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MOUNTING STRUCTURE FOR GRINDING WHEELS

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2 SHEETS—SHEET 1

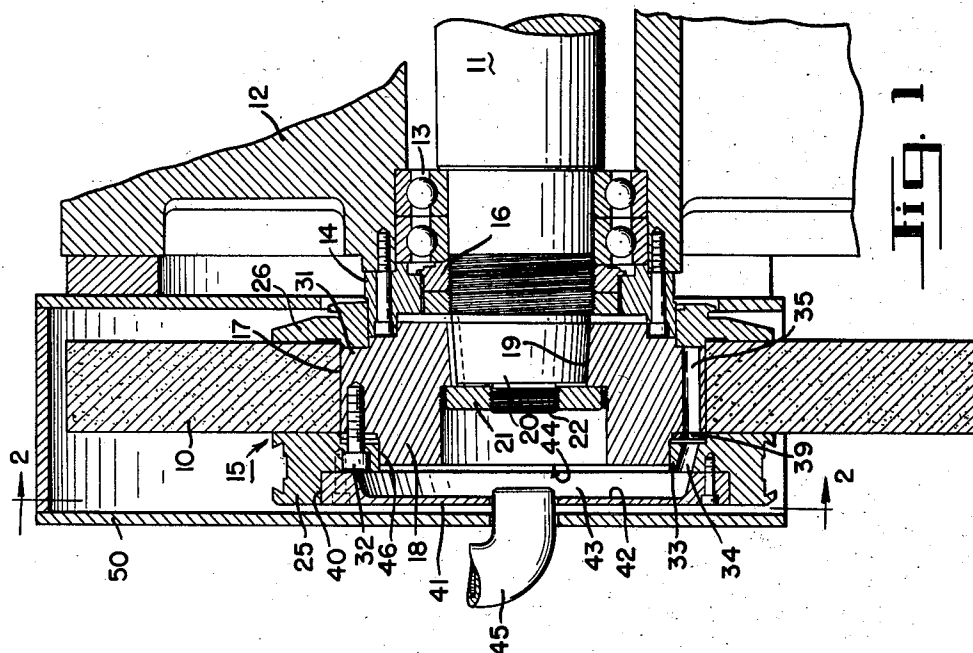


Fig. 1

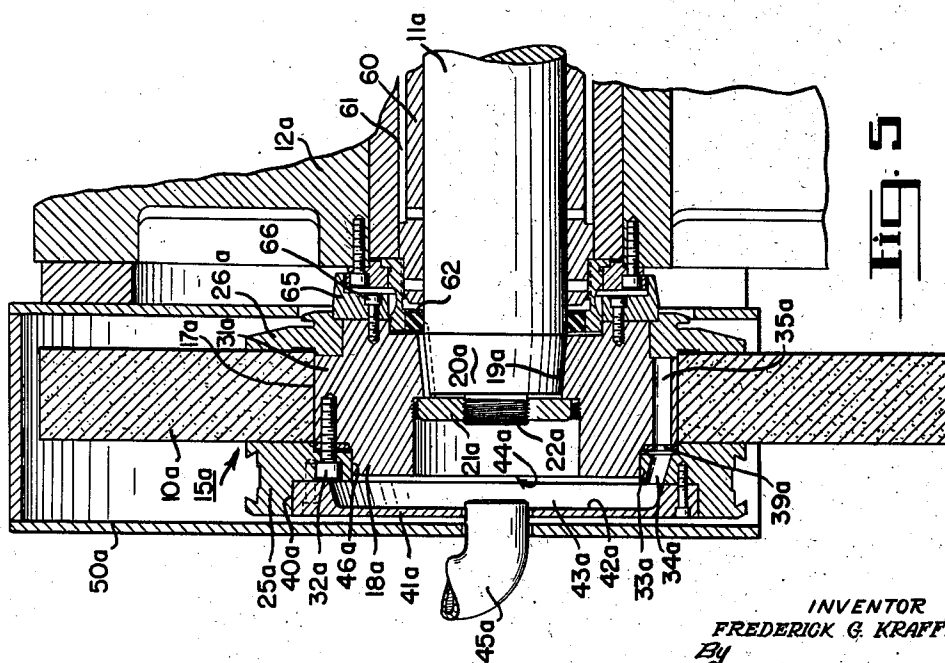


Fig. 5

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MOUNTING STRUCTURE FOR GRINDING
WHEELS

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This invention relates to grinding apparatus and particularly to apparatus relating to supplying cooling fluid to the grinding wheel of the apparatus.

In grinding processes using abrasive grinding wheels a large amount of heat is developed in and between the work and the grinding wheel while being ground by the grinding wheel, and particularly at the point of the grinding contact between the work and the grinding wheel. Cooling fluids have, in the past, been supplied to grinding wheels and the work for the purpose of maintaining the temperatures of the work as near as possible to normal room temperature to prevent burning of the work piece and also to avoid rapid deterioration of the grinding wheel. Sparks discharged from a ground surface by a grinding wheel is merely a representation of the high temperature involved in removing the surface metal of the work during the grinding process.

It has been found that the finished product resulting from a grinding operation is greatly enhanced if the temperature of the metal being removed is retained low by a full and adequate supply of cooling fluid to the immediate point of grinding contact between the grinding wheel and the work being ground.

However, due to the fact that the grinding wheel is bearing directly upon the work piece that is being ground it has been exceedingly difficult to apply an adequate supply of cooling fluid to the immediate point of contact between the grinding wheel and the work. The usual practice has been to direct jets of cooling fluid directly beneath the wheel at the point of contact between the grinding wheel and the work piece.

In more recent developments there has been apparatus provided for the purpose of supplying a cooling fluid to the immediate point of grinding contact between the wheel and the work piece by causing the cooling fluid to flow through the inner-structure of the grinding wheel and discharge at the peripheral surface of the grinding wheel at the point of grinding contact with the work piece to obtain a constant flow of cooling fluid at the specific point.

When the cooling fluid is so supplied through a grinding wheel it is highly effective both in lubricating the work piece being ground, for cooling the metal being removed and for washing the surface of the grinding wheel free of particle inclusions.

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It is therefore an object of this invention to provide an improved structure by which cooling fluid can be supplied to the internal structure of a grinding wheel for flow through the grinding wheel to the peripheral grinding surface.

It is still another object of the invention to provide a structure in accordance with the foregoing object wherein the hub mounting for the grinding wheel provides the distributing means for distributing cooling fluid to the internal structure of a grinding wheel so that the hub mounting provides the dual purpose of distribution of the cooling fluid as well as co-axial mounting of the grinding wheel on a drive shaft or spindle.

Another object of the invention is to provide an improved structure in accordance with the foregoing objects that is constructed and arranged for relative ease of manufacture and on which a standard grinding wheel can be mounted to thereby eliminate any necessity of special manufacture of grinding wheels to obtain uniform distribution of cooling fluid throughout the internal structure of the grinding wheel.

Further objects and advantages will become apparent from the drawings and the following description.

Figure 1 is a vertical cross-sectional view of an improved grinding wheel mounting structure incorporating features of my invention and as taken along line 1-1 of Figure 2.

Figure 2 is a vertical cross-sectional view taken substantially along line 2-2 of Figure 1 but with portions of the apparatus broken away to illustrate more fully the construction of the apparatus.

Figure 3 is a cross-sectional view taken along line 3-3 of Figure 2.

Figure 4 is a cross-sectional view taken along line 4-4 of Figure 2.

Figure 5 is a vertical cross-sectional view like Figure 1 but illustrating a sleeve mounting bearing for the spindle in place of a ball bearing mounting.

The grinding wheel 10 and hub mounting structure 15 for the same is supported upon a drive shaft or spindle 11 that is suitably journaled in the machine frame 12 by means of anti-friction ball bearings 13 which are held within the frame by a retaining ring 14 and having suitable grease retaining rings 16 associated therewith.

The grinding wheel 10 is provided with a cen-

tral axial opening 17 that engages the periphery of a mounting hub 18 thereby supporting the grinding wheel 10 directly upon the hub. The hub 18 has a tapered axial opening 19 that receives the tapered end 20 of the spindle shaft 11, a nut 21 being threadedly received on the threaded end 22 of the shaft 11 to secure the hub 18 on the spindle shaft 11.

The grinding wheel 10 is secured in fixed position on the hub 18 as retained between a pair of annular flanges 25 and 26. The flange 26 is secured to the hub 18 by means of cap screws 30, shown in Figure 4, the cap screws extending through an annular projection 31 that extends around the periphery of the hub 18. The flange 25 is secured to the hub by means of cap screws 32 shown in Figure 1, which extend through the annular projection 31 on the hub 18.

The flange 25 has an inwardly extending annular projection 33 that rests upon an annular ledge 46 provided on the hub 18 and through which the cap screws 32 extend. This inwardly projecting annular extension 33 in the inner periphery of the flange 25 carries a series of holes 34 that communicate with a series of holes 35 provided around the periphery of the hub 18 and extending axially of the hub parallel with the axis thereof through the annular projection 31 on the hub 18.

The holes 35 communicate with the peripheral surface 36 of the projection 31 by means of slots 37 that extend inwardly from the peripheral surface 36 into engagement with the holes 35, each hole 35 thus having a tangential communicating slot 37 through which liquid is delivered from the hole 35 to the inner peripheral surface of the axial opening 17 in the grinding wheel 10. A closure plate 38 is provided along one side of the holes 35, see Figure 3, to close the slots 37 at one end thereof while being provided with holes 39 that align with the hole 35 to permit liquid to enter into holes 35 through the closure plate 38. The opposite end of the holes 35 is closed by the flange 26, as illustrated in Figure 3.

The flange 25 has an annular recess 40 that receives a disc 41. The disc 41 has a central recess 42 that provides a cavity or chamber 43 adjacent the front wall 44 of the hub 18 to receive liquid as supplied through a pipe 45 from a suitable source of supply of cooling liquid.

A shield 50 is placed around the grinding wheel 10 and is suitably supported upon the machine frame 12 the shield preventing liquid from spraying over the machine frame.

In operation, upon rotation of the grinding wheel 10 and its hub mounting structure through the spindle 11 that is driven in any conventional manner, liquid supplied through the pipe 45 into the cavity 43 will be centrifuged radially in the cavity 43 for passage through the holes 34 in the flange 25 and thence into the holes 35 in the hub 18. From the holes 35 in the hub 18 liquid will be supplied to the tangentially and radially disposed slots 37 that engage the inner periphery of the axial opening 17 to apply liquid against the peripheral surface of the axial opening 17. Cooling liquid will move through the body of the grinding wheel during rotation of the grinding wheel under the action of centrifugal force working on the liquid until the liquid reaches the outer peripheral surface of the grinding wheel at which it is discharged.

It will be noted that the action of the centrifugal force on the liquid coolant supplied to the

inner periphery of the axial opening 17 of the grinding wheel 10 is limited to the action of the force on the column of the liquid that is in the slots 37 which would be in addition to the pressure applied to the body of liquid by centrifugal force acting upon that portion of the liquid within the chamber 43. In effect therefore the cooling liquid is supplied to the slots 37 as a fluid under pressure and only after the liquid enters the slots 37 does direct centrifugal action affect the movement of the liquid into the body of the grinding wheel 10.

In Figure 5 there is illustrated a slightly modified structure wherein the spindle 11a is carried in a sleeve bearing 60 that is mounted in the machine frame 12a. The shaft 11a is lubricated in the sleeve bearing 60 through the passages 61, and a suitable lubricant seal 62 is provided at the forward end of the sleeve bearing.

The hub 18a carries an annular ring 65 secured thereto by cap screws 66 that retains the flange 26a upon the hub 18a.

In other respects the structure illustrated in Figure 5 is the same as that illustrated in Figure 1 so that like parts are given corresponding reference numerals but with the suffix "a" added thereto. Also, the device of Figure 5 operates in the same fashion as that heretofore discussed with reference to the devices of Figure 1.

While the apparatus disclosed and described herein illustrates preferred forms of the invention, yet it will be understood that there are structural modifications that can be made without departing from the spirit of the invention, and that those modifications that fall within the scope of the appended claims are intended to be included herein.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Mechanism for feeding liquid through the body of an abrasive wheel which comprises in combination, a grinding wheel having a central axial cavity, a hub within said axial cavity engaging and supporting said grinding wheel across said cavity, and a pair of clamping plates, said hub having a plurality of passageways therein arranged substantially parallel to the central axis of said hub and adjacent the outer peripheral face thereof, said passageways being closed at their outer ends by said clamping plate, radially disposed slots communicating with said passageways and extending to and opening against said inner peripheral face of the grinding wheel, said slots being closed at their outer faces by said inner peripheral face and connecting said passageways thereto whereby coolant may be conducted through said hub and delivered against the inner peripheral face of the grinding wheel for movement through the body of said wheel and onto the outer peripheral working surface thereof.

2. Mechanism for feeding liquid through the body of an abrasive wheel which comprises in combination, a grinding wheel having a central axial cavity, a hub within said axial cavity engaging and supporting said grinding wheel across the said cavity, and a pair of clamping plates, said hub having a plurality of passageways therein arranged substantially parallel to the central axis of said clamping plates and adjacent the outer peripheral face thereof, said passageways being closed at their outer ends by said hub, radially disposed slots communicating with said passageways

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and connecting the same with said inner peripheral face of said grinding wheel, said slots being closed at their outer faces by said inner peripheral wheel face, and means comprising a recessed disc forming a chamber for liquid coolant disposed on one side of said hub and connected with a source of coolant supply, and ports connecting said chamber with said passageways in said hub whereby coolant may be conducted to and delivered against the inner face of said grinding wheel.

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