May 15, 1956 P. A. VONADA 2,745,225

LAPIDARY WHEEL

Filed June 27, 1955

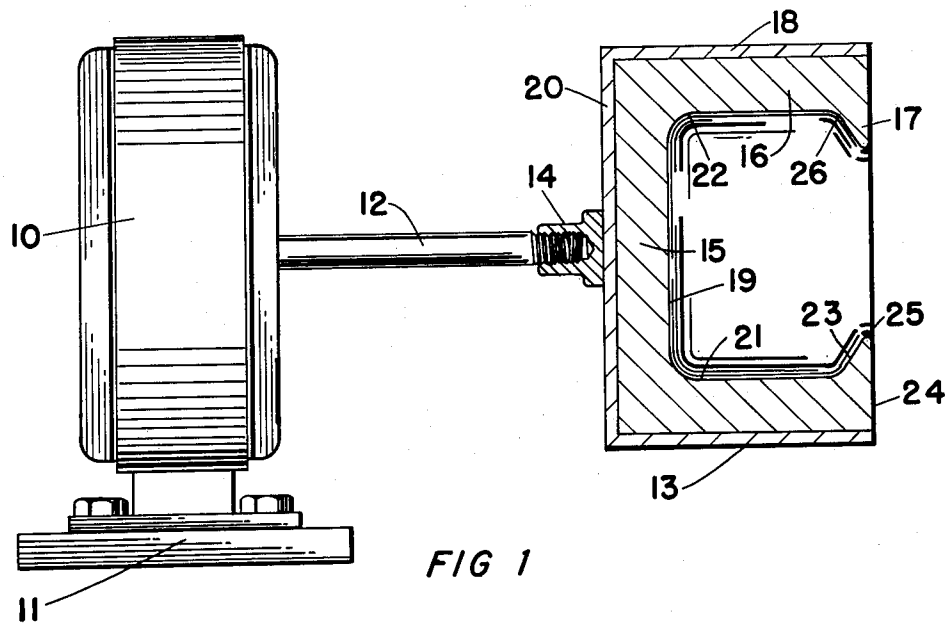

FIG 1

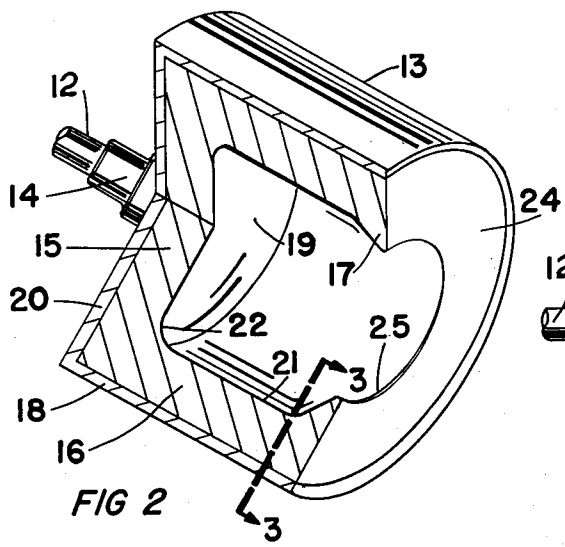

FIG 2

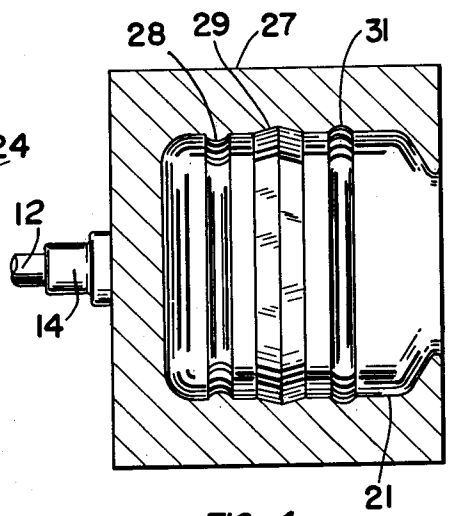

FIG 4

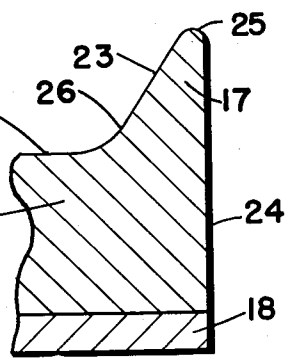

FIG 3

Phillip A. Vonada
INVENTOR
M. E. Frederick
ATTORNEY

United States Patent Office

2,745,225

Patented May 15, 1956

2,745,225

LAPIDARY WHEEL

Phillip A. Vonada, State College, Pa.

Application June 27, 1955, Serial No. 518,247

10 Claims. (Cl. 51—206)

The present invention relates to grinding and polishing gemstones or the like and more particularly to a new and improved wheel for grinding and polishing gemstones.

In the art of grinding and polishing gemstones it is the customary practice to rigidly attach a roughly cut piece of stone to a suitable holder, known in the art as a "dop stick," and by manually forcing the stone against a rotating disk-shaped abrasive wheel and adjusting the position of the holder with respect to the working surface of the abrasive wheel thus produce a curved surface on the stone. Such a stone having a curved surface is known as a "cabochon." The degree of perfection of a curved surface on such a stone is dependent upon the experience and ability of the person performing the operation and, as is obvious, a high degree of skill is necessary to produce a desired curved surface or to produce two or more stones having substantially the same curvature or form. It is well known in the art that if during the grinding or polishing operation the surface of the stone in contact with the abrasive wheel is allowed to become excessively hot due to the friction created thereby, the stone will crack. To prevent this undesirable result, a liquid such as water or oil is continuously applied to the surface of the abrasive wheel, thus carrying away a substantial amount of the heat generated and keeping that part of the stone in contact with the abrasive wheel at a safe temperature. Due to the centrifugal force of the abrasive wheel the liquid is continuously thrown off, and means must be provided to catch and retain the liquid. A further disadvantage of the present art is that one must have several abrasive wheels having a different degree of abrasiveness to perform the different operations such as grinding, sanding, polishing, et cetera, inherent in the production of a cabochon.

The present invention comprises a hollow or cup-shaped wheel having one or more working surfaces on the inside of the wheel and an inwardly protruding lip or raised portion integral with the inside forward edge or periphery of the open end of the wheel that cooperate in a new and novel manner and which will retain a relatively small amount of liquid within the wheel. The construction and use of my wheel, as will be more fully and clearly explained, provides means whereby an arcuate surface on a gemstone or the like may be easily and accurately formed or reproduced merely by holding the stone against one of the working surfaces. By provision of the inwardly extending lip a sufficient amount of suitable liquid as may be determined by the type of wheel and the size and type of stone being formed, may be retained within the wheel to properly cool a stone being formed or polished and thus eliminate the necessity of a continuous supply of such liquid and the associated means for catching and retaining said liquid to prevent the operator from being splashed or injured. By constructing my new and improved wheel of a substantially non-abrasive material and introducing a sufficient amount of a suitable granular abrasive mixed with a carrier such as

water, oil, or the like, substantially any desirable degree of abrasiveness may be secured, said composition acting both as an abrasive and as a coolant.

An object of the present invention is the provision of a simpler, easier, cheaper, and more accurate means for producing cabochons. As used herein, cabochon means a gemstone or the like having at least one surface that is not flat.

Another object is to provide a wheel for grinding and polishing which eliminates any need for a continuous supply of liquid to the wheel as well as the associated part or parts used or necessary to catch and retain the excess liquid.

A further object of the invention is the provision of a wheel for grinding and polishing having a plurality of working surfaces that cooperate in a new and novel manner, thus providing a single wheel that performs the functions of two or more conventional wheels.

A final object of the present invention is the provision of a wheel for grinding and polishing whereby cabochons may be produced with accuracy and expedition and at a cost which enables them to come into extensive commercial use.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

Figure 1 shows a side view of apparatus embodying the invention, but showing the cylindrical wheel in longitudinal section for better understanding;

Figure 2 is a perspective view of the wheel shown in Figure 1 with a section broken away;

Figure 3 shows an enlarged section of the device taken on line 3—3 of Figure 2 looking in the direction of the arrows; and

Figure 4 illustrates a modification of the device.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Figure 1 an electric motor **10** mounted on a base **11** and having a drive shaft **12** extending from one end thereof. A cylindrical wheel **13** is rigidly attached to the end of shaft **12** by means of a threaded coupling **14**. Where a coupling means is used having threads as I have shown, it is necessary that it be threaded such that rotation of shaft **12** will tend to tighten coupling **14** on shaft **12** to prevent the wheel from becoming disengaged from the shaft during use. However, it is to be understood that other means may be used to couple or attach wheel **13** to shaft **12** or other driving means such as an electric motor, belt driven wheel, or the like. In Figure 1 and Figure 2, as shown in its preferred form, wheel **13** is comprised of a circular rear portion **15** integral with a forwardly extending cylindrical portion **16**, said cylindrical portion having an inwardly protruding lip **17** integral with its inside forward periphery. Wheel **13** may be composed of a granular abrasive material mixed with a suitable binder of a type that is well known in the grinding and polishing art, or it may be composed of a substantially non-abrasive material. In either case, I have found it preferable, from the point of safety, to mount the wheel in a cylindrical metal shell **18** to prevent the possibility of fracture of the wheel while in use and consequent injury to anyone standing nearby. Use of the outer shell **18** having a back portion **20** integral therewith also provides a rigid base on which coupling **14** may be easily mounted in any suitable and conventional manner, such as by welding, screws, or the like. I have also found that wheel **13** may be suitably held in shell **18** if said shell **18** is shrunk

onto wheel 13 in a manner well known in the art thus providing a good tight fit. However, if it is desirable to have wheel 13 removable or replaceable, it may be held in shell 18 by means of screws, pins, or the like. As shown in Figure 1 and Figure 2, the rear portion 15 has a circular flat inside working surface 19 perpendicular to the longitudinal axis of the wheel and cylindrical portion 16 has a cylindrical inside working surface 21 concentric with the longitudinal axis of the wheel. The area of working surface 19 and the degree of curvature of working surface 21 are dependent on the inside diameter of the wheel which in turn may be determined by the degree of curvature that it is desired to produce on one surface of a gemstone. Obviously, if one wishes to produce on a gemstone a convex surface having a large radius, a wheel having a large internal diameter or radius will be necessary and if one wishes to produce on a gemstone a convex surface having a small radius, a wheel having a smaller inside diameter or radius will be necessary.

The rear portion 15 and the cylindrical portion 16 are joined or formed in such a manner that a rear peripheral working surface 22 is integral with and joins the flat rear working surface 19 and the cylindrical working surface 21, thus providing a still different working surface for operations not conveniently performed on said rear surface 19 and cylindrical surface 21, an example of which may be the forming of a spherical surface. Working surface 22 need not necessarily be concave in form, the precise form being dependent on the surface that it is desired that said working surface form, but I have found this to be the preferred form and where a substantially concave form is used such shape lends itself readily to increasing the ease and efficiency with which the interior of wheel 13 may be cleaned. Lip 17 is preferably integral with the forward inside periphery of cylindrical portion 16 and has an inside working surface 23 lying in a conical surface at an obtuse angle with surface 21, thus also lying in a conical plane at an acute angle with front surface 24. Working surface 23 and front surface 24 are joined by a convex working surface 25 having a small radius of curvature. It is to be noted that lip 17 may have a shape other than the preferred form I have described, such as ring shaped or the like, but I have found that the described form provides the maximum in strength and utility in addition to suitably retaining a liquid or fluid within the wheel. I have also provided a working surface 26 integral with and joining surface 21 and surface 23, said working surface 26 having a degree of curvature other than that of surface 21 or surface 22.

It will be readily understood that surface 26 and surface 23 cooperate in a new and unique manner to provide different working surfaces while in addition providing means whereby a liquid or fluid may be retained within the wheel, thus eliminating the necessity of a continuous supply of a liquid or fluid to the wheel and the associated parts necessary to feed the liquid or fluid to the wheel and catch and retain the excess. It will also be readily understood that the new and novel construction of my wheel provides, in addition to the above, a plurality of working surfaces that cooperate in a new and novel manner to provide a single wheel that performs the functions of several conventional wheels in addition to providing means whereby a gemstone or the like may be more easily and accurately formed. The width of working surface 23 or, to say it another way, the distance that lip 17 protrudes inwardly need be only such that during operation of the wheel an amount of liquid or fluid will be retained within the wheel sufficient to cover the surface of the stone being formed. Where the wheel provides the abrasive action and is composed of materials well known in the art, I have found that if a suitable liquid such as water, oil, or the like, is introduced into the wheel in an amount sufficient to keep the surface of the stone in contact with the wheel covered at all times, said surface of the stone will not, under normal operating conditions, reach a temperature sufficient to cause it to crack or be damaged. The precise reason for this is not known, but it is believed that the relatively small depth of the liquid combined with its relatively large radiating surfaces and the fact that it is being rotated is sufficient to dissipate enough heat such that the surface of the stone does not reach its critical temperature. I have further found that where the wheel is composed of a substantially non-abrasive material and a granular abrasive medium carried by a liquid is introduced into the wheel to provide the abrasive action, this fluid appears to perform the same function as described above thus providing means to form the stone and keep it below its critical temperature. To the best of my understanding this principle does not appear to have been fully appreciated by the prior art nor has it been applied to the grinding and polishing art and particularly to the art of grinding and polishing gemstones. It may be well to point out that in the art of grinding and polishing metal objects or the like it is highly desirable that the bits of metal removed by the abrasive not be allowed to remain in contact with the abrading surface because such will become imbedded in the surface of the wheel and materially reduce the abrasive properties of the wheel thus necessitating frequent redressing of the wheel. I have found that where my wheel is substantially comprised of an abrasive material and used in the manner described herein for grinding and polishing gemstones this is not necessarily the case and less frequent redressing of the wheel is necessary. For the case where my wheel is comprised of a substantially non-abrasive material and a granular abrasive material carried by a liquid is used to provide the abrading medium for grinding and polishing gemstones I have found that very seldom, if ever, is it necessary to redress the working surfaces of my wheel.

My wheel is very simple and easy to use. For the embodiment shown in Figure 1 the wheel is rotated at a speed suitable for the type of gemstone being formed and the type of grinding one wishes to perform. This speed varies and no precise speed may be recommended, but I have found that a generally suitable wheel speed is about 1100 revolutions per minute. It may be further noted here that my wheel may be used in the horizontal position as shown in Figure 1 or it may be used in a vertical position. For the case where my wheel is substantially comprised of an abrasive material, a suitable amount of liquid such as water, oil, or the like, is inserted into the wheel either when it is stationary or when it is being rotated. In this particular instance the liquid may be of substantially any kind that will act as a coolant. The centrifugal force due to the rotation of the wheel will cause the liquid to spread out over the working surfaces, said liquid having a substantially uniform depth. The gemstone, having previously been attached in any conventional manner to a suitable holder, is then held against an inside working surface covered or substantially covered by the aforesaid liquid. If one wishes to form a convex surface on a gemstone it is only necessary to hold a surface of the stone against and perpendicular to a radius of one of the concave surfaces, such as, for example, surface 21, until the desired shape is produced. A hyperbolic surface may be easily, simply, and accurately produced by holding a stone against surface 21 and moving it in an oscillatory manner, both to the right and to the left, through an angle of about forty-five degrees from the longitudinal axis of the wheel. If one wishes to produce a spherical surface it is only necessary to oscillate the stone in a similar manner through a similar angle of substantially ninety degrees. If one so desires, or finds it more convenient, a spherical surface may also be formed by holding the stone in the manner previously described and continuously rotating it through an angle of three hundred and sixty degrees. By simply varying the degree of oscillation as previously

described, or by simply oscillating the stone in a forwardly and rearwardly manner with respect to the longitudinal axis of the wheel, a plurality of different surfaces may be formed. As is now readily obvious, a plurality of arcuate surfaces may be more easily, quickly, and accurately produced merely by holding the stone against a working surface or by holding the stone against a working surface and moving it in a single simple manner. Where one wishes to produce arcuate surfaces on smaller stones having a radius of curvature other than that of surface **21**, the stone may be held, in the manner previously described, against surface **22** or surface **26**. Surface **22** lends itself readily, among other things, to the production of spherical surfaces. Surface **26** lends itself readily, among other things, to the production on small stones of convex surfaces having a relatively large radius of curvature and surface **23** is particularly useful in producing beveled edges or cylindrical surfaces. If desired, surface **25** may be used to form grooves or the like in the surface of a stone and surface **19** may be used to form substantially flat surfaces such as the back or rear surface of a gemstone. In view of the previous discussion of the methods of forming arcuate surfaces and the obviousness of the methods for forming a groove, beveled edge, flat surface, or cylindrical surface, a precise explanation of the use of surfaces **19**, **22**, **23**, **25**, and **26** is not believed necessary for one experienced in the art.

For the case where my wheel is composed of a substantially nonabrasive substance such as wood, plastic, cast iron, or the like, the abrasive medium may be supplied to the interior of the wheel in a manner identical to that previously described for a liquid. A granular abrasive such as comminuted Carborundum, emery, or the like, carried in a liquid such as water, oil, or the like, will provide a suitable abrasive and coolant medium. The degree of abrasiveness of this fluid may be varied by varying the size and type of granular abrasive and by varying the amount of liquid carrier. A surface of gemstone is then formed in the same fashion and manner as that previously described for a wheel composed of an abrasive material.

Figure 4 shows a modification of my wheel for producing a substantially identical surface on a plurality of gemstones. Wheel **27** as shown in Figure 4 is substantially the same as wheel **13** in Figure 1 and Figure 2 with the exception of the composition of the wheel, shell **18**, and the form of working surface **21**. In order to minimize the wearing away of the working surfaces and to keep said working surfaces substantially the same, wheel **27** is preferably composed of cast iron or the like which obviously obviates the necessity of a reinforcing shell **18**. Since in this case it is desired to produce a plurality of gemstones with a surface having substantially the same form or shape, a specific shaping surface or surfaces may be formed in surface **21**, examples of which are indicated by the numerals **28**, **29**, and **31**, wherein the numeral **28** indicates a convex working surface, the numeral **29** indicates a groove or working surface forming an obtuse angle, and the numeral **31** indicates a concave groove or working surface. More than one similar groove or surface may be used if it is desired to form several stones at one time, or a plurality of different grooves or surfaces may be used if it is desired to form a plurality of different surfaces at one time or with one wheel. Wheel **27** is used in substantially the same manner as that previously described herein for a non-abrasive wheel with a granular abrasive materal suspended in a liquid carrier substantially as previously described. From the above it is obvious that substantially identical surfaces may be easily and accurately produced on a plurality of gemstones merely by holding the stone against one of the forming grooves or surfaces until the desired surface is formed on the stone.

It will be readily understood from the foregoing description that my new and improved wheel provides a means whereby cabochons may be more easily, cheaply, and accurately produced and that it is a self-contained unit eliminating many of the necessary parts associated with conventional lapidary wheels. It will be further understood that a wheel constructed according to the foregoing disclosure will perform the functions of a plurality of conventional lapidary wheels in a more facile and convenient manner and that by use of the modification described herein a plurality of gemstones having substantially identical surfaces may be more easily and accurately produced.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed and desired to be protected by Letters Patent of the United States is:

1. Means for grinding and polishing gemstones or the like comprising: a hollow cylindrical body open at one end and having a wall closing its other end; an inwardly protruding lip rigidly connected to the periphery of the open end and adapted to retain a fluid within said body; and means connected to said body whereby said body may be rotatably driven.

2. Means for grinding and polishing gemstones or the like comprising: a hollow cylindrical body open at one end and having a wall closing its other end; an inwardly protruding lip rigidly connected to the periphery of the open end and adapted to retain a fluid within said body, said lip having an inside surface adapted to form a substantially frusto-conical working surface having its greater diameter at the base of the lip; and means connected to said body whereby said body may be rotatably driven.

3. In a hollow substantially cylindrical wheel for grinding and polishing gemstones or the like wherein the stone is held against an inside surface the combination comprising: a substantially cylindrical portion having a front and a rear portion; a wall closing off the rear portion and integral therewith; an inwardly protruding lip integral with the periphery of said front portion, said lip having an inside surface adapted to retain a fluid within said wheel and to provide a working surface; and means connected to said wheel whereby said wheel may be rotatably driven.

4. The combination as defined in claim 3 wherein the cylindrical wheel is comprised of an abrasive material and a suitable binder; and the fluid is a liquid adapted to act substantially as a coolant.

5. The combination as defined in claim 3 wherein the cylindrical wheel is comprised of a non-abrasive material softer than the stone being formed; and the fluid is comprised of a granular abrasive mixed with a carrier.

6. In a hollow substantially cylindrical wheel for grinding and polishing gemstones or the like wherein the stone is held against an inside surface the combination comprising: a substantially cylindrical portion having an inside working surface and having a front and a rear portion; a wall having an inside working surface and closing off said rear portion; a portion having an arcuate inside working surface and integral with said wall and said cylindrical rear portion; an inwardly protruding lip integral with the periphery of said front portion, said lip having an inside surface adapted to retain a fluid within said wheel and to provide an inside working surface; an arcuate working surface joining said cylindrical working surface and said lip working surface; and means fixed to said wall coaxially of said wheel for connection to a rotatably driven element.

7. In a non-abrasive cylindrical wheel for grinding and polishing gemstones or the like wherein the stone is held against an inside surface and a composition comprising a granular abrasive mixed with a carrier is used as the abrading medium the combination comprising: a sub-

stantially cylindrical portion having an inside working surface and having a front and a rear portion; a wall closing off the rear portion; an inwardly protruding lip integral with the periphery of said front portion, said lip having an inside surface adapted to retain said composition within said wheel and to provide a working surface; and means fixed to said closing wall coaxially of said wheel for connection to a rotatably driven element whereby said composition will be caused to cover said working surfaces of said wheel.

8. The combination as defined in claim 7 comprising in addition a portion having an inside arcuate working surface and integral with the wall and the cylindrical portion; and an inside arcuate working surface integral with and joining said cylindrical working surface and said lip working surface.

9. The combination as defined in claim 7 comprising in addition a working surface formed in the inside working surface of the cylindrical portion.

10. The combination as defined in claim 9 comprising in addition a non-abrasive cylindrical wheel comprised of a material that is at least as hard as the stone being formed.

References Cited in the file of this patent

UNITED STATES PATENTS

553,225	Barnes	Jan. 21, 1896
583,670	Chambers et al.	June 1, 1897
1,262,217	Leperre	Apr. 9, 1918
1,660,811	Perkins	Feb. 28, 1928
2,076,449	Doner	Apr. 6, 1937

FOREIGN PATENTS

1,528	Great Britain	June 9, 1871
6,978	Great Britain	May 12, 1894
21,676	Great Britain	Aug. 27, 1914
251,167	Germany	June 20, 1911