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(54) **REINFORCING MESH FOR ABRASIVE WHEELS AND RELATED ABRASIVE WHEEL**

(57) A reinforcing mesh for abrasive wheels comprising:
- a fabric or nonwoven fabric made of fibres; and
- at least one recognition element made of conductive material adhering to the fibre fabric.

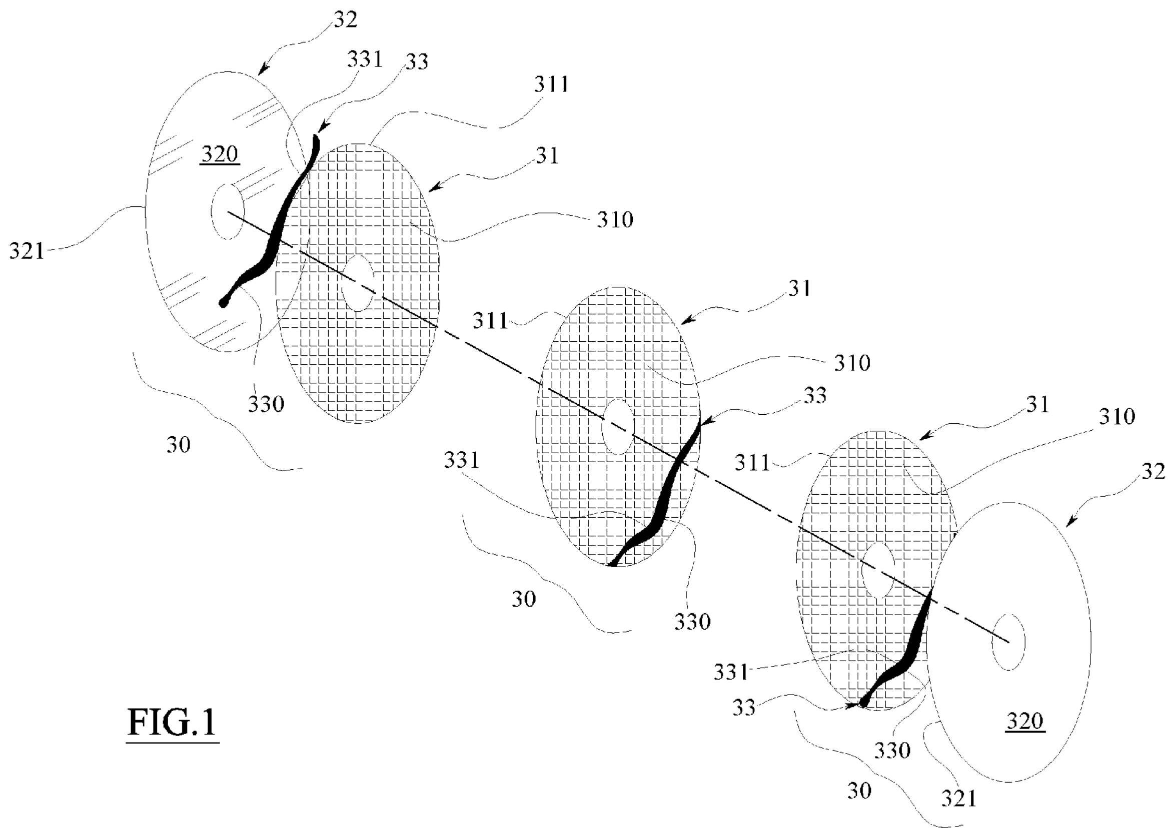

FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a reinforcing mesh for abrasive wheels, an abrasive wheel, for example with depressed centre or flat, for grinding or cutting, a process for manufacturing a reinforcing mesh, a method for producing an abrasive wheel and a procedure for controlling the production of abrasive wheels.

PRIOR ART

[0002] Abrasive wheels of the discoidal type with depressed centre or the flat type, conical, semi-flexible or rigid are known, used particularly on electric, compressed-air or more rarely hydraulic portable grinders of the high-speed type (60-100 m/s peripheral speed), also known as grinding machines, to perform dressing and/or cutting operations. Such abrasive wheels are essentially constituted by an abrasive mix reinforced by reinforcements constituted by one or more fabric meshes, by one or two metallic annular elements, commonly known as washers or ring nuts, which delimit the hole for fixing the wheel to the shaft of the grinding machine, and by an optional label made of paper or other applied material commonly used, which adheres to one of the two faces of the wheel (usually to the convex one).

[0003] The abrasive mix is constituted generally by grains of abrasive material (light green, dark green, black silicon carbide; corundum, zirconium-modified, semi-friable, red-brown, white, pink, ruby, ceramic-coated, silanized, monocrystalline corundum; sol-gel or sintered ceramic abrasives or others) having a predefined particle size (normally measured in meshes) which are mixed with resins, for example phenolic, liquid and/or powdered resins, and possibly modified with epoxy and/or other resins, modified with organic and/or vegetable or synthetic compounds, and other types of polyamide resins etc., and with additives and fillers.

[0004] According to the percentage of resin in the mix, the hardness of the abrasive wheel is defined, in particular the higher the percentage by weight over the weight of the abrasive of the resin, the greater the hardness of the abrasive wheel.

[0005] The reinforcement meshes are normally woven with filaments made of glass fibres, but other types of fibres, both natural and also of more advanced types might also be used, such as carbon, Kevlar or others; meshes woven on looms with a height in the order of 1.5 meters are immersed in a solution of liquid resins and solvents, wrung between pairs of rollers and dried in appropriate furnaces inside which the resin dries without polymerizing (polymerization being completed subsequently together with the curing of the wheel in dedicated polymerization furnaces).

[0006] The discs of mesh required to reinforce the wheels are obtained by die-cutting or other cutting methods from the mesh fabric thus impregnated with resin and dried. According to other methods for fabricating abrasive wheels, reinforcing meshes are used in rolls with techniques for lamination and coupling to the abrasive mix through roller conveyors; in other applications, they can be die-cut in square or differently shaped plates used to compose plates with sandwiches of abrasive mix and reinforcing meshes which are then die-cut to obtain the final abrasive wheels.

[0007] The meshes may optionally be pre-glued to a sheet of paper or polymeric material of low thickness and also to the labels.

[0008] The labels are made of paper or other synthetic material and normally are annular (however, they can have any other shape) and can occupy either the entire face of the wheel or a limited area of the face to which they adhere and bear the identification and informational data of the wheel.

[0009] Reinforcing meshes are arranged, preferentially, so that a first reinforcing mesh is substantially at the rear face (or back) of the abrasive wheel and a second reinforcing wheel is at the opposite front face.

[0010] Moreover, for example in particular for grinding will, there are also one or more reinforcing meshes interposed between the first and the second reinforcing mesh, within the thickness of the abrasive wheel. Lastly, there are also wheels without reinforcing meshes (for low rotation rates) and others provided with a single reinforcing meshes positioned at the centre of the abrasive wheel itself.

[0011] In most cases, abrasive wheels are produced by pressing inside moulds comprising a ring in which an open-top forming cavity is housed, known as female, and a complementary punch, known as male.

[0012] The abrasive wheel (green) pressed and formed is then subjected to slow heating to a growing temperature from 80 °C to 125 °C; under such conditions the resins of the abrasive mix and those that impregnate the reinforcement mesh(es) become fluid, "melting" together and "co-penetrating", so that the abrasive mix adheres to the mesh(es) together with which it creates a single block provided with very high mechanical resistance.

[0013] The subsequent heating to 170 - 200 °C (but also lower temperatures) determines the irreversible polymerization process of the resin.

[0014] A pressing need in the sector is to have absolute certainty that the reinforcing meshes, especially the first and the second reinforcing mesh, are always present in the abrasive wheel and that their presence is assured, because such reinforcing meshes have the important task of preserving the integrity of the abrasive wheel and assuring its safety in operation.

[0015] Therefore, both manufacturers and distributors and/or users have the need to detect and assure the correct presence of all reinforcing meshes which the abrasive wheel is to contain in accordance with its design, for example having available an automatic, safe, fast, reliable and economical check that makes it possible to identify any anomalies - i.e. the absence of the prescribed reinforcing meshes - with the possibility of preventing the marketing and the use of potentially dangerous abrasive wheels which, erroneously, lack one or more of said reinforcing meshes. Normally, such an inspection is carried out visually by trained personnel and it is possible only for meshes positioned on the surface of the wheel, while there is no certainty as to the correct presence of the intermediate meshes. Obviously, the cost of checks carried out by people is considerable and the quality of the check is relatively low because after viewing a few hundreds of pieces personnel can easily make mistakes and not notice wheels lacking reinforcing meshes because of the monotony of the process, allowing unsafe wheels to enter the market.

[0016] An object of the present invention is to solve the aforesaid needs and the intrinsic limits of the prior art, with a simple, rational and low-cost solution.

[0017] Such purposes are fully accomplished by the characteristics of the invention given in the independent claims. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

DISCLOSURE OF THE INVENTION

[0018] In particular, the invention makes available a reinforcing mesh for abrasive wheels comprising:

- a fabric (or nonwoven fabric) made of fibres; and
- at least one recognition element made of conductive material (for example electrically conductive) adhered to the fibre fabric.

[0019] Thanks to the particular properties of conductive materials, this solution makes it possible to satisfy the aforesaid needs of the prior art in a precise, rational, economical and functional manner.

[0020] In particular, thanks to the recognition element, the certain, repeatable, economical, safe and automated identification of each reinforcing mesh is made possible, for example when the mesh is incorporated in an abrasive mix of an abrasive wheel or otherwise in every productive step of an abrasive wheel.

[0021] According to an aspect of the invention, the recognition element can comprise a conductive strip elongated along a longitudinal axis, and provided with a transverse width with respect to the prevalent longitudinal axis with respect to a thickness thereof. The longitudinal axis of the strip can be curvilinear or straight or have any desired shape.

[0022] Thanks to this solution, it is possible to identify the recognition element easily and with certainty by means of a simple and economical sensor, for example an inductive sensor (also known as micro in the Italian technical jargon).

[0023] Advantageously, the flexural strength of the recognition element can be lower than or equal to the flexural strength of the fibre fabric.

[0024] Thanks to this solution, the addition to the reinforcing mesh of the recognition element does not substantially change the rigidity of the reinforcing mesh, which - then - can be adapted, like traditional reinforcing meshes, to the shape of the mould, without negatively interfering with the process of formation of an abrasive wheel.

[0025] According to an aspect of the invention, the conductive material can be selected in the group, preferably but not exclusively, between aluminium, copper, zinc, tin, lead, iron or alloys thereof as well as carbon fibre (or a conductive composite material) nickel, tungsten, magnesium, lithium, chromium and carbon or other elements of the metals group in the periodic table of the elements.

[0026] Advantageously, the reinforcing mesh can also comprise a sheet, for example made of a polymeric material or of a paper material, which can be provided with a face adhering to a face of the fibre fabric.

[0027] Advantageously, the recognition element can preferably be interposed between the face of the fibre fabric and the face of the sheet.

[0028] Thanks to this solution, the production of the reinforcing mesh can be facilitated and automated.

[0029] According to an aspect of the invention, the thickness of the recognition element can be smaller than or equal to the (maximum) thickness of the fibre fabric and/or of the sheet. Moreover, the width of the recognition element is sufficiently ample to be identified by a sensor, for example an inductive sensor.

[0030] Thanks to this solution, the introduction of the recognition element in the reinforcing mesh does not significantly change the thickness and the functionality of the fibre fabric and/or of the sheet and, hence, of the reinforcing mesh as a whole.

[0031] Preferably, the reinforcing mesh can comprise a plurality of recognition elements distributed (in a uniform or random or other manner) on one or both of the faces of the fibre fabric or otherwise fixed thereto.

[0032] According to a further (alternative or additional) aspect, the recognition element can be obtained by deposition, on the fibre fabric, of at least one conductive powder, preferably along a strip elongated along a longitudinal axis, and provided with a transverse width with respect to the prevalent longitudinal axis with respect to a thickness thereof. Advantageously, moreover, the recognition element can be plastically (and not elastically) deformable.

[0033] An additional aspect of the invention makes available an abrasive wheel comprising:

- an abrasive mix; and
- at least one reinforcing mesh, as described above, in which the reinforcing mesh is at least partially incorporated inside the abrasive mix and that, as stated, is provided with a recognition element.

[0034] Thanks to this solution, the technical problems expressed in the preamble are solved with an advantageous, easily implemented, safe and controllable solution.

[0035] An additional aspect of the invention makes available a process for manufacturing a reinforcing mesh comprising the steps of:

- producing a fabric made of fibres; and
- making the recognition element made of conductive material adhere to the fibre fabric.

[0036] Advantageously, the process may additionally (but not necessarily) comprise the step of die-cutting the fibre fabric with the recognition element adhered thereto, making a disc of reinforcing mesh provided with at least one portion of element made of conductive material adhered thereto.

[0037] Moreover, an additional aspect of the invention makes available a method for producing an abrasive wheel comprising the steps of:

- making a reinforcing mesh with the process described above; and
- at least partially incorporating a portion of reinforcing mesh within an abrasive mix;
- pressing the abrasive mix and the reinforcing mesh incorporated therein; and
- heat treating the abrasive mix and the incorporated therein reinforcing mesh previously pressed.

[0038] An additional aspect of the invention makes available a procedure for checking abrasive wheels comprising the steps of:

- producing an abrasive wheel with the method set forth above; and
- determining the presence of the reinforcing mesh incorporated therein by means of the detection, by a sensor, of the recognition element adhered to the reinforcing mesh.

[0039] The sensor, as stated, can be any sensor adapted to detect the presence of the recognition element positioned (inside) the abrasive wheel (or incorporated inside the abrasive mix that constitutes it).

[0040] For example, the sensor can work in various ways, the simplest of which the inductive type, which detects the magnetic field changes induced on the conductive material of which the recognition element is made.

[0041] Other sensors and detection methods can provide for detecting the presence of the recognition element by means of thermal vision (thermal camera), having previously subjected the abrasive wheel to a high frequency variable magnetic field that raised the temperature of the conductive parts only (induction heating), or of the recognition element only. As is well known, the conductive materials are heated by induction heating, hence from the detection of the area that became (more) heated, the presence (or absence) of the recognition element is detected (and hence the presence or absence of the related reinforcing mesh is determined) not only if it is in proximity to the surface, i.e. to one face, of the abrasive wheel but also it if is inside it; this is because the propagation of heat towards the surface of the abrasive wheel as a result of the heating of the conductive recognition element.

[0042] Other sensors and detection methods can provide for the use of (a myriad of) needles that feel a face of the abrasive wheel and when some of them comes in contact with the recognition element made of conductive material allow electrical current to flow along it and, hence, electrical current at the ends of the needles to be measured. From the measured electrical current, the presence (or absence) of the recognition element is detected (and hence the presence or absence of the related reinforcing mesh is determined). Other sensors and detection methods can provide for the use of an X-ray sensor, which generates an image of the abrasive wheel traversed by X-rays (commonly called radiography), which allows to identify - at each recognition element of conductive material (especially if made of metal) - contrast areas (for example dark) with respect to the rest of the abrasive wheel. From the identified contrast area, then, the presence of the recognition element is detected (and hence the presence of the related reinforcing mesh is determined).

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] Further features and advantages of the invention will be more apparent after reading the following description provided by way of a non-limiting example, with the aid of the accompanying drawings.

Figure 1 is an exploded view of three embodiments of reinforcing mesh according to the invention, in a possible installation configuration inside an abrasive wheel.

Figure 2 is an axonometric view of an abrasive wheel according to the invention.

Figure 3 is a section view along a section plan containing the axis of rotation of the abrasive wheel of figure 2.

Figure 4 is a section view of a mould for forming abrasive wheels.

Figures 4a-4e are schematic views of a sequence of forming an abrasive wheel, according to the invention.

Figure 5 is a flowchart of a method for producing an abrasive wheel, according to the invention.

Figure 6 is a flowchart of a process for manufacturing a reinforcing mesh, according to the invention.

Figure 7 is a flowchart of a procedure for checking abrasive wheels, according to the invention.

BEST MODE TO CARRY OUT THE INVENTION

[0044] With particular reference to such figures, 10 indicates overall an abrasive wheel, for cutting and/or grinding.

[0045] The abrasive wheel 10 comprises an annular body 20, provided with a central axis, which annular body 20 is for example substantially flat (see figures 2-3) or with depressed centre (not shown).

[0046] The annular body 20 is substantially circular and is provided with a central attachment hole 21 coaxial to the annular body 20.

[0047] The attachment hole 21 can be associated, substantially coaxially, with the free end of a rotary shaft of a grinding machine (or grinder) or cutting machine, not shown as it is of a known type.

[0048] The annular body 20 comprises two contrasting faces 22 and 23, one of which being a front face 22 and a contrasting rear face 23.

[0049] In one embodiment, shown in the figures, the faces 22 and 23 are overall parallel to each other and orthogonal to the central axis of the abrasive wheel 20.

[0050] In an alternative embodiment, the faces 22 and 23 can be overall inclined to each other, e.g. they are substantially conical or with contrasting conical shape e.g. converging towards the centre of the annular body 20 (wheels known as biconical, used to reduce friction on the flanks during the cut).

[0051] In general, the front face 22 is turned towards the free end of the rotary shaft of the grinding machine, when the abrasive wheel 20 is fixed to the rotary shaft itself (i.e. the attachment hole 21 is fitted onto it), and the rear face 23 faces the grinding machine.

[0052] In abrasive wheels with a depressed centre, in particular, the front face 22 is substantially concave (or has at least one concave central portion) and the rear face 23 is substantially convex (or has at least one convex central portion).

[0053] The annular body 20 has a substantially layered structure and has at least one or more layers of abrasive mix 24.

[0054] Each layer of abrasive mix 24 (once pressed and fired) defines a substantially monolithic body.

[0055] For example, each layer of abrasive mix 24 is made of a mix of abrasive powders that is compacted and firmly bound to a binding resin.

[0056] In practice, the layer of abrasive mix 24 is obtained through pressing a mix of granules of abrasive material, e.g. natural corundum, sand, recovered artificial corundum or the like, sol-gel abrasives or sintered ceramics, zirconium corundum, or the like, and mixed with an appropriate binder, e.g. based on binding resins, for example phenolic, liquid and/or powdered resins, and possibly modified with epoxy, phenoxy and/or other resins, modified with organic and/or vegetable or synthetic compounds, and other types of polyamide resins etc., and/or with additives and fillers.

[0057] For example, the quantity of resin is comprised between 8% and 40% by weight with respect to the weight of the abrasive material powder mix.

[0058] The abrasive material of the layer of abrasive mix 24 has particle size substantially comprised between 8 and 180 in mesh (however, the use of abrasive mixes with a larger or smaller particle size than the range, according to requirements, is not excluded).

[0059] The annular body 20 comprises one or more reinforcing meshes, globally indicated with the numeral 30, each substantially incorporated or at least partially incorporated in a layer of abrasive mix or interposed between them.

[0060] In practice, each layer of abrasive mix 24 (or the layers of abrasive mix) surround(s), in particular axially, the entire surface (upper and/or lower) of each reinforcing mesh 30, or at least a (significant) portion thereof.

[0061] Furthermore, a layer of abrasive mix 24 can also incorporate more than one reinforcing mesh 30.

[0062] Each reinforcing mesh 30 is shaped as a mesh disc obtained by die-cutting a larger mesh sheet or from a reel of mesh, as will be better described below.

[0063] In practice, each reinforcing mesh 30 has discoid shape provided with a central hole and it preferentially has an outer diameter substantially equal to (or slightly smaller than) the outer diameter of the annular body 20 and an inner diameter substantially equal to (or slightly smaller than) the diameter of the attachment hole 21. In some cases, the reinforcing mesh 30 can also have an outer diameter substantially smaller than the outer diameter of the abrasive wheel 10 in which it is used.

[0064] Each reinforcing mesh 30 comprises a layer of fibre fabric 31, i.e. a fabric (or nonwoven fabric) made with fibre yarns, preferably made of glass fibre, but other types of fibres could also be used such as carbon fibres, Kevlar fibres or fibres of other materials.

[0065] The layer of fibre fabric 31 comprises a pair of opposite faces, of which a first face 310, for example intended to be oriented towards the front face 22 of the annular body 20, and an opposite second face 311, for example intended to be oriented towards the rear face 23 of the annular body 20.

[0066] At least one reinforcing mesh 30 may comprise a sheet 32 (thin), permeable/holed or non-permeable/non-holed, which in turn comprises a first face 320, for example intended to be oriented towards the front face 22 of the annular body 20, and an opposite second face 321, for example intended to be oriented towards the rear face 23 of the annular body 20.

[0067] The sheet 32 has a thin thickness, preferably smaller than the thickness of the layer of fibre fabric 31.

[0068] Moreover, the sheet 32 has a smaller rigidity or flexural strength than the rigidity or flexural strength of the layer of fibre fabric 31.

[0069] Each sheet 32 is fixed, or made adherent, to a respective layer of the fibre fabric 31.

[0070] In particular, at least one between the first face 320 and the second face 321 of the sheet 32 adheres to (and is in contact with) at least one between the first face 310 and the second face 311 of the layer of fibre fabric 31.

[0071] The adhesion between the first face 320 or second face 321 of the sheet 32 with the first face 311 or second face 312 of the layer of fibre fabric 31 can be obtained by gluing, as will be better described below, e.g. by means of an appropriate glue (or resin).

[0072] For example, in a first embodiment, the sheet 32 can be made of a polymeric material, for example polyethylene, polypropylene, pvc, nylon, etc...

[0073] Preferably, the reinforcing mesh 30 proximal to the rear face 23 (or back mesh) of the annular body 20 has the sheet 32 made of polymeric material.

[0074] The sheet 32, for example, can also be made of fabric with disperse fibres, i.e. nonwoven (known as nonwoven fabric), which can be for example obtained both with synthetic and natural fibres.

[0075] Moreover, the reinforcing mesh 30 proximal to the rear face 23 (or back mesh) of the annular body 20 has the sheet 32 with its first face 320 adhering to and in contact with the second face 311 of a respective layer of mesh fabric 31.

[0076] In this case, the reinforcing mesh 30 proximal to the rear face 23 (or back mesh) of the annular body 20 is formed by the union of a (single) layer of mesh fabric 31 and a (single) sheet 32.

[0077] In a second embodiment, the sheet 32 can be made of a paper material.

[0078] For example, the sheet 32 is totally closed or provided with through windows or windows made of a (paper or synthetic) material.

[0079] For example, the reinforcing mesh 30 proximal to the front face 22 (or head mesh) of the annular body 20 has the sheet 32 made of polymeric material.

[0080] Moreover, the reinforcing mesh 30 proximal to the front face 22 (or head mesh) of the annular body 20 has the sheet 32 with its second face 321 adhering to and in contact with the first face 310 of a respective layer of mesh fabric 31.

[0081] In this case, the reinforcing mesh 30 proximal to the front face 22 (or head mesh) of the annular body 20 is formed by the union of a (single) layer of mesh fabric 31 and a (single) sheet 32.

[0082] Both the head and the back reinforcing meshes 30 can be associated with a sheet of polymeric or paper material or, alternatively, the head reinforcing meshes 30 is associated with a sheet of polymeric material and the back reinforcing mesh 30 with a sheet of paper material.

[0083] In addition, in a third embodiment, the reinforcing mesh 30 - for example when the reinforcing mesh 30 is intended to be interposed between a back reinforcing mesh 30 and a head reinforcing mesh 30 - has only the layer of fibre fabric 31, in which both the first face 310 and the second face 311 are free, i.e. they are not adherent to and/or in contact with any sheet 32.

[0084] At least one reinforcing mesh 30, for example each of them or at least one of them (preferably at least both the head and back reinforcing meshes 30), comprises a recognition element 33 made of conductive material, which is made adherent or fixed to the layer of fibre fabric 31 (in direct contact or not indirect contact therewith).

[0085] For example, the recognition element 33 has a flat shape (for instance belt-like) and elongated along a longitudinal axis A, which determines the prevalent dimension of the recognition element.

[0086] For example, the recognition element 33 also has a width, i.e. a first transverse dimension with respect to the longitudinal axis A, prevalent with respect to a thickness thereof, i.e. a second transverse dimension with respect to the longitudinal axis A orthogonal to the width.

[0087] For example, the recognition element 33 has a width substantially between 0.3 mm (which substantially corresponds to the limit of detectability of the sensor used to detect it) and covering 100% of the surface of the reinforcing mesh 30 to which it is associated.

[0088] More in detail, the recognition element 33 has a width substantially comprised between 0.3 mm and 20 mm, more preferably comprised between 0.3 mm and 5 mm, and further more preferably comprised between 0.3 mm and 3 mm.

[0089] For example, the recognition element 33 could occupy (in length and/or width) a (limited) portion of the (amplitude of the) reinforcing mesh 30 (and hence the abrasive wheel 10 to which it is associated) or extending (in length and/or width) for a prevalent portion of the (amplitude of the) reinforcing mesh 30 (and hence of the abrasive wheel 10 to which it is associated), to the limit of extending (in length and/or width) for the entire (amplitude of the) reinforcing mesh 30 (and hence of the abrasive wheel 10 with which it is associated). The recognition element 33 has a thin thickness, preferably smaller than the thickness of the layer of fibre fabric 31 to which it is fixed, and/or for example smaller than or equal to the thickness of the sheet 32 (when provided).

[0090] Preferably, the recognition element 33 (in every axial segment thereof) has a rigidity or flexural strength smaller than or equal to the rigidity or flexural strength of the layer of fibre fabric 31 to which it is fixed, for example smaller than or equal to the rigidity or flexural strength of the sheet 32 (when provided).

[0091] The recognition element 33 is, preferably, deformable in (exclusively) plastic manner, i.e. without elastic return or with substantially zero or, otherwise, negligible elastic modulus. The recognition element 33 comprises a first face 330 (substantially parallel to the longitudinal axis A and to the width thereof), for example intended to be oriented towards the front face 22 of the annular body 20, and an opposite second face 321, for example intended to be oriented towards the rear face 23 of the annular body 20.

[0092] Each reinforcing mesh 30 (or at least one of them) can comprise a plurality of recognition elements 33, for example arranged in a pre-ordered manner, for example in parallel strips or at random, preferably lying on a plane parallel to one between the first face 310 and the second face 311 of the layer of fibre fabric 31 or both.

[0093] Each recognition element 33 is fixed, i.e. made adherent, to a respective layer of fibre fabric 31 (and/or to the sheet 32 when provided).

[0094] In particular, at least one between the first face 330 and the second face 331 of each recognition element 33 is adherent (and in contact or not in contact) to at least one between the first face 310 and the second face 311 of the layer of fibre fabric 31 and/or one between the first face 320 and the second face 321 of the sheet 32, when provided. The adhesion between the first face 330 or second face 331 of the recognition element 33 with the first face 311 or second face 312 of the layer of fibre fabric 31 and/or with the first face 320 or the second face 321 of the sheet 32, when provided, can be obtained by physical / chemical adhesion or gluing, as will be better described below.

[0095] For example, in a first embodiment, where a sheet 32 is provided, the recognition element 33 can be interposed between the layer of fibre fabric 31 and the sheet 32, i.e. between the faces in mutual contact thereof.

[0096] In this case, the recognition element 33 can be fixed to the layer of mesh fabric 31 by means of the same adhesive that fixed the layer of mesh fabric 31 to the sheet 32.

[0097] In practice, in the first embodiment described above (i.e. in the case of the back reinforcing mesh 30), the recognition element 33 is arranged with its own first face 330 adhering to and in contact with the second face 311 of the layer of mesh fabric 31 and with its second face 331 adhering to and in contact with the first face 320 of the sheet 32.

[0098] In the first embodiment described above (i.e. in the head mesh), the recognition element 33 is arranged with its own first face 330 adhering to and in contact with the second face 321 of the sheet 32 and with its second face 331 adhering to and in contact with the first face 310 of the layer of mesh fabric 31.

[0099] In addition, (in the third embodiment and/or in the first and/or second embodiment described above) the recognition element 33 can be fixed to one of the (outer) faces of the layer of mesh fabric 31 and/or of the sheet 32 (when provided).

[0100] In particular, in the third embodiment described above, in which the reinforcing mesh 30 lacks the sheet 32, the recognition element 33 is fixed to one between the first face 310 or the second face 311 of the layer of mesh fabric 31.

[0101] In addition, the recognition element 33 can be at least partially intertwined or bound by binding with the fabric that constitutes the layer of mesh fabric 31.

[0102] In a first embodiment, each recognition element 33 is defined by (comprises or consists of) a strip of conductive material, for example, a monolithic strip made of metal.

[0103] In a second embodiment, each recognition element 33 is defined by (comprises or consists of) a conductive powder (in the form of strip or dispersion that "colours/impregnates" a part of or the entire layer of mesh fabric 31 and/or of the sheet 32, when provided), for example carried by means of a support vehicle, for example a glue or a resin or other vehicle suitable for the conformation (laying and producing a strip of conductive powder). In this case, it is possible to deposit the conductive powder, in the form of a strip or of any desired design, directly on one or both the faces 310 and 311 of the layer of mesh fabric 31 and/or of the sheet 32.

[0104] The conductive material whereof the recognition element 33 is made is, preferably, selected in the group consisting (preferably) of aluminium, iron, copper, tin, zinc, lead, titanium, or alloys thereof as well as carbon, etc...

[0105] Some types of abrasive wheels 10 like cutting wheels (see figures 2 and 3) can comprise, for example, only a pair of reinforcing meshes 30, of which a head reinforcing mesh 30, as described above, in proximity to/at the front face 22 and a back reinforcing mesh 30, as described above, in proximity to/at the rear face 23.

[0106] Other abrasive wheels 10 with greater dimensions, for example for grinding (see figures 4c-4d) could have at least one additional intermediate reinforcing mesh 30, for example interposed axially between the head reinforcing mesh 30 and the back reinforcing mesh 30, which is a reinforcing mesh lacking the sheet 32 (for example, preferably but without limitation, provided with the recognition element 33).

[0107] Other abrasive wheels 10 could instead have only one (single) intermediate reinforcing mesh 30 without having the external reinforcing meshes 30 (i.e. head and back). In this case it is extremely important to be able to be sure of the presence of the reinforcing mesh 30 in the abrasive wheel 10 itself, lacking which the abrasive wheel 10 would become extremely dangerous during use.

[0108] Each intermediate reinforcing mesh 30, for example, can have a different recognition element 33 (in conductive configuration and/or composition and/or in characteristics of detectability) with respect to the recognition element 33 positioned in the back or head reinforcing meshes 30.

[0109] To the rear face 23 of the annular body 20 of the abrasive wheel 10 can then be applied to an (annular) label, which bears the technical details of the abrasive wheel itself, in which the label is applied to a (flat or convex) annular portion of the rear face 23.

[0110] Lastly, the abrasive wheel 10 comprises one or more metallic annular elements, commonly known as washers or ring nuts, which delimit the attachment hole 21 of the annular body 20 to the shaft of the grinding machine.

[0111] The washer is fixed to the rear face 23 (or to the label) of the annular body 20 and comprises a hollow central shank that is inserted substantially to measure into the attachment hole 21 and that has axial thickness substantially equal to (or slightly smaller than) the axial thickness of the annular body 20.

[0112] In light of the above description, a method M (see figure 5) for producing an abrasive wheel 10 as described is as follows.

[0113] First of all, the aforesaid method M comprises a process P (see figure 6) for manufacturing a reinforcing mesh 30 usable for the production of abrasive wheels 10.

[0114] The process P for manufacturing a reinforcing mesh 30 comprises manufacturing (block P1) a sheet of fibre fabric (or a nonwoven fabric) starting from a fibre yarn, preferably glass fibres or other material as described above.

[0115] For example, the step of manufacturing the sheet of glass fibre fabric comprises manufacturing an ample sheet or a roll, for example with width greater than 30 cm and length of several metres.

[0116] Moreover, the process P could comprise the step of impregnating the sheet of fibre fabric with a resin or a solution of liquid resins and solvents.

[0117] Subsequently, the process P could comprise the steps of wringing, for example between pairs of rollers, and drying, in appropriate furnaces within which the resin dries without completing its polymerisation, the impregnated sheet of fibre fabric.

[0118] The process P could comprise, before or after the step of impregnating, a step of making (block P2) one or more recognition elements 33 (as described above) made of conductive material, adhere to the sheet of fibre fabric, for example applying it to one of the faces thereof.

[0119] In practice, during the adhesion step the recognition element 33 is arranged so that a face 330 or 331 thereof is substantially in contact with a face of the sheet of fibre fabric and remains adhering thereto.

[0120] It is possible that the adhesion step can be carried out by gluing, for example by means of resins, of the recognition element 33 or, alternatively, it is possible that the adhesion step can be carried out by forming (in place) the recognition element, for example by the deposition of a recognition element 33 (fluid or semi-solid) on the sheet of fibre fabric.

[0121] In particular, it is possible to arrange and make adhere a plurality of recognition elements 33 in the same sheet of fibre fabric, for example random or in a predetermined manner with a determined distribution pattern, so that in each selected area of the sheet (with size equal to or smaller than an abrasive wheel 10 to be manufactured) is positioned at least one recognition element 33 (or a plurality thereof).

[0122] A type of sheets of fibre fabric can consist of the aforesaid sheet of fibre fabric and the recognition element 33.

[0123] Alternatively, it is possible to complete the sheet of fibre fabric by the application (block P3) of a sheet 32 of paper material or of polymeric material, so as to coat one face of the sheet of fibre fabric.

[0124] In a type of sheets of fibre fabric, the sheet 32 is a sheet of polymeric material and, in an additional type of sheet of fibre fabric, the sheet 32 is a sheet of paper material.

[0125] In practice, the application of a sheet 32 can be accomplished by gluing the sheet 32 on an entire face of the sheet of fibre fabric, for example exploiting as a glue the resin or the resin solution with which the sheet of fibre fabric is impregnated, and laminating the layered structure defined in dedicated laminating rollers.

[0126] The step of applying the sheet 32 can preferably take place concurrently or subsequently (or at the limit previously) to the step of adhesion of the recognition element 33.

[0127] The step of applying the sheet 32 can comprise closing (by gripping) the recognition element 33 between the sheet 32 the sheet of fibre fabric 31.

[0128] However, the adhesion step can take place differently, i.e. by the application of the recognition element 33 on a face of the sheet 32 (before or after it is applied on the sheet of fibre fabric).

[0129] When the sheet of fibre fabric has been added of the recognition element 33 and, possibly, of the paper or polymer sheet 32, and it has duly been partially polymerised (so that the resin that impregnates it is not sticky, but neither is it totally polymerised), it is possible to collect it in reels, at least one for each type of reinforcing mesh that can be manufactured.

[0130] The process P, then, comprises die-cutting (block P4) the sheet or reel of fibre fabric to which the recognition element 33 was made to adhere (and the possible sheet 32), so as to form one or more disks of reinforcing mesh, appropriately shaped.

[0131] Each die-cut, or each disc of the reinforcing mesh, is such as to include, circumscribe or intersect at least a respective portion of a recognition element 33, which remains defined on the reinforcing mesh 30 that defines the disc or reinforcing mesh itself.

[0132] At this point the process P can be deemed concluded, and the method M can proceed with the actual formation of an abrasive wheel 10, for example by forming and pressing in a dedicated mould.

[0133] By way of example, a mould for forming (see figure 4) abrasive wheels 10 comprises a die able to be opposed to a punch for forming the abrasive wheel 10.

[0134] The moulding die for example comprises a cylindrical jacket which is closed inferiorly by a bottom wall.

[0135] In practice, the bottom wall comprises a discoid body with circumferential base and for example made of metallic material able, for example, to be inserted substantially to measure inside the cylindrical liner.

[0136] The bottom wall and the cylindrical jacket delimit an open-top forming chamber. Advantageously, the bottom wall can be slidably associated with respect to the cylindrical jacket so that the inner volume of the forming chamber can be changed, in practice changing the axial position of the bottom wall with respect to the cylindrical jacket.

[0137] The bottom wall has at the centre a centring pin rising from the upper face thereof and coaxial with the cylindrical jacket.

[0138] The centring pin, in particular, is inserted in a central hole obtained in the bottom wall and fixed therein or floating.

[0139] The upper face of the bottom wall can be substantially planar, if a flat abrasive wheel 10 is to be manufactured.

[0140] The upper face of the bottom wall preferably includes a central indentation, coaxial to the bottom wall itself, able to define a central concavity, so as to globally define a concave bottom wall for the formation of abrasive wheels 10 with depressed centre.

[0141] In any case, the bottom wall defines a resting plane for the abrasive wheel 10 to be formed substantially orthogonal to the axis of the cylindrical jacket.

[0142] The punch, for example, comprises an annular/discoidal body whose outer diameter is substantially equal to the outer diameter of the bottom wall of the mould die (or slightly smaller than the inner diameter of the cylindrical jacket), so that it can be inserted substantially to measure in the cylindrical jacket and be superposed to the bottom wall itself. If an abrasive wheel 10 with depressed centre is to be formed, the punch comprises a complementary shape to the bottom wall.

[0143] Moreover, in this case the punch can be manufactured in a monolithic body or by two concentric and separate annular bodies able to be actuated axially in an independent manner for the independent formation of the outer and inner periphery of the abrasive wheel 10.

[0144] The punch and the bottom wall are movable to approach/move away from each other, respectively for closing/opening the forming chamber, as is well known to the person skilled in the art.

[0145] The method M, then, initially comprises, for example, inserting in the forming cavity, so that is slips on the centring pin and it lies on the bottom wall (for example on the peripheral portion thereof), the washer with the hollow central shank rising from the bottom wall. Subsequently, when provided, the label is laid down on the bottom wall and/or on the washer.

[0146] Subsequently, a back reinforcing mesh 30 (for example as described above) is inserted (block M1 and figure 4a) in the forming cavity, for example resting on the bottom wall (directly or with interposition of the label).

[0147] In practice, the back reinforcing mesh 30 is obtained by die-cutting from the type of reinforcing mesh 30 that comprises, in addition to the layer of reinforcing mesh 31 (portion of the sheet of reinforcing mesh), at least one recognition element 33 arranged therein and, possibly, a sheet 32 (for example made of polymeric material).

[0148] The back reinforcing mesh 30 is positioned with the second face 321 of the sheet 32 resting (directly or indirectly) on the bottom wall of the forming cavity (or proximal thereto). The back reinforcing mesh 30 is inserted on the centring pin, so that it is substantially coaxial to the forming cavity.

[0149] On the back reinforcing mesh 30 (or between the meshes of the layer of mesh fabric 31 thereof) a (first) layer of abrasive mix 24 (or a rear layer) is distributed (block M2 and figure 4b) inside the forming cavity, for example, so as to cover and incorporate complete the back reinforcing mesh 30 and filling (for a predetermined thickness) the forming cavity. In practice, the quantity of abrasive mix that forms the layer of abrasive mix 24 fills the forming cavity for an axial thickness that exceeds the level of the first face 310 of the layer of mesh fabric 31 of the back reinforcing mesh 30, so that the latter if completely incorporated in the layer of abrasive mix.

[0150] If the plant and the method for forming the abrasive wheel 10 comprise only one station for depositing abrasive mix, i.e. the abrasive wheel 10 has a single layer of abrasive mix, the method M proceeds with positioning (block M4 and figure 4e) a head reinforcing mesh 30 on the abrasive mix layer that was just deposited.

[0151] In practice, the head reinforcing mesh 30 is obtained by die-cutting the type of reinforcing mesh 30 that comprises, in addition to the layer of reinforcing network 31 (portion of the sheet of reinforcing mesh), at least one recognition element 33 positioned therein and, preferably, a sheet 32 (for example made of paper material).

[0152] The back reinforcing mesh 30 is positioned with the first face 320 of the sheet 32 oriented at the opposite side with respect to the bottom wall of the forming cavity (or distal thereto). The back reinforcing mesh 30 is also inserted on the centring pin, so that it is substantially coaxial to the forming cavity.

[0153] At this point, the method M proceeds with pressing (block M5) the (back and head) reinforcing meshes 30 and the layer of abrasive mix 24 interposed between them in the forming cavity for obtaining the abrasive wheel 10 (coarse semi-finished product) of the desired shape (flat or with depressed centred).

[0154] Pressing takes place by action of the mutual approach between the punch and the bottom wall.

[0155] The method of forming individual abrasive wheels 19 by pressing, described above, should be construed to be limiting, for the method M may provide for reversing the sequence of the steps described above for the manufacture of the abrasive wheel 10 or may lack one of the steps described, or it may comprise inserting a single central reinforcing mesh 30 within the mixture.

[0156] The construction configurations of the abrasive wheels 10 are multiple (only external reinforcing meshes, external reinforcing meshes and internal reinforcing meshes, only internal reinforcing meshes, a single internal reinforcing mesh, multiple internal reinforcing meshes, etc...) but in any case the present method comprises inserting at least one reinforcing mesh 30 on at least one of the two faces of the abrasive wheel or at least one reinforcing mesh 30 inside the abrasive wheel 10 in the position deemed best suited for the functionality of the product and making the reinforcing mesh (if one) or the reinforcing meshes (if more than one) traceable by means of sensors as described below.

[0157] In addition, alternatively the method M could comprise manufacturing the individual abrasive wheels

10 by a different methodology, which could have a first step of forming (for example by pressing and/or laminating) an (ample) sandwich structure consisting of a superposition of reinforcing meshes 30 (in the multiple types of sequences described above) and one or more layers of abrasive mix 24 (as described above).

[0158] Said first step results in the formation of an ample plate (circular or quadrangular or with any desired shape) or a roll consisting of said sandwich structure (rough semi-finished product).

[0159] Moreover, this method comprises a subsequent second step of die-cutting the (ample plate or roll) sandwich structure for obtaining individual abrasive wheels 10, each provided with at least one (portion of the) reinforcing mesh 30 and, hence, with at least one (segment of the) recognition element 33.

[0160] To each of said individual abrasive wheels 10 may then be applied the washers and other elements for finishing and identifying the abrasive wheel itself.

[0161] It is clear that the present invention is also applicable to the aforesaid alternative method, because at least one reinforcing mesh 30 can be of the type described above, or provided with the respective recognition element 33 of conductive material.

[0162] If, instead, if the forming method and plant comprises two, three or more sequences of depositing abrasive powder, or the finished abrasive wheel 10 has to have multiple superposed layers of abrasive material (for example if it is a grinding abrasive wheel), before subjecting the abrasive wheel 10 to pressing and firing, the insertion (block M3 and figure 4c) is carried out of at least an additional intermediate reinforcing mesh 30 of additional layers of abrasive mix (see figure 4d) that will contribute (once superposed) to form an intermediate layer of abrasive mix of the annular body 20.

[0163] In practice, the intermediate reinforcing mesh 30 is obtained by die-cutting the type of reinforcing mesh 30 that comprises the layer of reinforcing network 31 (portion of the sheet of reinforcing mesh) and possibly only the recognition element 33 positioned therein, since it lacks the sheet 32.

[0164] The intermediate reinforcing mesh 30 is also inserted on the centring pin, so that it is substantially coaxial to the forming cavity.

[0165] Lastly, the abrasive wheel 10 thus formed is subjected to a thermal firing treatment (block M6), for example in dedicated polymerisation furnaces, in which the polymerisation of the binding resin is completed and the binding resin stably solidifies and holds the abrasive mix that constitutes the abrasive wheel itself (or the discoidal body that constitutes it) and/or the resins that impregnate the reinforcing meshes 30.

[0166] In the case of abrasive wheels 10 obtained by die-cutting from a pressed tile or from a laminated roll, the die-cutting of the abrasive wheels can also be carried out after the polymerisation cycle without modifying the advantages deriving from the use of reinforcing meshes 30 provided with recognition element 33.

[0167] In practice, the abrasive wheel 10 is subjected to a thermal cycle that envisages the insertion thereof in a furnace at a temperature substantially comprised between 70° and 220° C for a time substantially comprised between 1 minute and 100 hours, or may be fired in situ in the same mould, if the latter is heated.

[0168] Once the abrasive wheels 10 (rough semi-finished product or cooked) it is possible to proceed by means of a checking procedure C (see figure 7) to check whether the abrasive wheel 10 complies with safety standards, in particular if the reinforcing meshes 30 of the abrasive wheel 10 are actually present inside the annular body 20 of the abrasive wheel 10.

[0169] The checking procedure C is preferably an automatic procedure to obtain all deriving advantages, which comprises positioning at least one sensor, for example an inductive sensor, a thermal camera, and/or an X-ray sensor or a probe with feeler needle (or combination thereof), or the like, operatively connected with an electronic control unit, which is configured to actuate a selector or a signaller that selects or signals the abrasive wheels 10 found not to comply with the standard.

[0170] In particular, the checking procedure C comprises making the abrasive wheel 10 advance (block C1) along a direction of advance, for example bearing on a front face 22 or on a rear face 23 and/or while they rotate axially or roll on the lateral cladding.

[0171] During the advance of the abrasive wheel 10, they enter a checking station, in which is positioned the at least one aforesaid sensor, which is arranged with the axis of detection substantially orthogonal to the front face 22 or to the rear face 23 of the abrasive wheel 10 and in eccentric position (i.e. positioned at a distance from the axis of the attachment hole 21 of the abrasive wheel 10 greater than the outer diameter of the washer).

[0172] The sensor, in practice, is configured to detect (block C2) selectively a recognition element 33 fixed to a (back, head or intermediate) reinforcing mesh 30.

[0173] Preferably, it is possible to choose the type of sensor according to the type (or material) of the recognition element 33 to be identified.

[0174] For example, some conductive materials (like iron and aluminium) are best suited to be detected by means of an inductive sensor, other conductive materials (like iron) are more suited to be detected thermally by means of a thermal camera, other conductive materials (like those having a higher atomic mass, such as copper, lead and tin) are more suited to be detected with X-ray identification by means of an X-ray sensor; lastly, all conductive materials are suited to be detected by electrical probing and measuring the related electrical conduction, by means of a probe with feeler needles.

[0175] Moreover, the checking procedure C comprises determining (block C3) the presence of the reinforcing mesh 30 when the recognition element 33 fixed to the reinforcing mesh 30 is detected.

[0176] For example, to determine the presence of the back or head reinforcing mesh 30, the sensor could be an inductive sensor (also known as micro), which detects the presence of the recognition element 33 when it is within a predetermined detection distance from the sensor.

[0177] In practice, the sensor is positioned at a predetermined distance from the front face 22 or from the rear face 23 so that its detection distance allows to detect the reinforcing mesh 33 directly facing the sensor but not the reinforcing mesh 33 present on the opposite face, because it is too distant therefrom.

[0178] To discriminate between the back and head reinforcing mesh 30, it is sufficient to adopt two sensors facing the two faces of the abrasive wheel 10 and axially opposite. The method then becomes perfectly selective because it allows to detect with absolute precision the presence of the two (external) head and back reinforcing meshes 33 independently.

[0179] Alternatively, different sensors can be used, also in combination such as X-ray sensors or thermal sensors or others to detect the conductive recognition element 33.

[0180] For example, to determine the presence of the external or intermediate reinforcing mesh 30, the sensor could be an X-ray sensor or radiographic machine, which detects by means of appropriate software the presence of the recognition element 33 of the reinforcing mesh 30 (made of a conductive material with higher atomic mass than the prevalent atomic mass of the recognition element 33 of the head and back reinforcing meshes 30 and/or of the material of which the abrasive mix is made).

[0181] Another example of sensor for determining the presence of the conductive recognition element associated with the external or intermediate reinforcing mesh 30, can be a thermal camera, which detects the presence of the recognition element 33 appropriately heated by induction. The detection is indirect, i.e. detecting the heat generated by the recognition element 33 which, subjected to induction heating, increases its temperature and by heat conduction also the temperature of the part of abrasive wheel 10 in which it lies. Inductive heating can also be modulated with an appropriate choice of the conductive material generating in a selected reinforcing mesh 30 much greater heating than that generated by the conductive material of which are made the recognition elements 33 of the other reinforcing meshes present in the abrasive wheel 10. Heating depends on the Joule effect that is directly proportional to the specific resistance of the conductive material for which a less conductive material will be greatly heated whilst a very conductive material will be heated less.

[0182] Using a conductive material that heats greatly on a reinforcing mesh 30 and another conductive material that is heated very little on the other reinforcing mesh(es) 30, the selected reinforcing mesh 30 can be clearly highlighted. The generation of heat can then be easily detected by means of a thermal camera and recognised by means of an appropriate software or also directly by an operator looking at the image generated by the thermal camera.

[0183] The other reinforcing meshes 30 present in the abrasive wheel 10 and provided with conductive recognition element 33 can then be selectively identified with the other methods (e.g. X-rays or inductive sensor).

[0184] Hence, a sensor of the thermal camera or X-ray (or other) type can be used to detect the recognition element 33 of a back and/or head reinforcing mesh 30, or, vice versa, an inductive sensor may be used to detect the recognition element 33 of an intermediate reinforcing mesh 30.

[0185] Alternatively or in addition, to determine the presence of the back or head reinforcing mesh 30, the sensor could be a probe with feeler needles (which for example comprises a myriad of conductive needles that feel a face of the abrasive wheel 10).

[0186] When the probe with feeler needles, or its needles, comes in (electrical) contact with the recognition element 33 made of conductive material of a recognition element 30 proximal to the felt face, the electric circuit of the probe with feeler needles is closed and electric current is allowed to flow along the recognition element 33, allowing to measure - by means of the electronic control unit - the intensity of the electric current.

[0187] From the measured intensity of electrical current, the presence (or absence) of the recognition element 33 is detected and hence the presence or absence of the related reinforcing mesh 30 is determined.

[0188] The invention thus conceived is susceptible to many modifications and variants, all falling within the same inventive concept, as claimed below.

Claims

1. A reinforcing mesh for abrasive wheels comprising:

    - a fabric or nonwoven fabric made of fibres; and
    - at least one recognition element made of conductive material adhered to the fibre fabric.

2. The reinforcing mesh according to claim 1, wherein the recognition element comprises at least one strip of conductive material elongated along a longitudinal axis, and provided with a width, transversal with respect to the longitudinal axis, wherein the width is greater than a thickness of the strip and is not lower than 0.3 mm, preferably is comprised between 0.3 mm and 20 mm.

3. The reinforcing mesh according to claim 1, wherein the recognition element has flexural strength lower than or equal to the flexural strength of the fibre fabric.

4. The reinforcing mesh according to claim 1, wherein the conductive material is selected in the group of aluminium, iron, copper, zinc, titanium, lead, tin, nick-

el, tungsten, magnesium, lithium, chromium and carbon or otherwise any element of metallic nature present in the periodic table of the elements.

5. The reinforcing mesh according to claim 1, comprising a sheet provided with a face adhering to a face of the fibre fabric.

6. The reinforcing mesh according to claim 5, wherein the recognition element is interposed between the face of the fibre fabric and the face of the sheet.

7. The reinforcing mesh according to claim 5, wherein the sheet is made of a polymeric material.

8. The reinforcing mesh according to claim 5, wherein the sheet is made of a paper material.

9. The reinforcing mesh according to claim 1, wherein a thickness of the recognition element is lower than or equal to a thickness of the fibre fabric.

10. The reinforcing mesh according to claim 1, comprising a plurality of recognition elements distributed on a face of the fibre fabric.

11. The reinforcing mesh according to claim 1, wherein the recognition element is obtained by depositing on the fibre fabric at least one conductive powder, preferably along an elongated strip along a longitudinal axis, and provided with a transverse width with respect to the longitudinal axis prevalent with respect to a thickness thereof.

12. The reinforcing mesh according to claim 1, wherein the recognition element is plastically deformable.

13. An abrasive wheel comprising:

- an abrasive mix; and
- at least one reinforcing mesh according to claim 1, wherein the reinforcing mesh is at least partially incorporated within the abrasive mix.

14. A process for manufacturing a reinforcing mesh comprising the steps of:

- producing a fabric made of fibres; and
- making a recognition element made of conductive material adhere to the fibre fabric.

15. The process according to claim 14, further comprising the step of die-cutting the fibre fabric with the recognition element adhering thereto, making a disc of reinforcing mesh provided with at least one portion of recognition element made of conductive material adhering thereto.

16. A method for producing an abrasive wheel comprising the steps of:

- making a reinforcing mesh with the process according to claim 14; and
- at least partially incorporating a portion of reinforcing mesh within an abrasive mix;
- pressing the abrasive mix and the reinforcing mesh incorporated therein; and
- heat treating the abrasive mix and the incorporated therein reinforcing mesh previously pressed.

17. A procedure for checking abrasive wheels comprising the steps of:

- producing an abrasive wheel with the method according to claim 16; and
- determining the presence of the reinforcing mesh incorporated therein by means of the detection, by a sensor, of the recognition element adhering to the reinforcing mesh.

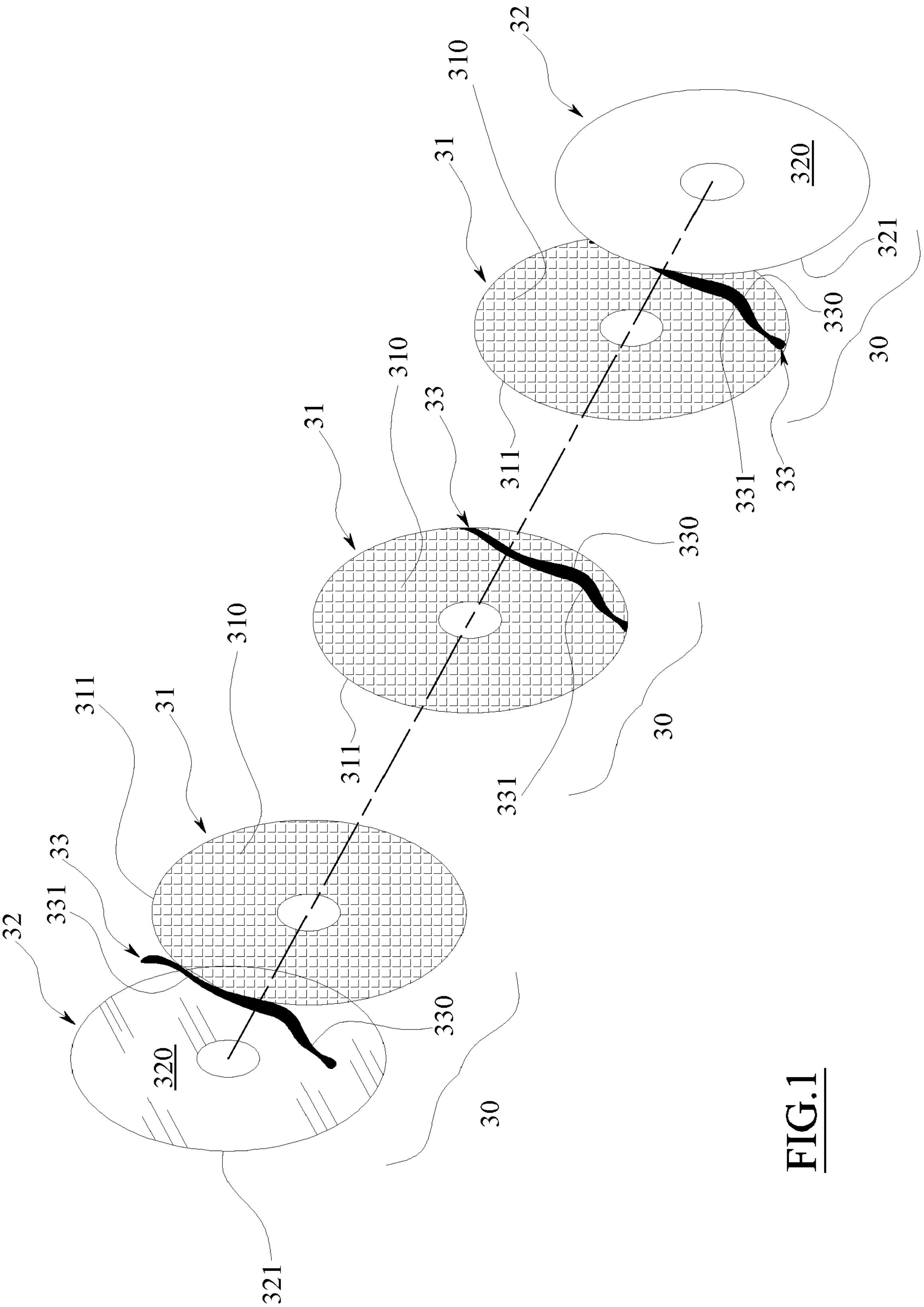
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FIG.1

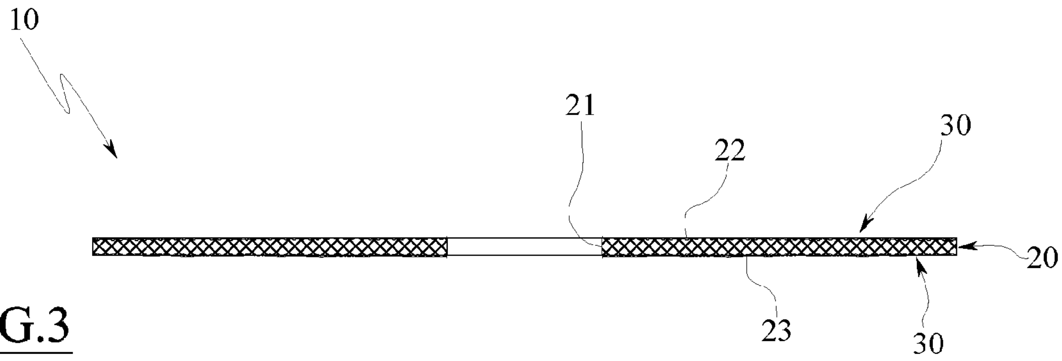

FIG.3

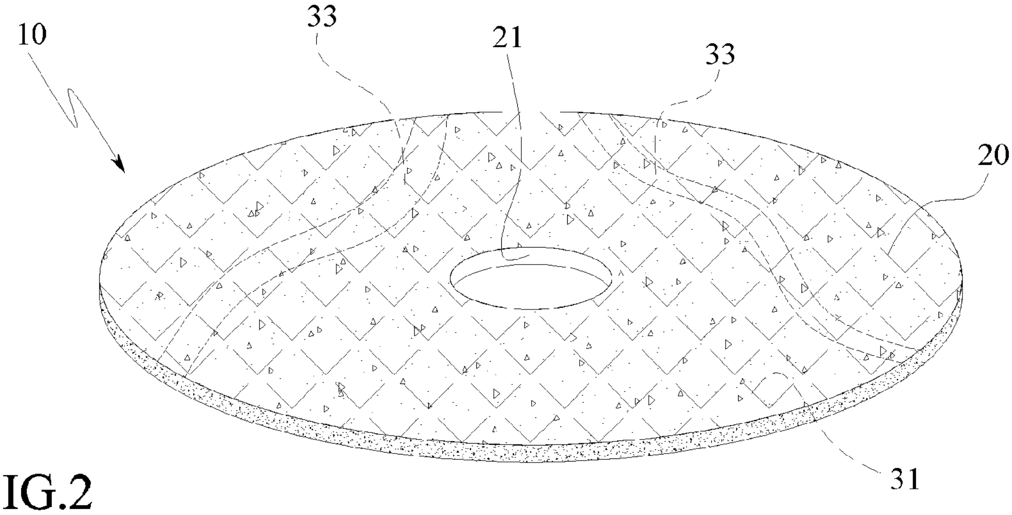

FIG.2

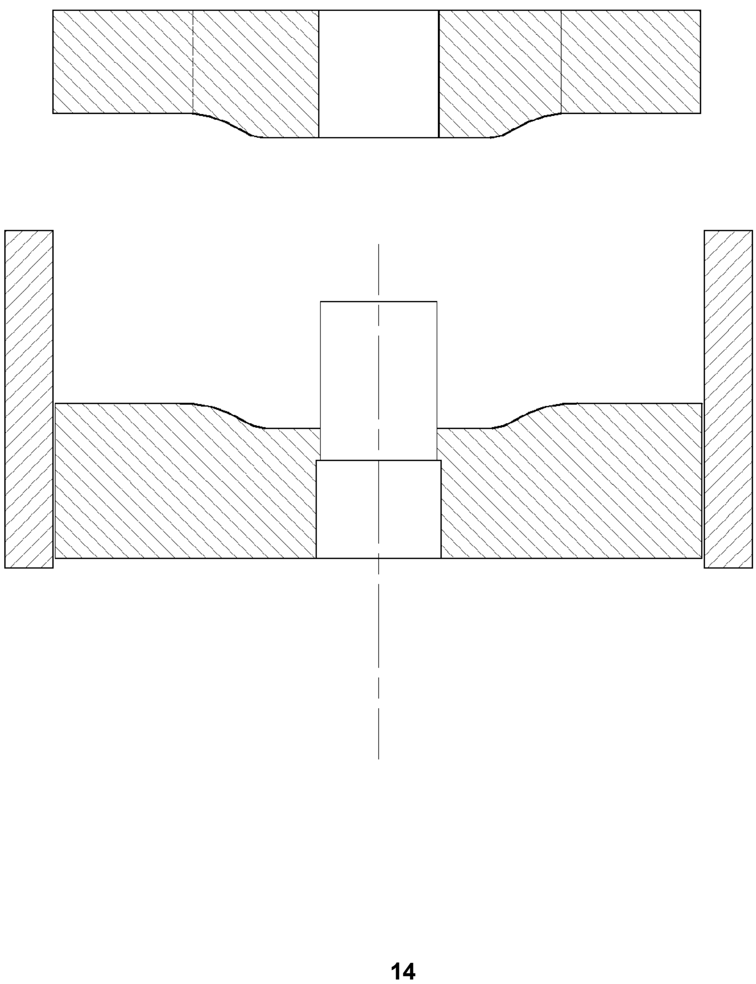

FIG.4

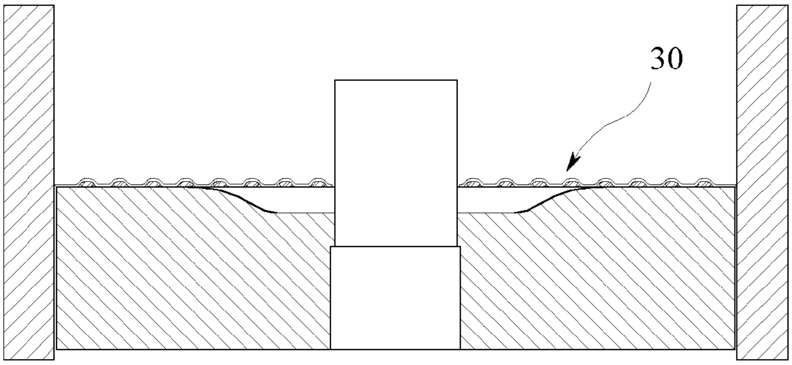

FIG.4a

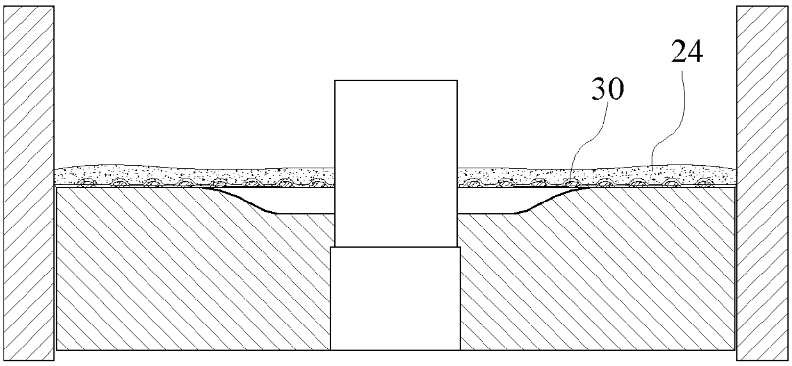

FIG.4b

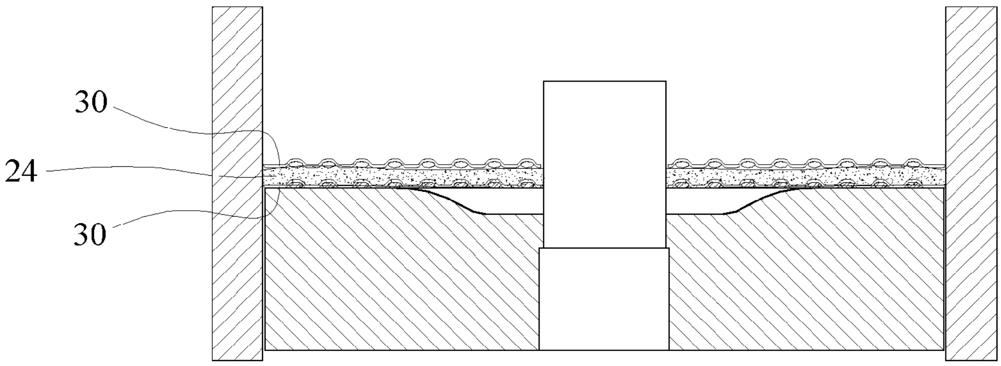

FIG.4c

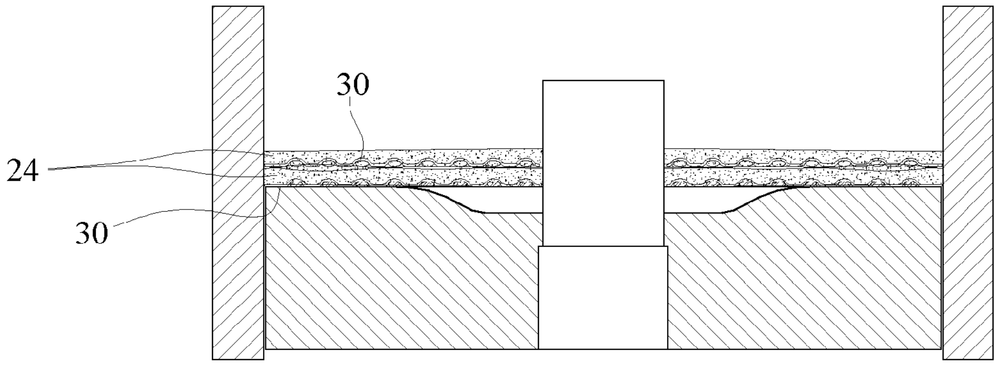

FIG.4d

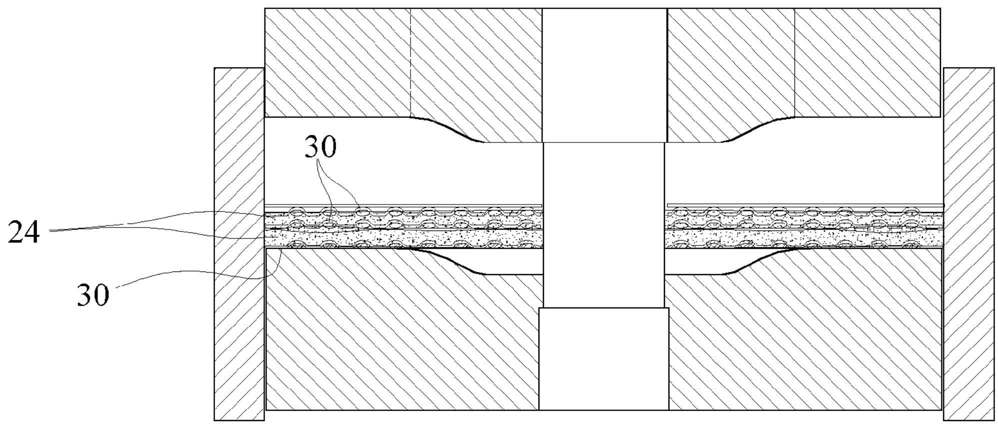

FIG.4e

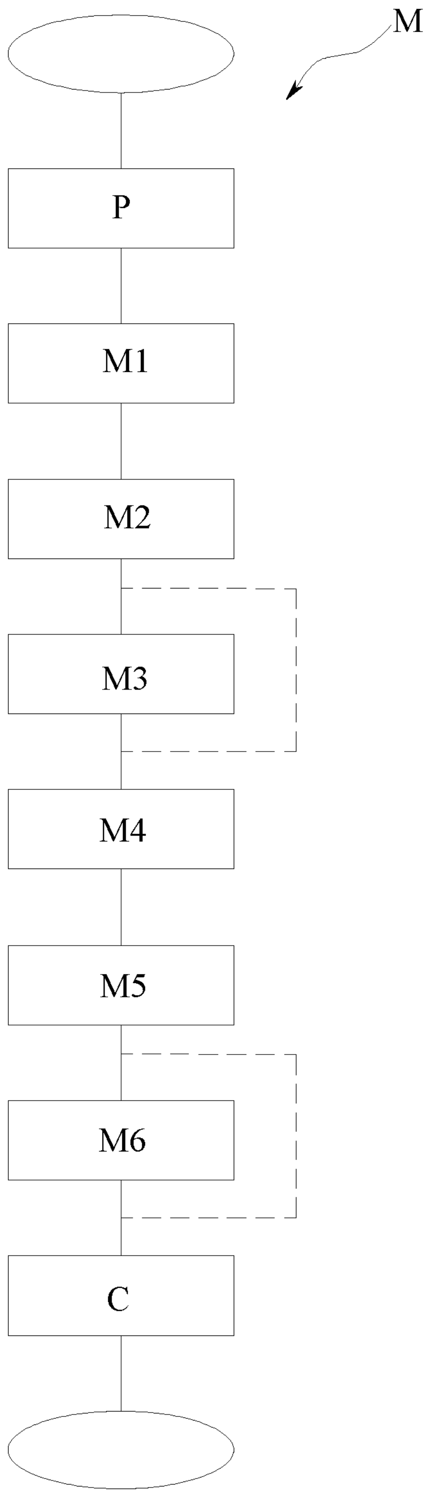

FIG.5

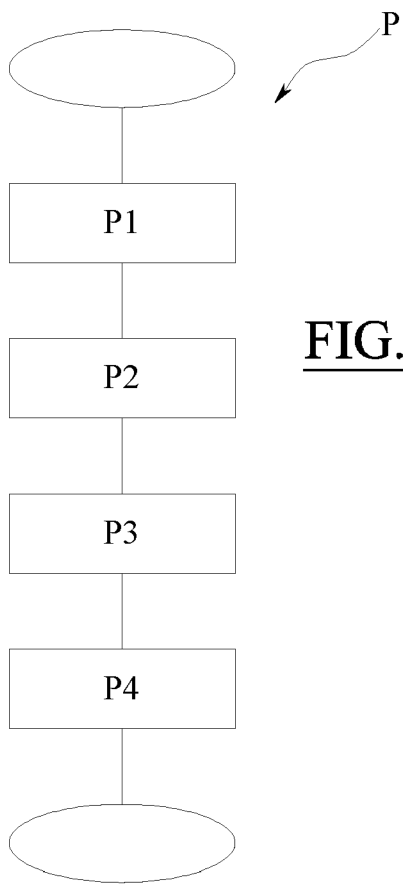

FIG.6

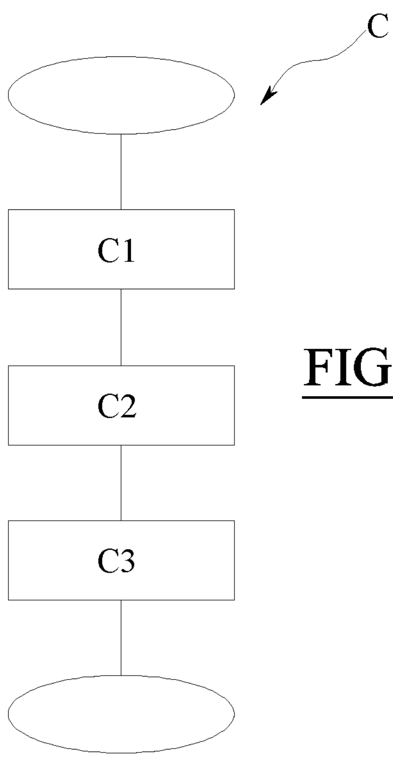

FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 4535

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X A	WO 93/15879 A1 (MINNESOTA MINING & MFG [US]) 19 August 1993 (1993-08-19) * claim 1; figure 4 * * page 10, lines 4-7 * * page 11, line 28 - page 12, line 8 * * page 12, lines 15-18 * -----	1,3-16 2,17	INV. B24D18/00 B24D3/00 B24D11/02 B24D11/00 B24D5/04 B24D7/04
X A	EP 0 623 424 A1 (KGS DIAMIND HOLDING B V [NL]) 9 November 1994 (1994-11-09) * column 6, lines 18-27; figure 1 * * column 7, lines 1-10 * * column 7, line 57 - column 8, line 1 * * column 3, lines 15-20 * -----	1,3-5, 10,12 2,17	
X	EP 3 222 388 A1 (FICAI PAOLO [IT]) 27 September 2017 (2017-09-27) * paragraphs [0009], [0084]; figure 11 * -----	1,3-5, 7-9,12, 14-16	
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			B24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 July 2020	Herrero Ramos, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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& : member of the same patent family, corresponding document

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