

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 509 251 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **92104457.4**(51) Int. Cl.⁵: **A47L 15/23**(22) Date of filing: **16.03.92**(30) Priority: **15.04.91 IT PN910023**(43) Date of publication of application:
21.10.92 Bulletin 92/43(84) Designated Contracting States:
DE ES FR GB IT(71) Applicant: **Zanussi Elettrodomestici S.p.A.**
Via Giardini Cattaneo, 3, C.P. 147
I-33170 Pordenone(IT)(72) Inventor: **Favret, Ugo**
Via Morassutti 12
I-33072 Casarsa, Pordenone(IT)(74) Representative: **Busca, Luciano et al**
PROPRIA S.r.l., Via Mazzini 13
I-33170 Pordenone(IT)(54) **Dishwashing machine with spray means supported by a removable basket.**

(57) Dishwashing machine with a removable basket (5) supporting a rotary spray arm (7) supplied with water through a nozzle (10) and a collecting conduit (11,12) connected with the spray arm, the nozzle being capable of producing a water jet (14) extending throughout an air gap which separates said collecting conduit from said nozzle. An annular aperture (16) encircling the nozzle (10) produces a water wall (18) extending throughout the air gap with a tubular configuration which encloses the water jet (14), thereby isolating it from the interior of the wash tub (3) so as to reduce noise generated by the spray arm.

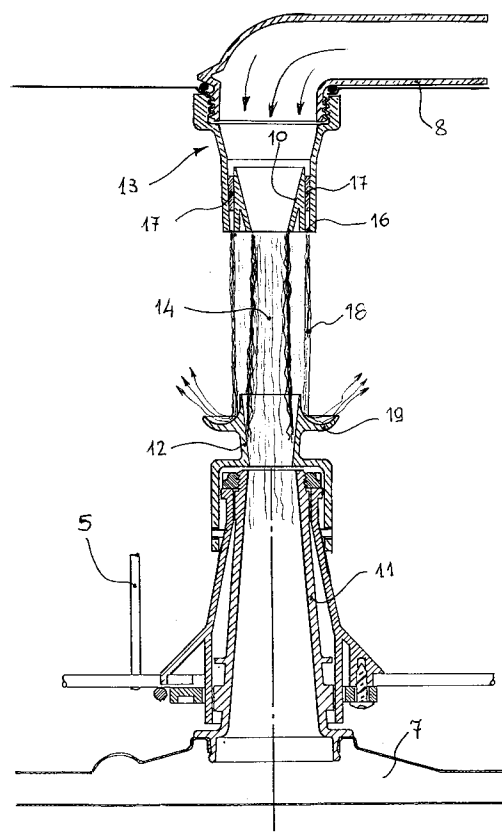


Fig. 2

EP 0 509 251 A1

The present invention relates to a dishwashing machine provided with at least a rotary spray arm supported by a respective removable basket.

As is known, dishwashing machines usually comprise a wash tub housing a lower removable basket and an upper removable basket for supporting the crockery, below the baskets being provided relevant rotatable spray arms which are supplied by a circulating pump. Preferably, the upper basket rotatably supports the respective spray arm and is selectively adjustable in height to contain crockery of different size; thus, it is necessary to provide detachable water connection means to supply the upper spray arm regardless of the vertical position of the associated basket.

To this aim several arrangements have been provided, for instance as disclosed in EP-A-0 401 767, wherein the water circuit to supply the upper spray arm includes connection valve members which are selectively actuable according to the position of the upper basket. Such arrangements, however, involve undesirable complication in the structure of the dishwashing machine.

Therefore, it is commonly preferable to use a water supply circuit of the kind disclosed for instance in GB-A-1 514 652, wherein the upper spray arm is fed with a water jet which issues from a nozzle disposed at the top of the wash tub, runs through an air gap and then is collected by a diffuser pipe extending vertically and connected with the spray arm.

This arrangement is satisfactory in operation and simple and compact in construction, but on the other hand may be undesirably noisy. It is known, in fact, that in correspondence of the air gap the water jet tends to drag a given amount of air down into the diffuser pipe, this amount of air being "emulsified" in the pressurized water inside the upper spray arm, thereby producing substantial noise in correspondence of the washing jets issuing from the spray arm. The longer the air gap covered by the supply water jet, the length of the air gap being variable according to the vertical position of the upper basket, the more remarkable is the above phenomenon.

It is the scope of the present invention to provide a dishwashing machine having at least a spray arm supported by a removable basket and provided with a particularly simple, reliable and noiseless water supply circuit.

According to the invention, this scope is attained in a dishwashing machine with spray means supported by a removable basket embodying the features recited in the appended claims.

The characteristics and advantages of the invention will become more apparent from the following description, given only by way of non-limiting example, with reference to the accompanying

drawing, in which:

Figure 1 diagrammatically shows a dishwashing machine according to the invention;

Figure 2 is a sectioned elevational view of an enlarged detail of the dishwashing machine as in Figure 1, according to a preferred embodiment;

Figure 3 is a sectioned elevational view of the enlarged detail as in Figure 2, according to another embodiment;

Figure 4 is a partially sectioned view of the enlarged detail as in Figure 3, according to an alternative embodiment; and

Figure 5 shows a sectional view of the enlarged detail as in Figure 2, according to a further embodiment.

With reference to Figure 1, the dishwashing machine basically comprises a wash tub 3 in which are housed at least a lower basket 4 and at least an upper basket 5 for supporting crockery. In a known manner, the baskets 4 and 5 are removable out of the wash tub 3 and are disposed above relevant spray arms 6 and 7, respectively, arranged to be fed with water, via a water supply conduit 8, by a circulating pump 9. More particularly, the supply conduit 8 extends outside the wash tub 3 upwardly and terminates with a water distribution head 13; this latter protrudes into the wash tub passing through the top wall thereof and includes a central nozzle 10. The upper spray arm 7 is centrally provided with a substantially vertical collecting conduit through which it is rotatably supported by basket 5. As described for example in the aforementioned GB-A-1 514 652 and as shown in Figure 2, the collecting conduit may comprise a diffuser 11 fixed to the spray arm 7 and forming a rotary hydraulic joint with a convergent tubular portion 12 which is mounted on the basket 5. Thus, when the upper basket 5 is placed in position into the wash tub 3 the collecting conduit 11, 12 is axially aligned with the nozzle 10, from which it is spaced apart by an air gap, to receive from it a water jet illustrated at 14 in Figure 2.

In a per se known manner, for instance by means of guide and roller members 15, the upper basket 5 can preferably be selectively arranged at different vertical positions in the wash tub 3, so that the length of the air gap to be covered by the water jet 14 may vary accordingly (up to a maximum length of approx. 5 cm, for example).

According to the invention, hydraulically operable means are provided to enclose the water jet 14 throughout the air gap between the collecting conduit 11, 12 and the nozzle 10, thereby substantially isolating the water jet from the interior of the wash tub 3, when the circulating pump 9 is in operation.

In the embodiment shown in Figure 2, such hydraulically operable means comprise a substan-

tially annular aperture 16 which is formed on the water distribution head 13 so as to encircle the main nozzle 10. This latter, in particular, is preferably made integral with the remaining portion of the water distribution head 13, to which it is fitted by means of at least two connection ridges 17. The latters preferably are thin and axially short, in order not to substantially affect the water jet (illustrated at 18 in Figure 2) issuing from the annular aperture 16, when the circulating pump 9 is in operation, with a substantially tubular configuration. The size of the annular aperture 16 may be easily calculated by those skilled in the art so as to obtain a laminar water jet 18 forming a water "wall" which is substantially uninterrupted throughout the angular and axial extent of the same water jet. In addition, the water jet 18 preferably impinges upon an annular baffle 19 projecting outwardly from the collecting conduit 11, 12. Such a baffle may for example be made integral with the tubular portion 12 and is arranged to divert the water jet 18 laterally (and/or upwardly) towards the crockery (not shown) disposed on the upper basket 5.

The operation of the dishwashing machine should be apparent. When the removable basket 5 is inserted into the wash tub 3 and the circulating pump 9 is operating, the rotary spray arm 7 is supplied by the nozzle 10 with a water jet 14 via an air gap. Concurrently, the annular aperture 16 produces a laminar water jet 18 which completely encloses the water jet 14 throughout the air gap, thereby substantially isolating the water jet 14 from the interior of the wash tub 3. In other words, the laminar water jet 18 provides a tubular water wall surrounding the main water jet 14. Hence, the velocity of the water jet 14 is substantially prevented from causing ambient air to be drawn in the spray arm 7 in correspondence of the air gap, the spray arm 7 being thereby particularly noiseless in operation.

It was experimentally found that even a particularly thin laminar water jet 18 is suitable to the purposes mentioned above; the water jet may temporarily "split" at localized areas to let air volumes pass which however are negligible as far as noise generation is concerned. This allows one to reduce to a minimum the proportion of water which must be subtracted out of the "supply" jet 14 to produce the "isolating" jet 18, which anyway is recovered, thanks to the baffle 19, to spray the crockery.

The annular aperture 16 is omitted in the embodiment according to Figure 3, wherein the water distribution head 13 only comprises a nozzle 20 arranged in a per se known manner to produce a water jet 21 which has a substantially cylindrical and homogeneous configuration. The collecting conduit associated with the upper spray arm 7 preferably includes only the diffuser 11; in any

case, the inlet mouth 22 of the collecting conduit has a smaller diameter than that of the water jet 21 in correspondence of the inlet mouth 22. As a consequence, only a central portion of the water jet 21 enters the collecting conduit 11; more particularly, in correspondence of the inlet mouth 22 the water jet 21 divides up into a central jet 23 which supplies the conduit 11 and then the spray arm 7, and a peripheral "isolating" annular jet 24 enclosing the inlet mouth 22. In order to promote such a division of the water jet, the edge of the inlet mouth 22 is preferably countersunk as shown in Figure 3. In addition, the peripheral water jet 24 preferably impinges upon an annular baffle 25 which, like the baffle 19 provided in the embodiment of Figure 2, protrudes outside from the collecting conduit 11 to divert the water jet 24 towards the crockery to be washed.

The operation of the embodiment as in Figure 3 is similar to that described with reference to Figure 2, with the difference that the "supply" water jet 23, consisting of the central portion of the water jet 21 produced by the nozzle 20, is isolated from the interior of the wash tub 3 by the annular water jet 24, consisting of the peripheral layer of the water jet 21 itself.

Obviously, since the two water jets 23 and 24 are defined in dependence on the position of the inlet mouth 22 of the collecting conduit 11, it is necessary for a correct operation that the inlet mouth 22 be precisely aligned with the nozzle 20 when the basket 5 is inserted in the wash tub.

This condition is more readily satisfied with the alternative embodiment shown in Figure 4, wherein, like in the embodiment shown in Figure 2, the collecting conduit of the spray arm 7 preferably comprises a tapered tubular portion 26 mounted on the basket 5 and forming a rotary hydraulic joint with the diffuser 11. The tubular portion 26 extends from the inlet mouth 22 upwards with a peripheral projection 27 having an axial length which is longer than the maximum axial length of the air gap to be covered by the water jet 21 produced by the nozzle 20. As is known, such a maximum axial length occurs when the upper basket 5 is arranged in the lowest of its selectively adjustable positions. The peripheral projection 27 is shaped with a cross-section substantially in the form of a circular segment, with an angular extension equal to or lower than 180°. In addition, the projection 27 is provided on the front side (right-hand side in Figure 4) of the tubular portion 26, that is, on the side facing the loading door (not shown) of the dishwashing machine. Hence, the projection 27 enables the basket 5 to be drawn out of the wash tub 3 in a usual fashion, while at least its inner upper portion is capable of stopping against the outer surface of the nozzle 20 (that to this purpose is preferably a

cylindrical surface) when the basket 5 is inserted in its operative position. Thus, the projection 27 ensures correct axial alignment of the collecting conduit 11, 26 with the nozzle 20 and also partially surrounds the water jet 21 throughout the air gap it covers.

In a similar way as described with reference to Figure 3, the portion of water jet 21 which is not surrounded by the projection 27 is divided up, in correspondence of the inlet mouth 22 of the collecting conduit, into a central jet 23 (not shown in Figure 4 for the sake of simplicity) and a peripheral jet 24 which may be diverted towards the crockery being washed through baffle means (not shown for simplicity sake) similar to the baffle 25 shown in Figure 3. Therefore, the central water jet 23 (not shown in Figure 4) which supplies the spray arm 7 is isolated with respect to the interior of the wash tub, partially by the peripheral projection 27 and partially by the peripheral water jet 24.

As an alternative, the aforementioned hydraulically operable means capable of enclosing the "supply" water jet throughout the air gap between the nozzle 20 and the collecting conduit of the spray arm 7 may have a completely mechanical structure, as shown in Figure 5. According to this embodiment of the invention, the collecting conduit associated with the spray arm 7 comprises a rotary hydraulic joint formed by a tubular portion 28 (mounted onto the basket 5) which is substantially cylindrical and provided with a tapered lower end 29 coupled with the diffuser 11. In the tubular portion 28 is loosely arranged a coupling pipe 30 having suitable length and freely slidable telescopically upwards to couple with the nozzle 20 (preferably tapered) through a corresponding countersunk end portion 31. When the circulating pump 9 of the dishwashing machine is inoperative, the coupling pipe 30 is at least partially inserted by gravity in the tubular portion 28, as shown in continuous line in Figure 5. Under these conditions the upper end portion 31 of the collecting conduit 11, 28, 30 is spaced from the nozzle 20 by an air gap which allows the basket 5 to be drawn.

When the circulating pump 9 is operated the nozzle 20 produces a water jet 21 which runs through the said air gap and is collected by the countersunk end portion 31 of the collecting conduit to supply the associated spray arm 7. Moreover, a proportion of the water jet 21 in the collecting conduit is diverted to flow upwardly along the gap between the tubular portion 28 and the coupling pipe 30. Such an upwardly extending water flow, illustrated at 32 in Figure 5, impinges upon an annular baffle flange 33 formed on the outer surface of the coupling pipe 30. Hence, the hydraulic thrust exerted by the water flow 32 causes the coupling pipe 30 to telescopically slide upwards

until its upper end portion 31 abuts against the nozzle 20 as shown in thick lines in Figure 5. It should be noted that this hydraulic reaction caused by the water flow 32 is effective even when the coupling pipe 30 is in its uppermost position, by virtue of the small axial length of the air gap and the substantially negligible friction occurring between the tubular members 28 and 30 when the coupling pipe is raised.

Therefore, when the circulating pump 9 is operating the water jet 21 (or at least the proportion 23 thereof which supplies the spray arm 7) is surrounded by the coupling pipe 30, and is thereby isolated from the interior of the wash tub 3, throughout the air gap which separates the collecting conduit 11, 28, 30 from the nozzle 20 when the pump 9 is inoperative. Thus, also in this embodiment the water jet 21 is prevented from drawing air, in correspondence of the air gap, into the spray arm 7, which would undesirably produce noise. Attention is also directed to the fact that even in this embodiment the reduced water flow 32 is advantageously diverted onto the crockery being washed thanks to the provision of the baffle 33.

From the foregoing description the simple construction and operation of the dishwashing machine according to the invention should be apparent.

Of course, the different embodiments described above by way of example may undergo a number of modifications without departing from the scopes of the invention.

Claims

1. Dishwashing machine comprising a wash tub in which it is housed at least a removable basket supporting a rotary spray arm arranged to be supplied with water by a circulating pump through a nozzle and a collecting conduit connected with the spray arm, said nozzle being capable of producing a water jet extending throughout an air gap which normally separates the inlet mouth of said collecting conduit from said nozzle, **characterized in that** hydraulically operable means (16,18; 22,24; 30) are provided capable of enclosing, throughout the said air gap, the water jet (14; 23; 21) which supplies said spray arm (7), so as to substantially isolating it from the interior of the wash tub (3), when said circulating pump (9) is in operation.
2. Dishwashing machine according to claim 1, **characterized in that** said nozzle (10) is formed on a water distribution head (13) connected with said circulating pump (9) and provided with a substantially annular aperture (16) which encircles said nozzle and is arranged to

produce a water wall (18) extending with a substantially uninterrupted tubular configuration, throughout said air gap, around the water jet (14) produced by said nozzle (10), said annular aperture (16) and said water wall (18) forming said hydraulically operable means.

3. Dishwashing machine according to claim 2, **characterized in that** said water wall (18) impinges upon baffle means (19) projecting outwardly from said collecting conduit (11,12) and arranged to divert the water wall towards the crockery being washed. 5 10
4. Dishwashing machine according to claim 1, **characterized in that** in correspondence of the inlet mouth (22) of said collecting conduit (11; 26) the water jet (21) produced by said nozzle (20) has a larger diameter than the inlet mouth, into which only a central portion (23) of the water jet (21) enters to supply said spray arm (7), a peripheral portion (24) of said water jet enclosing said inlet mouth (22) so as to form said hydraulically operable means therewith. 15 20 25
5. Dishwashing machine according to claim 4, **characterized in that** said peripheral portion (24) of the water jet (21) impinges upon baffle means (25) projecting outwardly from said collecting conduit (11,26) and arranged to divert said peripheral portion towards the crockery being washed. 30
6. Dishwashing machine according to claim 4, **characterized in that** said collecting conduit (11,26) comprises on its front side a peripheral projection (27) axially extending from said inlet mouth (22) towards said nozzle (20), against which it is arranged to stop, so as to partially surround the water jet (21) produced by said nozzle (20), when the removable basket (5) is positioned into the wash tub (3). 35 40
7. Dishwashing machine according to claim 6, **characterized in that** said peripheral projection (27) is shaped with a cross-section substantially in the form of a circular segment, with an angular extension equal to or lower than 180°, said nozzle (20) having a substantially cylindrical outer surface capable of coupling at least partially with the inner surface of the peripheral projection (27). 45 50
8. Dishwashing machine according to claim 1, **characterized in that** said hydraulically operable means comprise a coupling pipe (30) loosely arranged in said collecting conduit (28) 55

and capable of receiving the water jet (21) produced by said nozzle (20) and sliding telescopically towards the nozzle, by hydraulic reaction, so as to couple therewith.

9. Dishwashing machine according to claim 8, **characterized in that** baffle means (33) projecting outwardly from said coupling pipe (30) are provided to receive the hydraulic thrust exerted towards said nozzle (20) by a portion (32) of said water jet (21) flowing along the gap between the coupling pipe (30) and the collecting conduit (28), said baffle means (33) being arranged to divert said portion (32) of the water jet towards the crockery being washed.

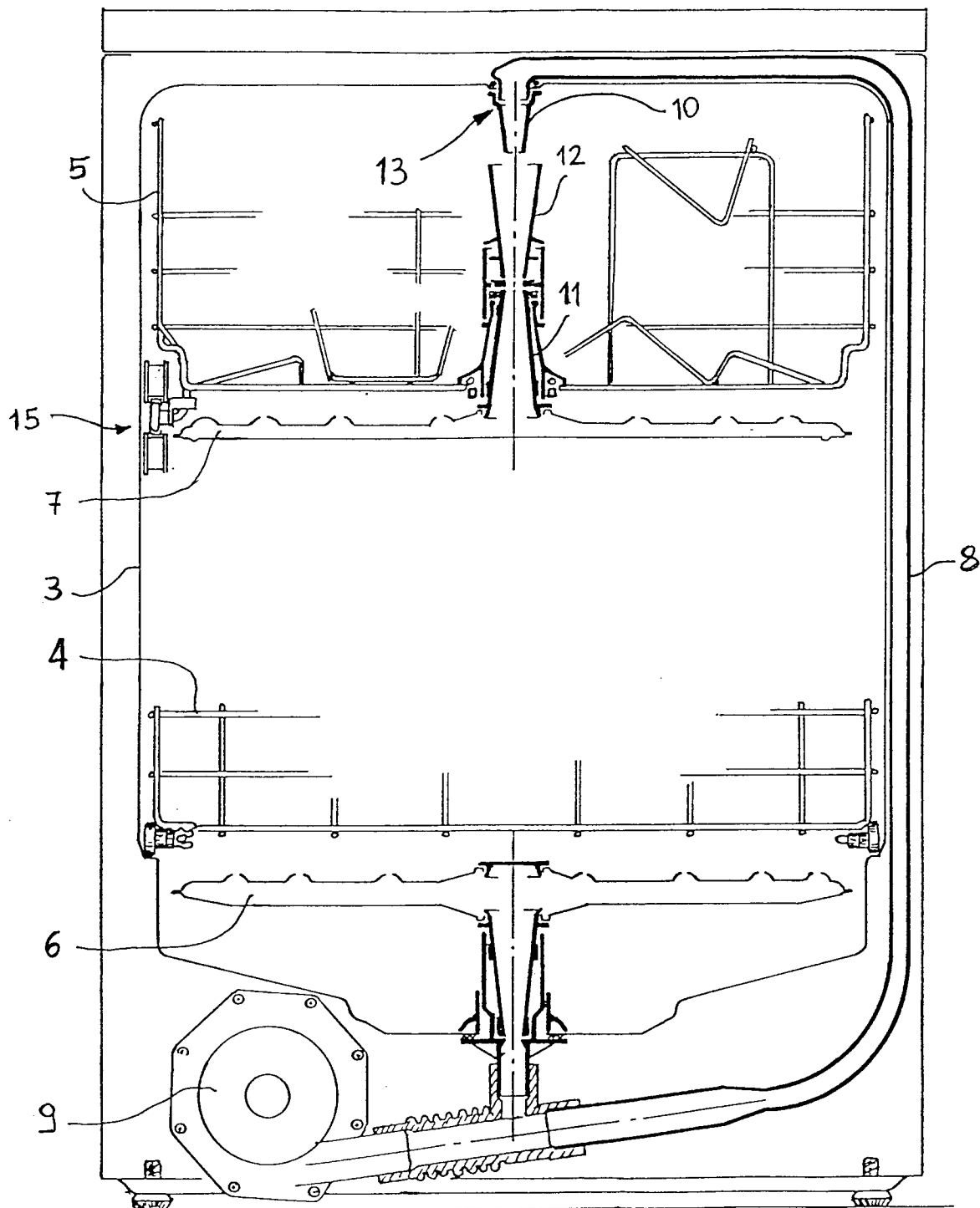


Fig. 1

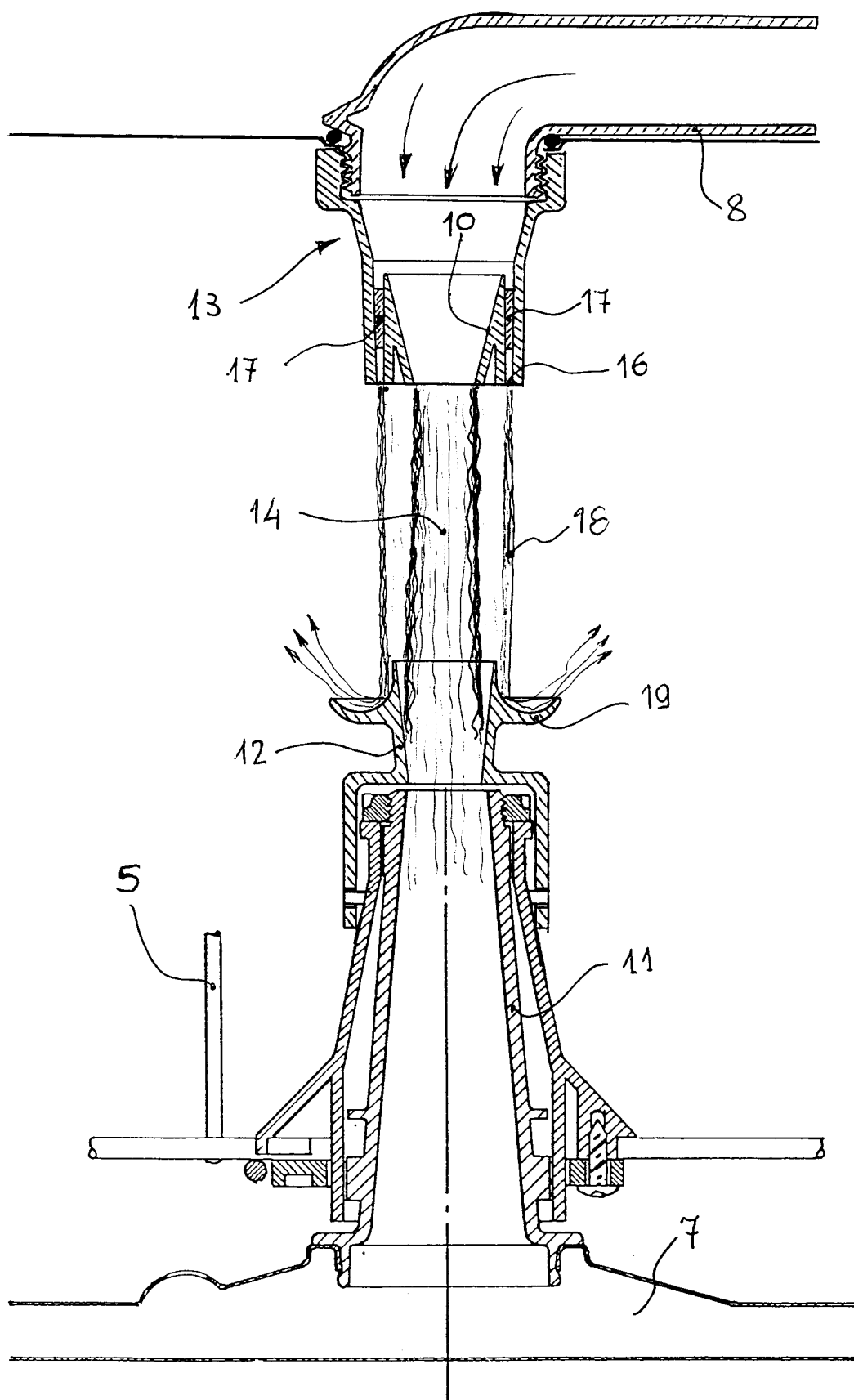


Fig. 2

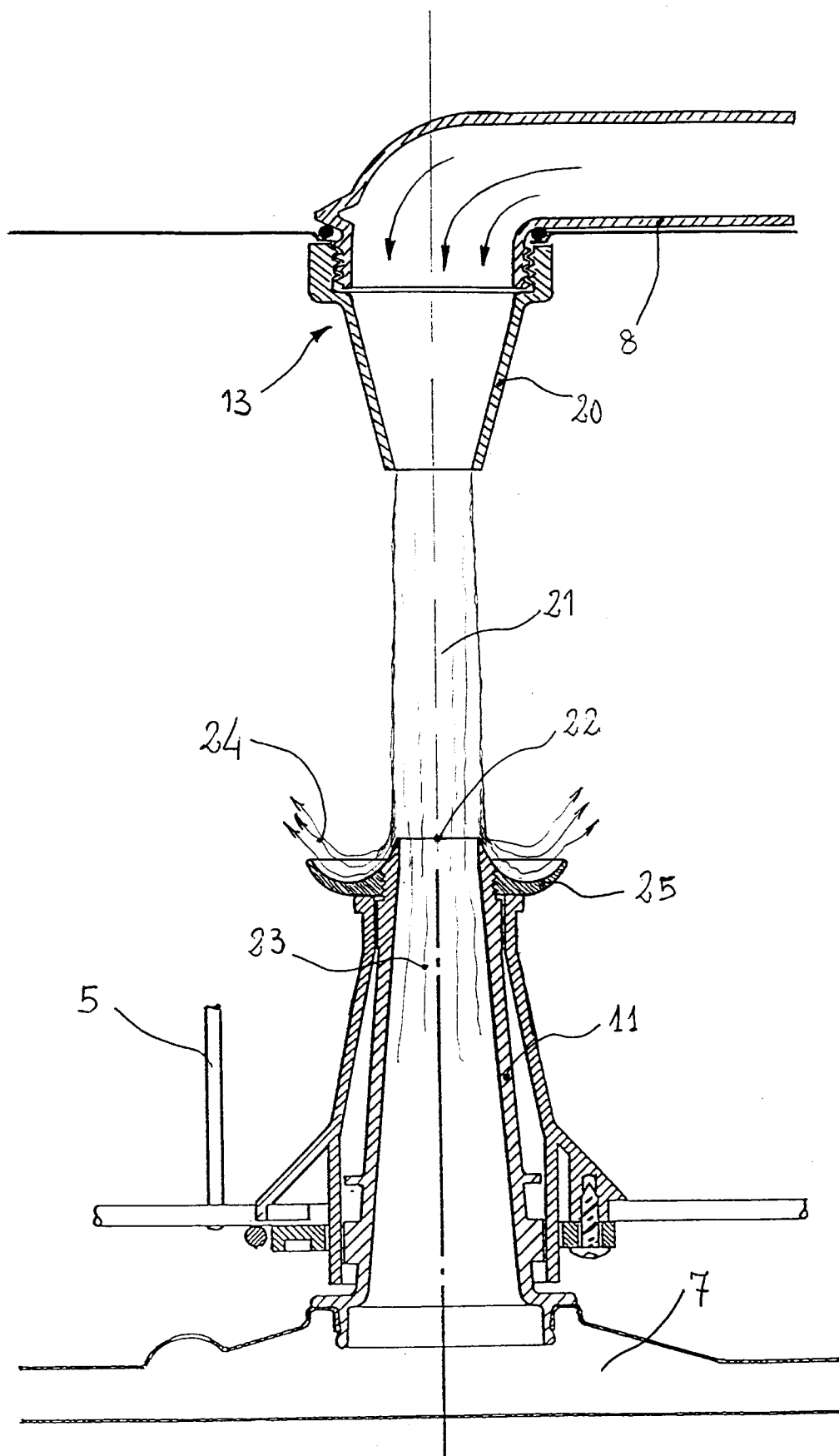


Fig. 3

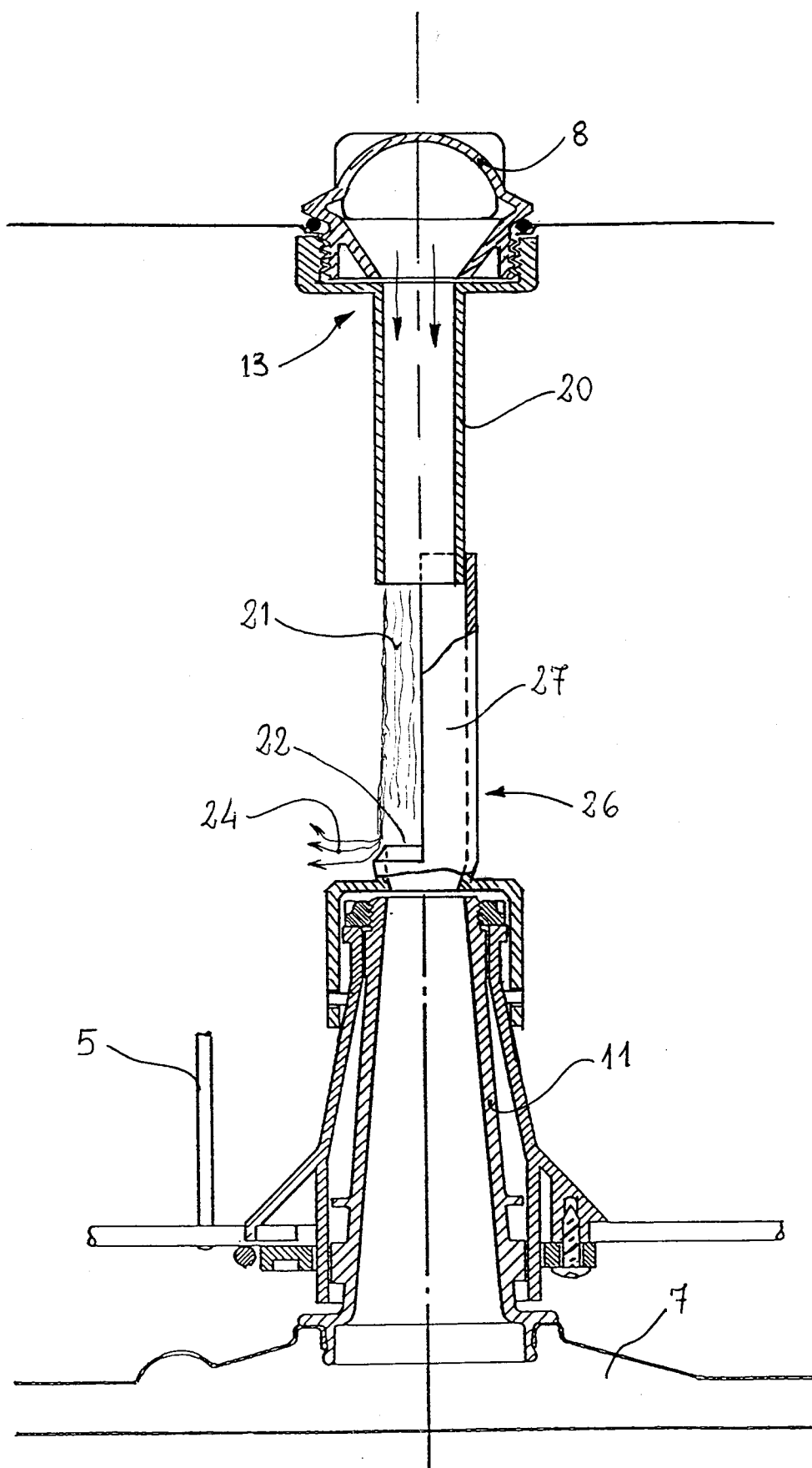
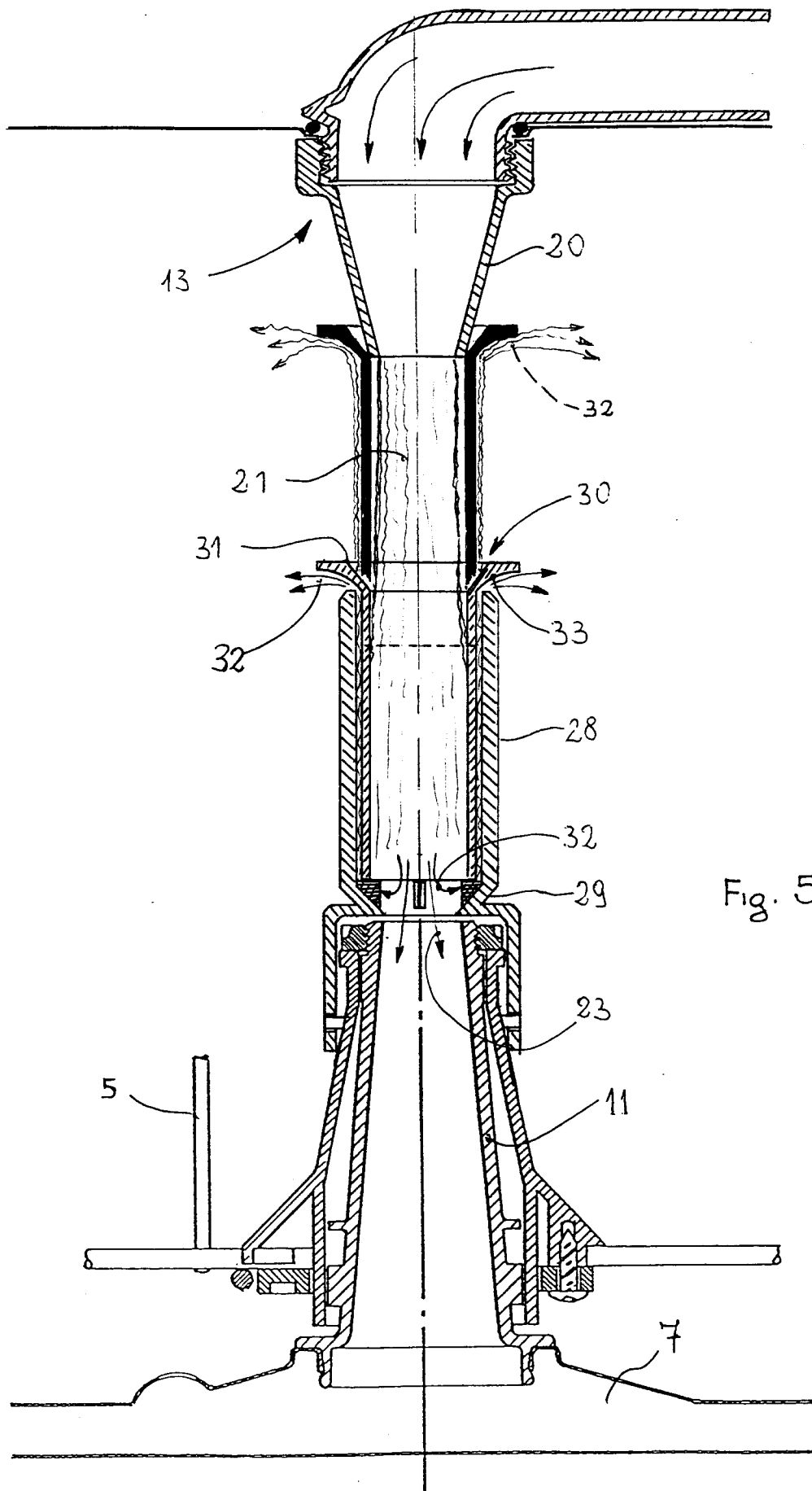


Fig. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 10 4457

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.5)
X	FR-A-2 651 427 (ESSWEIN) * the whole document * ---	1,8	A47L15/23
X	DE-A-3 540 238 (BLOMBERG-WERKE KG) * the whole document * ---	1,8	
A		9	
X	FR-A-2 062 035 (SOCIETE ESSWEIN) * the whole document * ---	1	
A		6,7	
X	FR-A-2 620 923 (BOSCH-SIEMENS HAUSGERATE GMBH) * the whole document * ---	1	
A		2-5	
A	DE-A-1 628 600 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) * the whole document * ---	1-5	
D,A	GB-A-1 514 652 (INDUSTRIE A. ZANUSSI S.P.A.) * the whole document * ---	1	
A	DE-A-2 207 373 (MIELE & CIE) * the whole document * ---	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	DE-U-8 801 390 (INDUSTRIE ZANUSSI S.P.A.) * the whole document * -----	1	A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 JULY 1992	Examiner KELLNER M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	