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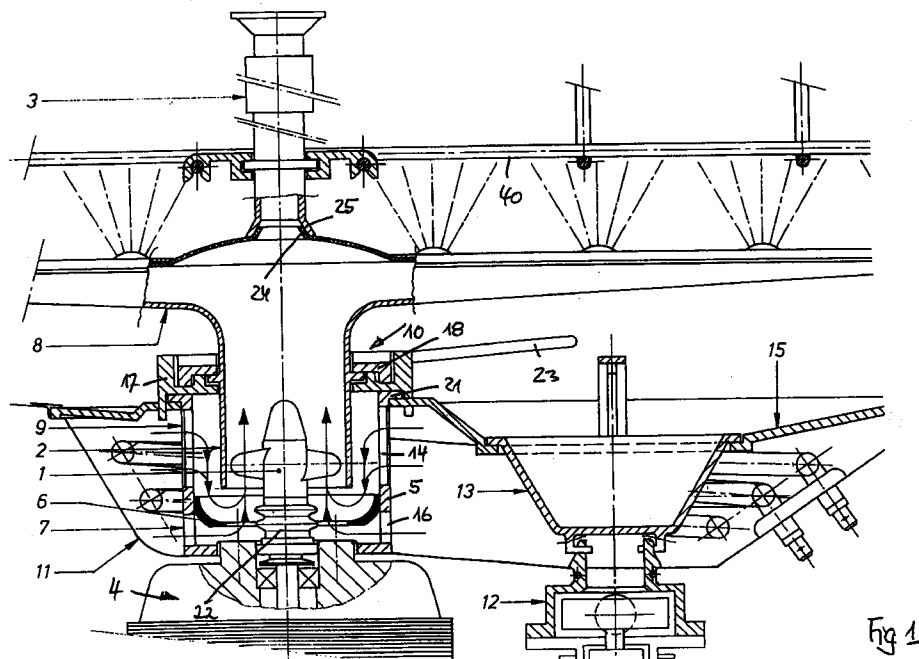
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(54) **Dishwashing machine with lower and upper spray arm and a circulating pump and wash liquor pump**

(57) The invention relates to a dishwashing machine with a lower and an upper spray arm and a circulating pump for circulating operation of the rinse water and a wash liquor pump in the sump in the bottom of the rinsing reservoir for the removal by suction of the rinse water in the suction operation. The deposition of sludge

in the sump of the rinsing reservoir and the subsequent removal by suction of the dirt particles with the rinse water is achieved by a depositing and suction area and a separate circulating area in the sump of the rinsing reservoir.



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Description

The invention relates to a dishwashing machine with lower and upper spray arm and with a circulating pump for the circulating operation of the rinse water and a wash liquor pump in the sump in the bottom of the rinsing reservoir for the removal by suction of the rinse water in suction operation.

In known dishwashers of this type only one pump has previously been used which, according to the direction of the rotation of the pump unit, is used as the circulating pump and the wash liquor pump. However this occasions a complicated rotary bearing in the lower spray arm with the integration of a fine filter, especially when the latter is to be cleaned automatically in the suction operation.

It is also already known to use a circulating pump separately from the wash liquor pump itself for the circulating operation. In this case the supply of rinse water to the spray arms presents difficulties, since in addition a separate supply line is often required.

The object of the invention, in a dishwashing machine of the previously mentioned type, is to arrange the circulating pump and the wash liquor pump in such a way that, in the circulating operation itself, the deposited dirt particles which are in the area of the wash liquor pump are not fed again to the spray arms.

According to the invention, the object is achieved in that the sump in the bottom is covered by means of a strainer plate, and in that there is placed into the first recess in the strainer plate a coarse filter, through which, by means of the incorporated wash liquor pump, the rinse water is removed by suction and in that, in a second recess of the strainer plate, separated from the wash liquor pump by means of radial bearings, the lower spray arm is positioned with a downward opening bearing shell in a rotatable position, and in that the bearing shell of the lower spray arm is enclosed by a fine filter which is held by the radial bearing and in that the circulating pump with the pump assembly projects into the bearing shell, serving as a pump casing, of the lower spray arm.

In the region of the coarse filter in front of the wash liquor pump a calm water-zone, in this development, can be created, separate from the circulating action of the circulating pump, out of which no agitated dirt particles are removed by suction. In addition, the entry to the pump assembly of the circulating pump is covered for the most part by the fine filter. The constructional design is very simple and demands only simple, easy to assemble components.

According to the development, the bearing shell with the outer collar is placed in a vertically adjustable position in the radial bearing which can be raised in the circulating operation by the flow of rinse water and which is used for coupling the lower spray arm to a coupling portion arranged in the lower crockery basket; then the rinse water can be directed over the lower

spray arm and the coupling portion in the lower crockery basket, leak-free to the upper spray arm, especially when the coupling portion in the lower crockery basket can also be adjusted upwards in a restricted vertical direction and connects to the upper spray arm.

The design of the fine filter comprises a filter casing and an attached fine filter plate or similar.

An advantageous development is characterised in that the filter casing has an upper inlet region and a lower inlet region, and in that the fine filter plate covers the lower inlet region, and in that the bearing shell of the lower spray arm extends to within the upper inlet region and that underneath the bearing shell in the fine filter a vertically adjustable disc-shaped valve element is placed, which can be raised, in the circulating operation, by the rinse water thereby opening the lower inlet region of the filter casing while, when reversing the direction of the rotation of the pump unit, the rinse water, which is being suctioned back from the spray arms, lowers the valve element to seal the lower inlet region. In the circulating operation a bypass is opened so that sufficient rinse water can be suctioned in and fed to the spray arms. In the suction operation the pump unit is reversed at least for a short time in its direction of rotation, closing the bypass. The rinse water which is suctioned back from the spray arms and the bearing shell is forced through the fine filter plate, the adhering dirt particles on its exterior surface being forced off and removed by the wash liquor pump.

In order to fix the fine filter in the sump, according to a development, the bottom of the sump in the region of the circulating pump is pulled up as a cylindrical dome, to the underside of which the electric motor of the circulating pump is attached and to which the cylindrical filter casing is fixed. If, in addition, the development is such that the radial bearing is constructed from two bearing shells between which an outer collar of the bearing sleeve is rotatably placed, and that the bearing shell facing the lower spray arm is adjustable in the bearing shell backer, which faces away from the lower spray arm, in a restricted vertical direction and in that the bearing shell, which faces away from the lower spray arm, is detachably fixed in the associated recess of the strainer plate, then the lower spray arm and the fine filter can be removed from the machine in a simple manner, when the lower crockery basket has been taken out.

The attachment of the fine filter in the strainer plate is simplified further in that the filter casing on the front-side turned towards the lower spray arm bears an outer collar; over the latter and over the bearing shell, facing away from the lower spray arm, the fine filter is held detachably in the strainer plate.

The adjustment movement of the valve element is limited in that the valve element in the open position strikes the open lower front-side of the bearing sleeve and in that the valve element causes a seal in the lower closed position towards the bottom of the sump and towards a closed ring of the filter which divides the

upper and the lower inlet region.

The valve element can then, without impairment, be placed by the pump unit into the fine filter, so that the valve element has a central bore the diameter of which is greater than the outer diameter of the pump assembly but smaller than the outer diameter of the bearing shell.

In order to seal the pump unit to the bottom of the sump there is a bellows seal applied to the driving axle of the electric motor.

The invention is described in greater detail, with the aid of an embodiment example, represented in the drawings which show:

Figure 1: a partial section in the region of the rotary bearing of the lower spray arm with the circulating pump in the circulating region, and

Figure 2: the same partial section, however with the positioning of the valve element in the suction operation.

In the partial section in the bottom of the rinsing reservoir the sump 11 can be seen which is covered by means of a strainer plate 15. In a first recess of the strainer plate 15 a coarse filter 13 is placed, in which the wash liquor pump 12 is incorporated. Separate from the wash liquor pump 12 and the coarse filter 13 in a second recess of the strainer plate 15, there is placed a fine filter 7, which consists of a filter casing 5 and a fine filter plate 9, which is attached thereto. The fine filter 7 is divided into an upper inlet region 14 and a lower inlet region 16. The filter casing 5 is, at the same time, shaped like a cage, so that large-surface inlet regions 14 and 16 arise which are separated from each other by a closed ring of the filter casing 5. The fine filter plate 9 covers the upper inlet region 14. The fine filter 7 is attached to a dome in the bottom of the sump 11. On the outside of the dome the electric motor 4 of the circulating pump 1 is attached. The upper front-side of the fine filter 7 bears an outer collar 21 which is held between a lower bearing shell 17 and the filter plate 15. In the lower bearing shell 17 an upper bearing shell 18 can be adjusted upwards in a vertically restricted direction. Between both bearing shell 17 and 18 an outer collar 20 of a bearing sleeve 2 of the lower spray arm 8 is placed in a rotatable position. The bearing sleeve 2 is attached to the lower spray arm 8 in one piece and extends over the upper inlet region 14 of the fine filter 7. Underneath the bearing sleeve 2 in the fine filter 7 a valve element 6 is placed in a vertically adjustable position. The valve element 6 is disc-shaped, turning the concave side to the lower spray arm 8. The valve element 6 has a central bore, the diameter of which is bigger than the pump unit 1 which projects into the bearing sleeve 2, but smaller than the outer diameter of the bearing sleeve 2. A bellows seal 22 seals the junction between the pump unit 1 and the sump 11.

As figure 1 shows, rinse water is removed by suction out of the sump 11 in the circulating operation. The flow of the rinse water is shown by arrows. The valve element 6 is raised, at the same time, by the suctioned-in rinse water, ensuring that the outer edge of the rim of the valve element 6, which is aligned parallel to the adjustable direction, has an accurate seating, when the latter stays on the closed ring of the filter casing 5.

The rinse water is in part removed by suction over the fine filter plate 9 and filtered while another part is delivered unfiltered through the open bypass which is above the lower inlet region 16 into the bearing sleeve 2. At the same time the lower spray arm 8 is raised so that the outlet 24 of the lower spray arm 8 is connected to the inlet opening 25 of a coupling section 3, which is arranged in the lower crockery basket 40 and creates a tight conduit for the rinse water to the upper spray arm. The coupling section 3 can also itself be placed in the lower crockery basket 40 in a limited vertically adjustable position, so that it displaces vertically and is connected with its outlet opening to the entry opening of the upper spray arm which is not shown.

The pump assembly 1 does not require its own pump casing and causes agitation in the rinse water, the direction of rotation of which corresponds with the direction of rotation of the spray arms which are predetermined by the Segner's drive of the same.

Should the upper bearing shell backer 18 be removed, then, as the hand lever 23 indicates, the connection between the lower bearing shell 17 and the collar 21 of the fine filter 7 to the strainer plate 15 can be lifted. The lower spray arm 8 and the fine filter 7 can then be taken out of the machine, cleaned and possibly replaced.

In the circulating operation, the rinse water in the region of the coarse water filter 13 and the wash liquor pump is not agitated, so that a calm water region exists in which the dirt particles can settle.

If the wash liquor pump 12 is switched on during the suction operation, the rinse water will then be directed out of the sump 11. During the suction operation the circulating pump 4 can be operated for at least a short while in the reverse direction of rotation. The pump unit 1 suctions the rinse water back from the spray arms and the bearing sleeve 2 as can be ascertained from Figure 2. Then the valve element 6 is moved downwards until it touches the sump 11 and seals the lower inlet region 16. The suctioned-back rinse water must pass over the fine filter plate 9 in the upper inlet region 14, pushing back the adhering dirt on the outside of the same and feeding the discharge over the coarse filter 13 and the wash liquor pump 12. The lower spray arm 8 and, if necessary, the coupling section 3 are brought into their lower exit positions, so that, after the suction operation, the lower crockery basket 40 can be withdrawn from the rinsing reservoir. Thus, connected with the suction operation is an automatic cleaning of the fine filter 7, which renders frequent removal of same unnecessary.

Combinations of partial features of the dishwashing machine according to the invention can also be used with advantage in other dishwashing machines, in which the lower spray arm is not vertically adjustable or in which the circulating pump may be simultaneously operated as a wash liquor pump.

Such a combination of part features is characterised according to one development in that the lower spray arm is rotatably mounted by means of a bearing sleeve and bearings in a coarse filter covering the sump, and in a filter surrounding the bearing sleeve, and in that the electric motor secured at the base of the sump projects with the pump unit into the bearing sleeve serving as a pump casing.

A further combination of part features provides that the lower spray arm is guided in a vertically restricted displaceable manner by means of a downwardly-open bearing sleeve and by means of bearings, and is rotatably mounted in a bearing shell covering a recess in a coarse filter covering the sump, and a filter surrounding the bearing sleeve, in that the circulating pump feeds the rinse water to the bearing sleeve and in that the supplied rinse water lifts the lower spray arm and connects its outlet opening with an inlet opening of a coupling section in the lower crockery basket.

Finally, an advantageous development results also in a combination of part features which is characterised in that the lower spray arm has a downwardly-open bearing sleeve, which accommodates the pump unit of the circulating pump and which is rotatably mounted in a bearing, the bearing being disposed in a recess of a coarse filter covering the sump, in that the bearing sleeve is surrounded by a filter which is subdivided into an upper inlet area with fine filter and a lower openable and closeable inlet area by means of a valve member, and in that the valve member during circulating operation releases the lower inlet area and upon a reverse direction of rotation of the pump unit during suction-out operation closes the lower inlet area of the filter.

Claims

1. Dishwashing machine with an upper and a lower spray arm and with a circulating pump for the circulating operation of the rinse water and a wash liquor pump in the sump of the rinsing reservoir for the removal by suction of the rinse water in the suction operation,
characterised in that
the sump (11) at the bottom is covered by means of a strainer plate (15),
in that, in a first recess in the strainer plate (15) a coarse filter (13) is placed through which, by means of the incorporated wash liquor pump (12) the rinse water is removed by suction,
in that, in a second recess of the strainer plate (15), separated from the wash liquor pump (12) by means of radial bearings (10), the lower spray arm

(8) is positioned with a downward opening bearing shell (2) in a rotatable position,
in that the bearing shell (2) of the lower spray arm (8) is enclosed by a fine filter (7) which is held by the radial bearing (10), and
in that the circulating pump (4) with the pump assembly (1) projects into the bearing shell (2), serving as a pump casing, of the lower spray arm.

2. Dishwashing machine according to claim 1,
characterised in that
the bearing shell (2) with the outer collar (20) is placed in a vertically adjustable position and which can be raised in the circulating operation by the flow of rinse water and which is used for coupling the lower spray arm (8) to a coupling portion (3) arranged in the lower crockery basket (40).
3. Dishwashing machine according to claim 1 or 2,
characterised in that
the fine filter (7) comprises a filter casing (5) and an attached fine filter plate (9).
4. Dishwashing machine according to one of claims 1 to 3,
characterised in that
the filter housing (5) has an upper inlet region (14) and a lower inlet region (16),
in that the fine filter plate (9) covers the upper inlet region (14),
in that the bearing sleeve (2) of the lower spray arm (8) extends
within the upper inlet region (14), and
in that, underneath the bearing sleeve (2) in the fine filter (7), a vertically adjustable disc-shaped valve element (6) is placed, which can be raised, in the circulating operation, by the rinse water, thereby opening the lower inlet region (16) of the filter casing (5), while when reversing the direction of rotation of the pump unit (1) the rinse water, removed by suction back out of the spray arm (8), lowers the valve element (6) to seal the lower inlet area (16).
5. Dishwashing machine according to one of claims 1 to 4,
characterised in that the bottom of the sump (11) in the region of the circulating pump (4) is pulled up as a cylindrical dome, to the underside of which the electric motor (4) of the circulating pump (1) is attached, and to which the cylindrical filter housing (5) is fixed.
6. Dishwashing machine according to one of claims 1 to 5,
characterised in that
the radial bearing (10) is constructed from two bearing shells (17, 18), between which an outer collar (20) of the bearing sleeve (2) is placed in a rotatable

position, the bearing shell (18) which faces the lower spray arm (8) is adjustable in the bearing shell (17) which faces away from the spray arm (8) in a restricted vertical direction, and in that the bearing shell backer (17) which faces away from the lower spray arm (8) is detachably fixed in the associated recess of the strainer plate (15).

7. Dishwashing machine according to claim 6, **characterised in that** the filter casing (5) on the front-side facing the lower spray arm (8) bears an outer collar (21); via the latter and the bearing shell backer (17) which faces away from the lower spray arm (8), the fine filter (7) is held detachably in the strainer plate (15).
8. Dishwashing machine according to one of claims 4 to 7, **characterised in that** the valve element (6) in the opening position abuts on the open lower front-side of the bearing shell (2), and in that the valve element (6) causes a seal in the lowered closing position towards the bottom of the sump (11) and towards a closed ring of the filter casing (50) which divides the upper and the lower inlet region (14, 16).
9. Dishwashing machine according to one of claims 4 to 8, **characterised in that** the valve element (6) has a central bore, the diameter of which is greater than the outer diameter of the pump assembly (1) but smaller than the outer diameter of the bearing shell (2).
10. Dishwashing machine according to one of claims 1 to 9, **characterised in that** a bellows seal (22) seals the pump unit (1) to the bottom of the sump (11).
11. Dishwashing machine according to one or more of claims 1 to 10, with a combination of part features which is characterised in that the lower spray arm (8) is rotatably mounted by means of a bearing sleeve (2) and bearings (10) in a coarse filter (13) covering the sump, and a filter (7) surrounding the bearing sleeve (2), and in that the electric motor (4) secured at the base of the sump (11) projects with the pump unit (1) into the bearing sleeve (2) serving as a pump casing.
12. Dishwashing machine according to one or more of claims 1 to 10, with a combination of part features which is characterised in that the lower spray arm (8) is guided in a vertically restricted adjustable

manner by means of a downwardly-open bearing sleeve (2) and by means of bearings (10) and is rotatably mounted in a bearing shell (17) covering a recess in a coarse filter (13) covering the sump, and a filter (7) surrounding the bearing sleeve (2), in that the circulating pump supplies the rinse water to the bearing sleeve (2) and in that the supplied water lifts the lower spray arm (8) and couples its outlet opening (24) with an inlet opening (25) of a coupling section (3) in the lower crockery basket (40).

13. Dishwashing machine according to one or more of claims 1 to 10, with a combination of part features which is characterised in that the lower spray arm (8) has a downwardly-open bearing sleeve (2), which accommodates the pump unit (1) of the circulating pump and which is rotatably mounted in the bearing (10), the bearing (10) being disposed in a recess of a coarse filter (13) covering the sump, in that the bearing sleeve (2) is surrounded by a filter (7) which is sub-divided into an upper inlet area (14) with fine filter (9) and a lower inlet area (16) which is openable and closeable by means of a valve member (6), and in that the valve member (6) during circulating operation releases the lower inlet area (16) and upon reversed direction of rotation of the pump unit (1) during suctioning operation, closes the lower inlet area (16) of the filter (7).

