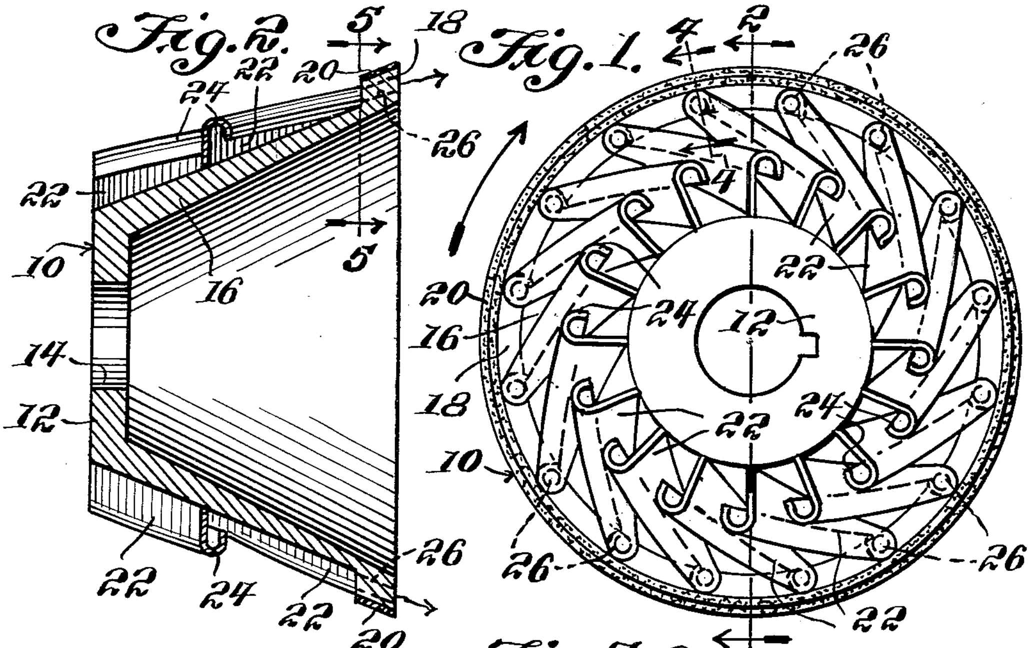
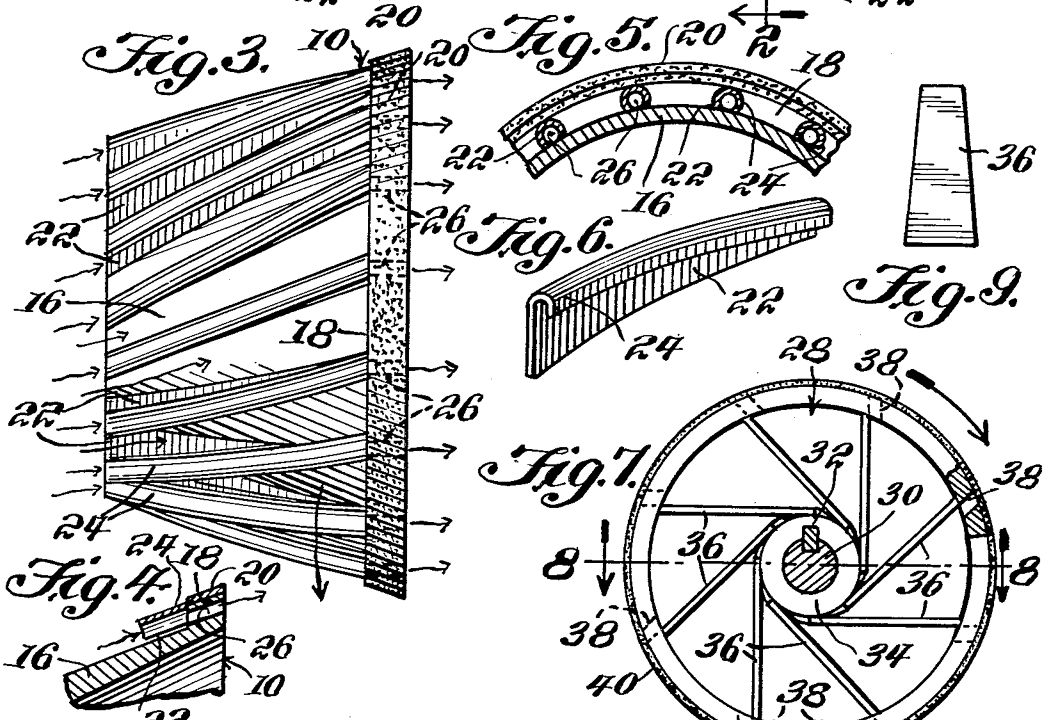
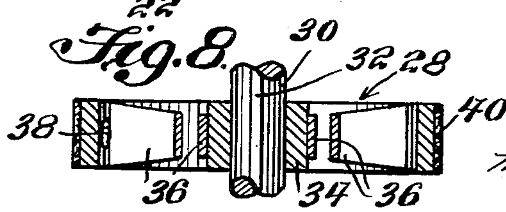
May 22, 1956 E. L. THOMAS 2,746,220

GRINDING WHEEL COOLING DEVICE

Filed Aug. 28, 1953







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United States Patent Office

2,746,220

Patented May 22, 1956

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2,746,220

GRINDING WHEEL COOLING DEVICE

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Application August 28, 1953, Serial No. 377,188

3 Claims. (Cl. 51—266)

This invention relates to grinding wheels, and more particularly has reference to means for cooling wheels of the type having thereon a composition having diamond bort as one of its main materials.

Diamond wheels generally fall into two main categories, namely, cup or dish wheels, and straight wheels. The type first named is the more common, both being widely used, and one difficulty which has been experienced in the use of both types of wheels resides in the problem of cooling the same. Wheels of this type tend to become very hot during use, and it is well known in the art that the heat factor prevents the continuous use of the diamond wheels over a lengthy period of time, thus detracting materially from the efficiency of said wheels. Further, the heat factor is one that affects adversely the preservation of diamond wheels, cutting down to an appreciable extent the ordinary life of a wheel of this nature.

The problem is a serious one in the art, in view of the fact that there is a continuing scarcity of diamond bort, used in the manufacture of diamond charged wheels, and in view of this scarcity, it has become the practice, in many instances, to construct the grinding wheels of reclaimed diamond dust. Wheels so manufactured do not represent a satisfactory solution of the problem, however, since they are not possessed of the durability of a diamond charged wheel in the manufacture of which new bort is used.

It has been proposed, comparatively recently, to employ carbon dioxide gas as a cooling means for diamond wheels, said gas being directed against the wheel while the same is in operation. While this method is satisfactory, it is also expensive and cumbersome in use, and accordingly, the main object of the present invention is to provide means carried by the wheel itself which will effectively cool the same responsively to the wheel's own velocity.

It is recognized that it is not broadly new to employ fan blades on a grinding wheel, which fan blades will stir up air currents during the rotation of the wheel, and it is not intended to claim so broad an application as the present invention. However, those grinding wheel cooling devices of this type of which I have knowledge have not worked with full efficiency, so far as can be determined, and it is therefore one important object of the present invention to provide an improved blading arrangement for grinding wheels which will be particularly effective in cooling the diamond concentrate thereof, when the wheel is rotated at high speed.

Another object of importance is to provide a blading means which will be especially adapted for use on cup-type or dished diamond wheels, these being approximately frustro-conical with the diamond concentrate being extended circumferentially of the larger end of the wheel.

Another object is to provide a blading assembly for a diamond wheel which will be particularly adapted, in a second form of the invention, for application to wheels of the straight or planiform type.

A further object of importance is to provide cooling means as described which will be so designed as to effectively cool the diamond concentrate of the wheel, without changing materially the conventional specifications of diamond wheels.

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Other objects will appear from the following description, the claims appended thereto, and from the annexed drawing, in which like reference numerals designate like parts throughout the several views, and wherein:

Figure 1 is an elevational view of a cup-type diamond wheel equipped with blading formed in accordance with the present invention, viewed from the smaller end thereof;

Figure 2 is a sectional view taken diametrically through the wheel of Figure 1, substantially on line **2—2** of Figure 1;

Figure 3 is a side elevational view of the wheel;

Figure 4 is an enlarged, detail sectional view taken substantially on line **4—4** of Figure 1;

Figure 5 is a sectional view taken substantially on line **5—5** of Figure 2;

Figure 6 is a perspective view of one of the cooling blades, per se;

Figure 7 is an elevational view of a straight type grinding wheel equipped with the blading formed in accordance with the present invention, the blading being of a modified form;

Figure 8 is a sectional view on line **8—8** of Figure 7; and

Figure 9 is an elevational view of one of the cooling blades of Figure 7, per se.

In the form of the invention shown in Figures 1–6, the blading has been applied to a cup-type or dished diamond wheel designated generally at **10** and having an inner end wall **12** formed with a center opening **14** adapted to receive a grinding wheel spindle, not shown, to which the grinding wheel would be keyed. At its periphery, the end wall **12** is integral with a frustro-conical side wall **16**, flaring in a direction away from the end wall **12** to the larger end of the wheel, said larger end being wholly open as best shown in Figure 2. At its larger end, the side wall **16** is circumferentially thickened on its outer side to provide a grinding ring **18**, and on the ring there is provided a diamond concentrate **20** which is the abrasive surface of the wheel.

Cooling blades, designated by the reference numeral **22**, are spaced equal distances apart about the circumference of the sidewall **16** as shown in Figure 1. The several blades **22** are all identical to one another, and accordingly, the description of one will suffice for all. As will be noted, each blade is formed from a single piece of material, curving gradually in the direction of its length, the body of the blade being reduced progressively in width from one of its ends to the other (see Figure 6). Integrally formed upon the blade body, and extending the full length of one side edge of said body, is a lip **24**, said lip being U-shaped in cross section and being extended in the direction of the other side edge of the blade body. The lip **24** defines a conduit for cooling air, the air traveling in the direction of the arrows shown in Figure 3 during use of the device.

Formed in the ring **18** of the diamond wheel is a circumferential series of openings **26**, these being spaced equal distances apart about the circumference of the wheel, in correspondence to the spacing of the blades. The openings **26** are extended transversely of the ring **18**, the openings being in communication at their opposite ends with the opposite side surfaces of the ring **18** on which the diamond concentrate **20** is located.

The blades **22** are welded or otherwise fixedly attached to the outer surface of the frustro-conical side wall **16** of the diamond wheel, with the wider ends of the blades being flush with the end wall **12** (Figures 2 and 3). The smaller ends of the blades terminate in abutting relation to the ring **18**, the smaller end of each blade being disposed at the location of a cooling opening **26**. Due to the gently curved shape of the blades, the blades are disposed in a spiralling arrangement about the periphery of the diamond wheel.

The blades are so mounted upon the outer surface of the side wall **16** of the wheel as to cause the larger ends of the blades to be the leading ends thereof, considering the blade mounting from the standpoint of direction of wheel rotation. The smaller ends of the blades are the trailing ends, and the lips **24** are extended from the blade bodies in the direction of wheel rotation. By reason of this arrangement, during high speed rotation of the grinding wheel, air will be trapped between the blades, throughout the circumference of the wheel, and will enter the spaces between adjacent blades at the larger ends thereof. Thereafter, the air will be directed as shown by the arrows in Figure 3 longitudinally of the blades, it being noted that the lips **24** will serve to trap the air to prevent loss thereof during its movement from end to end of the blades. Ultimately, the air will be funneled through the openings **26**, thus to cool the ring **18** and the diamond concentrate **20** below which the openings **26** extend.

In Figures 7–9, a modified form of the invention is shown, that is particularly adapted for use on straight type diamond wheels. One of these wheels has been shown by way of example, and has been designated generally by the reference numeral **28**. The wheel **28** is mounted upon a spindle **30**, being secured to the spindle for rotation therewith through the medium of a key **32** engaged in the hub **34** of the wheel.

Extending from the hub to the wheel periphery are equidistantly spaced cooling blades **36**. The blades **36** are arranged tangentially of the hub (see Figure 1), and as shown in Figure 9, are gradually diminished in width from their inner to their outer ends, the inner ends of the cooling blades being secured fixedly to the periphery of the hub and the outer ends of the cooling blades being secured fixedly to the rim of the wheel.

In this instance, the smaller ends of the blades, located at the wheel hub, are the leading ends, considering the construction from the standpoint of direction of wheel rotation. The outer ends of the blades, in this connection, are connected to the wheel ring immediately behind cooling openings **38** that extend through the diamond charged abrasive surface **40** of the ring.

In both embodiments of the invention, the construction is such as to cause the diamond wheel grinding ring to be cooled by reason of its own velocity, through the medium of a blading arrangement so designed as to supply cooling air in the location at which it is most needed, namely, adjacent the diamond concentrate, where most of the heat is produced during use of the diamond wheel.

It will be understood that the cooling blades **36** would, in a commercial embodiment of the invention, be transversely depressed or concaved, so as to cause the air to be trapped effectively thereby during rotation of the wheel, thus to cause the air to be channeled into the openings **38**. Further, the cooling blades **36** could project beyond the respective side surfaces of the wheel, so as to further aid in the trapping of air for subsequent passage of the air through the cooling openings.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles of operation and the means

presently devised to carry out said principles, it being considered that the invention comprehends any minor change in construction that may be permitted within the scope of the appended claims.

What is claimed is:

1. In a grinding wheel, a wheel body, a grinding ring on and surrounding said body, said grinding ring having circumferentially spaced cooling openings extending therethrough, a plurality of cooling blades mounted on said body, said blades having inner ends remote from said grinding ring and outer ends located alongside of said openings and engaging said grinding ring, wherein said wheel body has a conical sidewall having a smaller inner end and a larger outer end and a peripheral surface, said grinding ring being around the larger outer end of the side wall and projects radially from the side wall, said grinding ring has inner and outer sides through which said cooling openings extend, the blades being engaged with and extending along the peripheral surface of the side wall and angled relative to the axis of the wheel body.

2. In a grinding wheel, a wheel body, a grinding ring on and surrounding said body, said grinding ring having circumferentially spaced cooling openings extending therethrough, a plurality of cooling blades mounted on said body, said blades having inner ends remote from said grinding ring and outer ends located alongside of said openings and engaging said grinding ring, wherein said wheel body has a conical side wall having a smaller inner end and a larger outer end and a peripheral surface, said grinding ring being around the larger outer end of the side wall and projecting radially from the side wall, said grinding ring has inner and outer sides through which said cooling openings extend, the blades being engaged with and extending along the peripheral surface of the side wall and angled relative to the axis of the wheel body, said blades comprising flat bodies having inward longitudinal side edges engaging the peripheral surface of the side wall and outward longitudinal side edges having inwardly curved flanges defining air conduits.

3. In a grinding wheel, a wheel body, a grinding ring on and surrounding said body, said grinding ring having circumferentially spaced cooling openings extending therethrough, a plurality of cooling blades mounted on said body, said blades having inner ends remote from said grinding ring and outer ends located alongside of said openings and engaging said grinding ring, wherein said wheel body has a conical side wall having a smaller inner end and a larger outer end and a peripheral surface, said grinding ring being around the larger outer end of the side wall and projecting radially from the side wall, said grinding ring has inner and outer sides through which said cooling openings extend, the blades being engaged with and extending along the peripheral surface of the side wall and angled relative to the axis of the wheel body, said blades comprising flat bodies having inward longitudinal side edges engaging the peripheral surface of the side wall and outward longitudinal side edges having inwardly curved flanges defining air conduits, said blade bodies tapering from the smaller end of the side wall to the grinding ring.

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