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(54) **Dishwashing machine with improved hydraulic circuit**

Hydraulikkreislauf für eine Geschirrspülmaschine

Circuit hydraulique pour machine à laver la vaisselle

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Description

[0001] The present invention refers to a dishwashing machine, comprising a washing chamber housing at least a crockery basket, to which a tubular element is associated within which a fluid is flowing from a pump, one end of said tubular element being connected with a rotary spraying element, where said spraying element has at least two arms, in particular opposite to each other, and where said tubular duct is engaged with the spraying element substantially in the joining area of said arms.

[0002] It is known for dishwashing machines to be equipped with a washing chamber housing both an upper crockery basket and a lower crockery basket. The crockery are washed through two rotating sprayers, which spray the wash liquid onto the crockery contained in each basket and are fed with pressurized liquid from a proper washing pump located in the machine base-ment.

[0003] The lower sprayer is generally fed and supported directly by the pump body through a tubular element coming from the bottom, whereas the upper sprayer can be fed in several ways through a special hydraulic circuit originating from said pump. A first known technology in this respect is to provide a nozzle in the ceiling of the washing chamber fed through a duct from the pump, which sends a fluid jet downwards. This jet covers a run in the air before reaching a special funnel-shaped receiving element secured to the upper basket of the machine, which supports the upper sprayer in communication with it.

[0004] Viceversa, another known technology to feed the upper sprayer is to provide a substantially horizontal tubular element, supported by the upper basket, with one end connected with the sprayer, whereas the other end of said tubular element will be coupled with a suitable hydraulic take-off on the rear wall or on a side wall of the washing chamber. Thus, when the basket is in the crockery load/unload position (i.e. extracted) the tubular duct is released from said hydraulic take-off; on the contrary, when the basket is in its working position, the tubular element will be engaged with the hydraulic take-off, to allow connection of the sprayer with the supply circuit.

[0005] From US-A-5,449,011 a dishwashing machine is known, comprising a washing chamber housing at least a crockery basket to which a tubular element is associated, within which liquid coming from a pump flows; one end of said tubular element is connected to a rotating spraying element, which comprises two arms, where said tubular element is engaged with the spraying element substantially in the joining area of said arms; in said joining area the spraying element has a substantial enlargement with respect to its prevailing section, said enlargement developing according to a direction being substantially parallel to the section of the inlet of the spraying element.

[0006] Dishwashers of the known type have some problems concerning the wash-liquid flow within the sprayers; in particular, the sprayers of the known type are subject to charge losses, i.e. dissipation effects of the fluid pressure, bound to existing discontinuities in the hydraulic ducts.

[0007] More in detail, in the connecting area between the tubular feed element and the sprayer, due for instance to a passage from a fixed element to a rotating element and also due to the internal structure of the tubular element in said area, a high turbulence is present, which causes considerable charge losses to a consequent detriment of the wash-fluid energy.

[0008] Another reason for a high turbulence in this area is due to the fact that right in that area the flow from the tubular element has to separate and be channeled in the two opposite sprayer arms (i.e. bending 90°) and go from a substantially circular section as the one of the tubular element to a substantially rectangular section as the one of the sprayer.

[0009] It is the object of the present invention to solve the above problems and provide, in particular, a dishwashing machine equipped with a sprayer being of simple and low-cost realization, where the charge losses are considerably reduced so as to obtain with the same pump capacity a stronger washing action than in the machines of the known type.

[0010] Said objects are reached according to the present invention by a dishwashing machine having the characterizing features of the annexed claim 1; further advantageous embodiments of the present invention are then contained in the dependent claims 2 to 9.

[0011] Further characteristics and advantages of the present invention will be apparent from the following description and annexed drawings, which are supplied only by way of a non limiting example, wherein:

- Fig. 1 shows a schematic section of a dishwashing machine according to the present invention;
- Fig. 2 shows a partial section of the lower sprayer and the relevant tubular supporting and feeding element of a dishwashing machine according to the present invention;
- Fig. 3 shows a top view of the sprayer according to Fig. 2.

[0012] Some components of the dishwashing machine according to the present invention are not shown in the annexed figures as they are relatively simple and known as such. With reference to the above figures, the machine according to the present invention indicated by reference number 1 as a whole comprises a supporting frame 2 defining a washing tub 3 inside. Number 4 indicates a vertical tubular element whose upper end is coupled with a lower sprayer 5 provided for the washing of the crockery contained in a lower basket 6 of the dishwasher. The lower end of the tubular element 4 is connected with the delivery side of a pump indicated with

P. Number 7 indicates an upper crockery basket supporting a tubular element indicated with 8; an end of the tubular element 8 is connected with and supports an upper sprayer 9 provided for the washing of the crockery contained in the basket 7; the other end of the tubular element 8 is coupled during operation with an hydraulic take-off 10 forming part of an hydraulic circuit 11 fed by the pump P.

[0013] The sprayers 5 and 9 of the machine according to the present invention are obtained through a substantially similar technology; therefore, only the lower sprayer 5 will be detailed in the following description for simplicity's sake.

[0014] The sprayer 5 has two arms 7a and 7b, extending radially from opposite sides in respect to the tubular element 4 and provided with a plurality of spraying nozzles B for the washing fluid, which are so directed to splash all the crockery placed inside the basket 6 with a pressurized washing liquid fed through the tubular element 6 and the pair of arms 7a and 7b.

[0015] The coupling system between the tubular element 4 and the sprayer 5 is of the known type, which does not require any deeper description in this contest, as it will be enough to affirm that such a coupling allows the sprayer 5 to rotate.

[0016] Said rotation of the sprayer 5 occurs substantially around the axis of the tubular element 4 and is obtained through at least a couple of nozzles B delivering a part of the washing liquid along a direction having a tangential component to the circular path to be described by the sprayer.

[0017] According to the present invention, an enlargement of the sprayer section, having a concave profile indicated by 12, is defined on the upper internal surface of the sprayer 5 substantially in the joining area of both arms 7a and 7b. The concavity of said profile is opposed to the liquid flow coming from the tubular element 4.

[0018] As it can be seen in Fig. 3, the profile 12 has a substantially general elliptic shape: such a profile can be obtained for instance by a simple drawing operation of the sprayer upper side 5, if made of metallic material, or by a simple molding operation in case the sprayer is made of plastic material.

[0019] According to the present invention the operation of the dishwashing machine, concerning the lower sprayer 5 is as follows.

[0020] The liquid jet coming from the pump P first enters the tubular element 4 and from here the sprayer 5.

[0021] The presence of enlargement obtained by the profile 12 has the effect of converting the liquid speed coming from the tubular element 4 into pressure. Considering that generally the charge losses of the sprayer are proportional to the square of the liquid speed, it appears how the system described above allows to considerably reduce the load losses.

[0022] In other words, the enlargement obtained by the profile 12 presets a liquid volume to the arms 7a and 7b being sufficient to attenuate the liquid jet further com-

ing from the tubular element 4; thus, the enlargement obtained by the profile 12 allows to obtain a pressure tank.

[0023] Therefore, the availability of a pressure tank realized through the profile 12 reduces to a considerable extent the turbulence in the joining area between the tubular element 4 and the sprayer 5 and it also considerably reduces the loss effect due to the fluid being channeled in the two arms 7a and 7b. By so doing, the charge losses typical of the machine of the known type are drastically reduced and at an equal pump capacity the crockery will be splashed through the nozzles B with jets of washing liquid at a higher washing efficiency.

[0024] The characteristics and advantages of the present invention are apparent from the above description, according to which a dishwashing machine is indicated comprising a spraying element, where the charge losses are reduced in a simple and low-cost manner, so as to increase washing efficiency in respect to the machines of the known type.

[0025] This is obtained by providing a substantial enlargement of the sprayer section with respect to its prevailing section, in the joining area of both arms, where said enlargement is able to form a tank for converting into pressure the speed of the liquid coming from the tubular element.

[0026] Obviously, many changes may be made to the dishwashing machine described by way of example without departing from the scope of the invention as defined by the appended claims.

[0027] As an example, it is obvious that the detailed description herein with reference to the lower sprayer 5 may also be directly applied with the same advantages to the upper sprayer 9 of the dishwashing machine.

[0028] Another possible embodiment is to provide an enlargement also on the lower internal surface of the sprayer 5; this can be obtained by drawing or molding, or by properly shaping the joining area between the tubular element 4 and the sprayer 5.

[0029] Moreover, with a view to further improve the advantages of the present invention, the entire sprayer section, i.e. the prevailing section of the arms 7a and 7b may not only have the above concave profile but also a substantially elliptic configuration.

[0030] It is also obvious that the shape of the profile 12, which is concave and elliptic in the example, may be changed without modifying its function to obtain a pressure tank for the liquid flowing through both sprayer arms. To this purpose, the above enlargement of the sprayer section may globally have a substantially spherical configuration.

Claims

1. A dishwashing machine comprising a washing chamber (3) housing at least a crockery basket (6) to which a tubular element (4) is associated, within

which liquid coming from a pump flows, one end of said tubular element (4) being connected to a rotating spraying element (5), where said spraying element (5) comprises at least two arms (7a,7b), in particular opposed to each other, and where said tubular element (4) is engaged with the spraying element (5) substantially in the joining area of said arms (7a,7b), whereby in said joining area the spraying element (5) has a substantial enlargement (12) with respect to its prevailing section, **characterized in that** said enlargement (12) develops according to a direction being substantially perpendicular to the inlet section of said spraying element (4), said enlargement (12) being provided for forming a tank which converts into pressure the speed of the liquid coming from the tubular element (4) and/or presetting a liquid volume to said arms (7a,7b) which is sufficient to attenuate the liquid jet coming further from the tubular element (4)

2. A dishwashing machine according to Claim 1, **characterized in that** said enlargement (12) is at least partially defined on the internal surface of the spraying element (5) opposite to the surface being engaged on the tubular element (4).
3. A dishwashing machine according to Claim 1 or 2, **characterized in that** said enlargement consists at least of a substantially concave profile portion (12) of the internal surface of the spraying element (5), the concavity of said profile portion (12) being opposed to the liquid flow coming from the tubular element (4).
4. A dishwashing machine according to at least one of the previous Claims, **characterized in that** said enlargement or concave profile portion (12) has a substantially elliptic configuration.
5. A dishwashing machine according to at least one of the previous Claims, **characterized in that** said enlargement or concave profile portion (12) is obtained by drawing or molding operation of the portion of the spraying element (5) where it should be provided.
6. A dishwashing machine according to at least one of the previous Claims, **characterized in that** an enlargement (12) is defined also on the same internal surface of the spraying element (5) engaging with the tubular element (4).
7. A dishwashing machine according to the previous Claim, **characterized in that** said enlargement (12) is obtained by drawing or molding, i.e. by properly shaping the coupling area between the tubular element (4) and the spraying element (5).

8. A dishwashing machine according to at least one of the previous Claims, **characterized in that** the prevailing section of said arms (7a,7b) has a substantially elliptic shape.

9. A dishwashing machine according to at least one of the previous Claims, **characterized in that** said enlargement (12) has a substantially spherical global shape.

Patentansprüche

1. Geschirrspülmaschine, enthaltend eine Waschkammer (3), die zumindest einen Geschirrkorb (6) aufnimmt, zu dem ein rohrförmiges Element (4) gehört, in dessen Innerem eine von einer Pumpe kommende Flüssigkeit strömt, wobei ein Ende des rohrförmigen Elementes (4) mit einem sich drehenden Sprühelement (5) verbunden ist, das zumindest zwei Arme (7a, 7b), die insbesondere einander gegenüberliegend angeordnet sind, enthält, und wobei das rohrförmige Element (4) mit dem Sprühelement (5) im Wesentlichen im Verbindungsbereich der Arme (7a, 7b) in Eingriff steht, wobei das Sprühelement (5) in dem Verbindungsbereich eine wesentliche Erweiterung (12) gegenüber seinem vorherrschenden Querschnitt aufweist, **dadurch gekennzeichnet, dass** sich die Erweiterung (12) in eine Richtung entwickelt, die im Wesentlichen senkrecht zu dem Einlassabschnitt des Sprühelementes (4) verläuft, wobei die Erweiterung (12) vorgesehen ist, um einen Tank zu bilden, welcher die Geschwindigkeit der Flüssigkeit, die aus dem rohrförmigen Element (4) austritt, in Druck umwandelt, und/oder um ein Flüssigkeitsvolumen zu den Armen (7a, 7b) voreinzustellen, welches ausreichend ist, den Flüssigkeitsstrahl, welcher von dem rohrförmigen Element (4) weiterhin austritt, abzuschwächen.
2. Geschirrspülmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Erweiterung (12) zumindest teilweise auf der innenliegenden Oberfläche des Sprühelementes (5) gegenüberliegend zu der Oberfläche ausgebildet ist, die im Eingriff mit dem rohrförmigen Element (4) steht.
3. Geschirrspülmaschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Erweiterung zumindest aus einem im Wesentlichen konkaven Profilschnitt (12) der innenliegenden Oberfläche des Sprühelementes (5) gebildet ist, wobei die Konkavität des Profilschnitts (12) dem Flüssigkeitsstrom, der aus dem rohrförmigen Element (4) austritt, gegenüberliegt.
4. Geschirrspülmaschine nach zumindest einem der

vorstehenden Ansprüche,

dadurch gekennzeichnet, dass die Erweiterung bzw. der konkave Profilabschnitt (12) eine im Wesentlichen elliptische Ausgestaltung besitzt.

5. Geschirrspülmaschine nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, dass die Erweiterung bzw. der konkave Profilabschnitt (12) durch einen Ziehvorgang oder durch einen Gießvorgang des Abschnittes des Sprühelementes (5), wo er vorge-
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sehen werden soll, erhalten wird.

6. Geschirrspülmaschine nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, dass eine Erweiterung (12) ebenfalls an der gleichen innenliegenden Oberfläche des Sprühelementes (5), die in Eingriff mit dem rohrförmigen Element (4) steht, ausgebildet ist.

7. Geschirrspülmaschine nach dem vorstehenden Anspruch,

dadurch gekennzeichnet, dass die Erweiterung (12) durch einen Ziehvorgang oder durch einen Gießvorgang, d. h. durch geeignetes Verformen des Kupplungsbereiches zwischen dem rohrförmigen Element (4) und dem Sprühelement (5) gebildet ist.

8. Geschirrspülmaschine nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, dass die Arme (7a, 7b) vorwiegend eine im Wesentlichen elliptische Form aufweisen.

9. Geschirrspülmaschine nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, dass die Erweiterung (12) eine im Wesentlichen kugelförmige Gesamtform aufweist.

Revendications

1. Machine lave-vaisselle comprenant une chambre de lavage (3) qui abrite au moins un panier à vaisselle (6) auquel est associé un élément tubulaire (4) dans lequel s'écoule un liquide provenant d'une pompe, une extrémité dudit élément tubulaire (4) étant connectée à un élément de pulvérisation rotatif (5) dans laquelle ledit élément de pulvérisation (5) comprend au moins deux bras (7a, 7b), en particulier opposés l'un à l'autre, et dans laquelle ledit élément tubulaire (4) est engagé avec ledit élément de pulvérisation (5) sensiblement dans la zone de jonction desdits bras (7a, 7b), grâce à quoi dans ladite zone de jonction l'élément de pulvérisation (5)
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présente un élargissement important (12) par rapport à sa section principale, **caractérisée en ce que** ledit élargissement (12) se développe selon une direction qui est sensiblement perpendiculaire à la section d'entrée dudit élément de pulvérisation (4) ledit élargissement (12) étant prévu pour former un réservoir qui convertit en pression la vitesse du liquide provenant de l'élément tubulaire (4) et/ou pour préétablir un volume de liquide vers lesdits bras (7a, 7b) qui est suffisant pour atténuer le jet de liquide qui continue à provenir depuis ledit élément tubulaire (4).

2. Machine lave-vaisselle selon la revendication 1, **caractérisée en ce que** ledit élargissement (12) est au moins partiellement défini sur la surface interne de l'élément de pulvérisation (5) à l'opposé de la surface qui est engagée sur l'élément tubulaire (4).

3. Machine lave-vaisselle selon l'une ou l'autre des revendications 1 et 2, **caractérisée en ce que** ledit élargissement est constitué par au moins une partie à profil sensiblement concave (12) de la surface interne de l'élément de pulvérisation (5), la concavité de ladite partie de profil (12) étant opposée à l'écoulement de liquide provenant de l'élément tubulaire (4).

4. Machine lave-vaisselle selon l'une au moins des revendications précédentes, **caractérisée en ce que** ledit élargissement ou ladite partie de profil concave (12) a une configuration sensiblement elliptique.

5. Machine lave-vaisselle selon l'une au moins des revendications précédentes, **caractérisée en ce que** ledit élargissement ou ladite partie de profil concave (12) est obtenu(e) par une opération d'étirage ou de moulage de la partie de l'élément de pulvérisation (5) dans laquelle il/elle devrait être prévu(e).

6. Machine lave-vaisselle selon l'une au moins des revendications précédentes, **caractérisée en ce qu'un** élargissement (12) est également défini sur la même surface interne de l'élément de pulvérisation (5) engagée avec l'élément tubulaire (4).

7. Machine lave-vaisselle selon la revendication précédente, **caractérisée en ce que** ledit élargissement est obtenu par étirage ou par moulage, c'est-à-dire par une mise en forme appropriée de la zone d'accouplement entre l'élément tubulaire (4) et l'élément de pulvérisation (5).

8. Machine lave-vaisselle selon l'une au moins des revendications précédentes, **caractérisée en ce que** la section principale desdits bras (7a, 7b) a une forme sensiblement elliptique.

9. Machine lave-vaisselle selon l'une au moins des revendications précédentes, **caractérisée en ce que** ledit élargissement (12) a une forme globale sensiblement sphérique.

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FIG. 1

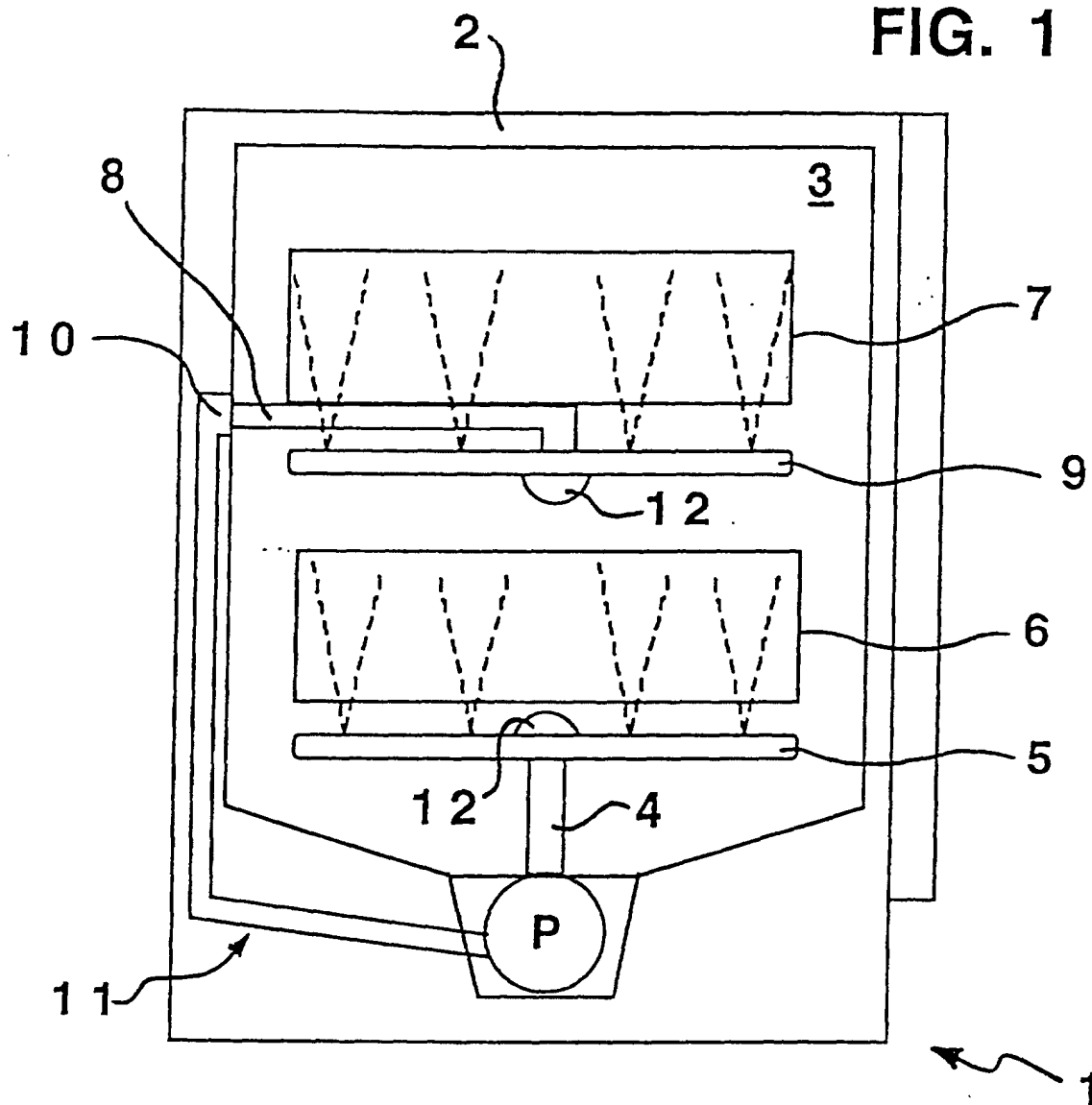
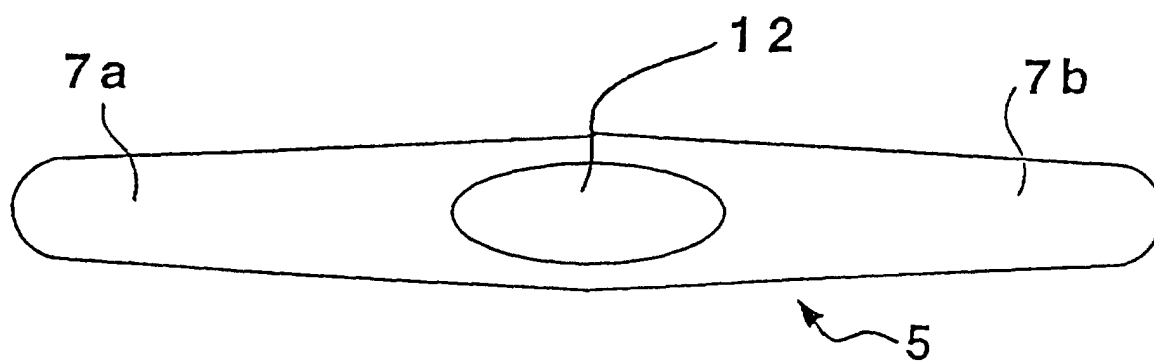


FIG. 3



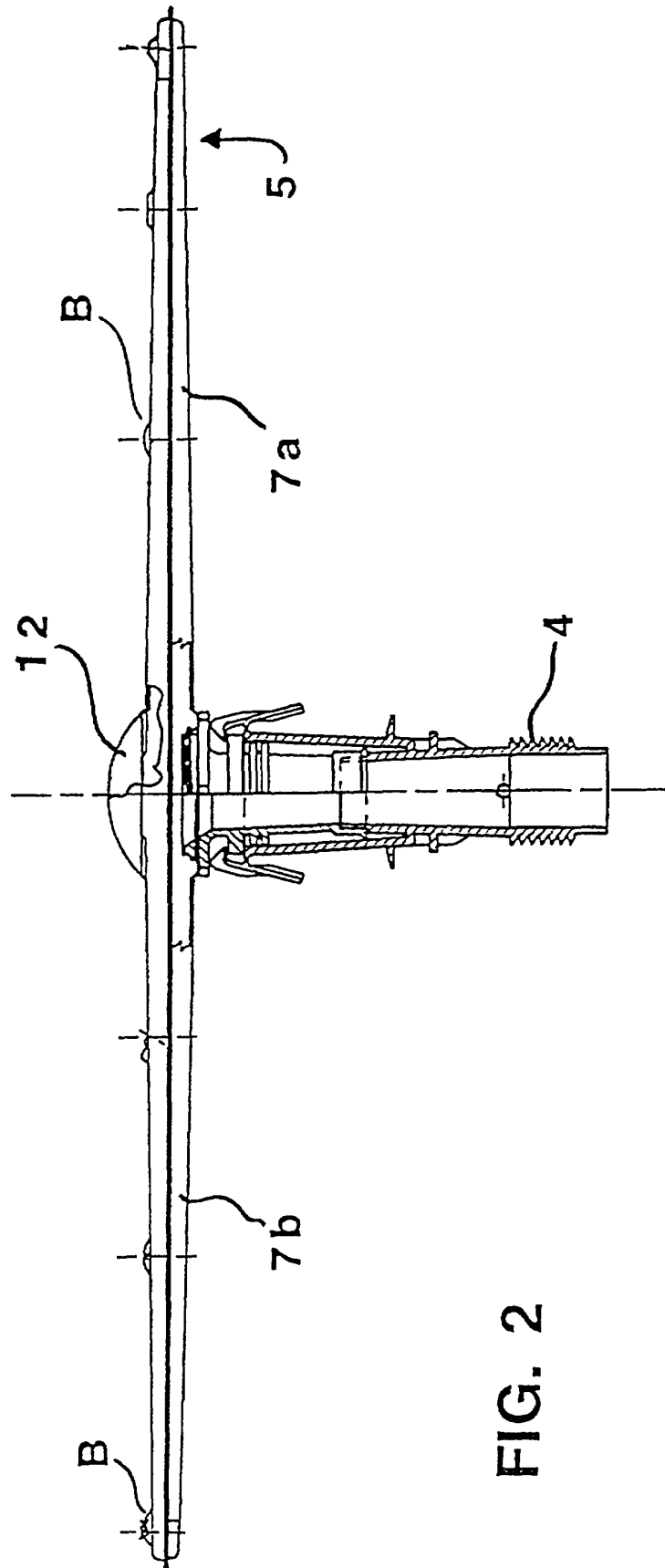


FIG. 2