Title: SYSTEM AND METHOD FOR AUTOMATIC GEMSTONE POLISHING

Abstract: The present invention is of a polishing system and method, which preferably provide a combination of vertical and angular displacement to a polishing wheel, comprising a tang; a polishing wheel, a vertical displacement element, attached to said tang, for vertically displacing said tang in relation to said polishing wheel; and an angular displacement element, attached to said tang, for angularly displacing said tang in relation to said polishing wheel. The system of the present invention can preferably be readily incorporated into an existing automatic polishing machine.
SYSTEM AND METHOD FOR AUTOMATIC GEMSTONE POLISHING

FIELD OF THE INVENTION

The present invention is of a polishing system and method, which preferably provide a combination of vertical and angular displacement to a polishing wheel. The polishing system and method of the present invention are preferably used for gemstone polishing. More preferably, the present invention is a method and system for automatic diamond polishing.

BACKGROUND OF THE INVENTION

Diamonds are utilized in a wide-range of applications due to their unique physical, optical and chemical properties. The characteristic properties include the following. Diamond is the hardest known substance. In addition, diamonds have the highest atomic density and the highest thermal conductivity at room temperature. Diamonds exhibit low friction and wear properties, are chemically inert and are wide-band gap semiconductors. The uses of diamonds include, use in cutting tools, use in high power electronic devices, use in low friction and wear surfaces, components for electronic devices and gemstones used for jewelry purposes.

Most uses of diamonds require shaping and polishing of the diamond surface to various degrees, in order to produce smooth surfaces of the diamond, depending on the desired application. Diamonds are commonly polished by a specialized instrument, known in the art as a ‘tang’ generally
polished by a specialized instrument, known in the art as a 'tang' generally using one of two different methods, manual polishing or automatic polishing. Automatic polishing is carried out by automatic polishing machines for polishing facets until the polishing reaches a pre-determined position. Thereafter, the polishing is stopped automatically and then indexing to the next facet to be polished, takes place. Contemporaneously, the automatic polishing machines automatically adjust for the correct grain orientation. The term 'grain' is defined herein as the angle between the velocity vector of the polishing wheel and the crystal structure of the diamond.

The disadvantages of manual and automatic practices known in the art include the following. The manual polishing methods of the background art fail to provide combination of angular and vertical displacement. Diamonds characteristically include different angled surfaces. Therefore, when polishing a diamond, which by necessity has to be polished in different angles, the polisher has to change the level of the tang, every time the polishing angle is changed. Furthermore, when the diamond size is changed the manual polishing method does not compensate for this and the polisher must re-level the tang.

Extensive re-leveling generally results in low productivity. Conversely, little or no leveling generally results in decreased quality diamonds.

In automatic polishing, precise vertical displacement is essential for creating even angles and sizes of the diamond facets. Uneven angles and facets of diamonds result in significantly depreciated market for the processed
diamond, or necessitate additional manual corrections, significantly increasing production costs.

For the purpose of achieving a high degree of precision, tight tolerances are required, thereby resulting in a high degree of friction between vertical displacement elements during the vertical displacement. Thus, the high friction levels, between vertical displacement elements, produced by the vertical displacement of the diamond on the polishing wheel, significantly limit the capability of controlling the diamond during the polishing process as described hereinbelow.

High degrees of friction, between vertical displacement elements, significantly limit the capability of controlling the degree of pressure applied by the diamond on the polishing wheel.

Insufficient pressure of the diamond on the polishing wheel results in lower polishing rates, thereby resulting in low productivity and higher production costs. Conversely, excessive pressure generally damages the diamond being processed.

In addition, due to high friction, between vertical displacement elements, in the vertical displacement during automatic polishing, detecting of the first contact point between a diamond and polishing wheel is extremely unreliable.

Hereinafter, the term “Scaife touch detection” refers to any first contact point between a diamond and a polishing wheel.

Hereinafter, the term “stop point” refers to any point at which polishing of a facet is ceased.
The Scaife touch detection reference point is necessary for determining the distance between the first contact point of the diamond and stop point. Furthermore, Scaife touch detection is often for controlling and as a reference point for altering characteristics of processes and displacement of any actuators or sensors used with the polishing system.

A further disadvantage of the automatic polishing methods and systems of the background art is due to the fact that a diamond is a non-isotropic material and polishing can only be performed at a certain grain position. Namely, at a certain angle between the diamond crystal and the velocity vector of the polishing wheel. The method commonly used in the art is based on measuring the degree of vertical displacement occurring during polishing within a certain time frame for different grain positions, thereby ascertaining where the highest and accepted value of polish occurs and thereafter polishing where the highest and accepted value of polish occurs.

Hereinafter, the term “Grain position for best polish” refers to any angle where the highest and accepted value of polish occurs.

Due to the relative high friction, between vertical displacement elements, encountered in precise vertical displacement during polishing, vertical displacement is often disturbed, distorted or not executed.

There is therefore a need for a system and method, such as is disclosed in the present invention, to provide a solution to the aforementioned problems and to be more efficient and cost-effective than known automated or manual polishing devices known in the art.
SUMMARY OF THE INVENTION

The present invention provides a stand-alone gemstone polishing system and method, combining vertical and angular displacement of a diamond relatively to a polishing wheel. This novel feature results in a method that uses the vertical high precision displacement to maintain polishing independent of the size or angle of the gemstone. Preferably, the present invention is a method and system for automatic diamond polishing.

The present invention also provides a system, which can be incorporated into an existing automatic polishing machine, which preferably includes the surrounding elements of the system.

Furthermore, the present invention provides a stand alone semi automatic apparatus. Moreover, the system of the present invention can be used as a part of a semi-automatic polishing apparatus, wherein optionally not all surrounding elements of the system are utilized.

In addition the system of the present invention provides a method of controlling the applied pressure or weight on the gemstone, which is being polished.

Still further, the present invention provides a method of precise detection of the initial contact point between the stone and the polishing wheel. This precise position is used as a reference point for calculating the distance of the polishing stop point.
The present invention also provides a method of calculating the calculating the grain, the optimum grain position and corresponding best rate of polish position.

In a first embodiment the present invention provides a system

BRIEF DESCRIPTION OF THE Drawings

FIG. 1 shows a schematic side view of a standard manual 'tang' known in the art;

FIG. 2 shows a schematic side view of an automatic polishing machine known in the art;

FIG. 3 shows a schematic side view of the system of the present invention utilized in an automatic polishing apparatus; and

FIG. 4 shows a schematic top view of an alternative embodiment of the system of the present invention.

FIGS. 5a-5c show a schematic top view of sub components of alternative embodiments of the system of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides a stand-alone polishing system and method combining vertical and angular displacement of gemstones relatively to a polishing wheel. This novel feature of the present invention results in a method for using a high precision vertical displacement, maintaining optimal polishing irrespective of size or the angle of the gemstone relatively to the
polishing wheel. Furthermore, the system of the present invention includes a sensing mechanism for sensing angular displacement during polishing, thereby readily facilitating substantially contemporaneous optimal vertical and angular displacement of a gemstone during the polishing process.

In the system of the present invention, the relatively high friction encountered, between vertical displacement elements, in the vertical displacement has no adverse effect on the grain position, Scaife touch detection or pressure control due to the system not being a part of the precise sensing device used for weight/pressure control, Scaife touch detection or best grain position.

Hereinafter, the term “Pavilion” or “Bottom” refers to any substantially lower, or bottom part of a gemstone.

Hereinafter, the term “Crown” or “Top” refers to a substantially upper portion or top part of a gemstone.

Hereinafter, the term “Table” refers to any substantially flat surface of a gemstone situated substantially above the crown of a gemstone.

Hereinafter, the term “grain displacement assembly” refers to any assembly for readily rotateably displacing gemstone substantially perpendicularly to the surface of a polishing wheel, for the purpose of obtaining an optimal grain position.

Hereinafter, the term “facet displacement assembly” refers to any assembly for readily rotateably displacing a gemstone along its vertical axis for purpose of polishing varying facets of a gemstone.
Hereinafter, the term "stroke displacement assembly" refers to any assembly for readily displacing a gemstone substantially parallel to the surface of a polishing wheel substantially contemporaneously with increasing or decreasing the distance between the center of the gemstone and the center of the polishing wheel.

The present invention further provides a system for controlling vertical displacement of a gemstone during the polishing process responsively to detection of angular displacement by an angular displacement sensor.

The present invention further provides a system which can be incorporated into an existing automatic polishing machine, which preferably includes the surrounding elements of the system of the present invention such as, but not limited to grain displacement assembly, facet displacement assembly and stroke displacement assembly.

Furthermore, the present invention provides a stand-alone semi automatic apparatus, which optionally can be used as a replacement to manual hand-held tongs, lifters for providing ready vertical displacement of a gemstone or sliders for providing ready "stroke" displacement.

Further still, the system of the present invention can be used as a part of a semi-automatic polishing apparatus, wherein optionally part of the surrounding elements of the system of the present invention are utilized. By way of example only, the system can optionally utilize a manual indexing of facets.
In all embodiments, the present invention additionally provides an option of a second angular displacement responsive to a sensor, thus providing a method for readily and rapidly ascertaining a best grain position.

Hereinafter, the term “fancy stone” refers to any gemstone devoid of a substantially round or rotationally symmetrical cut cross-section when viewed from the top.

Hereinafter, the term “Press Pot” or “Pot” refers to any gemstone securing means for securing a gemstone during a polishing process.

Hereinafter, the term “Wass cover” refers to any device for positioning a gemstone, such that the first facet to be polished is readily positioned in relation to the polishing wheel.

The system of the present invention optionally includes a manual faceting mode, an automatic faceting mode, or a combination thereof. In manual faceting mode, the apparatus of the present invention polishes a single facet at a time, wherein an operator manually rotates the gemstone from the facet being polished to the next facet to be polished. The manual mode optionally uses all types of suitable polishing heads (dop’s) including, but not limited to, Top, Bottom, Table, Fancies, Press pot, and Wass cover.

In automatic faceting mode, the system of the present invention automatically completes polishing the required number of facets, alternating automatically from polishing one facet to another by means of any suitable device, which is preferably an electrical device, including, but not limited to, a
actuator or solenoid. Upon completion of polishing the requested number of facets, the system terminates the polishing procedure.

Hereinafter, the term “ring” refers to any termination point indexing element utilizing an electrical short to signal a termination point, which does not secure the gemstone.

The system of the present invention provides optional modes of terminating the facet polishing. These modes of termination include, but are not limited to, the following. Termination of facet polish by contact of the ring or pot holding the diamond, with the polishing wheel, whereby the contact between the ring or pot and the polishing creates an electrical short, thereby indicating that the gemstone has reached to the polishing termination point.

By way of example only, the pot holding the diamond is selected such that upon the pot contacting the polishing wheel an electrical short is created, thereby providing a cessation signal for terminating the facet polishing.

Alternatively, termination of facet polishing is performed upon completion of a function to remove material from the gemstone’s surface of a preset number of microns.

Hereinafter, the term “contact recognition” refers to any contact after an electrical short occurs between the pot or ring and the polishing wheel, subsequent to contact between the ring or pot and the polishing wheel.

Termination of facet polishing can also be performed upon completion of a function for removing material from the gemstone’s surface of a preset number of microns, after contact recognition.
Alternatively, termination is achieved by the first recognition of either completion of a function to remove a preset amount of microns from the diamond surface, after contact recognition.

Thus, the following two modes are readily facilitated. First, polishing of a first facet according to any of the methods hereinabove. Second, measuring the height of vertical displacement element above the polishing wheel at substantially the exact time of completing the polishing of the first facet according to any of the methods described hereinabove. Thereafter, repeating the process for the remaining facets and polishing according to the same height measured on the first facet being completed.

The system of the present invention utilizes the substantially frictionless angular displacement responsive to a sensor, for precisely controlling the vertical dop shaft, by repeatedly and substantially constantly displacing the vertical dop shaft up and down substantially vertically, such that the vertical dop shaft is kept substantially vertical in relation to the polishing wheel.

Alternatively, the system of the present invention utilizes the substantially frictionless angular displacement responsive to a sensor, for precisely controlling the vertical holding device, by repeatedly and substantially constantly displacing the vertical displacement device up and down substantially vertically, such that the vertical dop shaft is kept substantially vertical in relation to the polishing wheel.

Furthermore, the system of the present invention uses a substantially frictionless angular displacement combined with any kind of sensor to precisely
detect the Scaife touch point between the stone on the polishing wheel, as detailed hereinabove.

The precise position is used as a reference point for calculating the distance of the polishing stop point from the surface of the gemstone.

Furthermore, the system of the present invention utilizes the substantially frictionless angular displacement combined with a sensor as a novel method for readily and rapidly ascertaining the best rate of polish position.

In addition, the system of the present invention uses the substantially frictionless angular displacement combined with a sensor to precisely control the pressure applied by the gemstone on the polishing wheel during the polishing process.

The present invention additionally provides a method for controlling the pressure or weight applied by the gemstone on the polishing wheel during the polishing process.

The system and method of the present invention provide a ready and efficient method of adding a second angular displacement responsive to a sensor, resulting in an additional method for readily and rapidly obtain the Grain position for best polish, based on measuring the friction between the stone and the polishing wheel, during the polishing process.

The automatic polishing apparatus of the present invention therefore provides a system that overcomes the outlined disadvantages of manual and automatic polishing methods available in the art.
The principles and operation of systems according to the present invention may be better understood with reference to the figures. The figures show a preferred embodiment of the present invention and are not limiting.

Figure 1 shows a schematic side view of a tang 10 commonly used as a standard manual polishing device known in the art. The manual system is described in order to clearly show the significant structural, componential and functional differences between the system of the present invention and the standard manual polishing device. Manual tang 10 is commonly used for manual polishing of diamonds. Tang 10 includes a securing dop 12 for securing a diamond 14. Diamond 14 is secured at a first extremity 16 of tang 10, whilst a second extremity 18 of tang 10 includes two supporting structures 20, held on a support base 22. A user commonly displaces tang 10 along an arc, wherein the axis of displacement is supporting structures 20. Thus, diamond 14 is displaced along the arc until diamond 14 contacts a polishing wheel 24. Supporting structures 20 further include two screw elements 26. Preferably, a height 28 of screw elements 26 is set for the purpose of leveling tang 10, such that a vertical dop shaft 30 is substantially perpendicular to polishing wheel 24 at substantially the exact point of polishing cessation on polishing wheel 24. Each diamond 14 is then optionally polished at different angles, as well as a single diamond 14, being polished such that different facets are readily polished at different angles.

Figure 2 shows a schematic side view of an automatic polishing machine as known in the art. This system as shown is commonly used for automatic polishing of diamonds. A tang 10, includes a securing dop 12 for securing a

Figure 3 shows a schematic side view of the system of the present invention utilized in an automatic polishing apparatus. This system can optionally be used to polish a gemstone, preferably a diamond. For the purpose of description of one embodiment of the invention in figure 3, which is in no way limiting, the gemstone will be referred to as a diamond. The main components of the system according to the present invention include the diamond holding system, vertical displacement mechanism, angular displacement mechanism and sensor system.

As shown in Figure 3, a tang 10 includes a securing dop 12 for securing a diamond 14 in a substantially fixed position. Tang 10 preferably includes a displacement mechanism 34 for combined vertical and angular displacement. Displacement mechanism 34 preferably operates via a linear displaceable element 36, attached to, or integrally formed with a stationary fixture 37. An angular displacement axis 38 is preferably attached to, or integrally formed with linear displaceable element 36. For the purpose of performing angular displacement, a leveling screw element 40 is provided for leveling tang 10, such that dop grain shaft 30 is substantially perpendicular to polishing wheel 24.
More preferably, leveling screw element 40 readily facilitates leveling tang 10, such that dop grain shaft 30 is precisely perpendicular to polishing wheel 24.

Leveling screw element 40 is optionally controlled by a sensor 42. Optionally, sensor 42 can be set to any sensitivity level for readily measuring any desirable parameter including, but not limited to, weight/pressure applied with diamond 14 on polishing wheel 24, displacement of diamond 14 Scaife touch point, and a termination point of polishing of a facet of diamond 14 on polishing wheel 24. In a preferred embodiment described herein, sensor 42 is a weight/pressure sensor, for substantially continuously weighing the weight of tang 10. A vertical displacement actuator 46 is provided for raising and lowering tang 10 away and towards from polishing wheel 24 respectively, while preferably maintaining dop grain shaft 30 substantially perpendicular to polishing wheel 24.

Occasioning on diamond 14 contacting polishing wheel 24 sensor 42 detects a reduction in weight/pressure owing to polishing wheel 24 bearing some of the weight of diamond 14. Thus, Scaife touch point is precisely recognized, as it involves only the angular displacement, used to maintain dop grain shaft 30 substantially perpendicular to polishing wheel 24 and therefore, the angular displacement is substantially frictionless.

The detection of the Scaife touch point occurs substantially irrespectively of any weight change detected by sensor 42. Furthermore, the vertical displacement is irrelevant to the process of determing the Scaife touch
point due to the process of determining the Scaife touch point requiring any weight change detected by sensor 42 combined with the angular displacement.

Thus, and as described hereinabove, the resulting measurement of the Scaife touch point is highly accurate.

Similarly, control of the weight/pressure between diamond 14 and polishing wheel 24 is readily achieved. As vertical displacement via vertical displacement actuator 46 continues in a generally downward displacement, more weight is applied on polishing wheel 24 by diamond 14 and less weight is applied on sensor 42. The exact weight exerted on diamond 14 can also be readily calculated by subtracting the current pressure of diamond 14 on sensor 42 from the initial pressure applied by diamond 14 on sensor 42.

The descending displacement of vertical actuator 46 is terminated occasionally on the desired weight/pressure of diamond 14 is obtained. In this way, highly accurate weight/pressure control on processing diamonds 14 is readily achieved due to the substantially frictionless angular displacement.

Subsequently, diamond 14 contacts polishing wheel 24 and applies the required weight/pressure between diamond 14 and polishing wheel 24. Polishing optionally continues by maintaining the applied weight/pressure for as long as the polishing process continues.

During polishing, diamond 14 brings about a reduction of the weight applied to polishing wheel 24. Consequently, less weight is carried by wheel 24 and more weight is borne by sensor 42. In order to maintain the same pressure on polishing wheel 24, vertical actuator 46 displaces tang 10 in a downwards
direction for the purpose of maintaining the required weight. This cycle of events continues until termination of the polishing process, as described hereinabove.

As iterated hereinabove, the ‘grain’ is defined as the angle between the velocity vector of rotating polishing wheel 24 and the crystal structure of diamond 14. The best grain position is used for the purpose of determining an optimal rate of polish of diamond 14. Optionally, the system of the present invention employs two different methods for determining the best grain position. In one embodiment the ratio between displacement and time is determined, in different grain positions, by rotating a dop grain shaft actuator 48. The grain position is then selected according to the position in which the largest ratio between displacement and time occurred. In an alternative preferable embodiment, readings of weight change on sensor 42 are measured while in different grain positions, by rotating dop grain shaft actuator 48. The position in which the greatest weight change is measured, is defined as the best grain position.

In a further embodiment, the system of the present invention optionally includes a second angular displacement axis 49. The second angular displacement axis 49 is the axis more affected by the friction arising from the contact of diamond 14 with polishing wheel 24 during the polishing process.

The higher the friction, the higher the rate of polish. A screw element 50 is held against pressure sensor 52. When polishing occurs, the friction between diamond 14 and polishing wheel 24 is high and the pressure of screw 50 on the
sensor 52 is decreased. During polishing, grain actuator 48 rotates diamond 14 substantially 360 degrees and the best polishing position is determined by the grain position in which the pressure on sensor 52 is lowest.

The system of the present invention optionally further includes surrounding elements including, but not limited to a facet displacement assembly 54 and a stroke displacement assembly 56.

Preferably, stroke displacement assembly 56 readily facilitates leveling stroke displacement assembly 56 during stroking, responsive to sensor 42 detecting a constant pressure between diamond 14 and polishing wheel 24.

Figure 4 shows a top view of Figure 3. Thus, tang 10 preferably includes a displacement mechanism 34 for combined vertical and angular displacement. Displacement mechanism 34 preferably operates via a linear displaceable element 36, attached to, or integrally formed with a stationary fixture 37. An angular displacement axis 38 is preferably attached to, or integrally formed with linear displaceable element 36.

In a further embodiment, the system of the present invention optionally includes a second angular displacement axis 49. The second angular displacement axis 49 is the axis more affected by the friction arising from the contact of diamond 14 with polishing wheel 24 during the polishing process.

The higher the friction, the higher the rate of polish. A screw element 50 is held against pressure sensor 52. When polishing occurs, the friction between diamond 14 and polishing wheel 24 is high and the pressure of screw 50 on the sensor 52 is decreased. During polishing, grain actuator 48 rotates diamond 14
substantially 360 degrees and the best polishing position is determined by the grain position in which the pressure on sensor 52 is lowest.

A bias 58 is provided for biasing screw 50 towards sensor 52. Preferably, bias 58 can be readily set to any pressure beneficial for enhanced polishing.

Figures 5a-5c show a preferred retro-fitting of an existing polishing system as shown in Figure 5a to an angular displacement system and sensor as shown in Figure 5b. Thus, an apparatus combining vertical and angular displacement is obtained by retrofitting an existing polishing system with an angular displacement system and a sensor as shown in Figure 5c.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.
What is claimed is:

1. A gemstone polishing system comprising:
   (a) a tang including a securing dop for securing a gemstone;
   (b) a polishing wheel;
   (c) a vertical displacement element, attached to said tang, for
       vertically displacing said tang in relation to said polishing wheel;
       and
   (d) an angular displacement element, attached to said tang, for
       angularly displacing said tang in relation to said polishing wheel.

2. The gemstone polishing system of claim 1, further comprising a
   sensor responsive to angular displacement of said tang, for
   leveling said tang in relation to said polishing wheel.

3. The gemstone polishing system of claim 1, further comprising a
   leveling mechanism responsive to angular displacement of said
   tang, for leveling said tang in relation to said polishing wheel.

4. A gemstone polishing system for polishing a surface of a
   gemstone, the system comprising:
   (a) at least one securing mechanism, said securing mechanism being
       configured to secure a gemstone;
(b) at least one vertical displacement element for vertical displacement of said tang in relation to a polishing wheel; and
(c) at least one angular displacement element for angular displacement of said tang in relation to said polishing wheel.

5. The gemstone polishing system of claim 4, further comprising a sensor responsive to angular displacement of said tang, for leveling said tang in relation to said polishing wheel.

6. The gemstone polishing system of claim 4, further comprising a leveling mechanism responsive to angular displacement of said tang, for leveling said tang in relation to said polishing wheel.

7. The gemstone polishing system of claim 4, wherein said system is automated.

8. The gemstone polishing system of claim 1, wherein said system is semi-automated.

9. The gemstone polishing system of claim 4, wherein said system is part of a semi-automated polishing system.
10. The gemstone polishing system of claim 4, wherein said system is a stand-alone semi-automated system.

11. The gemstone polishing system of claim 5, wherein said sensor is utilized to measure a Scaife touch point.

12. The gemstone polishing system of claim 5, wherein said sensor is utilized to control weight and pressure on said gemstone.

13. The gemstone polishing system of claim 5, wherein said sensor is selected from the group consisting of weight/pressure sensor, displacement sensor and contact sensor and combinations thereof.

14. The gemstone polishing system of claim 4, wherein said gemstone is a diamond.

15. The gemstone polishing system of claim 4, wherein said vertical displacement element further comprises a linear displacement element.

16. The gemstone polishing system of claim 4, wherein said angular displacement element further comprises an angular displacement axis.
17. The gemstone polishing system of claim 16, wherein said angular displacement axis employs a leveling screw to level said tang.

18. The gemstone polishing system of claim 4, wherein said angular displacement element further comprises two angular displacement axis.

19. The gemstone polishing system of claim 4 further comprising a surrounding element.

20. The gemstone polishing system of claim 19, wherein said surrounding element is selected from the group consisting of grain displacement assembly, facet displacement assembly and stroke displacement assembly.

21. The gemstone polishing system of claim 4, comprising a manual faceting mechanism.

22. The gemstone polishing system of claim 4, further comprising an automatic faceting mechanism.
23. A gemstone polishing tang system employing angular and vertical displacement, mounted on an existing automatic polishing machine, for polishing a surface of a gemstone, the system comprising:

(a) at least one holding mechanism, said holding mechanism being configured to secure the gemstone;

(b) at least one vertical displacement system for vertical displacement of the tang; and

(d) at least one angular displacement system for angular displacement of the tang.

24. The gemstone polishing tang system of claim 23 further comprising a sensor.

25. The gemstone polishing tang system of claim 24, wherein said sensor is utilized to measure a Scaife touch point.

26. The system of claim 24, wherein said sensor is utilized to control weight and pressure on said gemstone.

27. A method of automatically polishing a gemstone comprising the steps of:
(a) providing a tang system for polishing a gemstone, the system including:

(i) at least one securing mechanism, said securing mechanism being configured to secure said gemstone;

(ii) at least one vertical displacement system for vertical displacement of said tang,

(iii) at least one angular displacement system for angular displacement of said tang; and

(iv) a polishing wheel for polishing said gemstone;

(a) providing a gemstone to be polished by said system; and

(b) polishing said gemstone with said provided system.

28. A method of determining a Scaife touch point, comprising the steps of:

(a) providing a tang system for polishing a gemstone, the system including:

(i) at least one securing mechanism, said securing mechanism being configured to secure said gemstone;

(ii) at least one vertical displacement system for vertical displacement of said tang,

(iii) at least one angular displacement system for angular displacement of said tang; and

...
(iv) a polishing wheel for polishing said gemstone;

(b) providing a gemstone, said gemstone being secured in said securing mechanism;

(c) leveling said tang by means of a leveling screw configured to said angular displacement system;

(d) lowering said tang to said polishing wheel by means of said vertical displacement system, thus lowering said gemstone towards said polishing wheel; and

(e) reading a change in said sensor when the gemstone contacts said polishing wheel to determine said Scaife touch point of said gemstone.

29. The method of claim 28, wherein said sensor monitors the pressure between said gemstone and said polishing wheel.

30. The method of claim 28, wherein said gemstone is a diamond.

31. A method of controlling pressure between a gemstone and a polishing wheel, during a gemstone polishing process, comprising the steps of:

(a) providing a tang system for polishing a surface of a gemstone, the system including:
(i) at least one securing mechanism, said securing mechanism being configured to secure said the gemstone;

(ii) at least one vertical displacement system for vertical displacement of said tang,

(iii) at least one angular displacement system for angular displacement of the tang; and

(iv) a polishing wheel for polishing said gemstone;

(b) providing a gemstone, said gemstone being secured in said securing mechanism;

(c) leveling said tang by means of a leveling screw configured to said angular displacement system;

(d) providing a sensor for reading the pressure between said gemstone and said polishing wheel;

(e) reading said sensor at time zero to determine initial pressure;

(f) lowering said tang to said polishing wheel by means of said vertical displacement system to lower said gemstone towards said polishing wheel;

(g) reading said sensor at any time point to determine current weight;

(h) calculating weight on said gemstone by subtracting said initial weight from said current weight; and

(g) terminating said vertical displacement when reaching the desired pressure between said gemstone and said polishing wheel.
32. A method of polishing a gemstone comprising the steps of:

(a) providing a tang system for polishing a surface of a gemstone, the system comprising:

(i) at least one holding mechanism, said holding mechanism being configured to secure the gemstone;

(ii) at least one vertical displacement system for vertical displacement of the tang,

(iii) at least one angular displacement system for angular displacement of the tang; and

(iv) a polishing wheel for polishing said gemstone;

(b) providing a gemstone, said gemstone being held in a dop of said holding mechanism;

(c) leveling said tang by means of a leveling screw configured to said angular displacement system;

(d) providing a sensor, which reads the weight;

(e) reading said sensor at time zero to determine initial weight

(f) lowering said tang to said polishing wheel by means of said vertical displacement system to lower said gemstone towards said polishing wheel;

(g) reading said sensor at any time point to determine current weight;

(h) calculating weight on gemstone by subtracting said initial weight from said current weight;
(i) terminating said vertical displacement downwards when reaching the desired weight to control the pressure between said gemstone and said polishing wheel;

(j) polishing said gemstone with said polishing wheel resulting in decreased pressure between said gemstone and said polishing wheel and more weight on said sensor;

(k) maintaining said weight on said polishing wheel by lowering said tang; and

(l) repeating steps (h) and (i) until completion of polishing.

33. The method of claim 32 further comprising the step of terminating said polishing.

34. The method of claim 33, wherein said step of terminating said polishing is achieved by contact of a gemstone securing element with said polishing wheel.

35. The method of claim 33, wherein said step of terminating said polishing is achieved by achieving removal of a preset amount of material from said gemstone surface.

36. The method of claim 33, wherein said step of terminating said polishing is achieved by contact of a gemstone securing element
with the polishing wheel or achieving removal of a preset amount of material from said gemstone surface.

37. The method of claim 33-36, wherein said step of terminating said polishing is achieved by said step of either contacting of a gemstone holding element with the polishing wheel or achieving removal of a preset amount from the gemstone surface.

38. The method of claims 33-37 further comprising the steps of: polishing a first facet of said gemstone, according to any of the methods of claims 33-37, and measuring a height of vertical displacement element above said polishing wheel, at substantially the exact time of terminating the polishing of said first facet according to any of the methods of claims 33-37, thereafter, repeating the process for said remaining facets and polishing according to said height measured on said first facet being completed.

39. A method of determining the optimum grain position of a gemstone comprising the steps of:

(a) providing a tang system for polishing a surface of a gemstone, the system comprising:
(i) at least one securing mechanism, said securing mechanism being configured to secure said gemstone;

(ii) at least one vertical displacement system for vertical displacement of the tang;

(iii) at least one angular displacement system for angular displacement of the tang;

(iv) a polishing wheel for polishing said gemstone; and

(v) a dop shaft actuator, said dop shaft actuator configured to rotate 360 degrees and substantially contemporaneously read any weight change;

(b) providing a gemstone, said gemstone being secured in a dop of said securing mechanism;

(c) leveling said tang by means of a leveling screw configured to said angular displacement system;

(d) providing a sensor for reading a weight;

(e) reading said weight changes by means of said dop shaft actuator; and

(f) determining a position when said weight change reading is maximal, thus defining a best grain position.

40. The method of claim 39, further comprising the step of polishing said gemstone at said best grain position to achieve a best rate of polish of the gemstone.
41. The gemstone polishing system according to any one of claims 1-26, substantially as herein described and with reference to the figures.

42. The method according to any one of claims 27-40, substantially as herein described and with reference to the figures.

43. The gemstone polishing system according to 41, further comprising a stroke displacement assembly for facilitating leveling said stroke displacement assembly during stroking, responsive to said sensor detecting a constant pressure between said gemstone and said polishing wheel.