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(54) **Hood-type industrial dishwasher with improved drying circuit**

Hauben-Geschirrspülmaschine mit verbessertem Trocknungskreislauf

Lave-vaisselle à capot avec un circuit de séchage amélioré

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(73) Proprietor: **Bonferraro S.p.A.**
37060 Bonferraro (VR) (IT)

(72) Inventor: **Gobbi, Ezio**
46037 Roncoferraro (MN) (IT)

(74) Representative: **Concone, Emanuele et al**
Società Italiana Brevetti S.p.A.
Via Carducci 8
20123 Milano (IT)

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Description

[0001] The present invention relates to industrial dishwashers, and in particular to a hood-type dishwasher with an improved drying circuit aimed at a more effective and faster drying of the dishes.

[0002] It is known that air recirculation drying circuits applied to dishwashers, either with forced or natural ventilation, achieve through condensation a decrease in the humidity of the treated air so as to dry the dishes and/or reduce the emission of vapor upon opening of the dishwasher. In order to work properly, the circuit has to be almost airtight to prevent leakages of moist air that could condensate in cooler areas causing problems of corrosion and/or electrical safety.

[0003] As a consequence, the whole circuit is made up of plastic, rubber or steel members securely fixed to each other. Such a type of circuit structure is easily achievable in a household dishwasher with front opening door, but in a hood-type industrial dishwasher there is generally preferred an air discharge drying system since a hood-type dishwasher is substantially divided into a stationary lower half and a mobile upper half.

[0004] However, this drying process implies not only the emission of a lot of vapor, which is a problem for the environment where the dishwasher is located and for the operator, but also the rapid inflow of a great amount of external air that causes a fast cooling of the dishes at the end of the wash cycle. This results in a lower effectiveness of the drying process and a greater difficulty in reaching the HUE (Heat Unit Equivalent) threshold required to achieve a sanification effect. For example, a dishwasher disclosed in DE 102007004599-A1 includes a condenser unit to reduce the vapor discharge into the environment, yet does not prevent the inflow of external air.

[0005] On the other hand, also applying an air recirculation circuit to the stationary lower half of the hood-type dishwasher results in a poor effectiveness since the hottest and most humid air tends to rise upwards, whereby the air circulation only in the lower part would not affect the portion of air that most needs to be passed through the condenser. Therefore, even though the fast cooling of the dishes is prevented, there still remains the problem of a poor effectiveness of the drying process, which moreover in an industrial dishwasher has a very short length due to the limited length of the wash cycle.

[0006] Therefore the object of the present invention is to provide a hood-type industrial dishwasher which overcomes the above-mentioned drawbacks. This object is achieved by means of a hood-type industrial dishwasher provided with air recirculation drying circuit comprising a portion of the circuit arranged at the top of the hood. Other advantageous features of the present industrial dishwasher are disclosed in the dependent claims.

[0007] The main advantage of the dishwasher according to the present invention is that of being able to perform an effective drying of the dishes even in a short time thanks to the fact that the hottest and most humid portion of the air present within the wash chamber is efficiently sucked away at the top of the hood.

[0008] Such an arrangement of the suction mouth is also advantageous in that it is opposite with respect to the air reintroduction mouth located at the bottom of the wash chamber, so as to avoid "preferential paths" and to achieve an almost uniform airflow across the whole wash chamber for an optimal drying of all the dishes.

[0009] A further advantage of this dishwasher is, in its preferred embodiment, the arrangement of the drying device which is mostly located in the space available at the back of the machine, with a minimum additional bulk.

[0010] Still another advantage of the above-mentioned dishwasher, with respect to dishwashers with air discharge drying, is that of achieving the drying through air recirculation and therefore without a sudden decrease in the temperature of the dishes, thus allowing to exploit also the drying phase for the sanification.

[0011] These and other advantages and characteristics of the industrial dishwasher according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic side view showing a hood-type dishwasher according to the invention in an open position for the loading/unloading of the dishes;
Fig.2 is a diagrammatic side view showing said dishwasher in a closed position for the washing of the dishes; and
Fig.3 is a diagrammatic side view of the dishwasher showing the air recirculation during the drying phase.

[0012] Referring to Fig.1, there is seen that a hood-type industrial dishwasher according to the present invention conventionally includes a parallelepipedal wash chamber defined on four sides (left, right, top, front) by hood 1, on the bottom side by tank 2 where the filters are located and water is collected, and on the back side by the vertical wall 3 of the stationary lower part, along which hood 1 slides.

[0013] The novel aspect of the industrial dishwasher according to the present invention is the presence of a suction duct 4 at the top of hood 1. The inlet A of said duct 4 is preferably located along the front edge of hood 1, whereas outlet B is arranged at the back side, outside the wash chamber, oriented vertically downwards and tapered.

[0014] On the stationary rear wall 3 of the machine there is applied a vertical condensation duct 5, with a flared top inlet C suitable to receive the tapered outlet B of duct 4. Inside duct 5 there are arranged a fan 6, preferably a tangential fan in order to reduce its bulkiness, and a condenser 7. Duct 5 is connected to the wash chamber through an outlet D for the reintroduction of the dehumidified air, said outlet D being formed in the lower rear portion of the wash chamber.

[0015] In order to assure an adequate airtightness, a seal 8 is preferably provided between the suction duct 4 and the condensation duct 5, said seal being preferably arranged on the outside of outlet B but it could also be arranged on the inside of inlet C. It should also be noted that the tapering of outlet B, in addition to making easier the coupling between ducts 4 and 5, is also useful to prevent condensate drops from falling outside the condensation duct 5 when hood 1 is open as in Fig.1.

[0016] The simple and effective operation of the drying circuit of the dishwasher according to the present invention will be readily understood from the description given above.

[0017] As shown in Figs.2 and 3, when hood 1 is closed there is obtained a drying circuit along which air circulates between inlet A of the suction duct 4 at the top of the wash chamber and outlet D of the condensation duct 5 at the bottom of the wash chamber, the two ducts 4 and 5 being airtightly connected through coupling of outlet B of duct 4 with inlet C of duct 5.

[0018] Therefore during the drying phase there is achieved an effective air recirculation that affects the whole wash chamber.

[0019] It is clear that the above-described and illustrated embodiment of the dishwasher according to the invention is just an example susceptible of various modifications. In particular, the exact shape and arrangement of the members could be changed according to specific manufacturing needs, e.g. by forming inlet A more to the rear or by changing the type of coupling between ducts 4 and 5, as long as their automatic connection upon closing hood 1 is retained.

[0020] Similarly, fan 6 and/or condenser 7 could be replaced by other technically equivalent elements.

Claims

1. Hood-type industrial dishwasher with a wash chamber defined by a hood (1), a bottom tank (2) and a rear vertical wall (3) that makes part of the stationary lower part of the dishwasher, as well as with an air recirculation drying circuit comprising a condensation duct (5) containing a fan (6) and a condenser (7), **characterized in that** said drying circuit includes a suction duct (4) located at the top of said hood (1) and suitable to connect with said condensation duct (5) when the hood (1) is closed and to disconnect from said condensation duct (5) when the hood (1) is opined.

2. Hood-type industrial dishwasher according to claim 1, **characterized in that** the inlet (A) of the suction duct (4) is located along the front edge of the hood (1).

3. Hood-type industrial dishwasher according to claim 1 or 2, **characterized in that** the outlet (B) of the suction duct (4) is arranged at the back side of the hood (1), outside the wash chamber, and it is oriented vertically downwards.

4. Hood-type industrial dishwasher according to claim 3, **characterized in that** the outlet (B) of the suction duct (4) is tapered.

5. Hood-type industrial dishwasher according to any of the preceding claims, **characterized in that** the condensation duct (5) is applied to the rear vertical wall (3).

6. Hood-type industrial dishwasher according to claim 4 and 5, **characterized in that** the condensation duct (5) has a flared top inlet (C) suitable to receive the tapered outlet (B) of the suction duct (4).

7. Hood-type industrial dishwasher according to any of the preceding claims, **characterized in that** the the fan (6) is a tangential fan.

8. Hood-type industrial dishwasher according to any of the preceding claims, **characterized in that** the the condensation duct (5) is connected to the wash chamber through an outlet (D) formed in the lower rear portion of the wash chamber.

9. Hood-type industrial dishwasher according to any of the preceding claims, **characterized in that** a seal (8) is provided between the suction duct (4) and the condensation duct (5).

10. Hood-type industrial dishwasher according to claim 9, **characterized in that** the seal (8) is arranged on the outside of the outlet (B) of the suction duct (4).

Patentansprüche

1. Gewerbliche Geschirrspülmaschine mit Haube mit einem Spülraum, der von einer Haube (1), einem unteren Behälter (2) und einer senkrechten Rückwand (3) definiert ist, die Teil des feststehenden unteren Teils der Geschirrspülmaschine ist, sowie mit einem Umluft-Trocknungskreislauf, der einen Kondensationskanal (5) umfasst, der ein Gebläse (6) und einen Kondensator (7) enthält, **dadurch gekennzeichnet, dass** der Trocknungskreislauf einen Absaugkanal (4) aufweist, der sich oben in der Haube (1) befindet und sich dafür eignet, sich mit dem Kondensationskanal (5) zu verbinden, wenn die Haube (1) geschlossen wird, und sich von dem Kondensationskanal (5) zu trennen, wenn die Haube (1) geöffnet wird.

2. Gewerbliche Geschirrspülmaschine mit Haube nach Anspruch 1, **dadurch gekennzeichnet, dass** der

Einlass (A) des Absaugkanals (4) entlang der Vorderkante der Haube (1) angeordnet ist.

3. Gewerbliche Geschirrspülmaschine mit Haube nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Auslass (B) des Absaugkanals (4) an der Rückseite der Haube (1) außerhalb des Spülraums angeordnet ist und senkrecht nach unten gerichtet ist.

4. Gewerbliche Geschirrspülmaschine mit Haube nach Anspruch 3, **dadurch gekennzeichnet, dass** der Auslass (B) des Absaugkanals (4) konisch zuläuft.

5. Gewerbliche Geschirrspülmaschine mit Haube nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kondensationskanal (5) an der senkrechten Rückwand (3) angebracht ist.

6. Gewerbliche Geschirrspülmaschine mit Haube nach Anspruch 4 und 5, **dadurch gekennzeichnet, dass** der Kondensationskanal (5) einen aufgeweiteten oberen Einlass (C) aufweist, der dafür geeignet ist, den konisch zulaufenden Auslass (B) des Absaugkanals (4) aufzunehmen.

7. Gewerbliche Geschirrspülmaschine mit Haube nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Gebläse (6) ein Tangentialgebläse ist.

8. Gewerbliche Geschirrspülmaschine mit Haube nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kondensationskanal (5) über einen Auslass (D), der im unteren hinteren Abschnitt des Spülraums gebildet ist, mit dem Spülraum verbunden ist.

9. Gewerbliche Geschirrspülmaschine mit Haube nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zwischen dem Absaugkanal (4) und dem Kondensationskanal (5) eine Dichtung (8) vorgesehen ist.

10. Gewerbliche Geschirrspülmaschine mit Haube nach Anspruch 9, **dadurch gekennzeichnet, dass** die Dichtung (8) an der Außenseite des Auslasses (B) des Absaugkanals (4) angeordnet ist.

Revendications

1. Lave-vaisselle industriel du type à capot ayant une chambre de lavage définie par un capot (1), un réservoir inférieur (2) et une paroi arrière verticale (3) qui fait partie d'une partie inférieure stationnaire du lave-vaisselle, ainsi qu'un circuit de séchage à recirculation d'air comprenant un conduit de condensation (5) contenant un ventilateur (6) et un condenseur (7), **caractérisé en ce que** le circuit de séchage comprend un conduit d'aspiration (4) situé à la partie supérieure du capot (1) et adapté pour être connecté à un conduit de condensation (5) lorsque le capot (1) est fermé et pour être déconnecté du conduit de condensation (5) lorsque le capot (1) est ouvert.

2. Lave-vaisselle industriel du type à capot selon la revendication 1, **caractérisé en ce que** l'entrée (A) du conduit d'aspiration (4) est située le long du bord avant du capot (1).

3. Lave-vaisselle industriel du type à capot selon la revendication 1 ou 2, **caractérisé en ce que** la sortie (B) du conduit d'aspiration (4) est agencée au niveau du côté arrière du capot (1), à l'extérieur de la chambre de lavage, et il est orienté verticalement vers le bas.

4. Lave vaisselle industriel du type à capot selon la revendication 3, **caractérisé en ce que** la sortie (B) du conduit d'aspiration (4) est conique.

5. Lave-vaisselle industriel du type à capot selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le conduit de condensation (5) est appliqué sur la paroi arrière verticale (3).

6. Lave-vaisselle industriel du type à capot selon les revendications 4 et 5, **caractérisé en ce que** le conduit de condensation (5) a une entrée supérieure évasée (C) adaptée pour recevoir la sortie conique (B) du conduit d'aspiration (4).

7. Lave-vaisselle industriel du type à capot selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le ventilateur (6) est un ventilateur tangentiel.

8. Lave-vaisselle industriel du type à capot selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le conduit de condensation (5) est relié à la chambre de lavage à travers une sortie (D) formée dans la partie arrière inférieure de la chambre de lavage.

9. Lave-vaisselle industriel du type à capot selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**un joint (8) est agencé entre le conduit d'aspiration (4) et le conduit de condensation (5).

10. Lave-vaisselle industriel du type à capot selon la revendication 9, **caractérisé en ce que** le joint (8) est agencé à l'extérieur de la sortie (B) du conduit d'aspiration (4).

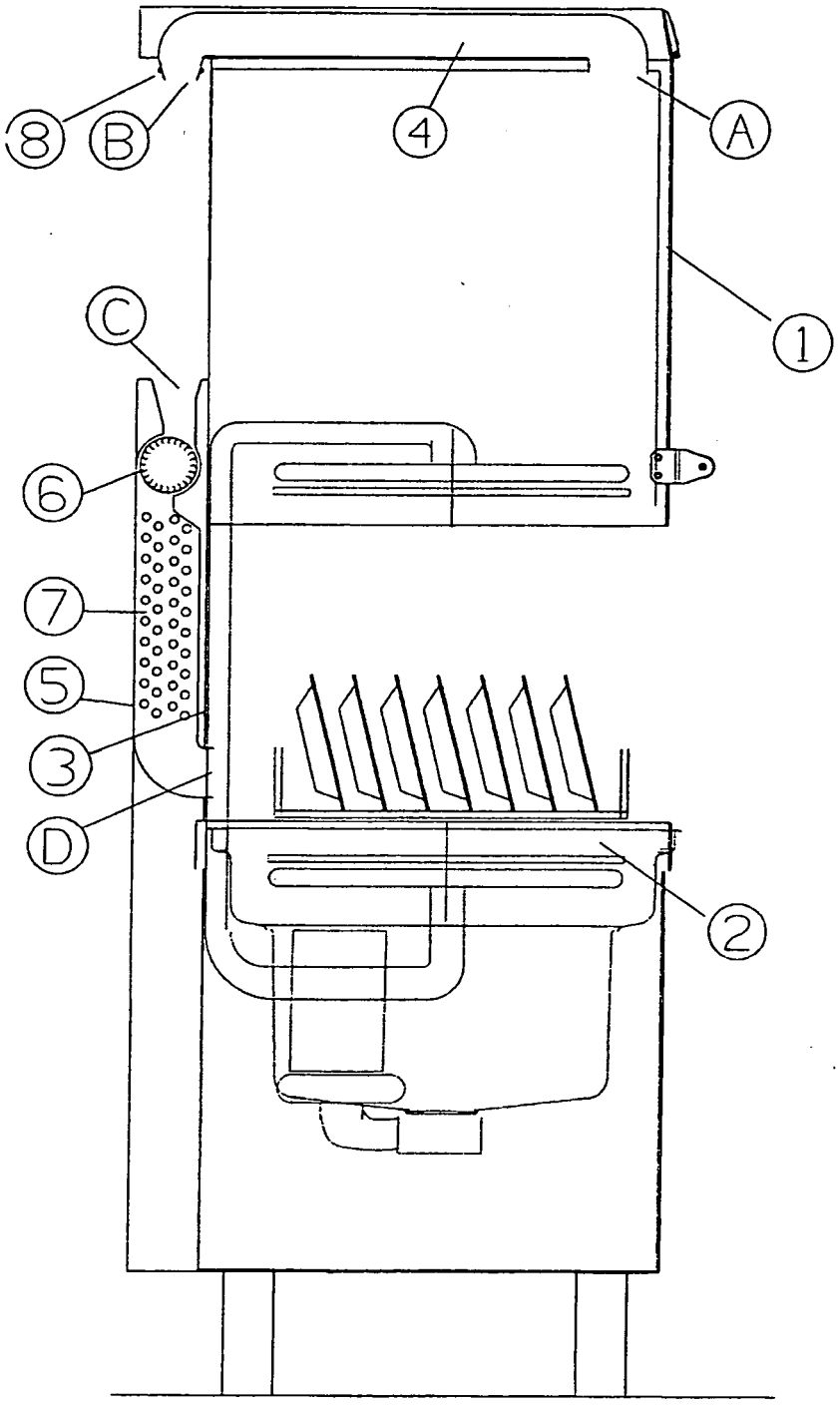


Fig.1

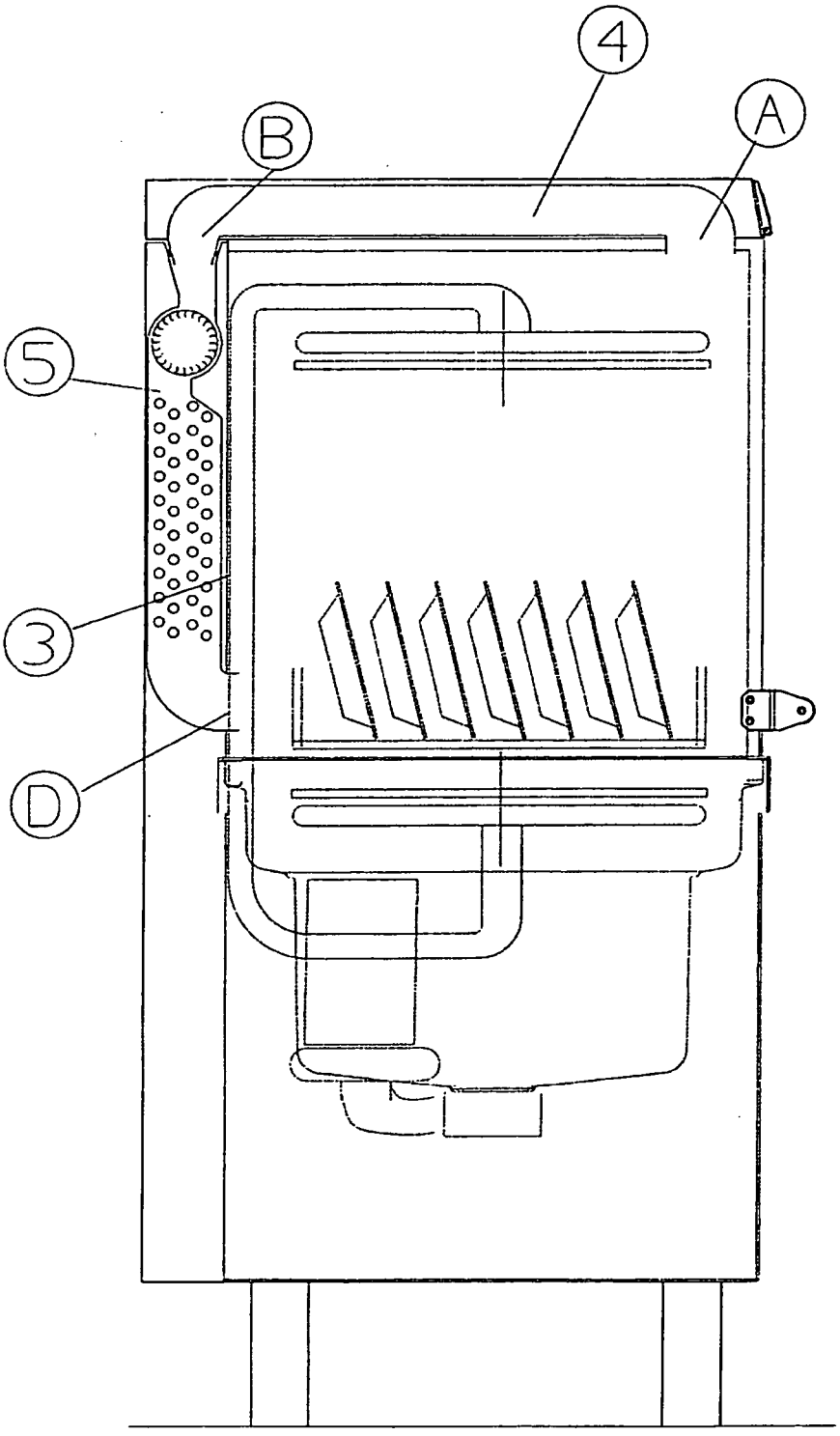


Fig.2

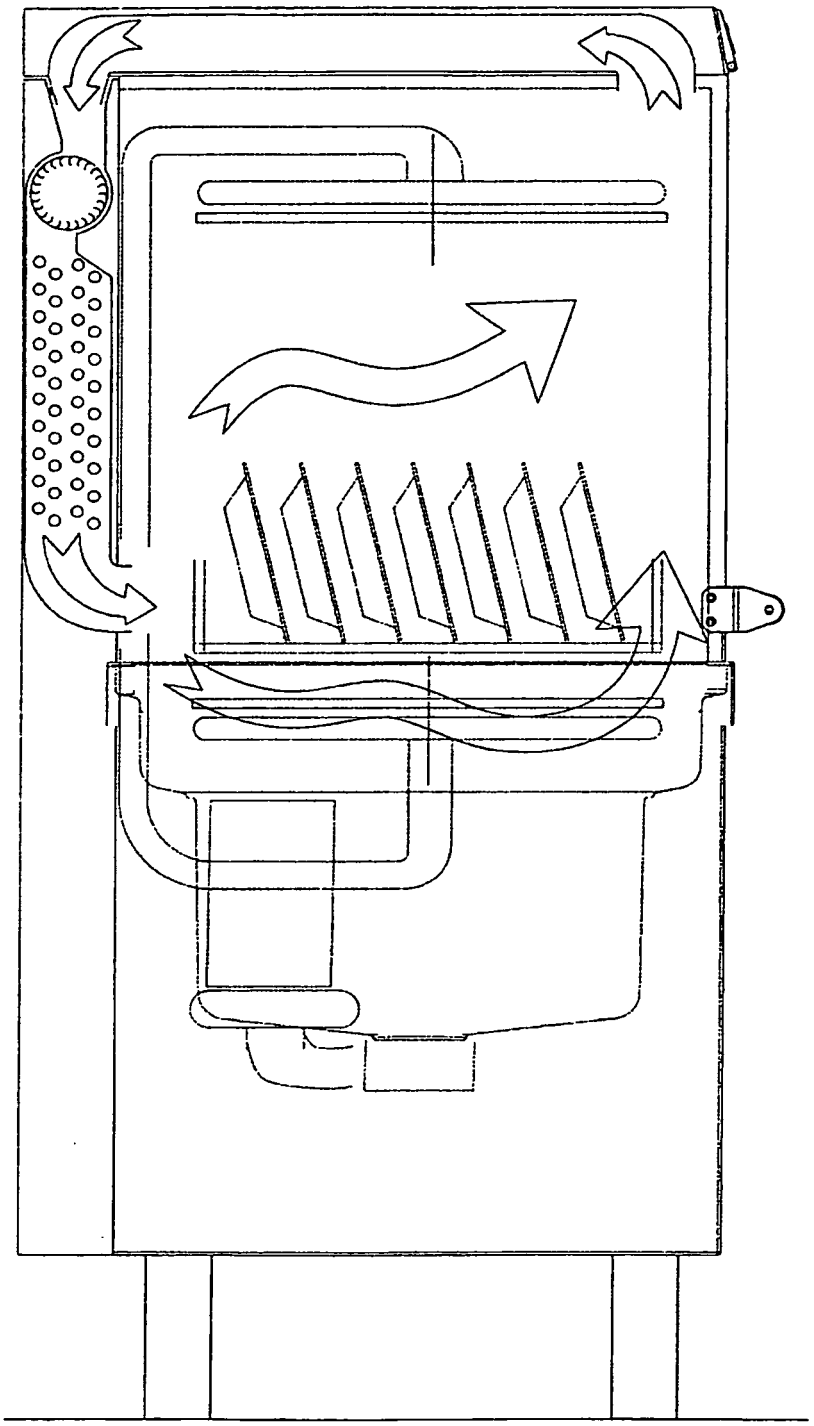


Fig.3

REFERENCES CITED IN THE DESCRIPTION

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