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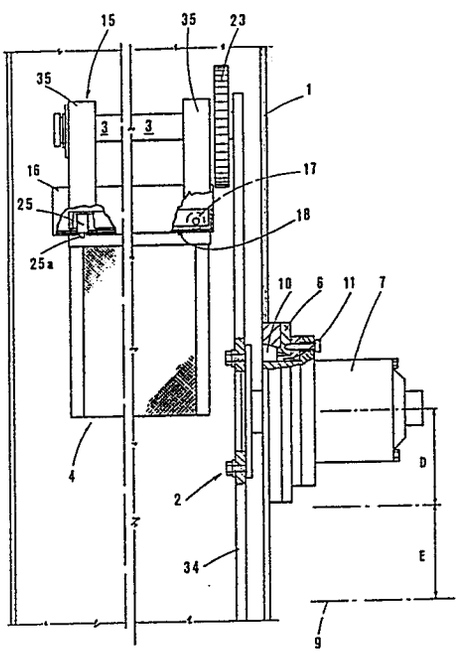
(71) Applicant: **AMA UNIVERSAL S.p.A., Via C. Bonazzi 2, I-40013 Castelmaggiore (Bologna) (IT)**

(72) Inventor: **Zucchini, Guido, Via del Lavoro 6, I-40013 Castelmaggiore(Bologna) (IT)**

(74) Representative: **Pederzini, Paolo, BUGNION S.p.A. Via Farini n. 37, I-40124 Bologna (IT)**

(54) Machine to wash metal and non-metal pieces, such as small items and mechanical components.

(57) In the machine the rotating element (2) carrying baskets (4, 4a) is supported by the washing tank (1) through at least a hub-holding flange (6) adapted to support said hub (7) in an eccentric position or in a position coaxial with the axis of the washing tank (1) respectively; furthermore, baskets (4, 4a) are supported by the rotating element (2) in a hanging relationship through an intermediate frame (15) swinging about a rod or pivot (3) carried by said rotating element (2) or directly by said rod or pivot (3).



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Machine to wash metal and non-metal pieces, such as small items and mechanical components

The present invention relates to a machine to wash metal and non-metal pieces, such as small items and mechanical components, of the type essentially designed to wash the pieces hermetically sealed in a washing chamber or tank, from which solvent is recovered and regenerated and where pieces are dried inside the washing tank itself through the forced endless circulation of a hot-air stream.

Such machines essentially comprise a hermetically sealed washing tank within which a rotating element or rotor provided with a basket to contain the pieces to be washed is moved.

While using said machines the applicant has noticed that some pieces devoid of holes, undercuts or the like can be washed by merely immerging them into the solvent and, above all, they can be dried irrespective of their position inside the basket, so that the use of baskets supported by the rotating element in a hanging relationship is allowed. Other pieces, instead, especially if small-sized and flattened, can adhere to each other if the flat surfaces thereof come into contact, which involes the necessity of moving them inside the containing baskets in order to avoid the above mentioned drawback which is very detrimental to such a washing and to a complete drying of the pieces. For the above reason it is necessary to provide for the use of baskets supported by the rotating element so that they may rotate about the axis thereof.

Obviously two washing tanks would be necessary for the use of the two different types of baskets mentioned above. Actually, as shown in Fig. 1, in the case of hanging baskets the overall dimensions of the rotating element or rotor together with the respective baskets (shown in full line in Fig. 1 where the diameter thereof is identified by ϕb) would be much smaller than the overall dimensions of the same rotor when provided with baskets designed to rotate about the axis of the rotor (shown in interrupted line in Fig. 1 where the diameter thereof is identified by ϕr).

Therefore, from a manufacturing point of view two different types of washing tanks having different sizes should have to be made in order to meet the different operational requirements.

The object of the present invention is to provide a machine of the above specified type having reduced sizes and being capable of allowing the use of both hanging and rotating baskets and in which the two above mentioned operating conditions can be achieved without carrying out any modifications to the main structure and the rotating element supporting the two types of baskets.

The invention, as defined in the claims, allows the above specified object to be reached by providing a washing tank equipped with a rotor-supporting flange that can be fastened to the tank so that it may take two different positions, in one of them the axis of the rotor is coaxial with the axis of the tank and in the other the axis of the rotor is eccentric relative to the axis of the

tank for the use of hanging baskets.

Advantageously, in order to promote standardization, the machine in question provides for the hanging baskets to be supported by a frame swinging about a pivot carried by the rotating element or by a second rotating element supported by said swinging frame. In the last mentioned case the machine provides the use of a kinematic mechanism adapted to make the second rotating element rotate depending upon the movement of the main rotating element, so that the basket supported thereby rotates too and the products contained therein undergo a sort of mixing.

The invention is described in greater detail hereinafter with reference to the accompanying drawings showing some embodiments thereof by way of non-limiting examples.

In the drawings:

- Fig. 1 diagrammatically shows the overall dimensions that a washing tank provided with hanging baskets and rotating baskets respectively should have, which overall dimensions are defined by diameter ør;
- Fig. 2 is a diagrammatic rear view of the washing tank of a machine according to the present invention when the overall dimensions thereof are according to diameter øb in Fig. 1;
- Fig. 3 is a diagrammatic view, on an enlarged scale relative to Figs. 1 and 2, of the upper part of the machine shown in Fig. 2 in which some portions have been removed in order that others may be rendered more prominent and in which a basket of the swinging type is visible;
- Fig. 4 is a diagrammatic front view, to an enlarged

scale relative to Figs. 1 and 2 and different from Fig. 3, of the rotating element of the machine shown in Fig. 2 supporting two baskets only of different types, both hanging from the rotating element, where the basket shown on the right-hand side is of the rotating type;

- Fig. 5 is a diagrammatic view out of scale with respect to the other figures, of the upper part of the machine shown in Fig. 2 where some parts have been removed in order that others may be rendered more prominent and in which a basket of the rotating type is visible.

Referring to Figs. 2, 3, 4, the washing machine according to the present invention substantially consists of a washing tank 1 within which a rotating element or rotor 2 rotates, which rotor is provided with a number of arms 34 from the free ends of which as many supporting rods or pivots 3 lead off that are adapted to support a plurality of baskets 4-4a designed to contain the pieces to be washed. The washing tank 1 is provided, in the region of its charging mouth, with a structure 36 slidably supporting baskets 4-4a to be brought into the washing tank 1.

According to a solution of the present invention, the washing tank 1 is provided, in an eccentric position with respect to its axis 9, with an opening 10 (see Fig. 3) which can be closed by a flange 6 in turn provided with an eccentric hole adapted to be passed through (see Fig.2) by a hub 7 of the rotating element 2. For reasons to be clarified in the following the eccentricity E of opening 10 with respect to the axis of the washing tank 1 is identical with the eccentricity D of hole 11 to the axis

of flange 6 (see detail shown in Figs. 2 and 3). Flange 6 can take, relative to the washing tank 1, two different configurations rotated through 180° with respect to each other and corresponding the former to the maximum eccentricity (equal to E + D) of the hole 11 of flange 6 relative to the axis 9 of the washing tank 1 (see detail shown in Fig. 2 in full line and in Fig. 3), the latter corresponding to the coaxial relationship between said hole and axis (see detail shown in Fig. 2 in interrupted line).

Still according to a solution of the present invention, each rod 3 of the rotating element 2 supports a swinging frame 15 (see Figs. 3, 4 and 5).

Each frame 15 consists of two rocker arms 35 articulated to the respective rod 3 at a central point thereof and without any possibility of sliding. They are connected to each other by two parallel substantially L-shaped guides 16, integral to their free ends. A gear wheel 23 is keyed on rod 3 in the vicinity of the rocker arm 35 which is closer to the respective arm 34, for the purposes to be clarified in the following.

Guides 16 are disposed in faced relationship and they are capable of slidably supporting sliding elements 17 associated with the supporting structure 18 of the containing baskets 4.

Structure 18, in the case of hanging and non-rotating containing baskets 4 (see Figs. 3 and 4) consists of two channel sections engaged to the longitudinal side walls of the containing baskets 4. To said channel sections are

integral the stems 17a of rollers constituting said sliding elements 17 of basket 4 as well as one or more locking members 24 consisting for example of a spring pin 25a adapted to enter a corresponding hole in guides 16 (see Figs. 3, 4 and 5) in order to prevent basket 4 from sliding relative to guides 16 when the machine is running.

The containing baskets 4 are of the drawer type (see Figs. 3 and 4) and the channel sections 18 are integral thereto in the region of their upper edges. In this way, the weight of each containing basket 4 added to that of the pieces contained therein, generates a torque in the respective frame 15, which torque during the rotation of the rotating element 2 causes the same to rotate about the corresponding rod 3 so as to maintain the inclination of the containing basket 4 unchanged with respect to tank 1, said basket, for example, always having its bottom in a horizontal position.

In the case of containing baskets of the rotating type 4a (see Figs. 4 and 5), the supporting structure 18 thereof consists, according to the present invention, of a T-shaped element 19 from the ends of the horizontal arms of which sliding elements 17 similar to those already described with reference to baskets 4 lead off, at right angles to the plane of said T-shaped element 19. One end of a pivot 20 parallel to rod 3 is applied to the vertical arm 22 of the T-shaped element 19. A second rotating element or rotor 21 is fitted on pivot 20 which rotating element is provided with a number of arms 21a (three in the example shown in Fig. 4) from the free ends of which respective

supporting rods 26 lead off; they are parallel to pivot 20 and hold a containing basket 4a therebetween. The free ends of the supporting rods 26 are connected to each other by an annular element 37 so that the same are not allowed to diverge due to the weight of the containing basket 4a and of the pieces contained therein.

The second rotating element 21 is integral to pivot 20 and it can freely rotate about its axis and a toothed or runged structure 24 is associated therewith so that it meshes with a gear wheel 23 keyed on the respective rod 3 of the first rotating element 2.

Each of said rotating containing baskets 4a is preferably of cylindrical form and is open at one of its ends where a closing cover 27 si provided. At least two locking elements 28 and 29 are associated with cover 27; they may for example be latches engaged into a hole 30a of a reinforcing rim 30 provided on basket 4a and into a hole 26a of one of the supporting rods 26, respectively.

In this way basket 4a is engaged with rotor 21 both axially and rotatably and, by effect of the rotation of the main rotor 2 and of the gear wheel 23 meshing with the toothed structure 24, it is caused to rotate about its own axis at a speed which is directly dependent on the rotation speed of the main rotor 2 and on the ratio between the number of teeth of the gear wheel 23 and the number of teeth of the toothed structure 24. By the rotation of basket 4a it is possible to cause the items contained therein to be submitted to a sort of mixing, which is also promoted by a series of longitudinal ribs or raised

portions formed inside the baskets and against which said items temporarily bear during rotation of baskets 4a.

According to a possible solution offered by the machine of the present invention, the second rotating element or rotor 21 can be rigidly carried at the ends of arms 34 belonging to the first rotating element 2 if it is not wished to have baskets 4 or 4a supported in a hanging relationship while needing the baskets to rotate for the purpose of mixing the items contained therein.

In this case, after eliminating frames 15 it is possible to key the second rotor 21 on a pivot (which can be the same rod or pivot 3 carried by arms 34).

As basket 4a is locked by means of latches 28 and 29 as above specified, during the rotation of rotor 2 it is possible to have a corresponding rotation of basket 4a about the axis of said rotor which results in the items being mixed therein. In order to make the locking of basket 4a to the second rotor 21 easier, the bottom of said basket 4a can be provided with a number of housings 31 being each adapted to receive one of the arms 21a of the second rotor 21 in a restrained fixing relationship.

When baskets 4a are supported in this manner it is convenient that the axis of the first rotor 2 be coaxial with axis 9 of tank 1. In order to achieve this condition it is sufficient to rotate the flange 6 through 180° so as to eliminate the eccentricity given by the sum of E + D (see Fig. 2). In this way baskets 4a can be plunged into the same amount of solvent as in the case in which hanging

baskets 4 are used since the distance L existing in the previous case between the axis of the main rotor 2 and the solvent level is now reduced to a value of L1.

By the use of a machine structured in the way described above it is therefore possible to produce a single washing tank 1 having a reduced bulkiness, that is according to the diameter øb shown in Fig.1, which can be used either for hanging containing baskets 4 or for containing baskets 4a directly carried by the main rotor, all that being achieved by merely positioning flange 6 in the described ways.

The system adopted for the hanging support of baskets 4 and 4a is particularly interesting as regards the problem of standardization and the greater production and operation economy. In fact, through a single swinging frame 15 it is possible to use containing baskets both of the drawer type 4 and of the rotating type 4a either simultaneously or at different moments but anyway without modifying the washing tank.

The invention as conceived is suceptible of many modifications and variations. For example opening 10 in the washing tank 1 instead of being eccentric and closed by flange 6, could have bigger sizes relative to the ones shown and be coaxial with the axis 9 of the washing tank 1 and in this case two closing flanges would be provided in place of flange 6, one having a passage hole for hub 7 which is coaxial with axis 9 of the washing tank 1 and the second having a passage hole for hub 7 which is eccentric enough to allow hanging baskets such as 4 and 4a to be used.

According to another possible alternate embodiment, opening 10 could be coaxial with axis 9 of the washing tank 1 and could have sizes allowing it to be closed in two stages either by a flange adapted to support hub 7 coaxially to tank 1 or by a flange adapted to support hub 7 eccentrically as hereinbefore described for the use of hanging baskets.

All of the details can be replaced by technically equivalent elements.

C L A I M S

1. A machine to wash metal and non-metal pieces such as small items and metal components comprising a washing tank (1) inside which a rotating element or rotor (2) can rotate about a horizontal axis, said rotor being provided with at least a rod or pivot (2) connected in cantilevered fashion to said tank and adapted to support a basket (4, 4a) containing the pieces to be washed; said washing tank (1) having at least an opening at the front which can be temporarily sealingly closed, for charging and discharging baskets (4, 4a) and a second opening (10) at the rear which can be permanently sealingly closed by a flange supporting the rotor hub, characterized in that the second opening (10) is coaxial or eccentric in an upward direction with respect to the axis (9) of tank (1) in such a way that it always contains said axis in its section, and is closed by at least a flange (6) supporting the hub (7) of rotor (2) coaxially or eccentrically with respect to the axis of said flange (6), said flange being adapted to be fastened to tank (1) so as to have hub (7) of rotor (2) on the axis (9) of tank (1) or eccentric in an upward direction with respect to said axis.

2. A machine to wash metal and non-metal pieces according to claim 1, characterized in that said opening (10) that can be permanently sealingly closed by flange (6) supporting the rotor hub (7) is eccentric in an upward direction with respect to the axis (9) of the washing tank (1) and in that said flange (6) is provided with a hole (11) for the passage of the rotor hub (7) which is eccentric with respect to the axis of said flange (6) by an amount

corresponding to the eccentricity of said opening (10) with respect to the axis (9) of tank (1); said flange (6) being adapted to be fastened to tank (1) according to two permanent positions, in one of which the hub (7) or support for rotor (2) is eccentric with respect to the axis (9) of tank (1) and in the other said hub (7) is coaxial with the axis (9) of tank (1).

3. A machine to wash metal and non-metal pieces according to claim 1, characterized in that each rod (3) carried by the rotating element (2) is parallel to the axis of rotation (8) of said rotating element (2) and supports a frame (15) freely swinging about said rod and provided with supporting guides (16) for the basket (4, 4a).

4. A machine to wash metal and non-metal pieces according to claim 3, using baskets (4) of the drawer type, rotatably and slidably movable relative to the rotating element (2) without altering their position with respect to the washing tank (1), characterized in that each basket (4) is provided with a structure (18) engaging it with said swinging frame (15) and comprising, on both sides thereof (4), sliding means (17) adapted to come into engagement with guides (16) provided on frame (15) and locking means (25) adapted to be fitted into at least a housing exhibited by at least one of said guides (16) when the basket (4) is coupled to frame (15).

5. A machine to wash metal and non-metal pieces according to claim 3, preferably using cylindrical and closed baskets (4a), movable about said rotating element (2) by varying their inclination relative to the washing tank (1),

characterized in that, relative to each swinging frame (15), it comprises a support structure for the basket (4a) consisting of a second frame (19) provided with sliding means adapted to be engaged with the guides of the swinging frame (15) and with locking means (25) adapted to be fitted into at least a housing exhibited by at least one of said guides (16) when the second frame (19) is coupled to the swinging one (15); and a support element (20) of a second rotating element (21) provided with arms (21a) parallel to the rod (3) carried by the first rotating element (2) and angularly spaced apart from each other so that they may hold a basket (4a) therebetween; said second rotating element (21) being provided with a toothed or runged structure (24) meshing with a gear wheel (23) steadily keyed on rod (3) carried by the first rotating element (2).

6. A machine to wash metal and non-metal pieces according to claim 3, characterized in that each of said containing baskets (4a) is closed at the front by a cover (27) provided with at least a closing element (28, 29) elastically movable along diametrically opposed directions; one of said closing elements (28) engaging into a hole (30a) located on the circumferential reinforcing rim (30) of the respective containing basket (4) and the other (29) engaging into a hole (26a) located in one of said support rods (26) of the second rotating element (21).

7. A machine to wash metal and non-metal pieces according to claim 5, characterized in that the bottom of said containing basket (4) has a projecting rim provided with

housings (31) to accommodate said arms (21a) of the second rotating element (21).

8. A machine to wash metal and non-metal pieces according to claim 5, characterized in that each of said containing baskets (4a) has a number of ribs (38) inside it which are adapted to enhance the mixing of the pieces to be washed.

9. A machine to wash metal and non-metal pieces according to claim 1, characterized in that the second opening (10) is coaxial with the axis (9) of tank (1) and in that it is provided with two interchangeable flanges for the closure of said opening, one of them is adapted to support hub (7) of the rotating element (2) coaxially with the axis of tank (1) and the other is adapted to support said hub (7) eccentrically in an upward direction with respect to the axis (9) of tank (1).

10. A machine to wash metal and non-metal pieces according to claim 1, characterized in that said opening (10) of tank (1) is eccentric in an upward direction with respect to the axis (9) of tank (1), said axis being contained in the section of said opening (10), and in that it is provided with two interchangeable flanges for the closure of said opening (10), one of them is adapted to support hub (7) of rotor (2) coaxially with said opening and the other is adapted to support said hub (7) coaxially with the axis (9) of tank (1).

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FIG 4

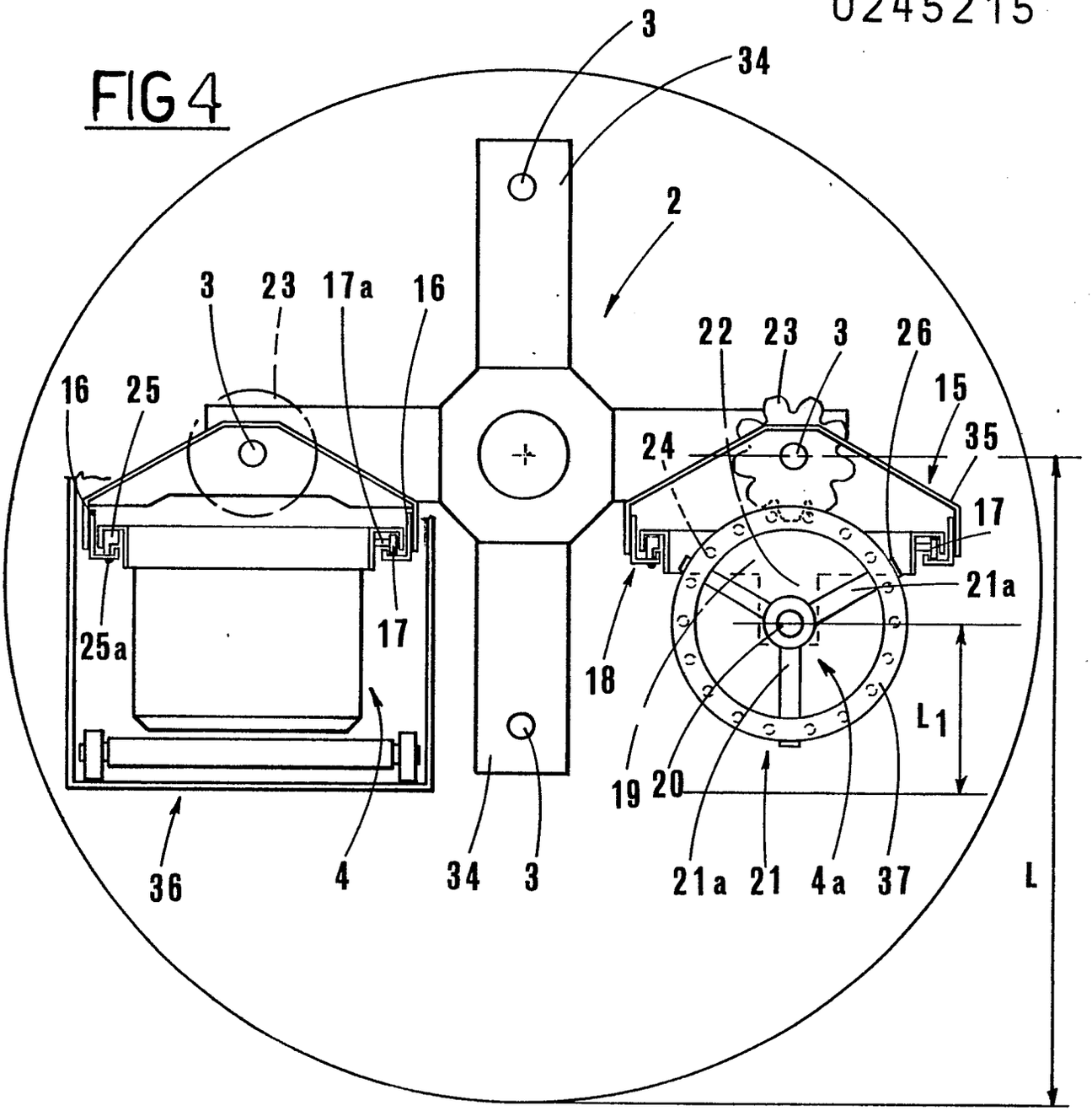

FIG 1

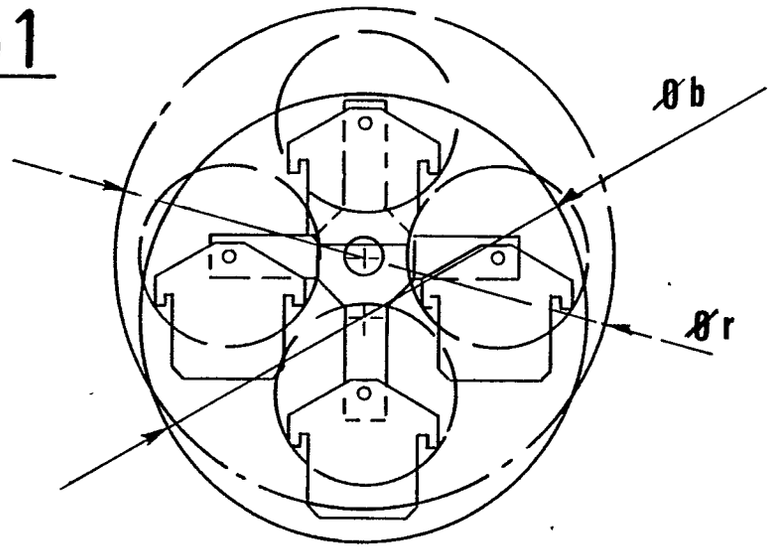

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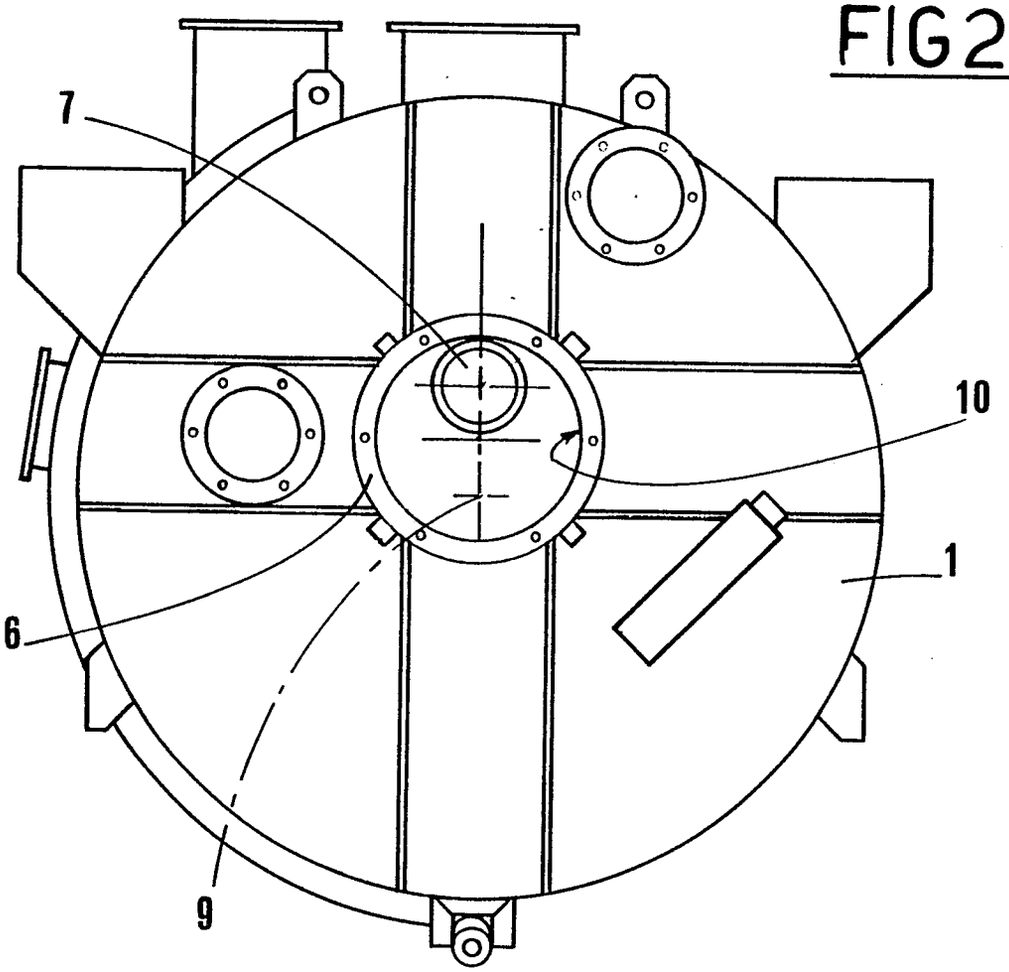
FIG2



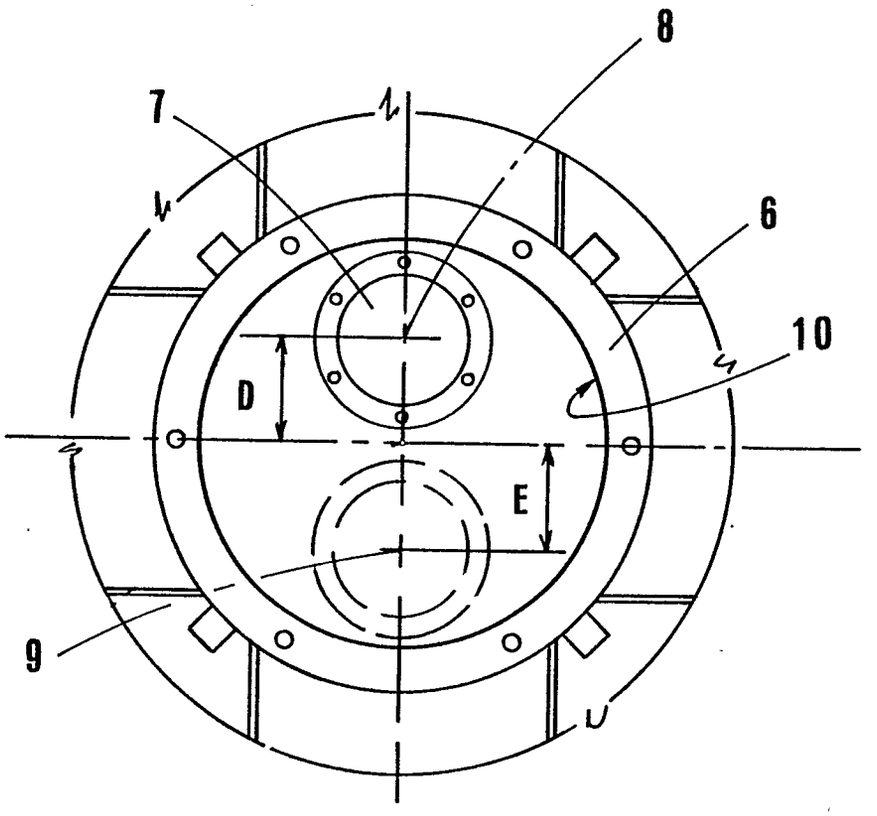


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FIG3

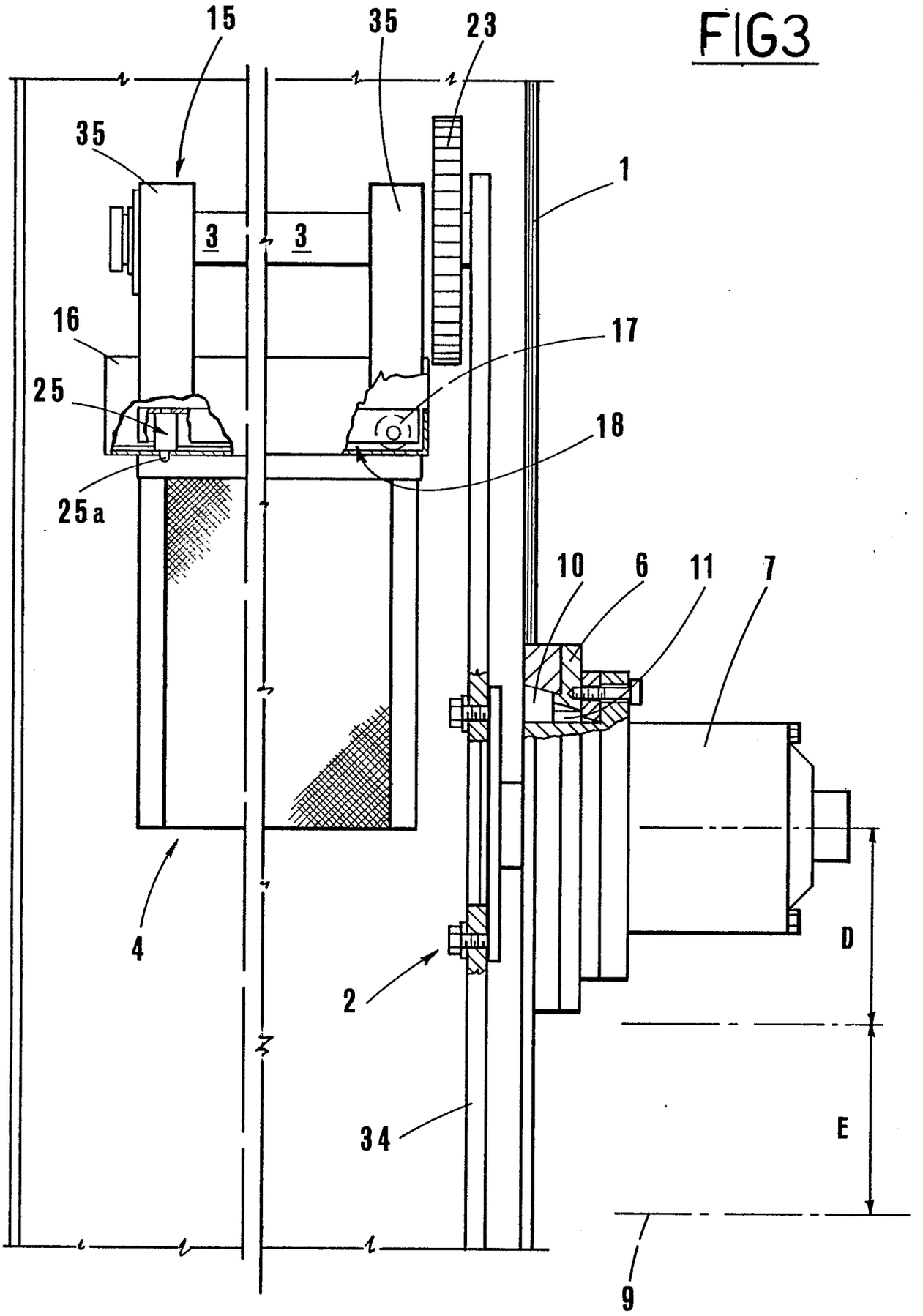

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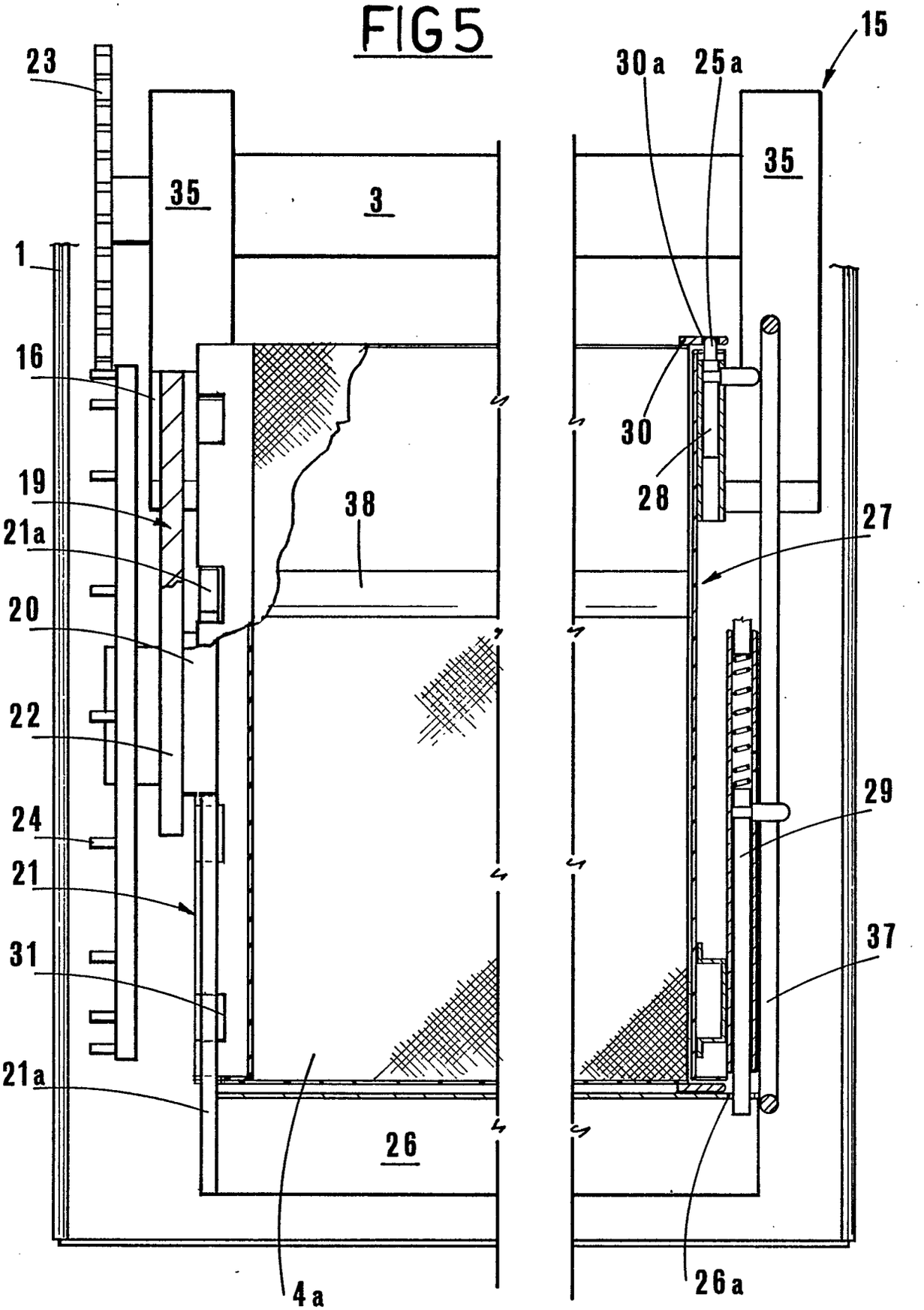
FIG5



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EUROPEAN SEARCH REPORT

0245215
Application number

EP 87 83 0135

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.4)
A	GB-A-2 113 719 (ZUCCHINI) * Page 3, figures 2,5 *	1	B 08 B 3/04 C 23 G 5/04
A	DE-C- 925 031 (EDHOFER) * Whole document *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 08 B
C 23 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-08-1987	VOLLERING J.P.G.

CATEGORY OF CITED DOCUMENTS

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