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(54) **Levelling machine and base structure hereby applied**

(57) Levelling machine, more particularly for levelling a floor layer (2), of the type whereby the levelling is performed by means of a rotating base structure (3),

characterized in that this base structure (3) comprises a support structure formed by a disc (7).

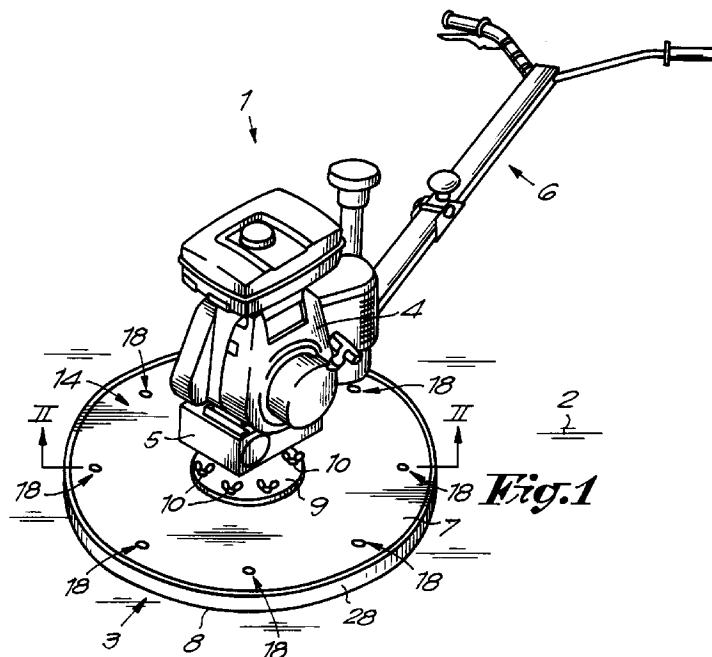


Fig.1

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Description

This invention relates to a levelling machine, particularly for levelling and/or for polishing a floor layer, as well as a base structure hereby applied.

In general, this levelling machine can be applied for the treatment of any floor layer which is made from a flattened quantity of material, for example concrete, floor plaster, and so on. In a particular application, this levelling machine can also be applied for levelling and/or polishing of top layers based on plastic material, for example epoxy mortier, which, as is known, can be applied upon a sublayer of concrete or the like. As known, different additives may be added to such top layers, either by mixing in or by sprinkling over, such as magnesium, quartz, little glass pearls and so on, whereby decorative effects are achieved which show to full advantage particularly after being treated with a levelling machine.

It is known that the material concerned is flattened over the floor in a liquid or paste-like condition. Subsequently one waits until the layer has become relatively hard, after which the treatment with the levelling machine is performed.

Depending on the type of the material, such levelling machine can also be applied in order to flatten newly applied raw material, for example a mixture of sand and concrete, which at that time is still lying completely unflat.

It is known that for this purpose there are existing levelling machines provided with a rotating base structure which is formed by three or four or more flattening blades which are attached on a spider-shaped part. Depending on the material to be processed, a polishing disc may be applied in place of using separate flattening blades, which disc will then be installed loosely under the spider-shaped part and the flattening blades and, during the rotation of the spider-shaped part, will be carried along by means of carrier elements, attached at the top side of the polishing disc, behind which elements the flattening elements are engaging. Such a levelling machine is, among others, described in the Belgian Patent Application No. 09500056 of the present applicant.

Although such a levelling machine, which is provided with a base structure with a spider-shaped part, works very efficiently, it shows a number of less advantageous characteristics.

For example, at the circumference of the base structure, a protection ring is necessary which has to prevent that the user of the machine might be touched by the flattening blades which are mounted at the ends of the spider-shaped part, and which simultaneously has to prevent that the flattening parts beat against the wall or other objects in the case that it is necessary to work alongside a wall or another object.

Such a protection ring complicates the construction considerably and makes it more expensive and furthermore offers very little protection because the danger remains that the user comes into contact with the rotat-

ing spider-shaped part via the upper side, through the protection ring.

Other protection means than a ring also complicate the construction, anyhow.

A spider-shaped part also has the disadvantage that it is composed of different constructive parts, which, as far as the price is concerned, has a relatively large influence upon the total price of the levelling machine.

The invention aims at providing a remedy for one or more of the aforementioned disadvantages. It also aims at a levelling machine which, according to a preferred form of embodiment, also in other points is more advantageous than the forms of embodiment known until now.

To this aim, the invention concerns a levelling machine, more particularly for levelling a floor layer, of the type whereby the levelling is performed by means of a rotating base structure, characterized in that this base structure comprises a support structure formed by a disc. Hereby, the "support structure" is understood as the structure serving as a support between the flattening surface and the driven shaft of the machine.

The use of a disc in place of a spider-shaped part makes the protection ring superfluous, because the edge of the disc takes over the protective function of the protection ring. Furthermore, along the top side a better protection is provided because the user can only come into contact with a rotating surface and thus cannot receive any beats from a rotating part. Simultaneously, a base structure is achieved which constructionally is considerably simpler than a spider-shaped part.

The disc which is functioning as support structure furthermore has the advantage that it can be carried out in a multifunctional manner, whereby is meant that it can, on option, be used as support structure for a flattening and/or polishing disc installed hereunder, or can be applied as such as a flattening and/or polishing element, whereby no separate second disc is necessary.

It is clear that the bottom side from the disc which functions as a support structure then is executed as levelling and/or polishing surface.

The disc functioning as support structure, according to the preferred form of embodiment, is manufactured in plastic, while the optionally flattening and/or polishing disc installed hereunder preferably consists of metal, for example steel sheet.

It is clear that the levelling machine according to the invention in its preferred form of embodiment also shows the following advantages:

- the application of a disc makes the levelling machine almost maintenance-free, because a smooth disc can be cleaned considerably easier than a spider-shaped part which, furthermore, is provided with attachment means for flattening blades, between which material from the floor layer can get stuck;
- the application of a disc consisting of plastic, moreover, has the advantages that the whole is even easier to clean because the adhesion of concrete

and such at plastic is less than at metal, that such disc in the long range is also easier to maintain than a metal construction, because oxidation is excluded, and that the weight of the base structure and thus of the levelling machine is considerably lower than in the case that a spider-shaped part made of steel is applied;

- if the plastic disc is directly applied as flattening and/or polishing element, the advantages appear that, in the contrary to the application of steel flattening and/or polishing elements, no liberation of pigments and/or colours occurs and that plastic in well-defined applications offers a better chemical resistance than metal;
- the application of a plastic disc also has economic advantages because plastic is easier to process, more particularly to cut than metal for example;
- the application of a support structure in form of a disc also has the advantage that a good anchoring between this disc and a polishing disc mounted hereunder can be realized and that optionally other elements than a polishing disc can be mounted under the support structure.

The invention of course also relates to the base structure itself, more particularly to the disc functioning as support structure, either in combination with e.g. a polishing disc mounted or mountable hereunder or not. Such base structure can, however, be sold separately and be mounted in exchange of the known embodiments upon existing machines.

In order to show better the characteristics of the invention, in the following, as example without any limitative character, a preferred form of embodiment is described with reference to the enclosed drawings, wherein:

figure 1 in perspective shows a levelling machine according to the invention;
 figure 2 on a larger scale shows a cross section according to line II-II in figure 1;
 figure 3 shows, in top view, the disc which is indicated by F3 in figure 2;
 figure 4 shows a cross section according to line IV-IV in figure 3;
 figures 5 and 6, on a larger scale, show the parts which are indicated by F5 and F6 in figure 2.

As shown in figure 1, the invention relates to a levelling machine 1, more particularly for levelling a floor layer 2, of the type whereby the levelling is performed by means of a rotating base structure 3.

Besides this base structure 3, the levelling machine 1 mainly consists of a motor 4, a reductor 5 and a control element 6 or such to move the machine over the floor layer 2 to be treated. The motor 4 can, as shown, be a thermic motor, for example a benzine motor, but can also be an electric motor which optionally is equipped with a frequency converter.

The levelling machine 1 rests with the base structure 3 upon the floor layer 3, whereby during working this base structure 3 rotates over the floor layer 2 in a horizontal plane.

The particularity of the invention consists in that the base structure 3 forms a support structure which is formed by a disc 7, which preferably has the shape of a circle and extends over the complete or almost complete working surface of the levelling machine 1.

As mentioned in the introduction, the disc 7 which functions as support structure, is preferably carried out in a multifunctional manner, which means that it, as shown in the figures 1 and 2, can be applied as support structure for a flattening and/or polishing disc 8 installed hereunder as well as it can be applied itself as flattening and/or polishing element, whereby the flattening and/or polishing disc 8 is not present at all.

The disc 7 which is shown in detail in the figures 3 and 4, preferably consists of plastic, with such a thickness, for example in the order of 20 mm, that it can perform the support function for which it is thought according to the invention. The flattening and/or polishing disc 8 preferably consists of metal, more particularly steel sheet with a minor thickness in order to limit weight.

The base structure 3 is preferably fixed via the disc 7 at a therefore provided machine flange 9, by means of a quick change attachment. As visible in the figures 1, 2 and 5, to this end screw connections 10, formed by bolts 11, extending through the disc 7 and the machine flange 9, and wing nuts 12 are applied, such that these wing nuts 12 are easy attainable along the top side of the base structure 3.

It is clear that other quick change attachments can be applied, too, such as for example bayonet connections.

The bolts 11 are preferably fixed at the disc 7 such that they remain at their place also during the removal of the base structure 3. To this end, as shown in detail in figure 5, locknuts 13 can be applied which are screwed upon the bolts 11 from the top side 14 of the disc 7 and which can, for example, take place in recesses 15 which are provided in the bottom side of the machine flange 9.

The bolts 11 are countersunk with their heads 16 into the bottom side 17 of the disc 7, due to which fact they do not form an obstacle for the installation of the flattening and/or polishing disc 8. In the case that the disc 7 shall also be applied as flattening and/or polishing element, thus without the flattening and/or polishing disc 8 being mounted, the bolts 11 are countersunk such that they become located at a distance D from the bottom side 17 in order to prevent that these bolts 11 leave traces in the floor layer 2, even after the disc 7 might have become somewhat thinner due to abrasion.

The base structure 3 is provided with fixation means which allow a preferably positive fixation between the disc 7 and the flattening and/or polishing disc 8. Hereby it is aimed at a fixed connection between the disc 8 and the disc 7 which offers the advantage that

the anchorage during transport is guaranteed. These fixation means consists in the shown example in screw connections 18 which are arranged along the circumference of the base structure 3. As shown in detail in figure 6, to this end screws 19 which are countersunk into the disc 7 can be applied which pass through the disc 7 from the top side and can be screwed into screw fittings 20 which are provided at the flattening and/or polishing disc 8. These screw fittings 20 consist in the shown example of nuts 21 which are provided at the top side of the flattening and/or polishing disc 8, which nuts 21 are welded onto the top side 23 by means of intermediate parts 22.

By application of countersunk screws 19 the appearance of protruding and dangerous parts at the top side 14 of the rotating disc 7 is excluded.

As shown in the figures 3 and 4, the disc 7 itself preferably consists only of a plate of mainly constant thickness, with a number of openings 24 and 25 provided herein, respectively for the bolts 11 and the screws 19.

Due to this the disc 7 is particularly simple to realize by means of simple cutting techniques or by means of an injection moulding process.

At its edge 26, the disc 7 is preferably provided with at least one rounding 27, which is important in the case that the disc 7 is applied as flattening and/or polishing element. By means of this rounding 27 is achieved that the levelling machine 1 becomes easier to steer, especially if a curve has to be made. Moreover, the generation of so-called grinding marks, which are circle-shaped traces produced by the base structure, is hereby excluded.

As indicated by the radius R1 in the enlargement of figure 6, the rounding 27 preferably is a circle-shaped rounding.

In order to enlarge the steering ease even more, in the case that the disc 7 is applied directly as a flattening and/or polishing element, the rounding 27 may optionally be preceded by another rounding with a larger radius.

In the case of the combined base structure 3, in other words, the combination of the discs 7 and 8, these latter are executed in such a way that they fit precisely into each other in order to obtain that the disc 7 exercises a centering effect onto the flattening and/or polishing disc 8.

In order to obtain that the discs 7 and 8 fit precisely into each other, the flattening and/or polishing disc 8 is provided with a standing, preferably vertical edge 28 fitting precisely around the disc 7. The fact that the standing edge 28 is vertical enables working very narrowly alongside a wall.

The flattening and/or polishing disc 8 is also provided with a rounding 29 which is preferably realized with a radius R2 of a circle, in order to avoid the so-called cutting.

According to a particular feature of the invention, the flattening and/or polishing disc 8 comprises a sup-

port plane 30 having, next to the outward circumference, at least one inclined transition part, and still better, as shown in figure 2, two transition parts 31 and 32 showing straight lines in cross section, which parts form different angles A and B with the horizontal plane. The central part 33 in between these is preferably flat and extends perpendicular onto the rotation shaft 34.

The transition part 31 serves for the prevention of the so-called cutting of the disc into the floor layer 2 and also offers the property that the material of the floor layer or, optionally, material to be polished into the floor layer 2, is easily drawn under the disc 8 and processed.

The transition part 32 which extends under a smaller angle than the transition part 31 allows for the levelling machine 1 to turn into one or other direction simply by tipping, by exerting a suitable pressure onto the handle 6, without running the risk that the levelling machine eventually may gyrate away.

The angles A and B are, for example, of the order of 5 and 3 degrees, respectively.

The radial length L1 of the transition part 31 is preferably considerably smaller than the radial length L2 of the transition part 32.

The length L2 is preferably 1,5 up to 2,5 as large as L1. The radial length L3 of the central part is preferably equal to 0,5 up to 0,7 times the total length L4 of the radius of the base structure 3.

The transitions between the inclinations are gradual. The transition parts 31 and 32 may also consist of curved planes.

Attention is drawn to the fact that, according to the invention, the aforementioned disc 7 might also be provided with similar transition parts.

The operation of the levelling machine 1 can easily be deducted from the figures and the foregoing description. By starting the motor 4 and switching on the rotative movement of the base structure, the flattening and/or polishing disc 8 or, in case this is not present, the disc 7 effects a levelling and/or polishing function on the floor layer 2.

It is clear that the device, which is described by means of the figures, provides all advantages compiled in the introduction.

The present invention is in no way limited to the form of embodiment described as example and represented in the figures, on the contrary can such levelling machine and base structure be realized in various forms and dimensions without leaving the scope of the invention.

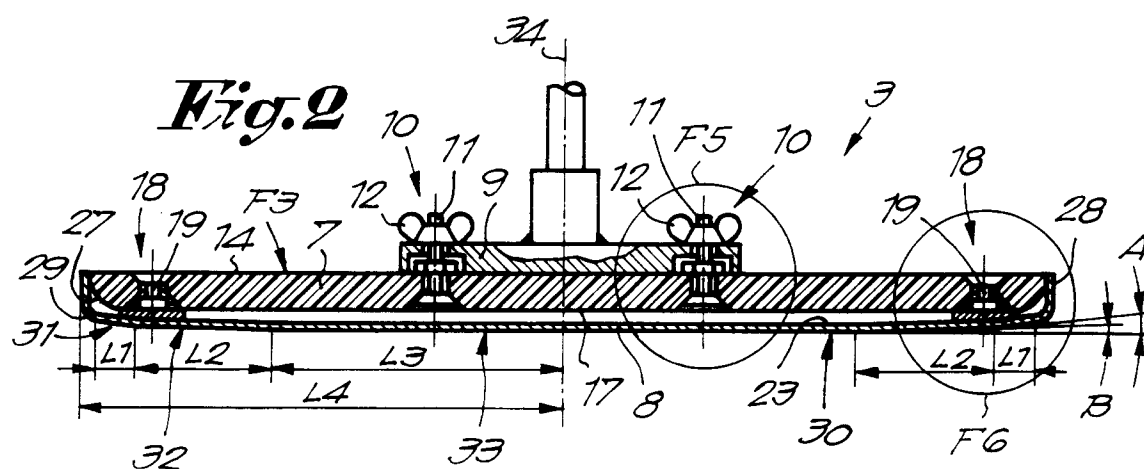
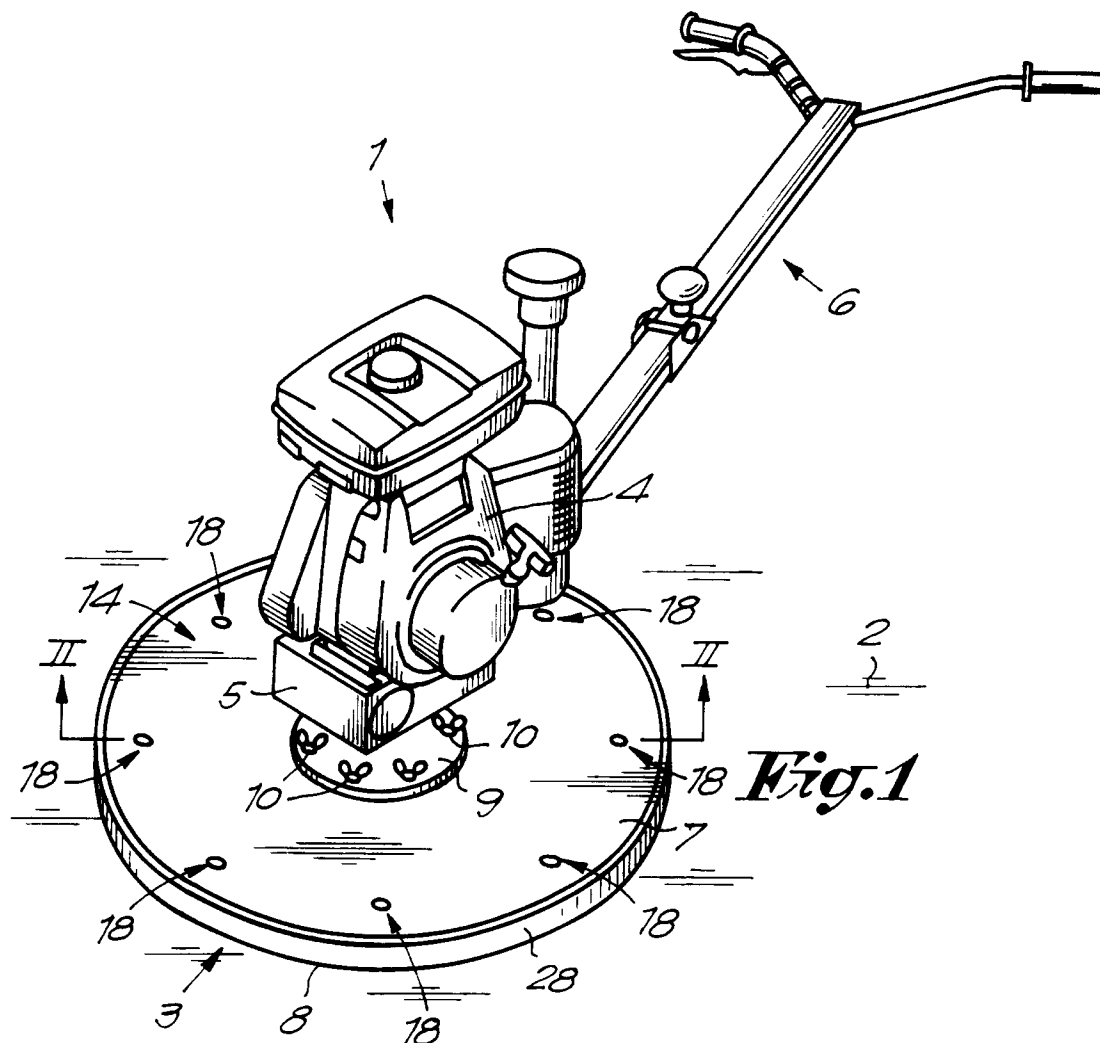
The base structure 3, for example, can also consist exclusively in a disc 7 having no provisions, such as openings 25, for the attachment of an underlying disc 8. It is also not excluded to fix the discs 7 and 8 to each other by means of a permanent connection.

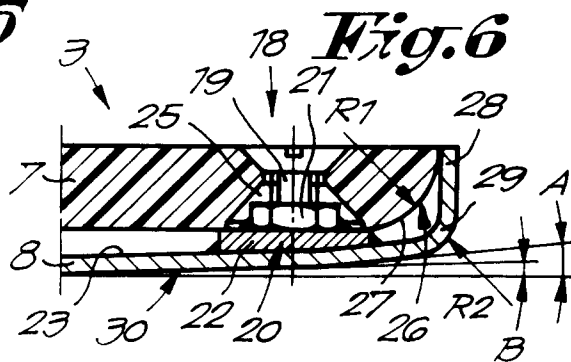
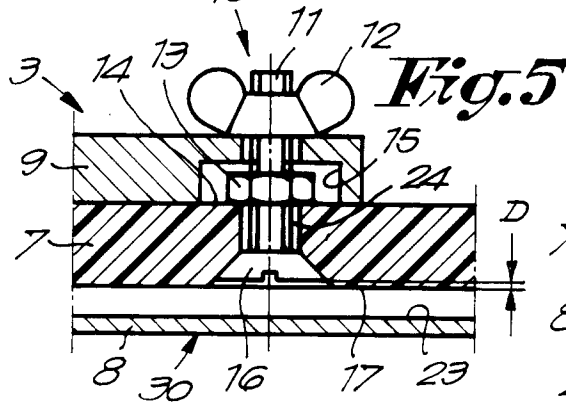
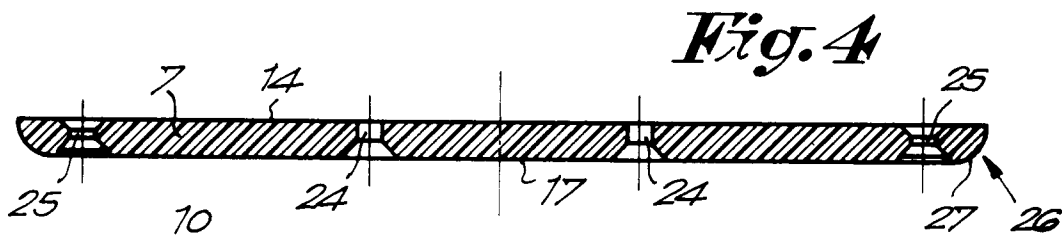
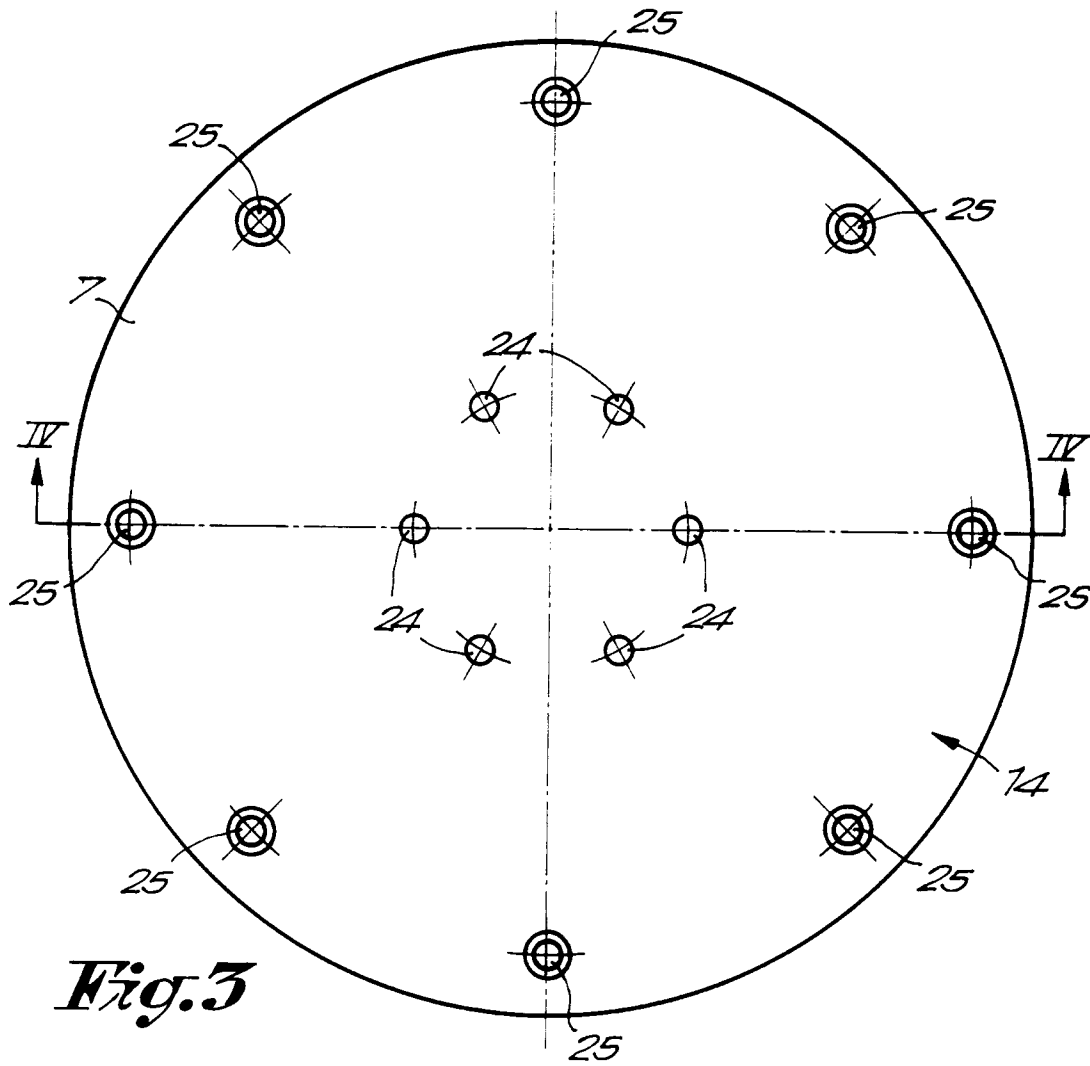
The aforementioned disc 7 can also consist of another material than plastic, such as wood or an aluminium alloy, whereby in that case a number of advantages will expire, which, of course, must not be a

disadvantage if one wants to achieve a particular application.

Claims

1. Levelling machine, more particularly for levelling a floor layer (2), of the type whereby the levelling is performed by means of a rotating base structure (3), characterized in that this base structure (3) comprises a support structure formed by a disc (7). 5
2. Levelling machine according to claim 1, characterized in that the disc (2) extends over the complete or almost complete working surface of the levelling machine (1). 10
3. Levelling machine according to claim 1 or 2, characterized in that the disc (7) consists of plastic. 15
4. Levelling machine according to one of the previous claims, characterized in that the bottom side (17) of the disc (7) is carried out as a levelling and/or polishing surface. 20
5. Levelling machine according to one of the previous claims, characterized in that the above-mentioned disc (7) is multifunctional, more particularly, that it is carried out in such a way that it provides at option for the possibility of either applying the disc (7) directly for levelling and/or polishing or applying the disc (7) as support structure for a flattening and/or polishing disc (8) mounted hereunder. 25
6. Levelling machine according to claims 4 or 5, characterized in that the disc (7) is provided with a quick change attachment with which it can be attached to a machine flange (9); that this quick change attachment uses bolt connections with bolts (11) which are passed through the disc (7) via the bottom side (17); and that the bolts (11) are countersunk into the disc (7) in such a way, that they become located at a distance (D) from the bottom side (17). 30
7. Levelling machine according to one of the previous claims, characterized in that the disc (7) is provided with a quick change attachment with which it can be attached to a machine flange (9) and that this attachment uses screw connections with bolts (11) and wing nuts (12). 35
8. Levelling machine according to one of the previous claims, characterized in that the base structure (3) consists in the combination of the above-mentioned disc (7) with a flattening and/or polishing disc (8) consisting of a thin metal plate. 40
9. Levelling machine according to claim 5 or 8, characterized in that the base structure (3) is provided with attachment means providing a positive attachment between the disc (7) and the flattening and/or polishing disc (8), which consist of screw connections (18) being arranged along the circumference of the base structure (3). 45
10. Levelling machine according to one of the claims 5, 8 or 9, characterized in that the disc (7), which functions as a support structure, and the flattening and/or polishing disc (8) fit exactly into each other. 50
11. Levelling machine according to claim 10, characterized in that the flattening and/or polishing disc (8) is provided with a standing vertical edge (28) fitting precisely around the disc (7). 55
12. Levelling machine according to one of the claims 5, 8, 9, 10 or 11, characterized in that the bottom side of the flattening and/or polishing disc (8) is showing a form having one or a combination of two or more of the following features:
 - a rounding (29) along the circumference;
 - at least one inclined transition part (31-32) at the outer circumference of the support surface (30);
 - two inclined transition parts (31-32) at the outer circumference of the support surface (30) which form different angles (A-B) with the horizontal plane;
 - two inclined transition parts (31-32) at the outer circumference of the support part (30), the innermost transition part (32) of which extends over a longer radial distance (L2) than the outermost transition part (31);
 - two inclined transition parts (31-32) at the outer circumference of the support surface (30) which form angles with the horizontal plane being of the order of 3 and 5 grades respectively.
13. Base structure for a levelling machine, characterized in that it shows one or more of the features of the base structure (3) described in the previous claims.
14. Base structure according to claim 13, characterized in that the disc (7) applied hereby consists only of a plate of constant thickness with a number of openings (24-25) arranged herein, respectively for the attachment under the levelling machine (1) and for the attachment of a flattening and/or polishing disc (8).
15. Base structure according to claim 14, characterized in that the disc (7) is provided with a rounding (27) at its edge (26), optionally preceded by another rounding with a larger radius.







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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 0218

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.6)
X	DE-U-90 10 799 (SICOTAN GMBH & CO KG) * claims 1-4; figure 1 * ---	1-14	E04F21/24
X	DE-C-556 874 (METALLOCHEMISCHE FABRIK AKT.- GES.) * the whole document * ---	1-4, 6-10,14	
X	FR-A-2 553 332 (GIACOMEL ET AL.) * claims 1-3; figures 1-6 * ---	1-4,6,7, 12,15	
X	FR-A-1 100 897 (M. JOANNY GARNIER) * the whole document * ---	1-4	
A	BE-A-821 515 (MARCEL CREUTZ ET AL.) * the whole document * ---	1	
A	FR-A-2 389 731 (DYNAPAC MASKIN AKTIEBOLAG) * claim 1; figures 1,2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
BERLIN		15 July 1996	Cuny, J-M
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