FLAP WHEEL AND A METHOD FOR PRODUCING A FLAP WHEEL HAVING A PLATE-SHAPED CARRIER

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ABSTRACT

“The invention relates to a method for producing a flap wheel (4) having a plate-shaped carrier, wherein a plurality of grinding flaps (7) overlapping in a shingle-like manner are glued to an annular carrier section (3, 5) that is centered on a rotational axis A of the flap wheel (4), wherein the carrier section (3, 5) is produced from an amorphous thermoplastic material, in particular ABS, wherein the surface (8) of the carrier section (3, 5) is activated prior to gluing, a heat-curing adhesive is applied to the activated surface (8) of the carrier section, and the grinding flaps (8) are placed and pressed onto the carrier section (5) provided with heat-curing adhesive (7).”
FLAP WHEEL AND A METHOD FOR PRODUCING A FLAP WHEEL HAVING A PLATE-SHAPED CARRIER

[0001] The invention relates to a method for producing a flap wheel having a plate-shaped carrier, whereby a number of grinding flaps overlapping in shingle-like manner are glued onto an annular carrier section that is centered on the rotational axis of the flap wheel, whereby the carrier section is produced from an amorphous thermoplastic resin, in particular, ABS. Further, the invention relates to a flap wheel of the same type.

[0002] Known flap wheels have a flap carrier that typically consists of fabric-reinforced or fiber-reinforced plastics, or is constructed from unreinforced thermoplastic resin. The grinding flaps consisting of grinding material are glued overlapping shingle-like onto the surface of the carrier. As is known, the carrier section carrying the flaps is most often positioned perpendicular to the axis of rotation. To improve two-dimensional grinding—in a special type of the flap wheel—the carrier section is inclined so that the clamping screw virtually lifts off the surface to be finished when the inclined grinding surface bears on it.

[0003] When using a flap wheel, care must always be taken that the carrier and/or the adhesive lying under the grinding flaps does not come in contact with the workpiece. This leads to contamination or damage of the workpiece to be finished. As long as the grinding flaps glued to the carrier section protrude in the radial direction on the surface of the carrier, they securely guard the tool from coming in contact with the carrier. However, wear of the grinding flaps leads to shrinkage of the diameter of the flap wheel, so that the surface of the carrier appears under the grinding flaps. This is the reason why most of the time, only a third of the flap coating can be utilized in practice.

[0004] In practice, this disadvantage is addressed by grinding off the material protruding beyond the carrier by holding the rotating carrier to a suitable edge. This approach is known as truing or trimming of the carrier.

[0005] As the result of removing the protruding part by machining, grinding is possible again without having to worry about any contact of the carrier with the workpiece. In this manner, a significantly larger part of the flap coating can be utilized. It is known that in order to make defined trimming possible while retaining a cleanly machined carrier edge, instead of the fiber-reinforced plastics, thermoplastic resins, in particular amorphous thermoplastic resins such as ABS are used for the carriers.

[0006] However, to glue such carriers consisting of amorphous thermoplastic resin, only cold-curing adhesives consisting of two components have been used previously, as these adhesives ensure a particularly good purchase of the flaps on the carrier. But these adhesives have the disadvantage of a relatively low viscosity which is a contributing factor to a slight shifting of the freshly glued on grinding flaps upon an impinging mechanical load, or when stored improperly, if the adhesive has not thoroughly hardened. On the other hand, an adjustment to a sufficiently high viscosity is hardly possible, as the adhesive must be conveyed and mixed with the curing agent. Furthermore, the viscosity cannot be reduced to improve pumping and dosing by heating with a nozzle, because the increase in temperature would cause an acceleration of the hardening.

[0007] If a heat-curing system based on epoxy resin is used instead for gluing a carrier consisting of amorphous ther-
Because of the relatively high heat tolerance, the desired viscosity of the adhesive can also be adjusted via the temperature. In this way, the heat-curing adhesive can be pumped and dosed without any problem. Due to the quick cooling on the flap carrier, the viscosity of the adhesive increases in a very short time, so that the flaps can be placed securely for handling [handlingsfest] and the glue does not run off on the carrier.

It is an additional advantage of heat-curing systems that these cannot harden in the components passing through them in the event of a longer stoppage of the production process. A time and cost-intensive exchange of these components, for example, a nozzle, after a stoppage of the production process, is consequently not required.

In a preferred embodiment, the activation of the surface of the carrier section takes place by slight grinding, partial chemical dissolving or slight etching. Each one of these activation methods can be automated easily and is therefore suitable for mass-producing flap wheels.

The activation of the surface according to the invention is preferably directly integrated into the production process. Activating the surface can be automated, so that in spite of the additional production step to be performed, a decrease of the level of production output can be avoided.

A very important advantage of the invention now lies therein, that by using the method according to the invention, a trimmable flap wheel with an inclined carrier section can be produced for the first time, because it is based on a thermoplastic resin. In it, the carrier section is inclined toward the axis of rotation of the carrier at an angle of between 50 and 85 degrees, in particular, between 60 and 90 degrees. This is now possible because the heat-curing adhesive has a sufficiently high viscosity with sufficient adhesive power during the processing stage, so that the flaps placed on it remain in their position and do not slide off the incline. Such flap wheels with an inclined carrier section have the significant advantage that the contact surface that is possible—and therefore the largest material abrasion—is especially large, because of the grinding surface that is inclined against the axis of rotation.

As a result of the incline and the larger contact surface that is possible, the user of flap disks with an inclined geometry benefits from a significant added value.

By using an adhesive with high viscosity according to the invention, the individual grinding flaps can be retained securely for handling [handlingsfest] and it can be avoided that the adhesive runs off prior to hardening. In contrast to using a heat-curing adhesive according to the invention, the cold-curing adhesive that has been used previously to glue carriers consisting of ABS is not suitable for gluing grinding flaps on a flap carrier that is positioned at an incline.

In the following, various abrasive wear conditions of a flap wheel are described in FIGS. 1 to 5. Shown are:

- FIG. 1 shows a schematic illustration of a carrier of a flap wheel with a straight carrier section;
- FIG. 2 shows a schematic illustration of a carrier of a flap wheel with a carrier section aligned at an incline;
- FIG. 3 shows a schematic illustration of a carrier aligned straight with a glued on grinding flap in new condition;
- FIG. 4 shows a schematic illustration of a carrier aligned straight with a worn grinding flap;
- FIG. 5 shows a schematic illustration with a carrier aligned straight with a trimmed carrier section.

FIG. 1 shows a schematic illustration of a straight carrier 1 of a flap wheel 2. Carrier 2 is located symmetrically around an axis of rotation A and has a straight carrier section 3, i.e. aligned perpendicular to the axis of rotation A. In FIG. 2, a carrier 4 with the same axis of rotation is shown which has an inclined carrier section 5—in the illustrated case—by approximately 70 degrees against axis of rotation A.

The various conditions of wear of a flap wheel with a trimmable carrier are shown in the additional figures on a straight carrier by way of example, but these are also applicable to a flap wheel with an inclined carrier section.

FIG. 4 shows a schematic illustration of a carrier 1 with a single grinding flap 8 glued onto surface 6 of carrier section 5 with adhesive 7. The still unused grinding flap 8 protrudes radially outward over surface 9 of carrier section 5. In the same way, it covers adhesive 7 located between it and carrier section 5. For finishing a workpiece, a section of the grinding flap is available that is outlined by arrows B and C.

In FIG. 5 after use, the grinding flap is worn extending over the area cited above up to the point marked with arrow. Adhesive 7 and carrier section 3 protrude radially at worn grinding flap 10. Some of adhesive 7 has already worn off. This poses the risk that upon further use of the flap wheel, the workpiece will also come in contact with surface 9 of protruding carrier section 3. To avoid this, carrier section 3 is trimmed. In this process, the parts of carrier section 3 and adhesive 7 that protrude at worn out grinding flap 10 are removed. FIG. 5 shows a carrier section 11 that is trimmed in this way. After removing those parts of carrier section 3 and adhesive 7 that protrude radially outward over worn out grinding flap 10, worn out grinding flap 10 again protrudes at the carrier section. Flap wheel 12 that is trimmed in this way can continue to be used. The process can be repeated as desired, so that the grinding flaps can be utilized over their entire grinding surface.

1. A method for producing a flap wheel (4) having a plate-shaped carrier, whereby a number of grinding flaps (7) overlapping in shingle-like manner are glued onto an annular carrier section (3, 5) centered on an axis of rotation (A) of the flap wheel (4), whereby the carrier section (3, 5) is produced from an amorphous thermoplastic resin, in particular ABS, wherein

the surface (6) of the carrier section (3, 5) is activated prior to being glued, that a heat-curing adhesive (7) is applied to the activated surface (6) of the carrier section, and that the grinding flaps (8) are placed onto the carrier section (5) to which heat-curing adhesive (7) has been applied and pressed onto it.

2. A method as recited in claim 1 wherein

the activation of the surface (6) takes place by slight grinding, partial chemical dissolving or slight etching.

3. A method as recited in claim 1, wherein

the activation of the surface (6) directly proceeds the placement of grinding flaps (7) on it, and it is thus integrated into the process.

4. A method as recited in claim 1 wherein

the heat-curing adhesive (7) is applied to the surface (6) of a carrier section (5), that is inclined to the axis of rotation (A) of the carrier (1) by between 50 and 85 degrees, in particular, between 60 and 80 degrees.
5. A flap wheel (4), in particular produced by a method as recited in claim 1, having a plate-like carrier (1) that carries a number of shingle-like overlapping grinding flaps (8), whereby the grinding flaps (8) are glued onto a carrier section (3, 5), and whereby the carrier section (3, 5) consists of an amorphous thermoplastic resin, in particular ABS, wherein
the grinding flaps (8) are glued onto the carrier section (3, 5) with a heat-curing adhesive (7).
6. A flap wheel (4) as recited in claim 5, wherein
the carrier section (5) is inclined to the axis of rotation (A) of the carrier (1) between 50 and 85 degrees, in particular between 60 and 80 degrees.