

July 28, 1964

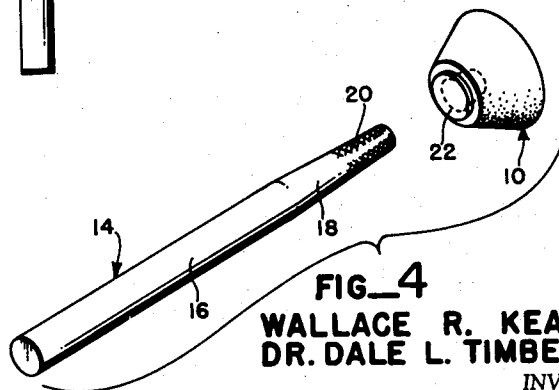
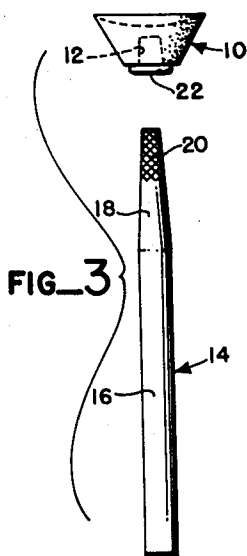
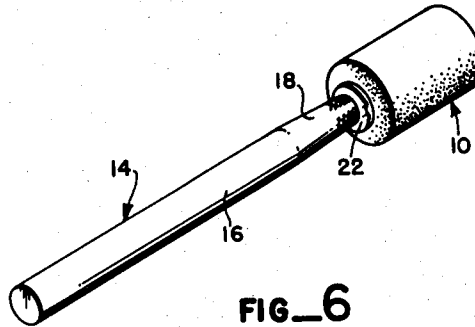
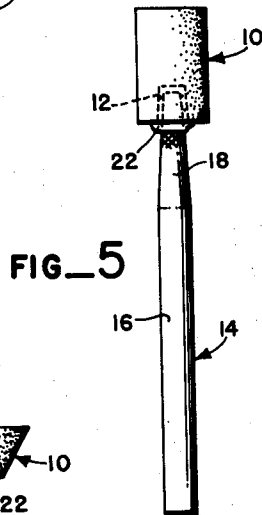
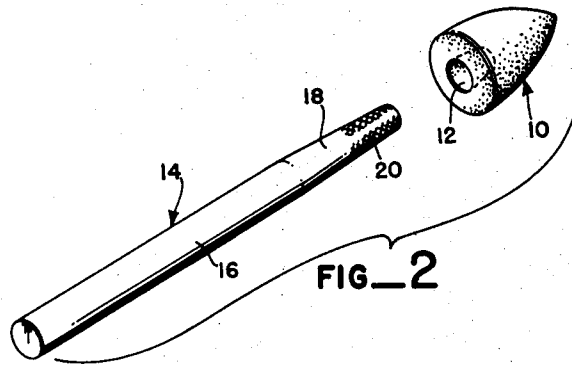
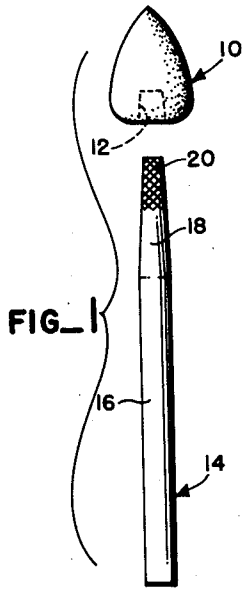
W. R. KEAN ETAL

3,142,138

MOUNTED ABRASIVE STONE AND METHOD OF MAKING SAME

Filed May 8, 1963

2 Sheets-Sheet 1



WALLACE R. KEAN
DR. DALE L. TIMBERLAKE
INVENTOR

BY

W Secret

July 28, 1964

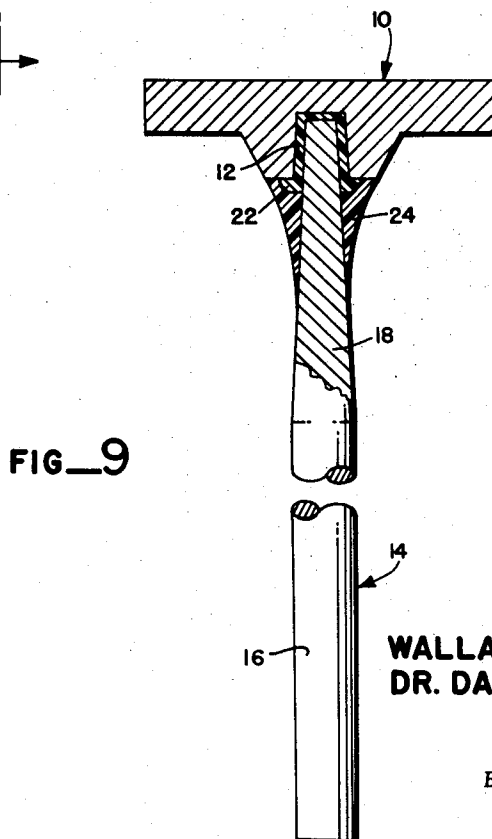
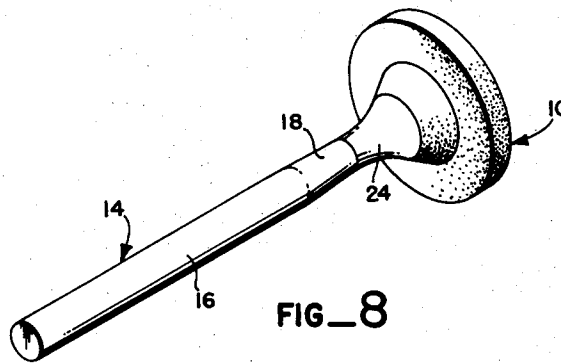
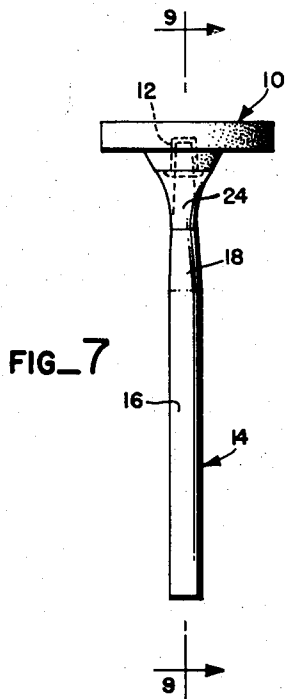
W. R. KEAN ETAL

3,142,138

MOUNTED ABRASIVE STONE AND METHOD OF MAKING SAME

Filed May 8, 1963

2 Sheets-Sheet 2



WALLACE R. KEAN
DR. DALE L. TIMBERLAKE
INVENTOR.

BY *TW Secret*

1

2

3,142,138

MOUNTED ABRASIVE STONE AND METHOD OF MAKING SAME

Wallace R. Kean, 177 Crown Terrace, San Francisco, Calif., and Dale L. Timberlake, 1333 W. Camelback Road, Phoenix, Ariz.

Filed May 8, 1963, Ser. No. 278,835

6 Claims. (Cl. 51—206)

This invention relates to a mounted abrasive stone and which stone comprises an abrasive head and a shaft.

Abrasive materials have been used for grinding and polishing and for drilling purposes for a number of years. One of the oldest types of an abrasive cutting stone is the grinding wheel which can be used for sharpening tools such as axes and the grinding of mechanical equipment such as crank shafts, cam shafts and the like. These grinding wheels rotate at what is now a relatively low speed. However, these grinding wheels, because of their size and weight, need to be balanced in order to do an accurate abrading operation. Numerous inventions have been made for balancing the grinding wheel. Typical of these are Hudson, United States Patent 2,070,360, who adds a weight to the flat non-cutting surface of a grinding wheel to balance the same. Another patent is that of Simonds, Reissue Number 20,207, who adds a weight to the grinding wheel and takes advantage of the porosity of the grinding wheel to incorporate the weight into the wheel. Another patent to Simonds is 1,986,648 who paints a material on the facial surface of the grinding wheel so as to add weight to the same and to balance the wheel. Again, these grinding wheels rotate at a relatively low speed and, also, have a large facial area which makes it possible for them to take up a weight or for a weight to be added. In this invention, mounted abrasive stones are balanced. At the present time dental abrasive drills may rotate at a high speed such as 25,000 or 50,000 revolutions per minute. In some cases the dental drills even rotate at a speed of 300,000 revolutions per minute. As can be readily appreciated, the drill has to be accurately balanced or at this rate of high speed the mounted abrasive stone or drill vibrates and due to its imbalance does not have a true cutting edge. Further, it is not possible to achieve accurate cutting with the mounted abrasive stone which is out of balance and which imbalance also reduces the life of the mounted abrasive stone which rotates at these high speeds. One of the difficulties with balancing this type of mounted abrasive stone is that the abrasive stone has a very small area and it is rather difficult to accurately add weight to the abrasive stone. Because of this limitation on the adding of weight to the abrasive stone of the dental drill, we have devised a method for balancing dental drills and abrasive drills by adding a liquid coating at the junction of the abrasive head and the shaft. This liquid coating flows and balances the abrasive drill. Further, the liquid coating hardens and becomes solid and is thereby permanently positioned at the junction of the drill and the shaft. Accordingly, an object of this invention is to provide a mounted abrasive stone having a longer stone life than presently available mounted abrasive stones; a stone which runs truer than presently available stones as our stone is rotationally balanced; and a mounted abrasive stone which has more accurate cutting qualities than the presently available stones; a stone which has an increased bonding strength between the abrasive stone and the shaft on which the stone is mounted; a mounted abrasive stone which is sealed between the stone and the shaft so as to protect the primary bonding agent from chemicals such as sterilizing solutions and the like; and a mounted abrasive stone which is sealed between the abrasive head and the shaft so as to make sterilization quicker, easier and

more positive because the irregular places between the junction of the stone and the shaft are sealed from outside elements. These and other important advantages and objects of the invention will be more particularly brought forth upon reference to the accompanying drawings, the detailed specification and the appended claims.

In the drawings:

FIGURE 1 is a view looking at an abrasive head or abrasive stone with a hole in the head for receiving a shank;

FIGURE 2 is a prospective view looking at the bottom of the abrasive stone with a hole in the stone for receiving the shank;

FIGURE 3 is a view looking at an abrasive stone having a hole in it and with a bonding agent in the hole and on the bottom of the abrasive stone, and illustrates the shank;

FIGURE 4 is a prospective view looking at the bottom of the abrasive stone with a hole in the bottom of the stone and a bonding agent in the hole and on the bottom of the stone, and illustrates the shank preparatory to being inserted into the bonding agent in the hole;

FIGURE 5 is a view showing the abrasive stone with a hole therein, the bonding agent and a shank projecting into the hole in the abrasive stone and the bonding agent;

FIGURE 6 is a prospective view looking at the bottom of the abrasive stone with the bonding agent on the bottom of the abrasive stone, and a shank positioned in the abrasive stone and the bonding agent;

FIGURE 7 is a prospective view of the abrasive stone with a hole in it, a bonding agent in the hole and a shank projecting into the hole, and a coating agent contacting the base of the abrasive stone surrounding the bonding agent and the shank projecting into the abrasive stone;

FIGURE 8 is a prospective view looking at the bottom of the abrasive stone and shows the coating agent contacting the bottom of the abrasive stone and surrounding the upper part of the shank which projects into the abrasive stone; and

FIGURE 9 is a longitudinal cross-sectional view of the mounted abrasive stone and shows the stone with the shaft hole, the bonding agent in the hole, the end of the shaft in the hole, and a coating agent contacting the base of the stone, covering the bonding agent and contacting the shaft.

In the manufacture of an abrasive stone a selected size and hardness of silicon carbide or aluminium oxide is mixed with a bonding agent such as vitreous clays, shellac or synthetic resins and molded into a desired shape. The desired shape is then fired in a kiln to make a hardened abrasive stone. The stone is mounted on a shaft or a shank. In FIGURES 1 and 2 there is illustrated a stone 10 having a shaft hole or opening 12 in the base. To digress a minute, in FIGURES 1 through 8 there are illustrated a number of abrasive stones. It is seen that these abrasive stones are of various configurations, but all are referred to by reference numeral 10. The purpose of the various configurations is to illustrate the various abrasive stones which may be covered by this invention, but which invention is not limited to these shapes and configurations.

There is a shaft 14. The shaft 14 may be made on an automatic screw making machine from rust resisting steel rods such as stainless steel rods of a correct diameter. The shaft 14 has a main body portion 16 and a tapered end 18. The tapered end 18 is knurled at 20 for better bonding between the head 10 and the shaft 14.

In FIGURES 3 and 4 it is seen that there is applied a first bonding agent or a bonding agent 22 to the base of the abrasive stone 10. Some of the bonding agent 22 is in the shaft hole 12. The primary bonding agent may be of any oxyphosphate type such as calcined cupric

oxide and phosphoric acid. Also, this bonding agent may be a polyester resin or a phenol-aldehyde resin or an epoxy resin, to name a few.

In FIGURES 5 and 6 there is illustrated the positioning of the knurled end 20 of the shaft 14 in the shaft hole 12 of the abrasive stone 10. Also, it is seen that the primary bonding agent 22 is unevenly distributed over the bottom or base portion of the abrasive stone 10 and the tapered end 18 of the shaft 14. At higher rotational speeds in the range of 25,000 revolutions per minute to 300,000 revolutions per minute, such an unbalance of the mounted abrasive stone causes the drill to vibrate. This vibration causes the mounted abrasive stone to run erratically and to cut inaccurately. In addition, this unbalance leads to further unbalance as the stone does not wear truly round as a certain area of the stone is cutting while another area of the stone is not cutting. As a result, that area which is cutting is abraded away faster than that area of the stone which is not cutting. This further shortens the life of the stone because then the stone itself becomes unbalanced.

To correct this unbalance, the bonding agent 22 is allowed to dry. Then, each mounted abrasive stone is inspected and then placed in a small chuck and rotated rapidly to check the balance. At this time a coating agent 24 is applied with a small brush to the area of the joint when the mounted abrasive stone is still in the chuck and can be rotated slowly by hand. The entire joint area, viz., that region at the tapered end and knurled portion 20 of the shaft 14 in the hole 12, is sealed evenly with the coating agent from the shaft over the primary first bonding agent 22 to the lower surface of the abrasive stone or the base of the abrasive stone. If the first bonding agent 22 has been squeezed out unevenly, then the coating agent 24 is applied so as to fill in the opposite side to make the joint uniform. The amount of coating agent 24 which is applied is dependent upon the amount of uneven bonding agent 22 in the joint. The coating agent is applied until the joint is "built-up" evenly. However, for the sake of uniformity a certain band or zone of the joint is covered and sealed for each shape of the mounted abrasive stones. The banded mounted abrasive stone is then taken out of the chuck and placed in a holder that allows the shaft 14 to stand vertically. As the coating agent 24 has not yet hardened, it has a tendency to flow very slowly in a downwardly direction due to gravity. The flow of the coating agent 24 naturally stops as it hardens or cures. However, when the mounted abrasive point is stored in an upside-down position, the coating agent does not flow out of the base area of the stone as it would have to move in a substantially horizontal plane and surface tension prevent this.

The coating agent 24 may be an epoxy type coating agent and may comprise a bis-phenol-A epichlorohydrin and a polyamide type chemical. With the mixing of these two reactants the reaction begins. The resulting product or the reaction mixture has to be used within a relatively short time or else it cures and hardens so as to be inapplicable. The viscosity of the reaction mixture is in the range of 75 to 95 krebs units at room temperatures of approximately 20-25° C.

From the foregoing, it is seen that we have provided a mounted abrasive stone which is rotationally balanced and also, which has the added feature of being stronger than the conventional mounted abrasive stones in that the coating agent 24 is also a strong bonding agent. The coating agent 24 contacts both the shaft 14 and the base of the abrasive stone 10. As the coating 24 may be an

epoxy type resin, there is this additional strength. Further, the coating agent 24 seals the end of the shaft 14 and the primary bonding agent 22 so as to form a continuous smooth surface which is easier to keep clean and also prevents a pocket or a breeding place for germs. In addition, the coating agent 24 acts as a film or a protector for the bonding agent 22.

Having presented the invention, what we claim is:

1. An abrasive drill, said drill comprising an abrasive head and a shaft, the abrasive head having a shaft hole, a first bonding agent bonding the abrasive head to the shaft, said shaft being in said shaft hole, a second bonding agent substantially covering the first bonding agent and also bonding the abrasive head to the shaft and said second bonding agent being distributed on said drill in a manner which insures a high degree of rotational balance for said drill.

2. A method for making an abrasive drill, said drill having an abrasive head, a shaft, and a first bonding agent bonding the abrasive head to the shaft; said method comprising applying a coating agent over the first bonding agent and by rotating said drill while the coating is fluid distributing the coating agent on the drill in a manner which insures a high degree of rotational balance for the abrasive drill.

3. A method for making an abrasive drill, said drill having an abrasive head, a shaft, and a first bonding agent bonding the abrasive head to the shaft, said method comprising applying a coating agent over the first bonding agent, and rotating said abrasive drill while the coating agent is liquid and can flow whereby a high degree of rotational balance for the abrasive drill is attained, and thereafter curing the coating agent.

4. A method for making an abrasive drill, said drill having an abrasive head and a shaft, said method comprising bonding the shaft to the abrasive head with a first bonding agent, allowing the first bonding agent to dry and then applying a coating agent over the first bonding agent and by rotating the drill while the coating agent is still fluid distributing the coating agent on the drill in a manner which insures a high degree of rotational balance for the abrasive drill.

5. A method for making an abrasive drill, said drill having an abrasive head and a shaft, said method comprising bonding the shaft to the abrasive head with a first bonding agent allowing the first bonding agent to dry, applying a coating agent over the first bonding agent while rotating said abrasive drill, and further rotating said abrasive drill while the coating agent can flow to distribute the coating agent to improve thereby the rotational balance of the abrasive drill.

6. An abrasive drill having an abrasive head and a shaft, the abrasive head having therein a shaft hole in which the shaft is mounted, a first bonding agent disposed in the shaft hole bonding the abrasive head to the shaft, a second bonding agent sealing the juncture of the shaft with the shaft hole and covering the first bonding agent, said second bonding agent being distributed on said drill in a manner which insures a high degree of rotational balance for the drill, said second bonding agent further acting also as a protective film over the first bonding agent.

References Cited in the file of this patent

UNITED STATES PATENTS

1,986,648	Simonds	Jan. 1, 1935
2,763,970	Miller et al.	Sept. 25, 1956
2,907,148	Sheets	Oct. 6, 1959