet, wherein the duct of each of the second rods is connected fluidly and in a light-conducting manner to the inlet via the second canal.

[0014] Each of the rods may further comprise at the duct opening a spring-loaded valve. The spring-loaded valve may be biased in a first position and, when cleaning liquid is pumped through the duct, may be configured to be pushed into a second position. The valve may comprise an optical filter, which in the first position of the valve is placed in a passage through the duct opening and in the second position of the valve is removed from the passage through the duct opening.

[0015] The optical filter may comprise a band-pass filter. Respective two of the band-pass filters, which pertain

to a same light barrier, may have equal transmission bands. In addition, at least two of the band-pass filters, which pertain to different light barriers, may have different transmission bands.

[0016] According to another aspect, a load-sensing system for use in a load-sensitive dishwasher machine is provided. The system comprises a dishwasher rack as presently described, at least one light source, which is arranged to irradiate light into the inlet of the dishwasher rack, and at least one light sensor, which is arranged to detect light emitted from the inlet of the dishwasher rack.

[0017] The light source may be arranged to irradiate the light into the inlet such that light is emitted into the first canal. In addition, the light sensor may be arranged to detect light emitted from the inlet via the second canal.

[0018] The light source may emit light over a spectral range which includes different parts of the different transmission bands of the band-pass filters. The load-sensing system may further comprise a diffraction device for enabling wavelength-specific light detection by means of the light sensor.

[0019] The load-sensing system may further comprise a processing unit. The processing unit may be configured for processing a signal from the light sensor regarding the presence of one or more items being placed in one or more of the receptacles of the dishwasher rack.

[0020] The processing unit may further be configured to generate a control signal for at least one process parameter of the dishwasher machine based on the processed signal.

[0021] According to another aspect a dishwasher machine is provided. The dishwasher machine comprises a dishwasher rack as presently described and/or a load-sensing system as presently described.

[0022] According to another aspect, a method of operating a load-sensitive dishwasher machine as presently described is provided. The method comprises controlling, by means of a processing unit of the dishwasher machine, the light source to irradiate light into the inlet, controlling, by means of the processing unit, a light sensor of the load-sensing system to detect an intensity of light emitted from the inlet, processing, by means of the processing unit, a sensor signal which is received from the light sensor and which is indicative of the detected intensity to determine whether an item to be washed is placed in the receptacle, and generating and outputting, by means of the processing unit, a control signal for at least one process parameter of the dishwasher machine based on the processed sensor signal.

[0023] Further features, objectives and advantages of the invention will become apparent from the detailed description and the accompanying drawings. There is shown in:

Fig. 1 a schematic representation of a dishwasher rack according to an embodiment;

Fig. 2 a schematic representation of rods of a dish-

washer rack, the rods having a spring-loaded valve in a first position, according to an embodiment;

5 Fig. 3 a schematic representation of rods of a dishwasher rack, the rods having a spring-loaded valve in a second position, according to an embodiment;

10 Fig. 4A a schematic representation of canals of a dishwasher rack accommodated in a tube, according to an embodiment;

Fig. 4B a schematic representation of canals of a dishwasher rack arranged separately according to another embodiment;

Fig. 5 a schematic representation of light-conducting in a duct of a dishwasher rack according to an embodiment;

Fig. 6 a schematic representation of an arrangement for wavelength-specific light detection as part of a load-sensing system for a dishwasher according to another embodiment;

Fig. 7 a schematic representation of a load-sensitive dishwasher according to another embodiment, and

Fig. 8 a flow diagram of a method of operating a load-sensitive dishwasher according to another embodiment.

35 **[0024]** Fig. 1 shows a perspective view of a schematic representation of a dishwasher rack 100 for use in a load-sensitive dishwasher machine. The dishwasher rack 100 comprises a plurality of rods 110, a plurality of duct openings 112 arranged in the rods 110, inlets 120, a pipe 130, and one or more canals 140. The rods 110 are arranged such that multiple receptacles 150a-150c for items to be washed are formed. The duct openings 112 are arranged adjacent to respective receptacles 150a-150c of the dishwasher rack 100.

45 **[0025]** Each of the rods 110 comprises duct for ducting cleaning liquid in the extension direction of each rod 110. The ducts of the rods 110 are in fluid connection with the inlet 120 via one or more canals 140 and/or via the pipe 130. In the shown example, the dishwasher rack 100 is configured for spraying cleaning liquid, such as water or detergent, through the duct openings 112 when cleaning liquid is injected into the inlet 120. For example, the injected cleaning liquid is ducted from the inlet 120 via the pipe 130 and/or one or more canals 140 to one or more of the rods 110, from where the injected cleaning liquid is sprayed from respective duct openings 112 to get in contact with one or more items placed in the corresponding receptacles 150a-150c adjacent to the respective

duct opening.

[0026] Each of the rods 110 is further configured to provide for light-conducting parallel to the extension direction of the rod 110. The duct openings 112 are further configured to function as an optical interface for coupling-out light which has been ducted inside the respective rod 112 or for coupling-in light which is irradiated on the duct opening 112 from outside, for ducting the irradiated light into the structure of the dishwasher rack 100. Analogously to the fluid connection between the duct openings 112 and the inlet 120, the dishwasher rack 100 thus provides for a light-conducting connection between each of the duct openings 112 and the inlet 120 via one or more canals 140 and/or the pipe 130. In particular, the dishwasher rack 100 enables ducting cleaning liquid and/or light from the inlet 120 to each of the duct openings 112 or reverse.

[0027] The duct openings 112 are arranged such that respective two of the duct openings 112 of different rods 110 face each other, while being positioned at different sides of a receptacle 150a-150c. In that manner, using the above described functionality of the dishwasher rack 100, when light is irradiated into the inlet 120, each facing pair of openings 120 constitutes a light barrier. In particular, when light is irradiated into the inlet 120, placing an item to be washed in any of the receptacles 150a-150c, a light barrier extending in that receptacle is likely to be interrupted. As a consequence, less of the light emitted by one of the facing duct openings 112 will be coupled back into the dishwasher rack 100 via the respective facing duct opening 112. Less light intensity will therefore be guided back to the inlet 120 and be emitted from the inlet 120.

[0028] In the described manner, the dishwasher rack 100 allows for determining, based on a detected light intensity emitted from the inlet 120, the presence or absence of one or more items in one or more of the receptacles 150a-150c. Moreover, arranging a light barrier in each receptacle allows for spatially resolved information about objects placed in the dishwasher rack 100, for example, at various stages before, during or after a cleaning process. Spatial resolution can also be increased by implementing multiple, separate light circuits as above described, in different regions of the dishwasher rack 100. Moreover, techniques, such as filtering of light, can be used to locate more accurately received intensity information of light corresponding to different light barriers of the dishwasher rack 100, as will be described in more detail below.

[0029] Furthermore, the dishwasher rack 100 allows for acquiring information about items being placed in receptacles 150a-150c of the dishwasher rack 100 by sensing the presence of the item at the very same place where also cleaning liquid for the item is sprayed out. This allows for very accurate control of cleaning conditions adapted to the particular load in sensing area. The dishwasher rack 100 enables, for example, controlling at least one process parameter of the cleaning process of the load-

sensitive dishwasher machine to correspond to the particular load situation in one or more receptacles 150a-150c. For example, the dishwasher rack 100 comprises in some examples a valve system and/or multiple duct circuits that allow for selective delivery of cleaning liquid based on the determined presence of items to be cleaned in a respective receptacle 150a-150c.

[0030] Furthermore, the load-sensing functionality of the dishwasher rack 100 is integrated into the cleaning liquid delivery system of the dishwasher rack 100. Therefore, no external sensing devices are needed to be attached to the rack 100, hence a use of the dishwasher rack 100 is not hindered.

[0031] To enable for a light-conducting connection between the duct openings 112 and the inlet 120, in some examples each rod 112 comprises a hollow tubular duct inside the rod 112, through which cleaning liquid can be ducted. The duct is provided with a highly reflective cladding, such that light can be ducted with little loss through the same hollow duct, especially while no cleaning liquid is present in the duct. In other examples, light-guiding cladding is provided in the hollow duct of each rod 112. In other examples, an optical fibre is accommodated in each rod 112 and is arranged such that light irradiated from outside on the duct opening 112 becomes coupled into the light-guiding fibre.

[0032] Fig. 2 shows a schematic representation of an arrangement 200 of rods 210, 212 as described above. The rods 210, 212 are arranged at different sides of a receptacle 250. The arrangement 200 comprises a first rod 210, having a duct opening 114, a spring-loaded valve 220 with spring 224, a valve body 228, and an optical filter 230. The first rod 210 further comprises a duct 244 for ducting cleaning liquid or light, as above described. The arrangement 200 further comprises a second rod 212, which in the shown example corresponds structurally to the first rod 210. In particular, also the second rod 212 comprises a duct opening 216, a spring-loaded valve 222 with a spring 226 and a valve body 229, including an optical filter 232, and a duct 242 for ducting, for example, light and/or cleaning liquid.

[0033] As described in connection with Fig. 1, the arrangement 200 of Fig. 2 is configured to constitute a light barrier between the rods 210, 212. For that purpose, the duct openings 214, 216 are arranged such that they face each other. As shown in Fig. 2, the spring-loaded valves 220, 222 are biased in a first position. In that position, the optical filters 230, 232 are placed in a passage of the duct openings 214, 216. In that manner, the optical filters function as filters for light which is guided through the duct 240 of the first rod 210 to be coupled out of the duct 240 via the filter 230 and the duct opening 214. The out-coupled light passes the receptacle 250 and reaches the duct opening 216 of the duct 242 of the second rod 212. When reaching the duct opening 216, the irradiated light is coupled into the duct 242 and guided back to the inlet 120. For the described purpose, the optical filters to 230, 232 have identical transmission bands, in some exam-

ples. In other examples, the filters 230, 232 have at least overlapping transmission bands at a wavelength of the light arriving via the duct 240 of the first rod 210.

[0034] The spring-loaded valves 220, 222 allow for optically sensing the presence of items in the receptacle 250, for example, during a loading stage and/or prior to starting of the cleaning process of the dishwasher machine. Furthermore, as set forth in more detail below, the provision of optical filters 230, 232 allows for spatially resolving the light intensity information detected by a load sensing system regarding the presence of items in different receptacles 250. It can be achieved by the use of a broad irradiation light spectrum and by using different filters 230, 232 having different transmission bands at different receptacles 250 or at different parts of a same receptacle 250.

[0035] Fig. 3 shows the arrangement 200 of Fig. 2, wherein like numerals denote like features. Different from Fig. 2, Fig. 3 shows the arrangement 200 during a cleaning stage of the dishwasher machine, while cleaning liquid is delivered via the duct 240. By the injection pressure of the cleaning liquid, the spring-loaded valve 420 is now pushed in a second position, in which the duct opening 214 provides an open passage for the cleaning liquid to be sprayed towards the receptacle 250. Moreover, at this stage, also the second rod 212 is delivered cleaning liquid via the duct 242 and acts similar to the first rod 210. In that manner, cleaning liquid is applied to an item in the receptacle 250 from either side, thereby increasing a cleaning efficiency of the dishwasher rack.

[0036] Fig. 4A shows a schematic representation of a tube 400 in which the first canal 410 and the second canal 420 are accommodated. With reference to Figs 1 and 2, the tube 400 can be used in a dishwasher rack having a plurality of first rods according to the first rod 210 of Fig. 2 and a plurality of second rods according to the second rod 212 of Fig. 2. In some examples, multiple first rods are connected to the first canal 410, and multiple second rods are connected to the second canal 420. For example, in a detecting stage of the dishwasher machine, light is irradiated into the inlet 120 such that the light is coupled into the first canal 410. Analogous to Fig. 2, each of the first rods connected to the first canal 410 will thus receive light from the first canal 410. Conversely, all light collected by the multiple second rods 212 will become coupled into the second canal 420 and be emitted from the inlet 120 via the second canal 420. A corresponding arrangement facilitates, for example, a placing of a light source and a detector of a load-sensing system and enables also for more accurate intensity measurements and evaluation. Meanwhile, in a washing stage of the process, cleaning liquid can be injected equally into both the first canal 410 and the second canal 420, such that all first and second rods act similarly in the cleaning process, as described in connection with Fig. 3.

[0037] Fig. 4B shows an alternative arrangement 400' of a first canal 410' and a second canal 420'. Different from the arrangement 400 of Fig. 4A, the arrangement

400' corresponds to a separate arrangement of the first and the second canals 410', 420'. In the shown example, each of the first and second canals 410', 420' is shown connected to a rod.

[0038] Fig. 5 shows a schematic representation of light-guiding in a tubular duct 500, as described above. In the shown example, the tubular duct 500 is provided with a reflective cladding to provide for the guiding of light in an extension direction of the duct 500, for example, during a process stage while no cleaning liquid is delivered via the duct 500.

[0039] Fig. 6 shows a schematic representation of an arrangement 600 for wavelength-specific intensity measurements. The arrangement 600 is used in some examples as part of a load-sensing system for use with the dishwasher rack 100, as described above. The arrangement 600 comprises a light sensor 610 having multiple sensing fields on which light of different wavelengths is directed. The arrangement 600 further comprises a diffraction device 620, such as a diffraction prism or a diffraction grating, configured to spectrally resolve polychromatic light incident on the device 620. The arrangement 600 further comprises focusing elements 630, 632.

[0040] As described above, the sensing arrangement 600 is used in some examples to differentiate the intensity information based on light emitted from the inlet 120 regarding different receptacles 150a-150c of the dishwasher rack 100. For that purpose, as described in connection with Fig. 2, different rods pertaining to different light barriers are equipped with optical bandpass filters having different transmission bands. Accordingly, spectral intensity information can be used to determine the presence or absence of items in different receptacles 150a-150c by analysing the intensity information related to the transmission band of the optical filters in rods adjacent to that receptacle. For example, a white light source may be used for radiating light into the inlet 120, whereas spectrally filtered light is returned from each of the light barriers, wherein the wavelength or wavelength range of the filtered light of each light barrier is indicative of the pertinent receptacle 150a-150c.

[0041] Fig. 7 shows a schematic view of a load-sensitive dishwasher 700. The load-sensitive dishwasher 700 comprises a load-sensing system 710 comprising a dishwasher rack 720, a light source 730, a light sensor 740, and a processing unit 750. Concerning these elements, the above description applies correspondingly. The load sensing system 710 further comprises a database 760, communicatively coupled to the processing unit 750, and a cleaning unit 770 configured to modify at least one condition pertaining to the cleaning process of the dishwasher machine 700. Examples of the cleaning unit 770 include a heating, a cleaning liquid pump, a detergent pump, etc. The processing unit 750 is configured to generate a control signal based on the process signal received from the light sensor 714 and output the generated control signal to the cleaning unit 770 to drive the cleaning unit 770 accordingly. The database 760 may comprise

data, such as a mapping table, based on which the processing unit 750 generates the control signal in accordance with the processed signal received from the light sensor 740.

[0042] Fig. 8 shows a method 800 for operating a load-sensitive dishwasher machine, as described above. The method 800 comprises controlling, by means of the processing unit of the dishwasher machine, a light source to irradiate light into the inlet of the dishwasher rack, block 810. The method 800 further comprises controlling, by means of the processing unit, a light sensor of the load sensing system to detect an intensity of light emitted from the inlet, block 820, and processing the sensor signal received from the light sensor to determine whether an item to be washed is placed in the receptacle, block 830. The method 800 further comprises generating and outputting, by means of the processing unit and towards a cleaning unit of the dishwasher, the control signal for at least one process parameter of the dishwasher machine based on the processed sensor signal, block 840.

Claims

1. Dishwasher rack (100; 720), for use in a load-sensitive dishwasher machine (700), comprising a plurality of rods (110; 210, 212), which are arranged to define at least one receptacle (150a-150c; 250) for an item to be washed, and at least one inlet (120), wherein each of the rods (110; 210, 212) comprises:

a duct (240, 242) for ducting cleaning liquid in an extension direction of the rod (110; 210, 212), and

at least one duct opening (112; 214, 216) adjacent to the at least one receptacle (250), wherein the duct (240, 242) of each rod (110; 210, 212) is fluidly connected to the inlet (120) such that a fluid connection exists between the inlet (120) and the duct opening (112; 214, 216); wherein the duct (240, 242) of each rod (110; 210, 212) is further configured for ducting light parallel to the extension direction of the rod (110; 210, 212), the duct (240, 242) being connected to the inlet (120) in a light-conducting manner such that a light-conducting connection exists between the inlet (120) and the duct opening (112; 214, 216), and

wherein the rods (110; 210, 212) comprise at least one first rod (210) and at least one second rod (212) which are arranged on different sides of the receptacle (150a-150c; 250), and the duct opening (214) of the first rod (210) faces the duct opening (216) of the second rod (212), such that a light barrier of an optical load-sensing system of the dishwasher machine is constituted in the receptacle (150a-150c; 250) between the first rod (210) and the second rod (212), when light

is irradiated into the inlet (120) by means of a light source of the load-sensing system.

2. Dishwasher rack (100; 720) according to claim 1, wherein the first rod (210) and the second rod (212) are arranged such that the light barrier is blocked when an item to be washed is placed in the receptacle (250).
3. Dishwasher rack (100; 720) according to claim 1 or 2, wherein the duct (240, 242) of each rod (110; 210, 212) comprises a hollow tubular core and at least one of a light-reflecting cladding, a light-guiding cladding and an optical fiber.
4. Dishwasher rack (100; 720) according to any of the preceding claims, wherein the duct opening (214, 216) of each rod (110; 210, 212) is configured to function as a nozzle for spraying cleaning liquid from the duct (240, 242) towards the receptacle (250) and as an interface for coupling light into, or out of, the duct (240, 242).
5. Dishwasher rack (100; 720) according to any of the preceding claims comprising multiple first rods (110; 210) and multiple second rods (110; 212) arranged on different sides of multiple receptacles (150a-150c; 250) of the dishwasher rack (100; 720) such that at least one light barrier is constituted in each receptacle (150a-150c; 250).
6. Dishwasher rack (100; 720) according to claim 5, further comprising at least one first canal (140; 410), which extends between the multiple first rods (110; 210) and the inlet (120), wherein the duct (240) of each of the first rods (110; 210) is connected fluidly and in a light-conducting manner to the inlet (120) via the first canal (140; 410), and at least one second canal (140; 420), which extends between the multiple second rods (110; 212) and the inlet (120), wherein the duct (242) of each of the second rods (110; 212) is connected fluidly and in a light-conducting manner to the inlet (120) via the second canal (420).
7. Dishwasher rack (100; 720) according to claim 6, wherein each of the rods (110; 210, 212) further comprises at the duct opening (112; 214, 216) a spring-loaded valve (220, 222), which is biased in a first position and, when cleaning liquid is delivered through the duct (240, 242), is configured to be pushed into a second position, wherein the valve (220, 222) comprises an optical filter (230, 232), which in the first position of the valve (220, 222) is placed in a passage through the duct opening (214, 216) and in the second position of the valve (220, 222) is removed from the passage through the duct opening (214, 216).

8. Dishwasher rack (100; 720) according to claim 7, wherein the optical filter (230, 232) comprises a band-pass filter, wherein respective two of the band-pass filters (230, 232), which pertain to a same light barrier, have equal transmission bands, and wherein at least two of the band-pass filters (230, 232), which pertain to different light barriers, have different transmission bands.
9. Load-sensing system (710), for use in a load-sensitive dishwasher machine (700), comprising:
- a dishwasher rack (720) according to any of the preceding claims;
 - at least one light source (730), which is arranged to irradiate light into the inlet (120) of the dishwasher rack (720), and
 - at least one light sensor (740), which is arranged to detect light emitted from the inlet (120) of the dishwasher rack (720).
10. Load-sensing system (710) according to claim 9 comprising a dishwasher rack (720) according to any of claims 6 to 9, wherein the light source (730) is arranged to irradiate the light into the inlet (120) such that light is emitted into the first canal (410; 510), and wherein the light sensor (740) is arranged to detect light emitted from the inlet (120) via the second canal (420; 520).
11. Load-sensing system (710) according to claim 9 or 10 comprising a dishwasher rack (720) according to claim 8, wherein the light source (730) emits light over a spectral range which includes different parts of the different transmission bands of the band-pass filters, and wherein the load-sensing system (710) further comprises a diffraction device (620) for enabling wavelength-specific light detection by means of the light sensor (610; 740).
12. Load-sensing system (710) according to claim 11, further comprising a processing unit (750), configured for processing a signal from the light sensor (740) regarding the presence of one or more items being placed in one or more of the receptacles (150a-150c) of the dishwasher rack (720).
13. Load-sensing system according to claim 12, wherein the processing unit is further configured to generate a control signal for at least one process parameter of the dishwasher machine based on the processed signal.
14. Load-sensitive dishwasher machine (700) comprising a dishwasher rack (720) according to any of claims 1 to 8 and/or a load-sensing system (710) according to any of claims 9 to 13.
15. Method (800) of operating a load-sensitive dishwasher machine, the dishwasher machine having a dishwasher rack comprising a plurality of rods, which are arranged to define at least one receptacle for an item to be washed, and at least one inlet, wherein each of the rods comprises a duct for ducting cleaning liquid in an extension direction of the rod and at least one duct opening adjacent to the at least one receptacle, wherein the duct of each rod is fluidly connected to the inlet such that a fluid connection exists between the inlet and the duct opening, wherein the duct of each rod is further configured for ducting light parallel to the extension direction of the rod, the duct being connected to the inlet in a light-conducting manner such that a light-conducting connection exists between the inlet and the duct opening, and wherein the rods comprise at least one first rod and at least one second rod which are arranged on different sides of the receptacle, and the duct opening of the first rod faces the duct opening of the second rod, such that a light barrier of an optical load-sensing system of the dishwasher machine is constituted in the receptacle between the first rod and the second rod, when light is irradiated into the inlet by means of a light source of the load-sensing system, the method comprising:
- controlling (810), by means of a processing unit of the dishwasher machine, the light source to irradiate light into the inlet;
 - controlling (820), by means of the processing unit, a light sensor of the load-sensing system to detect an intensity of light emitted from the inlet;
 - processing (830), by means of the processing unit, a sensor signal which is received from the light sensor and which is indicative of the detected intensity to determine whether an item to be washed is placed in the receptacle;
 - generating and outputting (840), by means of the processing unit, a control signal for at least one process parameter of the dishwasher machine based on the processed sensor signal.

FIG 1

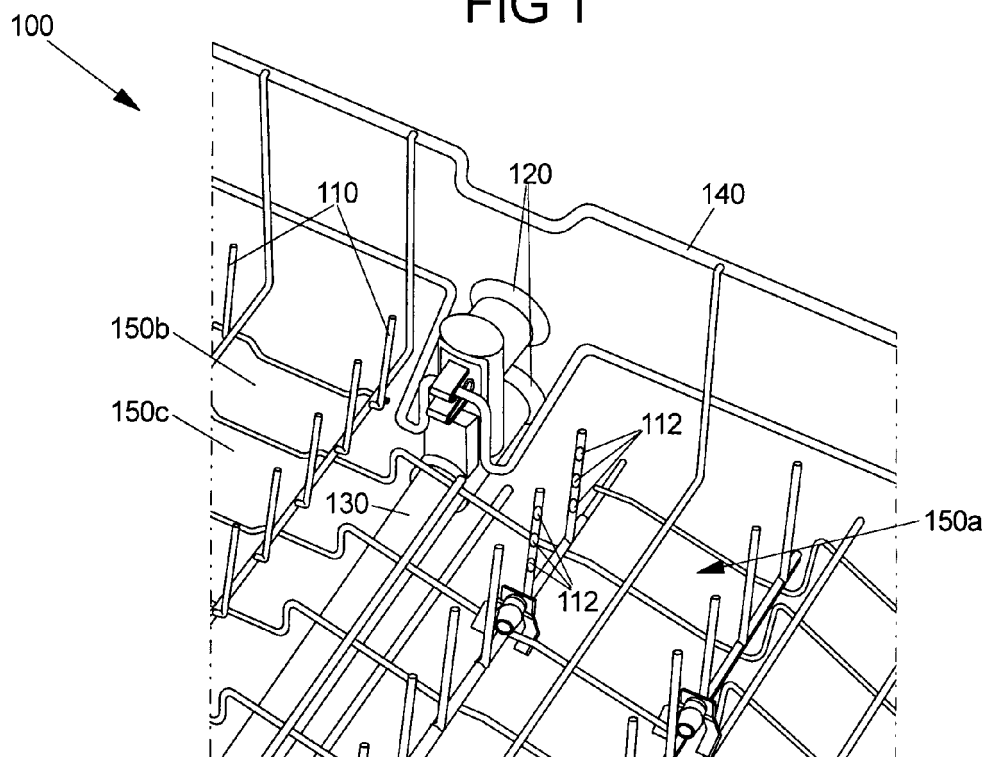


FIG 2

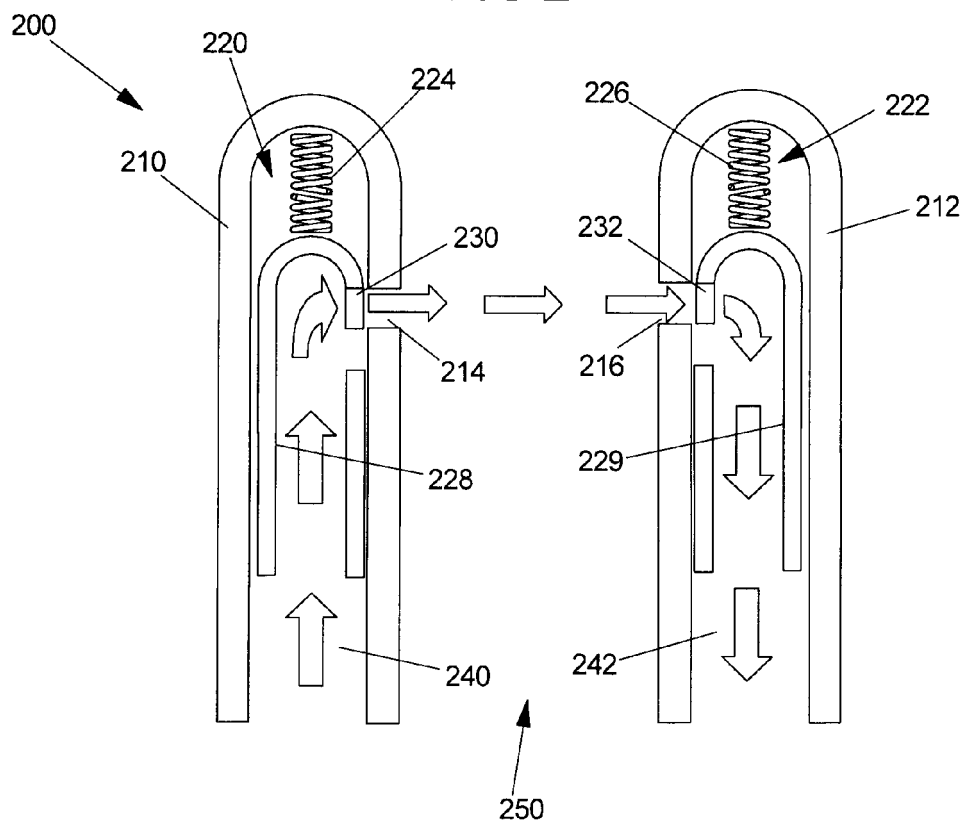


FIG 3

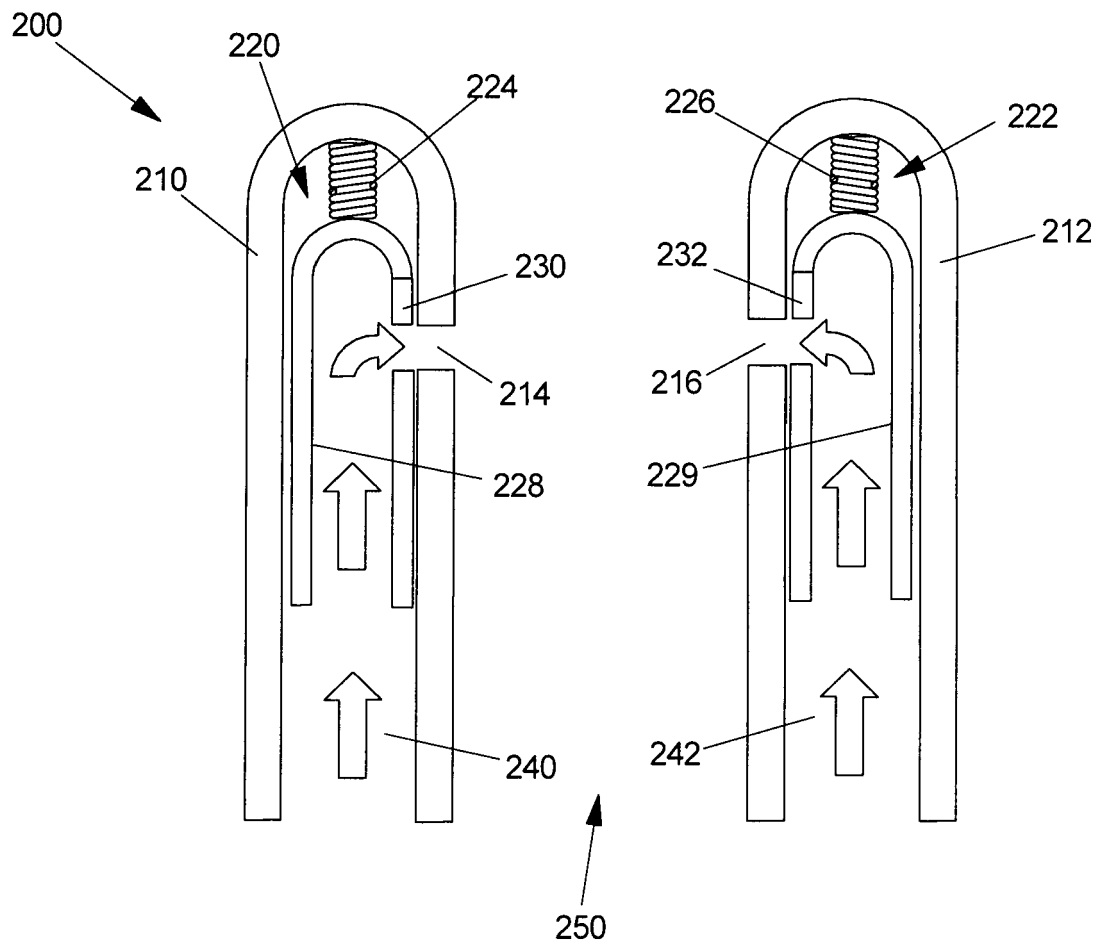


FIG 4A

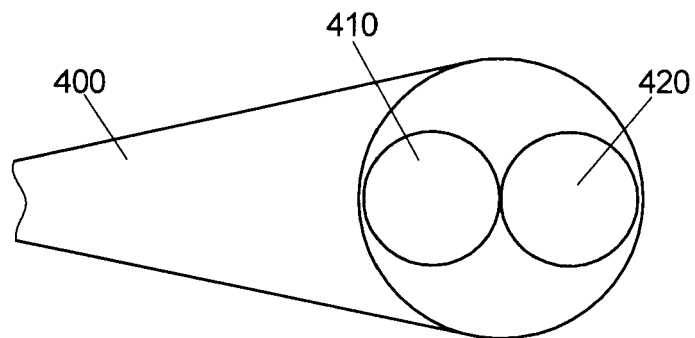


FIG 4B

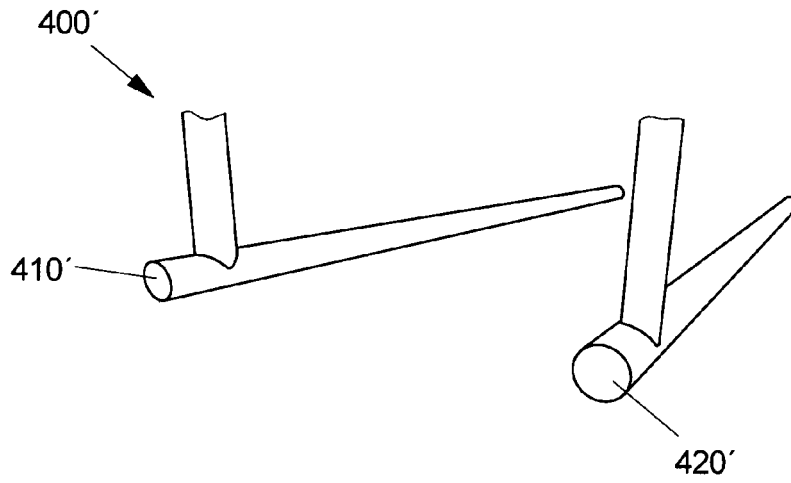


FIG 5

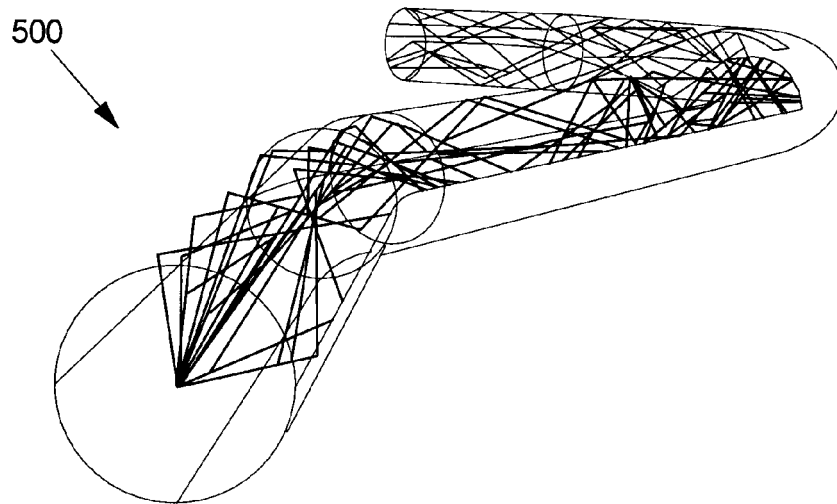


FIG 6

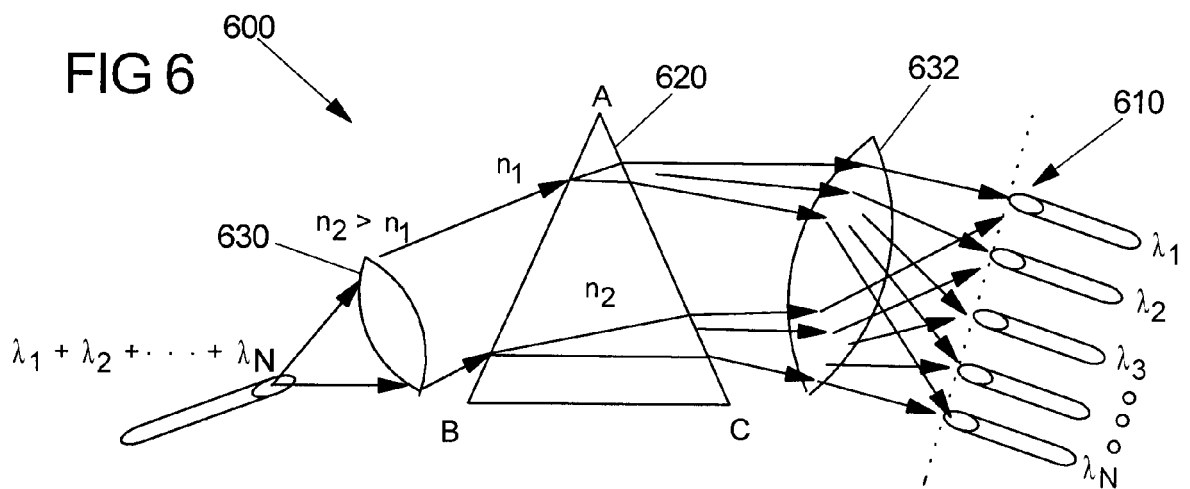


FIG 7

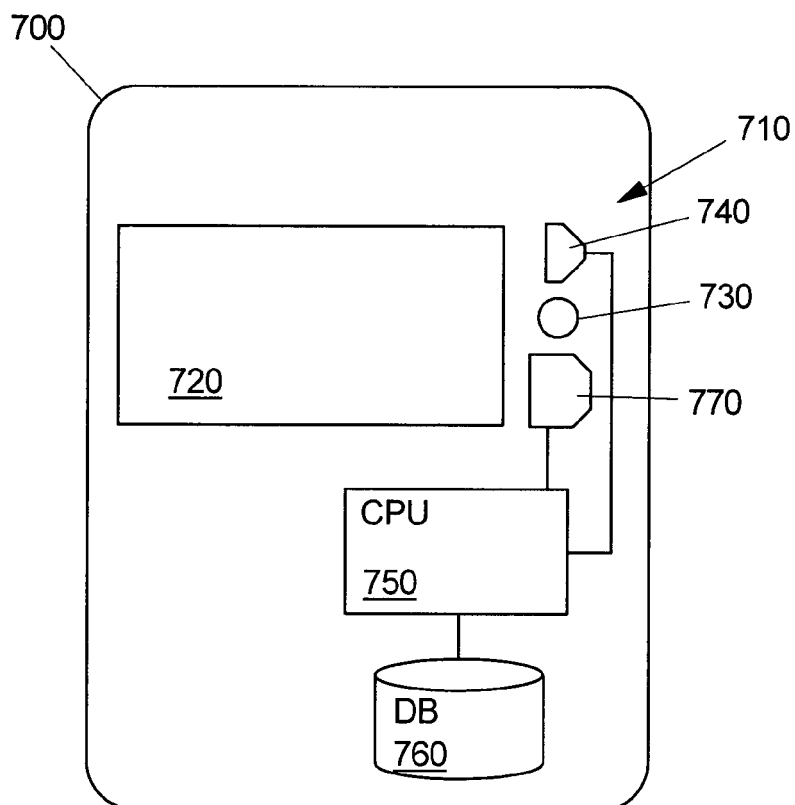
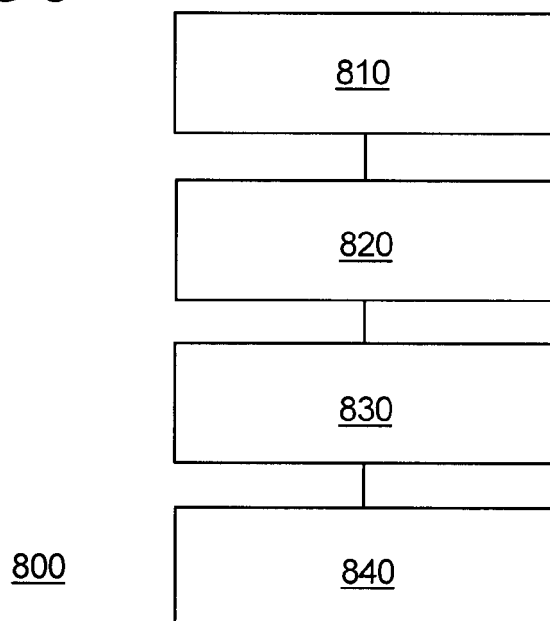


FIG 8





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