

Jan. 5, 1943.

E. I. WHITING

2,307,312

ABRADING WHEEL

Filed Sept. 4, 1941

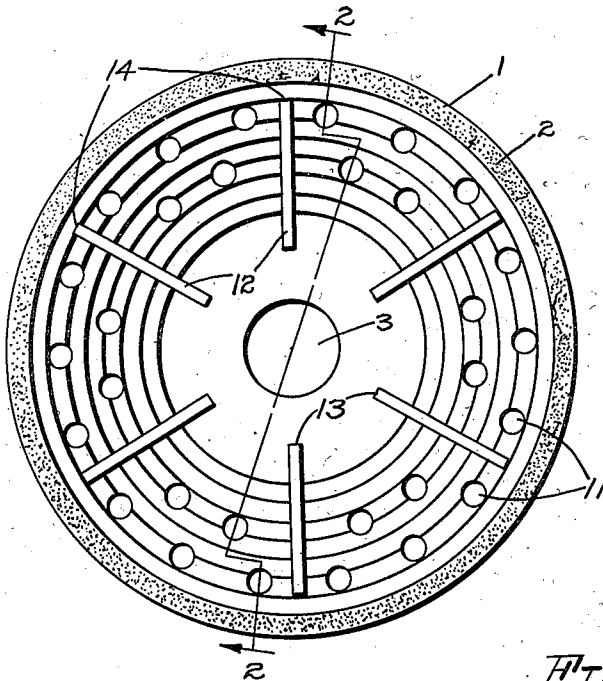


FIG. 1

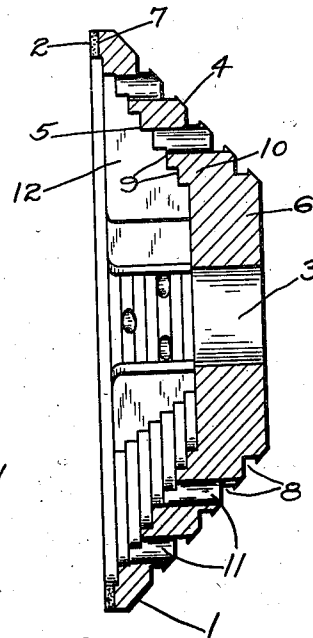


FIG. 2

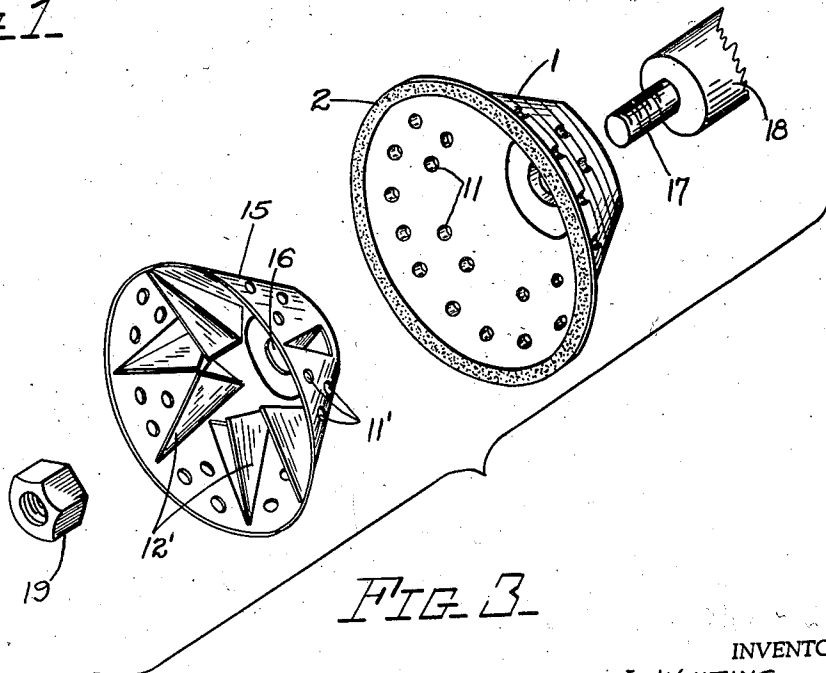


FIG. 3

INVENTOR.
EUGENE I. WHITING.
BY *Claude H. Snider*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,307,312

ABRADING WHEEL

Eugene I. Whiting, Upton, Mass., assignor to
Draper Corporation, Hopedale, Mass., a cor-
poration of Maine

Application September 4, 1941, Serial No. 409,556

6 Claims. (Cl. 51—209)

This invention relates to abrading wheels, and more particularly relates to means for cooling the wheel, the abrading surface and the material in contact with it during an abrading operation.

Since the advent of very hard cutting materials, as tungsten carbide, for use as cutting tools in machining operations much difficulty has been experienced in obtaining a satisfactory device for sharpening these tools. Such material is not only very hard but it has a comparatively low heat conductivity causing ordinary abrasives to wear out very quickly and the material being worked on to heat up excessively at the point of contact with the abrading wheel. To overcome the first difficulty an abrading substance has been developed which comprises diamond particles placed in a bonding material and affixed to a central carrying body to form an abrasive wheel. But until the present invention no satisfactory expedient had been devised to prevent the work and the wheel from overheating during a continuous grinding operation with the deleterious consequences that followed.

It has been found that the excessive heat produced in the grinding process causes the metal being ground to develop surface cracks, or checks, especially at the cutting edges of sharp edged tools where the body of metal is small, which may result in the tool being ruined or its effective useful life substantially reduced. Also the excessive heat greatly reduces the life and effectiveness of some types of abrasive wheels in common use for such grinding operations. To prevent these defects from occurring it has been found necessary to shorten the grinding period and allow ample time for the work and the wheel to cool off before proceeding. Thus, besides the extreme care necessary to prevent the work from overheating much time was lost while the tool lay idle.

It is the object of the present invention to provide an abrading wheel which can be used to grind such substances as tungsten carbide in a continuous operation without danger of overheating the material being ground or the abrading wheel. To this end I have devised a means for dissipating heat from the body of the abrading wheel and also for directing a current of air to the point of contact of the abrading material and the surface being abraded, as well as to the body of the article containing the aforesaid surface, by means of which the heat generated during the grinding operation is carried away from these articles to such a degree that the

danger of overheating them is eliminated. This may be accomplished as shown in one exemplary modification, by providing some of the surfaces of the abrading wheel with fins of metal to produce more surface on the wheel from which the heat can be taken by the air passing over it, by providing axially disposed holes in the body of the wheel through which air may be forced to carry the heat therefrom, and by providing fan blades on or adjacent the wheel which, upon rotation, will create a current of air directed to the abrading surface of the wheel and to the article upon which the abrading operation is being performed.

The foregoing and other objects of the invention may be attained by the means illustrated on the accompanying drawing in which:

Fig. 1 is a side elevation of one form of abrading wheel embodying the invention.

Fig. 2 is an end view of the same in section taken approximately along the line 2—2 of Fig. 1.

Fig. 3 shows a modification of the invention in which the fan blades are placed on an element separate from the wheel and shows the parts in their proper relative positions ready for assembly.

Since the advantages derived from the use of this invention are not limited to a wheel of any specific shape, the wheel may have the form shown in the drawing, in which 1 represents a central supporting section. An abrading substance 2 may be affixed to a portion of the wheel, as on the rim thereof, and a central opening 3 may be provided in the section 1 by which the wheel can be mounted on a driving shaft.

The outer surface 4 of the wheel may have a substantially frusto-conical form, and the inner surface 5 may have a similar form. The walls of the inner and outer surfaces may be substantially parallel, although this is not necessary to the invention, containing between them the solid section 10 of the wheel body. At the apex of the central section is the disc like wall 6 in which is the opening 3, and at the base of the section the inner and outer surfaces are joined by the annular surface 7 upon which the abrasive material may be affixed.

The surface areas of the inner and outer surfaces may be increased to permit more rapid transfer of heat from the wheel body to the surrounding atmosphere, and this may be accomplished by placing circumferential grooves 8 in the outer conical surface 4 in radially spaced relationship, and circumferential recesses 9 in

the inner conical surface 5, also in radially spaced relationship. By this construction there will be produced fin-like projections extending from the wheel surfaces which will afford an efficient means for transferring heat from the wheel body to the air adjacent the wheel. The surfaces of the wheel may be roughened, as by sand blasting, to further increase the exposed area.

The section 10 may have openings 11 placed in it which communicate with the axial inner and outer surfaces 4 and 5 of the wheel. These openings permit a flow of air through the wheel body which will aid in carrying heat from the wheel. The openings also help to provide an adequate supply of air to the fan blades to be mentioned later.

In the wheel shown by way of example in Fig. 1 the conical form of the axial interior portion 5 creates a concave section. Within this section may be placed blades 12 which are disposed in a radial direction so that their radial inner ends 13 will terminate adjacent the center of rotation of the wheel. Sufficient clearance is left between the ends 13 of the blades to allow a fastening means, as a nut, to be placed between them so that the wheel may be secured to a driving shaft placed in the opening 3. The radial outer ends 14 of the blades 12 may be made to terminate close to the abrasive material affixed to the rim of the wheel. The blades may be secured to the central section of the wheel in an integral manner as shown in Fig. 2, or may be formed on an element separate from the wheel, as shown in Fig. 3. In the latter construction it is convenient, although not necessary, to form the blades 12' on an element 15 which may be shaped to conform to a face of the wheel. The blades may be formed integral with the element as by partially cutting a portion of the metal from the body of the element and then bending it into a position normal to the surface thereof. The element may be provided with openings 11' which correspond in position to the openings 11 in the member 1 and it may have an opening 16 at the center substantially of the same size as the diameter of the end portion 17 of the drive shaft 18 to which the wheel is to be fastened. The device then can be assembled by placing the abrading wheel and the bladed element on the drive shaft and securing them together by the same fastening means used to secure the wheel to the shaft, as by the nut 19. In this modification the annular recesses may be omitted from the face of the wheel adjacent the bladed element so that the latter can be clamped closely thereto.

Upon rotation of the wheel the blades also will rotate with it and act as a fan to draw air from the region of the center of rotation and force it radially outwardly along the face of the wheel adjacent the blades and direct it on the abrasive material at the rim of the wheel. The vacuum created by forcing the air from the center of rotation also will cause air to flow through the openings 11 from the axial outer to the axial inner surfaces of the wheel body. Since, under working conditions, the temperature of the air surrounding the wheel will be less than the temperature of the wheel body, the flow of air over and through the wheel will carry the heat away from it and keep the temperature of the wheel below the point where the effect of the heat would be destructive. It has been found that with this construction a strong current of air is obtained at the rim of the wheel and surround-

ing the abrasive substance. When the wheel is brought close to the article to be abraded, the current of air also impinges on it.

Normally, when contact is made between an abrading wheel and the work the abrasive action causes the temperature of the elements to rise to a high degree which, if prolonged, will be destructive. By directing a current of cool air to both the wheel and the work and by concentrating a strong blast at the point of contact between these articles, the heat is dissipated from them very rapidly and their temperatures are kept below the point where they would be damaging.

Each of the expedients set forth above may be employed alone to produce an improved result over that which would be obtained by using an abrading wheel not having them, or they may be used in conjunction to obtain the desired result.

Having thus described a preferred embodiment of my invention, I claim:

1. An abrading wheel comprising a body portion having a circular periphery, an abrading substance on the body portion adjacent the said periphery, projecting fins placed in spaced relationship on a face of the said body portion for increasing the area of said face, and fan blades abutting a face of the body portion and rotatable therewith whereby a current of air is directed toward the said circular periphery upon rotation of the wheel.

2. An abrading wheel comprising a central section with an axially disposed face having substantially the form of a truncated cone, an abrading substance affixed adjacent the outer periphery of the said central section, a hollow interior portion in said central section, circumferential fins on said axially disposed surface of said central portion in radially disposed relation for increasing the area of said surface, communicating means between the hollow interior portion and the said axially disposed face of the wheel, and fan blades placed in the said hollow interior portion whereby, upon rotation of the blades a current of air is directed toward the outer periphery of the wheel.

3. An abrading wheel comprising a central section with an exterior surface having the form of a truncated cone, an abrading substance fixed to the base of the cone adjacent the periphery thereof, a hollow interior portion in said central section having its sides substantially parallel to the said exterior surface, circumferential grooves placed in the axially disposed surfaces of said central portion in radial spaced relationship, fan blades placed within the hollow interior portion and openings formed in said central section, whereby upon rotation of the wheel, a current of air is drawn through said openings and directed to said abrading substance.

4. An abrading wheel comprising a central supporting means, an abrading substance adjacent the outer rim of said supporting means, a plurality of openings passing through said supporting means and disposed in radial and circumferential spaced relationship and fan blades fixed in radially disposed spaced angular relationship and projecting axially in relation to said central supporting section and placed abutting an axial side of said central supporting section whereby, upon rotation, a current of air is directed through said openings and thence radially outwardly along an axial face of said central supporting section toward the periphery thereof.

5. An abrading wheel comprising a central supporting section having an axially disposed face of concave form, blade means in said concave portion projecting axially from and radially disposed on said central supporting section, an abrasive substance affixed to said central supporting section on the concavely formed side and adjacent the periphery thereof and openings formed in said central supporting section in spaced circumferential relationship whereby, upon rotation of the wheel, a current of air is directed through said openings and radially outward along the said face of said concavely formed portion and on to said abrasive substance.

6. An abrading wheel comprising a central section having exterior and interior surfaces substantially in the form of truncated cones, the sides of the interior and exterior surfaces being substantially parallel thereby forming a substantially concave interior portion for said central

section, the surfaces of said central section being made with a roughened texture, annular grooves placed in said interior and exterior surfaces in radially spaced relationship, an abrasive substance affixed to the base of the conical central section adjacent the outer rim thereof, radially disposed fan blades attached within the concavely shaped interior portion of said central section in angular spaced relationship, a plurality of openings formed in said central section in radially and circumferentially spaced relationship and disposed in uniform sequence between the aforesaid fan blades, whereby upon rotation of the wheel a current of air is directed through the said openings and is joined with a current of air directed radially outwardly along said interior surface and to the cutting surface of said abrasive substance.

EUGENE I. WHITING.