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ABRADING WHEELS WITH UNDERCUT RELIEF GROOVES

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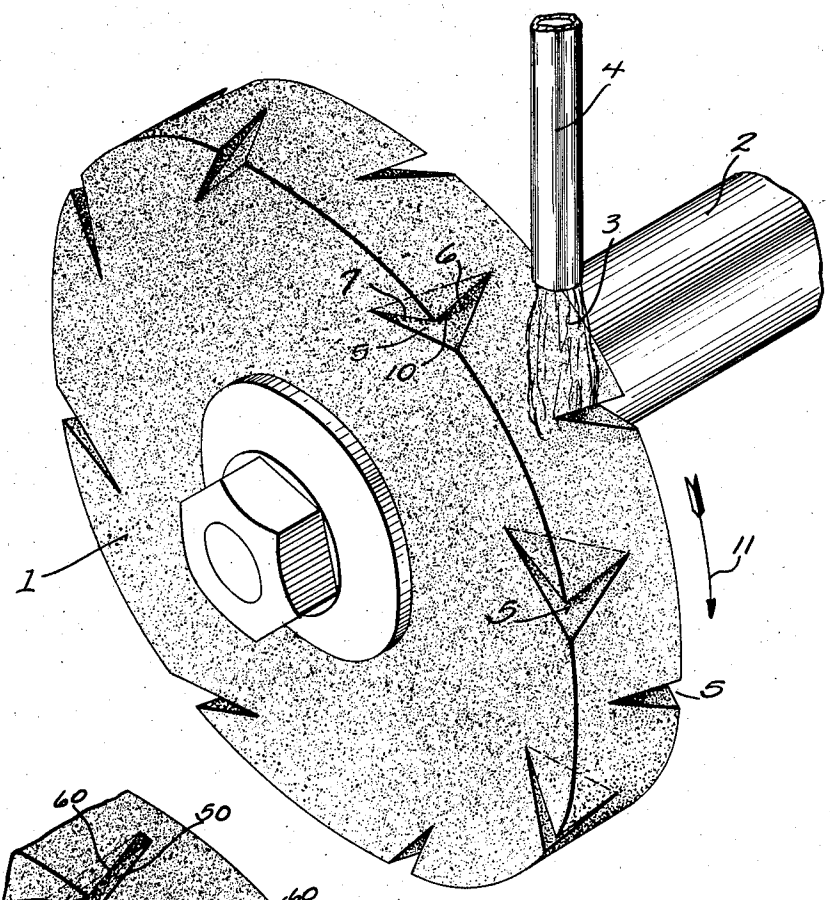
Fig. 1



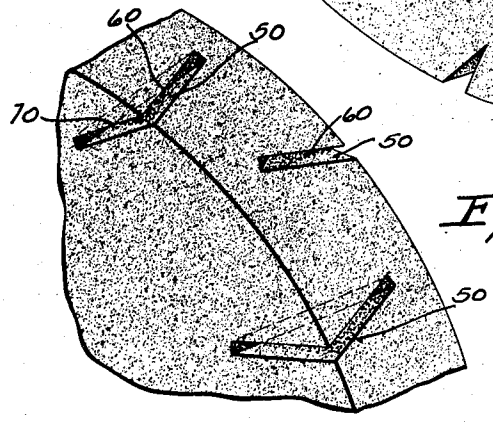


Fig. 2

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ABRADING WHEELS WITH UNDERCUT RELIEF GROOVES

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7 Claims. (Cl. 51—206)

This invention relates to an improvement in abrading wheels with undercut relief grooves.

The invention has particular reference to wheels used in machine shop practice under circumstances such that they are bathed with coolant during operation. The invention is based on my discovery that by undercutting grooves in the wheel surface which engages the work, I am able to accelerate the abrading action and reduce the heat developed, even as compared with other wheels having relieved cutting surfaces.

In a preferred embodiment illustrated, the wheel is an outside wheel having staggered notches extending inwardly alternately from its opposite margins, each notch being undercut backwardly with reference to the direction of wheel rotation so that an overhanging edge behind each successive notch engages the work. The notches may run out rearwardly, as in Fig. 1, or may have parallel sides, as in Fig. 2, but in either case the overhanging edge desirably has a substantial rake angle so that it engages the work at progressively advancing points to minimize wheel breakage.

Such a wheel runs exceptionally cool and does not burn the work, even when air is the sole coolant. However, it is particularly effective in machine shop practice where a stream of liquid coolant is directed on the work and retained in the pockets formed by the notching operation to flow rearwardly and laterally from the cutting edge instead of being entirely thrown off centrifugally.

While the invention is illustrated in an outside wheel, it will be understood that its utility is not limited to such wheels, since wheels of any type may be provided with undercut grooves or notches in accordance with the teachings hereof.

In the drawings:

Fig. 1 shows in perspective an abrasive wheel embodying the invention, portions of the arbor and the coolant supply tube being fragmentarily illustrated.

Fig. 2 fragmentarily illustrates a modified embodiment in perspective.

The abrasive wheel **1** may be of any desired material and mounted on any suitable arbor **2**. It may be operated with or without coolant, but is particularly useful where coolant **3** is supplied in accordance with usual machine shop practice through a tube **4** or the like.

The cutting surface or surfaces are provided with undercut grooves or notches **5**. The embodiment selected for the purpose of exemplifying the invention is a cylindrical wheel and the notches **5** are provided in its respective margins where they are staggered to lie first on one margin and then the other. Each notch has a portion **6** extending across the periphery of the wheel with a substantial rake or angle, in this case rearwardly from parallelism with the axis. Another portion **7** extends inwardly and rearwardly (with respect to the direction of rotation) along the end face of the wheel. The sides of the notch may be convergent, as in Fig. 1. However, in Fig. 2 I have exemplified the fact that the sides of portions **60** and **70** of notch **50** may be parallel.

As indicated by dotted lines, the portions **6** and **7** of the notches **5** (and corresponding portions **60** and **70** of notches **50**) are connected beneath the overhanging edge **10**, so that each notch undercuts the edge **10** which first engages the work when the wheel is rotated in the direction indicated by the arrow **11**.

The undercut serves to retain a substantial part of the coolant delivered onto the face of the wheel and to cause such coolant to flow rearwardly for discharge from the trailing portion **7** of the notch before the inertia of the coolant is overcome by the high speed rotation of the wheel. It is believed that this is a factor in the notable increase in cooling effect produced by the undercut notches.

In any event, abrasive wheels embodying the invention run remarkably cool and under given conditions of operation will have far less tendency to burn the work than do ordinary abrasive wheels. This is the more notable because of the fact that the abrasive action produced by wheels embodying the present invention is very rapid.

The inclination of the overhanging edge respecting the wheel axis prevents the work from engaging the entire edge at once and perhaps shattering the wheel. As shown, the edge picks up the load progressively as successive portions of margin **10** engage the work.

I claim:

1. An abrasive wheel of the character described comprising end surface portions and an intervening peripheral surface portion, said wheel being provided with two series of undercut notches, each of which extends into the peripheral portion and a respective end portion of the wheel, the notches extending into one end portion of the wheel being staggered peripherally of the wheel with respect to the notches extending into the other end portion thereof and all of said notches being undercut to provide a margin overhanging the notch and projecting in the direction of wheel rotation, each of said notches having a rearward rake from the angle between said end surface portions and said peripheral portions with respect to the direction of wheel rotation.

2. The device of claim 1 in which said notches have approximately parallel margins.

3. A cutting wheel according to claim 1 in further combination with means for projecting a liquid coolant upon the wheel to be picked up in the portions of said notches in the peripheral portion of the wheel and discharged through portions of such notches in the end portions of the wheel.

4. An abrasive wheel of the character described comprising a wheel having a face portion and a peripheral portion angularly related and a series of peripherally spaced notches extending across the angle into the respective peripheral and face portions of the wheel and progressively decreasing in depth to run out on the peripheral portion and the face portion at points remote from the said angle, each notch being undercut correspondingly with respect to the direction of wheel rotation to produce a forwardly overhanging edge.

5. An abrasive wheel of the character described comprising an end surface portion and a peripheral surface portion, the said wheel being provided at points spaced about its periphery with undercut grooves extending into its end surface portion and its peripheral surface portion, wheel portions forming said grooves including edges which extend across said end portion on a minor chord thereof and edges which extend across the peripheral portion with a rearward rake deviating from parallelism with the axis of the wheel, whereby the wheel edges lying behind the respective notches form an acute angle between the peripheral portion and the end portion of the wheel and project to overhang the respective notches in the direction of wheel rotation.

6. An abrasive wheel having two angularly related cutting surfaces, said wheel being provided with a plurality of grooves extending across the angle between said cutting surfaces, said grooves being undercut to present a cutting edge which projects over the groove in the direction of wheel rotation, each said groove having a rearward rake from the angle between said working surfaces along each said working surface with respect to the direction of wheel rotation, whereby successive portions progressively engage the work.

7. An abrasive wheel comprising a wheel having two angularly related cutting surfaces and a plurality of notches extending across said angle into the respective cutting surfaces, each said notch being undercut with

respect to the direction of wheel rotation, as to each said cutting surface to produce a forwardly overhanging edge on each said cutting surface.

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