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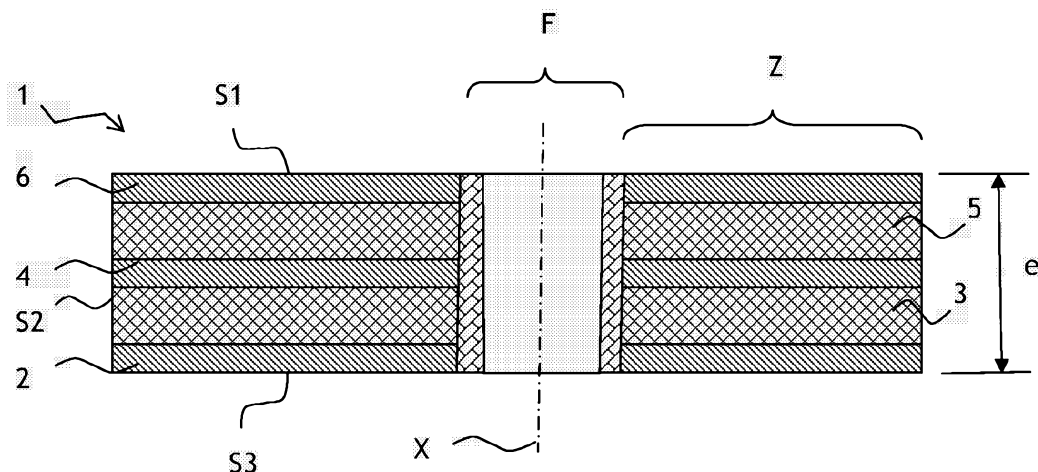
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[Suite sur la page suivante]

(54) Title: FINE FETTLING WHEEL, USE OF SAID WHEEL, AND METHOD AND DEVICE FOR PRODUCING THE SAME

(54) Titre : MEULE D'EBARBAGE FINE, UTILISATION DE CETTE MEULE, PROCEDE ET DISPOSITIF POUR LA FABRIQUER.



(57) Abstract: The invention relates to a fettling, optionally sawing, wheel (1), in the form of a disk, said wheel comprising a central axis X, a central attaching region F, and at least one peripheral working region Z which extends outside the central fixing region in relation to the central axis, said wheel comprising at least one layer (3, 5) formed from abrasive grains and two layers which do not contain any abrasive grains (2, 6) surrounding the wheel. The inventive wheel is characterised in that the working region Z has a total thickness of less than 4 mm and preferably less than or equal to 3.2 mm.

(57) Abrégé : L'invention se rapporte à une meule (1) d'ébarbage, et éventuellement de tronçonnage, sous forme de disque, ladite meule présentant un axe central X, une zone de fixation centrale F et au moins une zone de travail périphérique Z s'étendant extérieurement à la zone de fixation centrale par rapport à l'axe central, ladite meule comportant au moins une couche (3, 5) formée à partir de grains abrasifs et deux couches ne contenant pas de grains abrasifs (2, 6) encadrant la meule, caractérisée en ce que la zone de travail Z présente une épaisseur totale e inférieure à 4 mm et de préférence inférieure ou égale à 3,2 mm.

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**GRINDING WHEEL FOR FINE TRIMMING, USE OF THIS GRINDING
WHEEL, AND PROCESS AND DEVICE FOR MANUFACTURING IT**

The present invention relates to a grinding wheel for
5 trimming, and possibly for parting, in the form of a
disc, said wheel having a central axis, a central
fastening zone and at least one peripheral working zone
extending to the outside of the central fastening zone
relative to the central axis, said wheel comprising at
10 least one layer formed from abrasive grains and two
layers not containing abrasive grains flanking the
wheel.

The term "trimming" should be understood within the
15 context of the present invention to mean any thinning
operation, wearing operation, sharpening operation,
polishing operation, etc., as opposed to a parting
operation that consists of a cutting operation.

20 It is known in the prior art, in particular from
International Patent Application WO 00/74898, to
produce thin grinding wheels not for trimming but for
parting.

25 Moreover, those skilled in the art know the ISO 525
standard relating to abrasive products in general.

Like any standard, it is the exhaustive reflection of
what those skilled in the art consider to be necessary
30 and sufficient for achieving satisfactory products.

In particular, this standard defines the essential
criteria for the production of trimming grinding
wheels, corresponding to the types with the references
35 27, 28, and 29 in that standard.

According to that standard, a trimming grinding wheel
must necessarily have a thickness between 4 and 10 mm.

It has turned out, completely surprisingly, that it is possible to produce trimming grinding wheels that do not meet the thickness criterion of the standard but do meet all the other criteria, especially relating to safety when using the wheels, and are completely satisfactory for the intended trimming application.

Thus, the present invention relates in its broadest aspect to a grinding wheel for trimming, and possibly for parting, in the form of a disc, said wheel having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fastening zone relative to the central axis, said wheel comprising at least one layer formed from abrasive grains and two layers not containing abrasive grains flanking the wheel, characterized in that the working zone has a total thickness of less than 4 mm and preferably equal to 3.2 mm or less.

The wheel has a burst speed of at least about 150m/s, and a single impact resistance of at least 290N.

This thickness can be measured over the entire width and the entire length of the working zone.

The wheel according to the invention has at least two adjacent working sectors and preferably three pairwise adjacent working sectors.

Preferably, these working sectors are substantially pairwise perpendicular.

The wheel according to the invention may in particular have a thickness of not less than 1 mm and especially of 1.25 mm or 1.6 mm or 2 mm or 2.5 mm or 3.2 mm.

In a preferred embodiment, the wheel according to the invention includes at least two layers formed from abrasive grains, each of these layers being flanked by two layers not containing abrasive grains.

Moreover, in one particular embodiment, at least one outer layer not containing abrasive grains, or even both outer layers not containing abrasive grains has or have a smaller diameter than the total diameter of the wheel.

Within the context of the present invention, the term "layer" denotes a layer comprising at least one material intended to constitute the wheel. These layers are of two types:

- layers not containing abrasive grains, especially of the protective sheet or "paper" type or of the reinforcing sheet or "fabric" type; or
- layers formed from abrasive grains, of the type comprising abrasive grains bonded together by a binder.

Moreover, within the context of the present invention, the term "cake" denotes a layer of constituent formed from abrasive grains, which has a consistency such that the cake can be handled, and especially grasped and moved by hand or with the aid of a machine.

This cake may therefore consist of a single layer formed from abrasive grains or may include, on one face, a layer not containing abrasive grains.

Moreover, within the context of the present invention, the term "working sector" denotes an area of the wheel in contact with which it is possible to trim.

Moreover, it turns out that, completely surprisingly, it is possible to use the process for manufacturing thin parting wheels known from International Patent Application WO 00/74898 to produce trimming wheels according to the invention.

The present invention thus also relates to a process for manufacturing a grinding wheel for trimming, and possibly for parting, in the form of a disc, said wheel

- having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fixing zone relative to the central axis, said wheel comprising at least one layer based on abrasive grains and two layers not containing abrasive grains flanking the wheel, in which process:
- a layer based on abrasive grains is formed directly in a mould in the absence of a subjacent reinforcing layer;
 - optionally, a reinforcing layer is deposited on this layer of abrasive grains;
 - the layer or layers are pressed in order to form a cake;
 - the cake is removed from the mould;
 - the cake is assembled with:
 - either one or both reinforcing layers, so that two reinforcing layers flank the wheel
 - or at least one other cake and at least one or both reinforcing layers so that two reinforcing layers flank the wheel; and
 - the assembly is pressed so as to form a grinding wheel for trimming, and possibly for parting, a working zone of which has a total thickness of less than 4 mm and preferably equal to 3.2 mm or less.

The wheel has a burst speed of at least about 150m/s, and a single impact resistance of at least 290N.

Thanks to the fact that a cake is firstly produced and that the various layers are then superposed, the time required to pass to each subsequent station may be considerably reduced since it no longer depends on the duration of the operation of pouring in the pulverulent product or the high-pressure pressing operation. Furthermore, the pressure used may be reduced.

The present invention also relates to the use of a wheel according to the invention and especially a wheel produced by the process described above, said wheel being in the form of a disc and having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fastening zone relative to the central axis, the

working zone having a total thickness of less than 4 mm and preferably equal to 3.2 mm or less, in order to carry out a trimming operation.

5 Furthermore, the present invention also relates to an installation for manufacturing grinding wheels for trimming, and possibly for parting, in the form of discs, said wheels each having a central axis, a central fastening zone and at least one peripheral working zone extending to the outer periphery of the
10 central fastening zone relative to the central axis, said wheels each comprising at least one layer based on abrasive grains and two layers not containing abrasive grains flanking the wheels, said installation comprising:

- a station for filling a mould with the layer or layers
15 of constituent from which a cake is formed;

- a machine for pressing the layer or layers of constituent contained in the mould in order to form said cake;

- an assembly station intended to form a stack of superposed layers from at least one cake and from at least one
20 other layer of constituent; and

- a pressing machine for compressing the stack and for forming a grinding wheel for trimming, and possibly for parting, a working zone of which has a total thickness of less than 4 mm and preferably equal to 3.2 mm or less.

25

The wheel has a burst speed of at least about 150m/s, and a single impact resistance of at least 290N.

Advantageously, the wheel according to the invention may be used
30 for trimming and possibly also for parting.

The present invention will be more clearly understood on reading the following detailed description of non-limiting exemplary embodiments and from the appended figure which illustrates an
35 axial section through a trimming wheel according to the invention.

It should be pointed out that the proportions between the various elements shown have not been strictly respected in this figure so as to make it easier to
5 examine it.

Figure 1 illustrates a trimming wheel (1) according to the invention.

10 This wheel (1) has a general form of a disc and thus has a central axis X, a central fastening zone F and at least one peripheral working zone Z extending to the outside of the central fastening zone relative to the central axis.

15 The fastening zone consists of a metal washer and allows the wheel to be fastened to a hub of a grinder.

This washer need not be flat, so as to allow a wheel
20 having a step.

The wheel (1) comprises at least one, and preferably two, layers (3, 5) formed from abrasive grains and at least two layers (2, 6) not containing abrasive grains
25 flanking the wheel.

If the wheel comprises two layers (3, 5) formed from abrasive grains, it is preferable to interpose a layer (4) not containing abrasive grains between these two
30 layers (3, 5) formed from abrasive grains.

Each layer (2, 4, 6) not containing abrasive grains is for example a phenolic-resin-coated fibreglass mesh.

35 Various weights of glass fibre mesh may be used, such as for example 75 to 420 grams per square metre.

A sheet of paper may also be adhesively bonded to one or both outer faces of the wheel.

Moreover, it is possible that one or even both of the outer layers (2, 6) not containing abrasive grains has or have a smaller diameter than the total diameter of the wheel and has or have a reduced diameter of around 2 to 50 mm.

The layers (3, 5) are formed from abrasive grains which predominantly consist, for example of alumina (Al_2O_3) or, for example, a zirconia/alumina ($\text{ZrO}_2/\text{Al}_2\text{O}_3$) mixture or else grains predominantly consisting of silicon carbide (SiC). The abrasive grains used may furthermore be subjected to various thermal, mechanical physical or chemical treatments in order to improve their abrasive performance (hardness, friability, roughness, etc.).

The layers (3, 5) formed from these abrasive grains may consist of abrasive grains having various dimensions, the mean size of which is generally defined by those skilled in the art by the term "grit", or of a mixture of grains having various dimensions. The mean size of the abrasive grains is, according to one possible embodiment of the invention, between 1035 μm (24 grit) and 122 μm (150 grit).

For example, the layers (3, 5) may be formed from abrasive grains bonded together by a binder composed of various phenolic resins in powder form (for example a novolac) and/or in liquid form (for example a resol) and possibly with additives or fillers. For example, the fillers or additives used may predominantly consist of iron sulphide, aluminium potassium fluoride, potassium sulphate or calcium carbonate (limestone).

According to the invention, the working zone Z has a total thickness e of less than 4 mm and preferably equal to 3.2 mm or less.

The wheel (1) has three pairwise adjacent working sectors (S1, S2, S3): the sectors S1 and S3 correspond to the main working surfaces and the sector S2 corresponds to the outer edge of the wheel.

5

A wheel having the structure illustrated in Figure 1 was produced.

The mixture of grains used in each layer (3, 5) consisted of two types of grains, one having a mean size of 508 μm (46 grit) representing 85% by volume of the total volume of the mixture of abrasive grains and the other having a mean size of 406 μm (60 grit) representing 15% by volume of the total volume of the mixture of abrasive grains.

The binder used in each layer (3, 5) consists of 65% by volume of phenolic resin (liquid + powder containing 15 wt% hexamethylenetetramine) and of filler: 15 vol% iron sulphide, 18 vol% potassium sulphates and 2 vol% limestone.

Each layer (3, 5) thus consisted of about 44% by volume abrasive grains and 46% by volume of binder, the remainder being porosity.

The fabric used for the layers (2, 4, 6) had a weight of 195, 170 and 195 grams per square metre, respectively.

30

The combination of the constituents underwent a cold-pressing step in order to form the wheel, followed by a baking step according to the prior art.

This wheel has, after manufacture, a thickness e of about 2.5 mm and an overall diameter of 125 mm.

This wheel, although not having the thickness required by the ISO 525 standard for a trimming wheel, satisfied

all the safety tests of the EN 12413 standard relating to trimming wheels of the 27, 28 and 29 type.

5 In particular, it satisfied the burst speed test, since it only burst at a speed (V_{BR}) of about 190 m/s (the standard requires resistance to a speed of at least 150 m/s).

10 In the single side impact resistance test (with a Force F_{SI}), it withstood a force of 290 N, as required by the standard.

15 The present invention has been described above by way of example. Of course, a person skilled in the art is capable of producing various alternative forms of the invention without thereby departing from the scope of the patent as defined by the claims.

20 It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

25 In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

CLAIMS

1. Grinding wheel for trimming in the form of a disc, said wheel having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fastening zone relative to the central axis, said wheel comprising at least one layer formed from abrasive grains and two layers not containing abrasive grains flanking the wheel, characterised in that the working zone has a total thickness of less than 4 mm, said wheel has a burst speed of at least about 150 m/s, and said wheel provides a single impact resistance of at least 290N.
2. The wheel according to Claim 1, characterised in that the working zone has a total thickness equal to 3.2 mm or less.
3. The wheel according to either Claim 1 or 2, characterised in that said wheel has at least two adjacent working sectors.
4. The wheel according to Claim 3, characterised in that said wheel has three pairwise adjacent working sectors.
5. The wheel according to either Claim 3 or 4, characterised in that the working sectors are substantially pairwise perpendicular.
6. Wheel according to any one of the preceding claims, characterised in that said wheel has a thickness of not less than 1 mm.
7. The wheel according to Claim 6, characterised in that said wheel has a thickness of not less than 1.25 mm.
8. The wheel according to Claim 6, characterised in that said wheel has a thickness of not less than 1.6 mm.

9. The wheel according to Claim 6, characterised in that said wheel has a thickness of not less than 2 mm.
10. The wheel according to Claim 6, characterised in that said wheel has a thickness of not less than 2.5 mm.
11. The wheel according to Claim 6, characterised in that said wheel has a thickness of not less than 3.2 mm.
12. The wheel according to any one of the preceding claims, characterised in that said wheel includes at least two layers formed from abrasive grains, each of these layers being flanked by two layers not containing abrasive grains.
13. The wheel according to any one of the preceding claims, characterised in that at least one outer layer not containing abrasive grains, or even both outer layers not containing abrasive grains has or have a smaller diameter than the total diameter of the wheel.
14. Process for manufacturing a grinding wheel for trimming, in the form of a disc, said wheel having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fixing zone relative to the central axis, said wheel comprising at least one layer based on abrasive grains and two layers not containing abrasive grains flanking the wheel, in which process:
- a layer based on abrasive grains is formed directly in a mould in the absence of a subjacent reinforcing layer;
 - a reinforcing layer is deposited on this layer of abrasive grains;
 - the layer or layers are pressed in order to form a cake;
 - the cake is removed from the mould;
 - the cake is assembled with:
 - either one or both reinforcing layers, so that two reinforcing layers flank the wheel

- or at least one other cake and at least one or both reinforcing layers so that two reinforcing layers flank the wheel; and

the assembly is pressed so as to form a grinding wheel for trimming, and possibly for parting, a working zone of which has a total thickness of less than 4 mm and said wheel has a burst speed of at least 150 m/s, and said wheel provides a single side impact resistance of at least 290N.

15 16. The process according to Claim 14, wherein a reinforcing layer is deposited on this layer of abrasive grains.

17. The process according to either Claim 14 or 15, wherein the assembly is pressed so as to form a grinding wheel for trimming, and possibly for parting, a working zone of which has a total thickness equal to 3.2 mm or less.

18. Use of the wheel according to any one of Claims 1 to 13, said wheel being in the form of a disc and having a central axis, a central fastening zone and at least one peripheral working zone extending to the outside of the central fastening zone relative to the central axis, the working zone having a total thickness of less than 4 mm in order to carry out a trimming operation.

19. Use according to Claim 17, characterised in the working zone having a total thickness equal to 3.2 mm or less.

20. Use according to either Claim 17 or 18, characterized in that the wheel comprises at least one layer based on abrasive grains and two layers not containing abrasive grains flanking the wheel, said wheel being manufactured by a process according to Claim 14.

21. Installation for manufacturing grinding wheels for trimming in the form of discs, said wheels each having a central axis, a central fastening zone and at least one peripheral

working zone extending to the outer periphery of the central fastening zone relative to the central axis, said wheels each comprising at least one layer based on abrasive grains and two layers not containing abrasive grains flanking the wheels, said
5 installation comprising:

- a station for filling a mould with the layer or layers of constituent from which a cake is formed;

- a machine for pressing the layer or layers of constituent contained in the mould in order to form said cake;

- 10 - an assembly station intended to form a stack of superposed layers from at least one cake and from at least one other layer of constituent; and

- a pressing machine for compressing the stack and for forming a grinding wheel for trimming, and possibly for parting,
15 a working zone of which has a total thickness of less than 4 mm and said wheel has a burst speed of at least about 150 m/s, and said wheel provides a single impact resistance of at least 290N.

21. The installation according to Claim 20, characterised in
20 the working zone having a total thickness equal to 3.2 mm or less.

22. A grinding wheel for trimming substantially as herein described with reference to Figure 1.

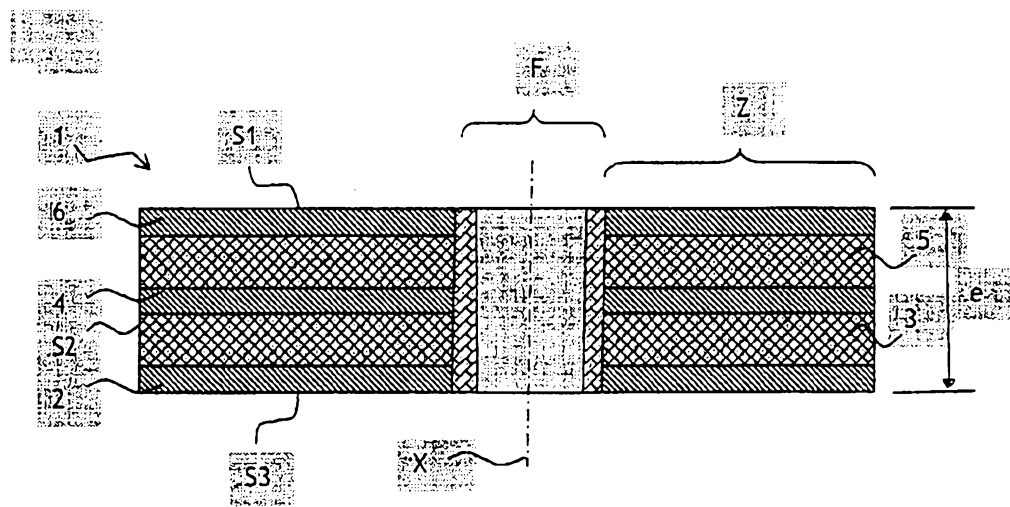


Fig. 1