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(54) Dishwashing machine with lower and upper spray arm and a circulating pump with liquid heating means

(57) The invention relates to a dishwashing machine with a lower and upper spray arm and a circulating pump which sucks in rinse water from a sump of the rinsing container and feeds the spray arms, the impeller of which projects into the rinsing container and is surrounded by a pump casing which is provided with inlet openings.

The installation of a tubular heating element for heating the rinse water may thus be used for reducing the parts and assembly costs and also for improving the heat efficiency in that the pump casing is formed by a tubular heating element, the connections of which are directed to the lower side of the base of the rinsing container which is designed as a downcomer and in that the upper end of the tubular heating element is also fixed in a filter covering the downcomer and/or in a bearing element which is held in the filter and provided with exits to the spray arms.

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Description

[0001] The invention relates to a dishwashing machine with a lower and upper spray arm and a circulating pump which sucks in rinse water from a sump of the rinsing container and feeds the spray arms, the impeller of which projects into the rinsing container and is surrounded by a pump casing which is provided with inlet openings.

[0002] Dishwashing machines of this type are known with various constructive designs as DE 31 02 547 A1 and EP 0 546 434 B1 show. The circulating pump is thereby attached to the downcomer, an electric motor of common construction as a unit driving the impeller of the pump unit. In order to reduce the cost of the parts for the circulating pump, the pump case is formed integrally with the downcomer.

[0003] It has also been proposed already for the lower spray arm with a bearing sleeve to be allowed to project so far into the downcomer that the said bearing sleeve encompasses the impeller as a pump casing.

[0004] The rinse water which is sucked in by the circulating pump has also been heated already in dishwashing machines by a tubular heating element as DE 35 34 754 C2 shows.

[0005] It is the object of the invention in a dishwashing machine of the type mentioned at the beginning to develop the tubular heating element and to connect it with the downcomer in such a way that it contributes to a reduction in parts and assembling or to simplifying the assembly and at the same time to increasing the efficiency of the heating.

[0006] This object is resolved according to the invention in that the pump casing is formed by a tubular heating element, the connections of which are directed to the lower side of the base of the rinsing container which is designed as a downcomer and in that the upper end of the tubular heating element is also fixed in a filter covering the downcomer and/or in a bearing element which is held in the filter and provided with exits to the spray arms.

[0007] The tubular heating element in this design takes over the function of the pump casing and, by virtue of the fact that the tubular heating element stands in rinse water and has water streaming through both inside and outside, the efficiency is considerably increased. The heating may thus be designed to use less power, i.e. to be cheaper. The assembly of the tubular heating element in this manner also saves space and is simple to perform.

[0008] The tubular heating element may consist thereby of a steel pipe with a coiled heating element or a heating spiral which is embedded in quartz and inserted between two pipe sections.

[0009] The secure mounting of the tubular heating element in the downcomer of the rinsing container can be achieved in a simple manner in that the tubular heating element stops at a spacing from the base of the downcomer and is held in the downcomer by means of insulated supply connections which are accessible on the underside of the downcomer. The tubular heating element can then be connected electrically in a simple way.

[0010] The upper end of the tubular heating element facing towards the lower spray arm can be fixed in addition so that the tubular heating element facing towards the lower spray arm proceeds into a bearing shoulder with which it is located in a bore of the filter or so that the bearing element has a shell-shaped bearing projection into which the tubular heating element is introduced and held securely against rotation therein and so that the bearing element is held in a bore of the filter together with a fine filter which surrounds the tubular heating element and has inlet openings.

[0011] The bearing element according to a further development can be used for the pivoting mounting of the lower spray arm in that the bearing element is provided in addition with a bearing bush for the bearing shaft of the lower spray arm and in that the exit to the lower spray arm contains a supply channel to the lower spray arm rotatably. The exit to the upper spray arm or to the upper spray nozzles is connected to a connecting channel on or in the back wall of the rinsing container.

[0012] According to a further development, the cost of parts and assembly of the circulating pump is reduced in that the electric motor for the circulating pump is designed as a synchronous motor with a rotor and an electronically controllable stator surrounding said rotor, in that the rotor is located rotatably in a rotor housing-pot which is formed in the downcomer and open towards the rinsing container and in that the stator is pushed up onto the rotor housing-pot in the direction of the downcomer and fixed on it non-rotatably. In this development, the downcomer takes over the function of the motor housing and in part the rotatable mounting for the rotor.

[0013] The invention is explained in greater detail in a partial section through the circulating pump combined in one unit with a tubular heating element.

[0014] In the drawing only a partial area of the downcomer 10 of the rinsing container is shown in which a circulating pump is installed for the rinse water. The circulating pump sucks in the rinse water from a sump of the downcomer 10 which is set deeper down and not shown.

[0015] In the downcomer 10 there is a rotor housing-pot 11 formed which is open towards the rinsing container, i.e. upwards and forms in the base area a receiving means 12 for a bearing of a bearing shaft 22 of a rotor 20 of an electric motor. A stator 21 of an electronically commutating synchronous motor which is provided with an electronic control mechanism is pushed onto this rotor housing-pot 11 and held on it non-rotatably. This can be achieved by introducing appropriate guiding and holding elements.

[0016] The bearing shaft 22, which is the drive shaft of the electric motor and bears the rotor 20 at the same

time, can be positioned rotatably in a further bearing 23 and facing towards the rinsing container. This further bearing 23 is held in an end plate 24 which is held in an extended bearing section 13 of the downcomer 10. The bearing shaft 22 bears, abutting onto the further bearing 23, an impeller 27 which is surrounded by a tubular heating element 28 forming the pump casing of the pump unit. The tubular heating element 28 can be a steel pipe section onto which a heating element is coiled. Said tubular heating element can also have a heating spiral 29 which is embedded in quartz and held between two pipe sections. This tubular heating element 28 has insulated connection pieces 29a at the bottom end which are kept insulated in the downcomer 10 and led onto the underside of same where they are held with an element 30 and are accessible as supply terminals 29b. A fine filter 25 is inserted round the tubular heating element 28 so that fine dirt particles can be trapped. This fine filter 25 can be provided with controllable inlet openings in the lower region if this is required for supplying the spray arms with an adequate amount of rinse water. This fine filter 25 can be designed integrally with the end plate 24 and, in addition, be held in a further bearing section 14 which, like the bearing section 13, abuts onto the upper end of the rotor housing-pot 11.

[0017] The filter 31 covering the downcomer 10 has a bore 32 in which the fine filter 25 together with the upper end of the tubular heating element 28 and a bearing element 34 are held. The fine filter 25 is inserted into the bore 32 of the filter 31 till it abuts onto a shoulder 33. The bearing element 34 is connected detachably to the fine filter 25 and/or filter 31 in a manner which is not shown and has a bearing projection 35 which is facing towards the tubular heating element 28, into which bearing projection the upper end of the tubular heating element is introduced and held therein. Exits 36 and 37 are formed on this bearing element 34. The exit 36 leads to a connecting channel, which is placed on or in the back wall of the rinsing container, to the upper spray arm or to the upper spray nozzles. The exit 37 is directed vertically and serves at the same time as a receiving means for a supply channel 38 to the lower spray arm. In addition, the bearing element 34 has a bearing bush 39 in which a bearing shaft 40 of the lower spray arm is located rotatably.

[0018] As can be seen in the section, the rinse water sucked in by the pump flows along on the outside and the inside of the tubular heating element 28 so that the heating efficiency is considerably improved. The heating power of the tubular heating element can hence also be reduced which can be utilised for a reduction in the operational costs.

[0019] The upper end of the tubular heating element 28 can also be held like the fine filter 25 with the bearing element 34 in the bore 32 of the filter 31.

Claims

1. Dishwashing machine with a lower and upper spray arm and a circulating pump which sucks in rinse water from a sump of the rinsing container and feeds the spray arms, the impeller of which projects into the rinsing container and is surrounded by a pump casing which is provided with inlet openings, characterised in that

   the pump casing is formed by a tubular heating element (28), the connections (29a, 29b) of which are directed to the lower side of the base of the rinsing container which is designed as a downcomer (10), and
   in that the upper end of the tubular heating element (28) is also fixed in a filter covering the downcomer (10) and/or in a bearing element (34) which is held in the filter (31) and provided with exits (36, 37) to the spray arms.

2. Dishwashing machine according to Claim 1, characterised in that

   the tubular heating element (28) stops at a spacing from the base of the downcomer (10) and is held in the downcomer (10) by means of insulated (29a) supply terminals (29B) which are accessible on the underside of the downcomer (10).

3. Dishwashing machine according to Claims 1 or 2, characterised in that

   the tubular heating element (28) facing towards the lower spray arm proceeds into a bearing shoulder with which said tubular heating element is fixed in a bore (32) of the filter (31).

4. Dishwashing machine according to Claim 1 or 2, characterised in that

   the bearing element (34) has a shell-shaped bearing projection (35) into which the tubular heating element (28) is introduced and held therein in a non-rotatable manner and
   in that the bearing element (34) is held in a bore (32) of the filter (31) together with a fine filter (25) which surrounds the tubular heating element (28) and has inlet openings (26).

5. Dishwashing machine according to Claim 4, characterised in that

   the bearing element (34) is in addition provided with a bearing bush (39) for the bearing shaft (40) of the lower spray arm and
   in that the exit (37) to the lower spray arm rotat-

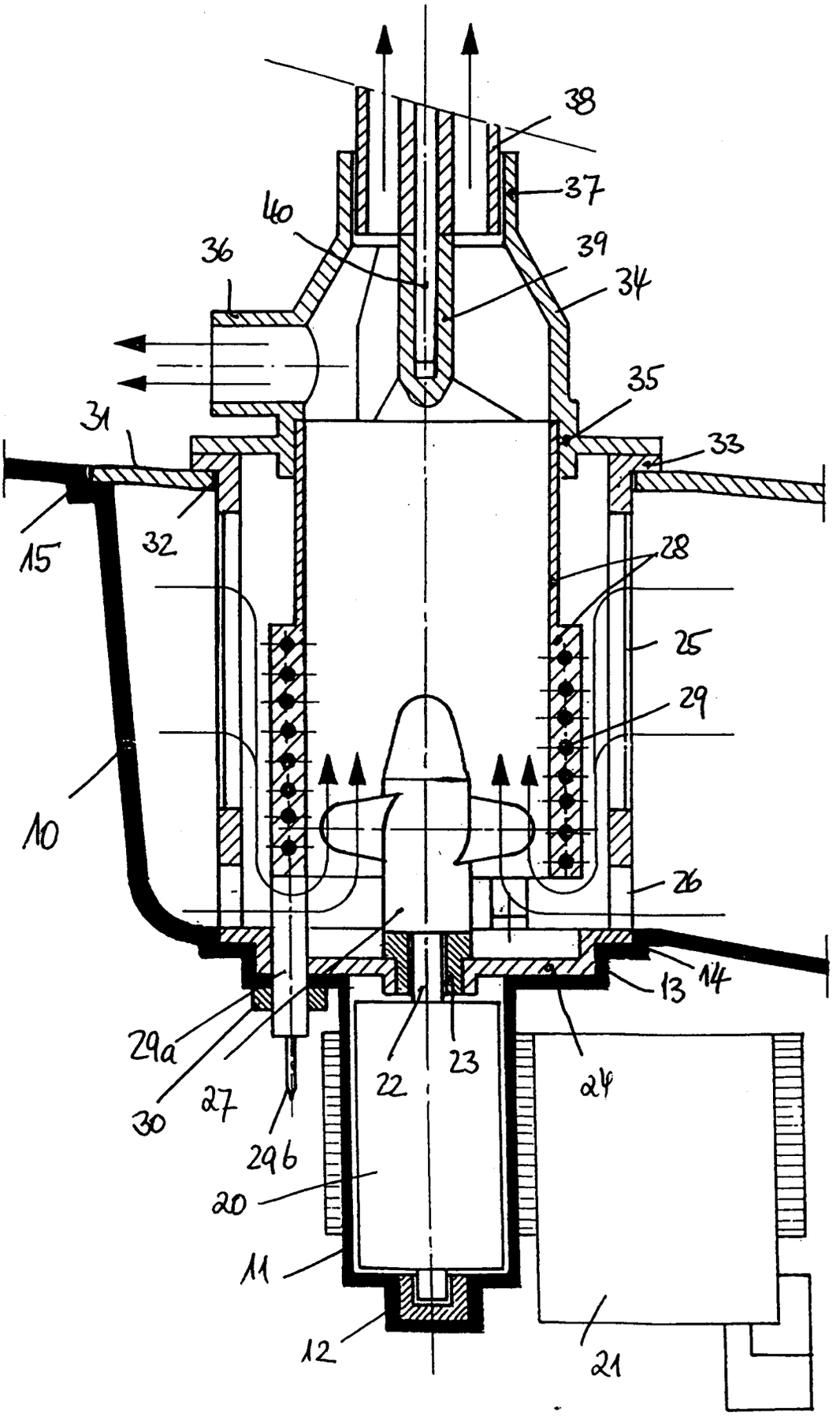
ably accommodates a supply channel (38) to the lower spray arm.

6. Dishwashing machine according to one of the Claims 1 to 5
characterised in that

the electric motor for the circulating pump is designed as a synchronous motor with a rotor (20) and a stator (21) which is electronically controllable and surrounds said rotor,
in that the rotor (20) is located rotatably in a rotor housing-pot (11) which is open towards the rinsing container and formed in the downcomer (10), and
in that the stator (21) is pushed up in the direction of the downcomer (10) onto the rotor housing-pot (11) and is non-rotatably secured thereon.

7. Dishwashing machine according to one of the Claims 1 to 6,
characterised in that

the tubular heating element (28) consists of a steel pipe with a coiled heating element or of a heating spiral (29) which is embedded in quartz and installed between two pipe sections.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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 4525

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DE 17 03 089 A (LICENTIA GMBH) 23 December 1971	1	A47L15/42
A	* page 3, line 1 - page 4, line 14; figure 1 *	4	
Y	DE 36 27 732 A (EGO ITALIANA) 18 February 1988 * column 4, line 29-39 *	1	
A	* column 5, line 57 - column 8, line 15; figure 2 *	2,7	
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A	DE 39 14 760 A (AWECO KUNSTSTOFFTECH GERAETE) 8 November 1990 * column 2, line 58 - column 3, line 20; figures 2,3 *	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	13 November 1998	Laue, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 11 4525

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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