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(54) **A screen filter for a liquid-conducting device, in particular a dishwashing machine**

Flachfilter für ein wasserführendes Gerät, insbesondere eine Geschirrspülmaschine

Filtre plat pour un appareil conducteur d'eau, notamment un lave-vaisselle

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(73) Proprietor: **WHIRLPOOL CORPORATION**  
**Benton Harbor**  
**Michigan 49022 (US)**

(72) Inventors:  
• **Kunkel, Jochen**  
**V.le G. Borghi 27,**  
**21025 Comerio (IT)**  
• **Heil, Michael**  
**V.le G. Borghi 27,**  
**21025 Comerio (IT)**

• **Fierling, Yannich**  
**V.le G. Borghi 27,**  
**21025 Comerio (IT)**

(74) Representative: **Spina, Alessandro et al**  
**Whirlpool EMEA SpA**  
**Via Carlo Pisacane, 1**  
**20016 Pero (MI) (IT)**

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• **PROF DR ING GOTTFRIED WEHRENSTEIN: "Mit**  
**Kunststoffen konstruieren Eine Einführung", ,**  
**XP002182430,**

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## Description

**[0001]** The invention concerns a screen filter for a liquid-conducting device, in particular a household dishwashing machine, that is designed flat with flow holes, separates the water-conducting space from a drainage shaft and lies at the bottom of the water-conducting space, sealing the perimeter.

**[0002]** Such a screen filter is disclosed in EP 0 988 825 A2. The screen filter removes entrained solid particles from the liquid when draining the liquid from the space by passing it through the holes. They are held back by the screen filter and do not end up in the drainage shaft. The solid particles can be taken out when removing the screen filter and disposed of when cleaning the screen filter.

**[0003]** Filter screens of this type are usually designed as flexible metal punch-hole components that on the one hand can not optimally be designed in terms of flow restriction, i.e. the entire flow surface, and on the other hand cannot effectively seal the edges due to production reasons. Oftentimes the result is that small solid particles cannot sufficiently be retained and end up in the drainage shaft.

**[0004]** US-A-5700329 describes a flat screen type filter for a dishwasher made of metallic material, provided with legs to link the filter with other portions of the dishwasher.

**[0005]** GB-A-1530206 discloses a flat screen filter for dishwashers made in a single piece of plastic molded material.

**[0006]** The task of the invention is to create a dishwashing machine with a screen filter of the type mentioned at the outset that can be manufactured easily and cost efficiently, that is optimized in terms of flow restriction and the entire flow surface, and that largely excludes the influence of material fatigue due to its design.

**[0007]** This requirement is solved by the invention thanks to the features listed in the appended claims.

**[0008]** The flow holes can be selected very small such that even the smallest of solid particles are retained. The number of flow holes can be selected very large to achieve a large overall flow area while simultaneously retaining very small solid particles. At the same time, reinforcement links on the bottom of the screen filter provide the screen filter with sufficient stability and stiffness even in thin screen filters. This also achieves long, device-specific lifetimes for screen filters manufactured in this way.

**[0009]** The intended design of the screen filter is that it provides a material thickness of approx. 1 to 1.2 mm and that the diameter of the flow holes is approx. 1 mm and a hole spacing of approx. 2 mm in row direction. It is intended furthermore that adjacent rows of flow holes are each offset opposite to each other by half the distance, and the imaginary connection lines of the midpoints of three directly adjacent flow holes form an isosceles triangle, thus the entire flow surface can be optimized to the maximum by the honeycombs, which are

separated by reinforcement links.

**[0010]** The design of the reinforcement links provides for a thickness of between 0.5 to 0.8 mm and a height of approx. 2 mm.

5 **[0011]** In one design, optimal use of screen filter surface space is achieved in that the reinforcement links arranged on the bottom separate individual, normally constructed, hexagonal honeycomb fields, which are furnished with "2 N -1" rows of flow holes, wherein "N" is the number of holes at the edges of the honeycombs. The design provides rows of holes at the honeycomb edge with "N" flow holes and rows of holes with "2 N -1" flow holes in the middle of the honeycombs field.

10 **[0012]** Draining the liquid from which solid particles have been removed can be improved in that the profile of the flow holes flares out towards the underside, preferably designed as truncated cones.

15 **[0013]** The invention is described in more detail using the example embodiments shown in the drawings. They show:

Fig. 1, in a perspective view, the underside of a screen filter for a dishwashing machine,

Fig. 2, a partial view of the bottom side of a hexagonal field of the screen filter of Figure 1,

Fig. 3, a sectional view along the line III-III of the field of Figure 2,

Fig. 4, a sectional view along the line IV-IV of the field of Figure 2,

30 Fig. 5 a sectional view of an edge zone of the screen filter of figure 1,

Fig. 6 through Fig. 7 the arrangement and design of the honeycomb-shape designed flow holes.

35 **[0014]** The design of the screen filter 10 shown in Fig. 1 is typical for a dishwashing machine. The opening 11 embedded in the screen filter 10 normally surrounds a coarse filter that is set in the drainage shaft, wherein the edge 12, which sticks up on the underside 13 of the screen filter 10 accepts the fit after sealing. The edge 14 that encompasses the circumference of the screen filter 10 also protrudes on the underside 13 and serves the same purpose.

40 **[0015]** The screen filter 10, which is designed and manufactured as a plastic-injection mould part is relatively thin with a material thickness of approx. 1 to 1.2 mm and can therefore be produced with little material expense. In order for the entire surface of the screen filter 10 to maintain sufficient stability, reinforcement links 15 that stick up are injected on the underside 13 next to the edges 12 and 14 that have a thickness of between 0.5 mm and 0.8 mm and a height of approx. 2 mm and separate the fields 16. These fields 16 are designed for optimal use of space as standard hexagons that border each other in a honeycomb shape and cover the vast majority of the surface space of the screen filter 10. These fields 16 are provided with rows of flow holes 17, the arrangement of which will be shown as an example.

**[0016]** In order to attain the greatest flow passage within a honeycomb, the holes are arranged like in Fig. 6 and 7. Flow passage is optimized in that the flow holes are arranged in the shape of an isosceles triangle. The distance "d1" equals the length of the sides. The distances "d1" and "d2" are contingent upon the minimal wall thicknesses "m" and "t" of the mould draft "a". In order to achieve maximum flow passage the screen is designed with two distances "d1" and "d2"; "d1" defines the hole spacing within a honeycomb and "d2" the minimum hole spacing between the outer holes of two bordering honeycombs (see Fig. 6).

**[0017]** Figure 2 shows such a field 16 of the screen filter 10 in the view of its underside 13. Reinforcement links 15 encompass the field 16 and the adjacent fields 16 link up without surface loss. The flow holes 17 have a diameter of approx. 1 mm and are arranged in rows, wherein they provide a hole spacing of approx. 2 mm in the rows. In the example embodiment 13 rows are provided that begin and end with 7 flow holes on the edges of the field 6 and increase to 13 flow holes 17 in the middle, as shown in the sectional views of Fig. 3 and 4. Since the adjacent rows of flow holes 17 are always offset to each other by half the distance, the distance of the rows is kept small and the surface of the field 16 can be used optimally for a large flow surface, however, the surface of flow holes 17 is kept very small in order to retain small solid particles as well.

**[0018]** The flow holes 17 may continually increase in profile from the topside to the underside 13 of the screen filter 10 in order to improve the flow of liquid that has been freed of solid particles. A truncated cone-like design of the flow holes 17 has proven to be particularly beneficial, as can be seen in the partial views in Fig. 3 through 5.

## Claims

1. A household dishwashing machine having a screen filter (10) that is designed flat with flow holes (17), separates the water-conducting space from a drainage shaft and lies at the bottom of the water-conducting space, **sealing the perimeter, characterized in that** the screen filter (10) is designed and manufactured as a plastic-injection mould part, that on its underside (13) is divided at least in partitions by means of injected reinforcement links (15) in fields (16) designed as regular hexagons that border each other in a honeycomb shape and cover the vast majority of the surface space of the screen filter (10), such fields (16) being provided with the flow holes (17) that are arranged in rows.
2. A household dishwashing machine according to claim 1, **characterized in that** the screen filter (10) has a thickness of approx. 1 to 1.2 mm and that the flow holes (17) have a diameter of approx. 1 mm and a hole spacing of approx. 2 mm in the rows.

3. A household dishwashing machine screen filter according to claim 2, **characterized in that** adjacent rows of the flow holes (17) are each offset from each other by half the hole spacing.
4. A household dishwashing machine according to claims 1, 2 or 3, **characterized in that** the imaginary connecting lines of the midpoints of three directly adjacent flow holes (17) form an isosceles triangle.
5. A household dishwashing machine according to one of claims 1 through 4, **characterized in that** the reinforcement links (15) provide a thickness between 0.5 to 0.8 mm and provide a height of approx. 2 mm.
6. A household dishwashing machine according to one of claims 1 through 5, **characterized in that** the reinforcement links (15) separate the fields (16) with rows of flow holes (17), wherein the rows, which are at the edges of the field (16), are provided with N flow holes and in the middle of the field (16) with 2N-1 flow holes (17).
7. A household dishwashing machine according to one of claims 1 through 6, **characterized in that** the profiles of the flow holes (17) grow continually larger in the direction of the underside (13), preferably designed truncated cone-shaped.
8. A household dishwashing machine according to one of claims 1 through 7, **characterized in that** the screen filter is provided with defined bearing surfaces that guarantee a favorable flow contact with retainers and also provide a positive form fit at the edge even after material fatigue has set in.

## Patentansprüche

1. Haushaltsgeschirrspülmaschine mit einem Filtersieb (10), das flach mit Strömungslöchern (17) ausgelegt ist, den wasserleitenden Raum von einem Entleerungsschacht trennt und am Boden des wasserleitenden Raums liegt, **wodurch der Umfang abgedichtet wird, dadurch gekennzeichnet, dass** das Filtersieb (10) als ein Plastikspritzgussteil ausgelegt und hergestellt ist, das an seiner Unterseite (13) zumindest in Bereichen durch eingespritzte Verstärkungsglieder (15) in Felder (16) aufgeteilt ist, die als reguläre Sechsecke ausgebildet sind, die wabenförmig aneinandergrenzen und den überwiegenden Teil der Oberfläche des Siebfilters (10) bedecken, wobei diese Felder (16) mit den in Reihen angeordneten Strömungslöchern (17) bereitgestellt sind.
2. Haushaltsgeschirrspülmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Filtersieb (10) eine Dicke von ungefähr 1 bis 1,2 mm aufweist

und dass die Strömungslöcher (17) einen Durchmesser von ungefähr 1 mm und einen Lochabstand von ungefähr 2 mm in den Reihen aufweisen.

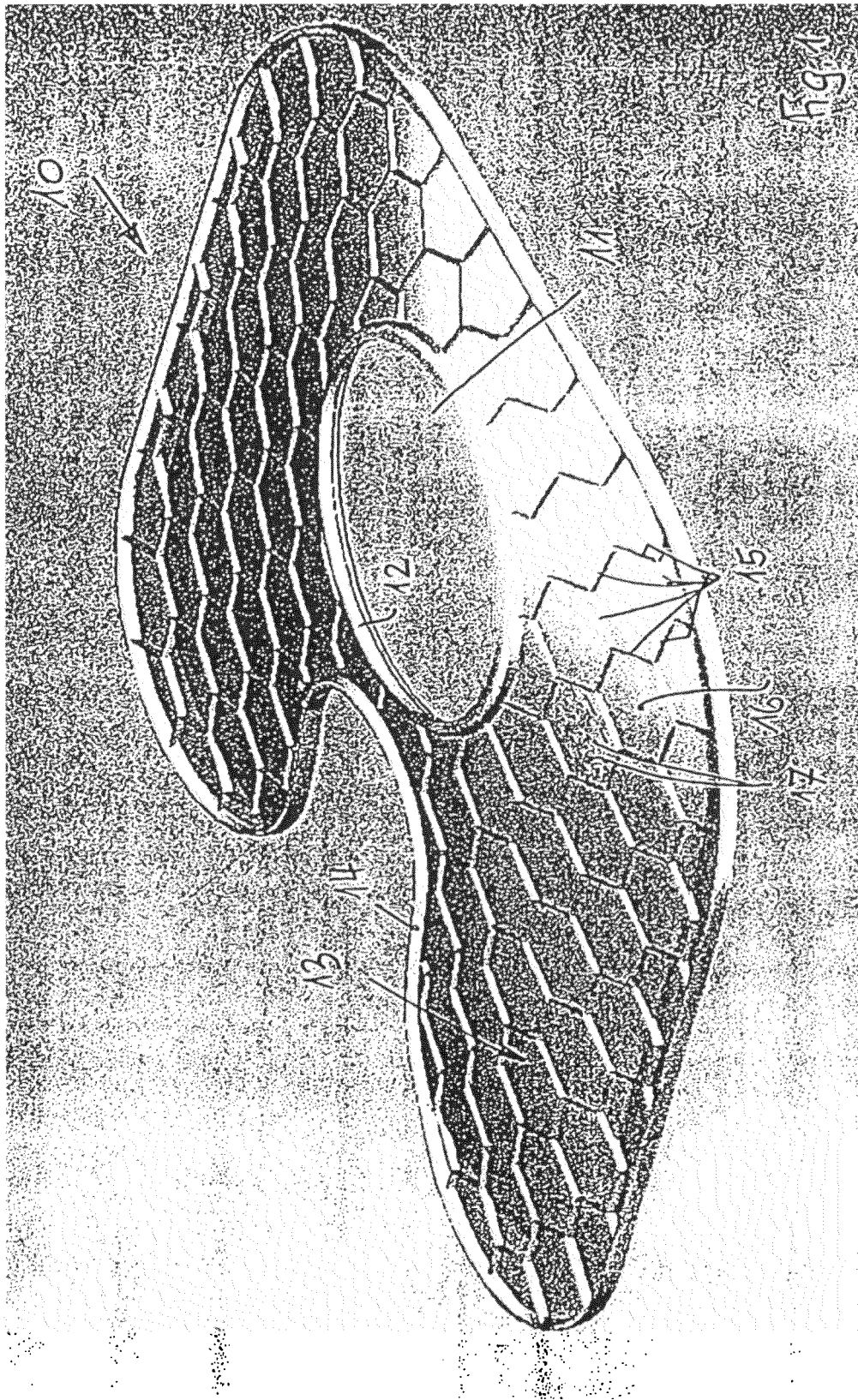
3. Haushaltsgeschirrspülmaschinen-Siebfilter gemäß Anspruch 2, **dadurch gekennzeichnet, dass** benachbarte Reihen der Strömungslöcher (17) jeweils um eine Hälfte des Lochabstands voneinander versetzt sind. 5
4. Haushaltsgeschirrspülmaschine gemäß Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** die imaginären Verbindungslinien der Mittelpunkte der drei direkt benachbarten Strömungslöcher (17) ein gleichschenkliges Dreieck ausbilden. 10
5. Haushaltsgeschirrspülmaschine gemäß einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Verstärkungsglieder (15) eine Dicke zwischen 0,5 bis 0,8 mm bereitstellen und eine Höhe von ungefähr 2 mm bereitstellen. 15
6. Haushaltsgeschirrspülmaschine gemäß einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Verstärkungsglieder (15) die Felder (16) mit Reihen von Strömungslöchern (17) trennen, wobei die sich an den Kanten des Feldes (16) befindlichen Reihen mit N Strömungslöchern und in der Mitte des Feldes (16) mit 2N-1 Strömungslöchern (17) bereitgestellt sind. 20
7. Haushaltsgeschirrspülmaschine gemäß einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Profile der Strömungslöcher (17) in der Richtung der Unterseite (13) kontinuierlich größer werden, wobei sie bevorzugt kegelstumpfförmig ausgelegt sind. 25
8. Haushaltsgeschirrspülmaschine gemäß einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das Filtersieb mit definierten Lagerflächen versehen ist, die einen gewünschten Strömungskontakt mit Halterungen garantieren, und ebenso einen positiven Formschluss an der Kante bereitstellen, selbst nachdem eine Materialermüdung eingesetzt hat. 30

#### Revendications

1. Machine à laver la vaisselle domestique ayant un filtre à tamis (10) qui est conçu plat avec des trous d'écoulement (17), sépare l'espace de conduction d'eau d'un axe de drainage et repose au fond de l'espace de conduction d'eau, **en scellant le périmètre, caractérisé en ce que** le filtre à tamis (10) est conçu et fabriqué comme une partie en plastique moulée par injection qui, sur son dessous (13), est divisée au moins en séparations au moyens de ner- 35

vures de renforcement injectées (15) délimitant des champs (16) conçus comme des hexagones réguliers qui sont contigus les uns par rapport aux autres en forme de nid d'abeilles et couvrent la grande majorité de l'espace superficiel du filtre à tamis (10), ces champs (16) étant pourvus de trous d'écoulement (17) étant agencés en rangées.

2. Machine à laver la vaisselle domestique selon la revendication 1, **caractérisée en ce que** le filtre à tamis (10) a une épaisseur d'approximativement 1 à 1,2 mm et **en ce que** les trous d'écoulement (17) ont un diamètre d'approximativement 1 mm et un espacement entre trous d'approximativement 2 mm dans les rangées. 40
3. Machine à laver la vaisselle domestique selon la revendication 2, **caractérisée en ce que** des rangées adjacentes des trous d'écoulement (17) sont chacune décalées l'une de l'autre de la moitié de l'espacement de trous. 45
4. Machine à laver la vaisselle domestique selon la revendication 1, 2 ou 3, **caractérisée en ce que** les lignes de connexion imaginaires des points milieu de trois trous d'écoulement (17) directement adjacents forment un triangle isocèle. 50
5. Machine à laver la vaisselle domestique selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** les nervures de renforcement (15) donnent une épaisseur entre 0,5 et 0,8 mm et donnent une hauteur d'approximativement 2 mm. 55
6. Machine à laver la vaisselle domestique selon l'une quelconque des revendications 1 à 5, **caractérisée en ce que** les nervures de renforcement (15) séparent les champs (16) avec des rangées de trous d'écoulement (17), dans laquelle les rangées, qui sont aux bords du champ (16), sont pourvues de N trous d'écoulement et dans le milieu du champ (16) de 2N-1 trous d'écoulement (17). 60
7. Machine à laver la vaisselle domestique selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** les profils des trous d'écoulement (17) croissent continument dans la direction du dessous (13), de préférence en forme de cône tronqué. 65
8. Machine à laver la vaisselle domestique selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** le filtre à tamis est pourvu de surfaces de support définies qui garantissent un contact d'écoulement favorable avec des éléments de retenue et fournissent un emboîtement de forme positive au niveau du bord même après que la fatigue du matériau s'est installée. 70



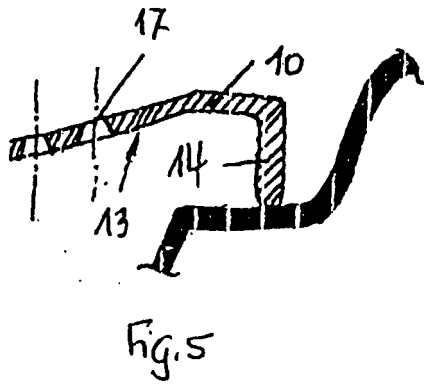
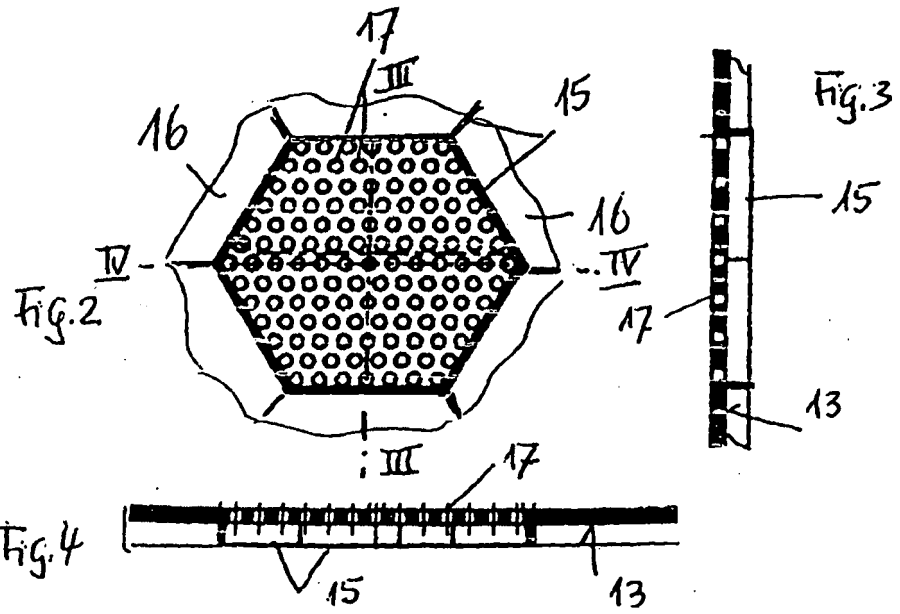


Figure 6

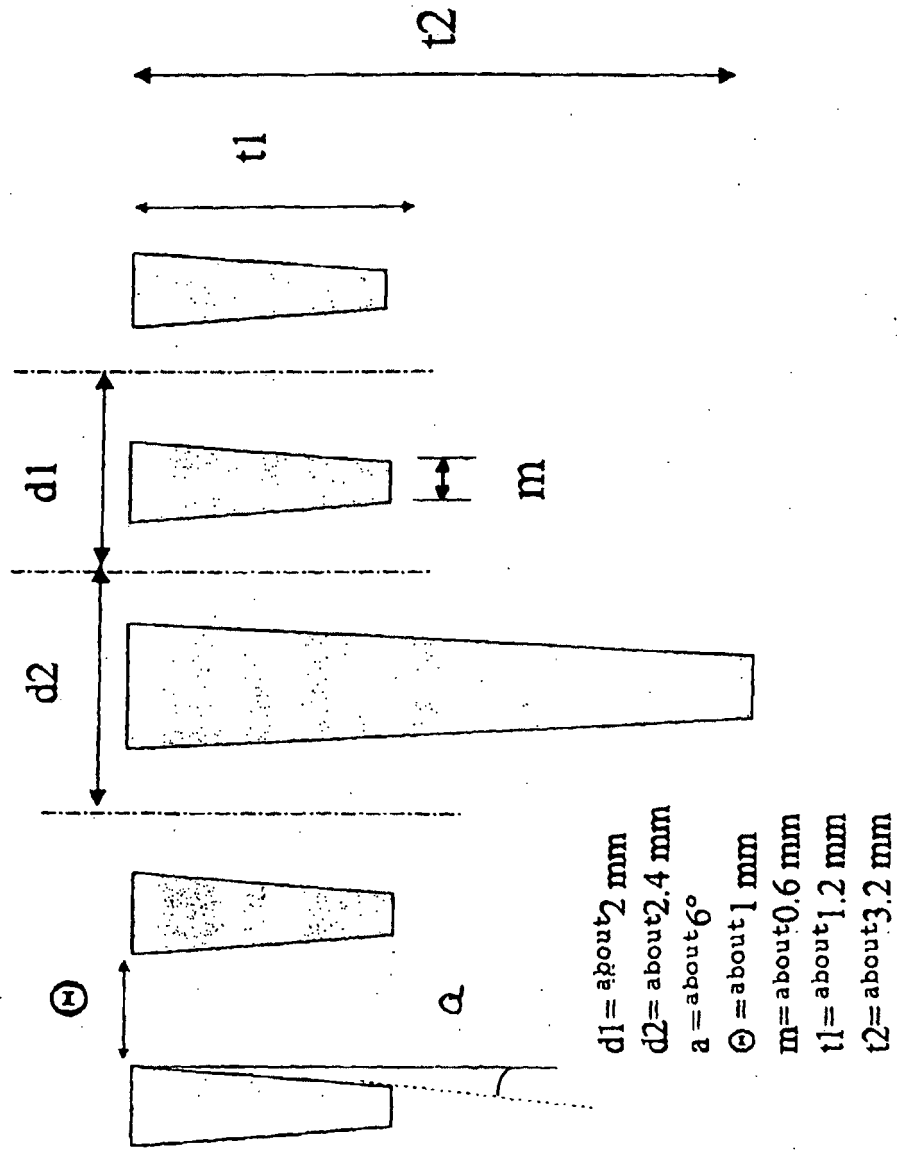
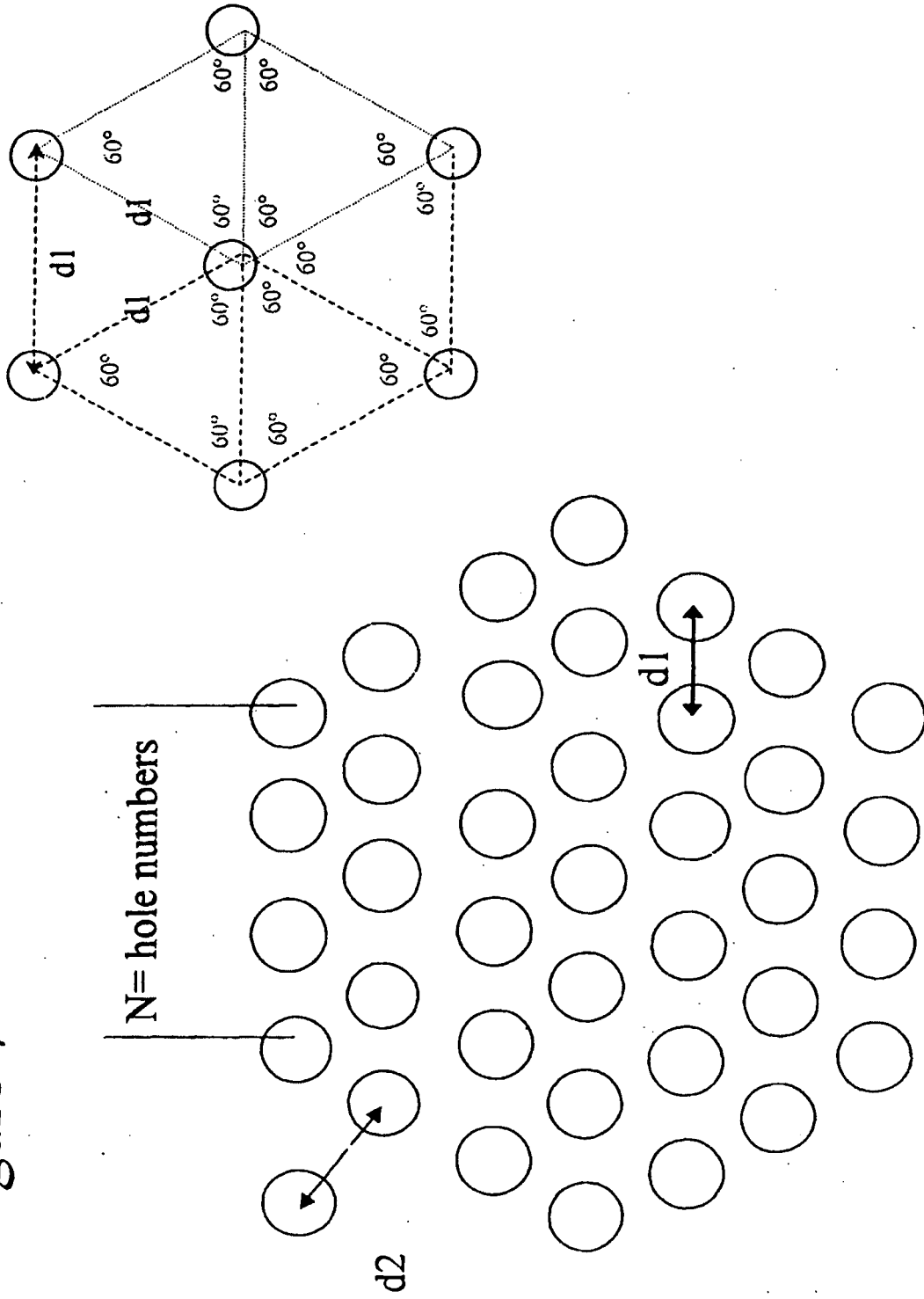


Figure 7



**REFERENCES CITED IN THE DESCRIPTION**

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