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(54) APPARATUS AND METHODS FOR GEMSTONE AND MINERAL SPHERE GRINDING AND POLISHING

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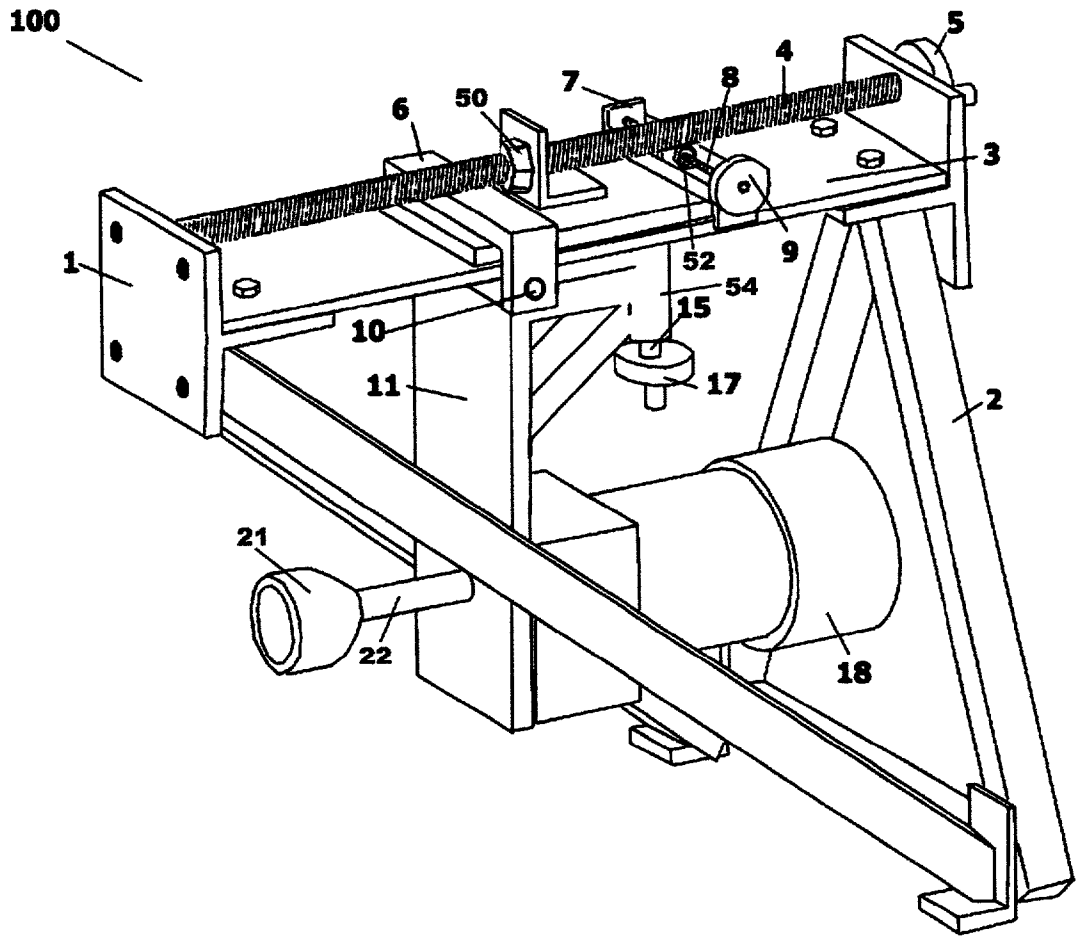
(57) ABSTRACT

Apparatus and methods for forming a generally spherical object from a workpiece are disclosed. In one embodiment, an apparatus includes a frame having a laterally-projecting elongated member, and a support member slideably engaged with the elongated member. A motor is coupled to the support member and pivotably suspended below the elongated member. A surface treating member is attached to the shaft of the motor and is adapted to engage the workpiece. In an alternate embodiment, an apparatus includes two laterally-projecting elongated members and a pair of surface treating modules that engage the workpiece from opposite sides. In yet another embodiment, an apparatus includes three laterally-projecting elongated members and three surface treating modules that engage the workpiece from approximately equidistant directions. The inventive apparatus and methods advantageously allows gravity to naturally force the surface treating members toward the workpiece, thereby improving the engagement of the surface treating members toward the workpiece.



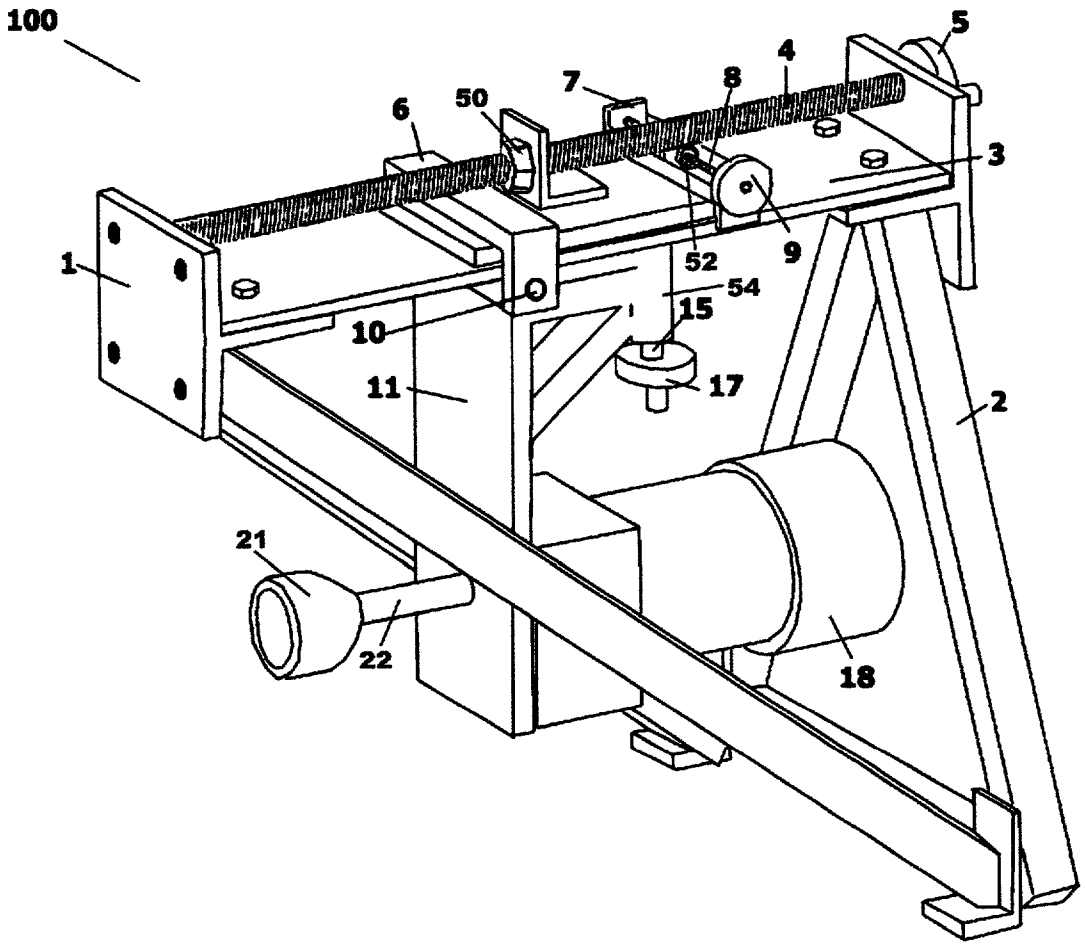


Fig 1.

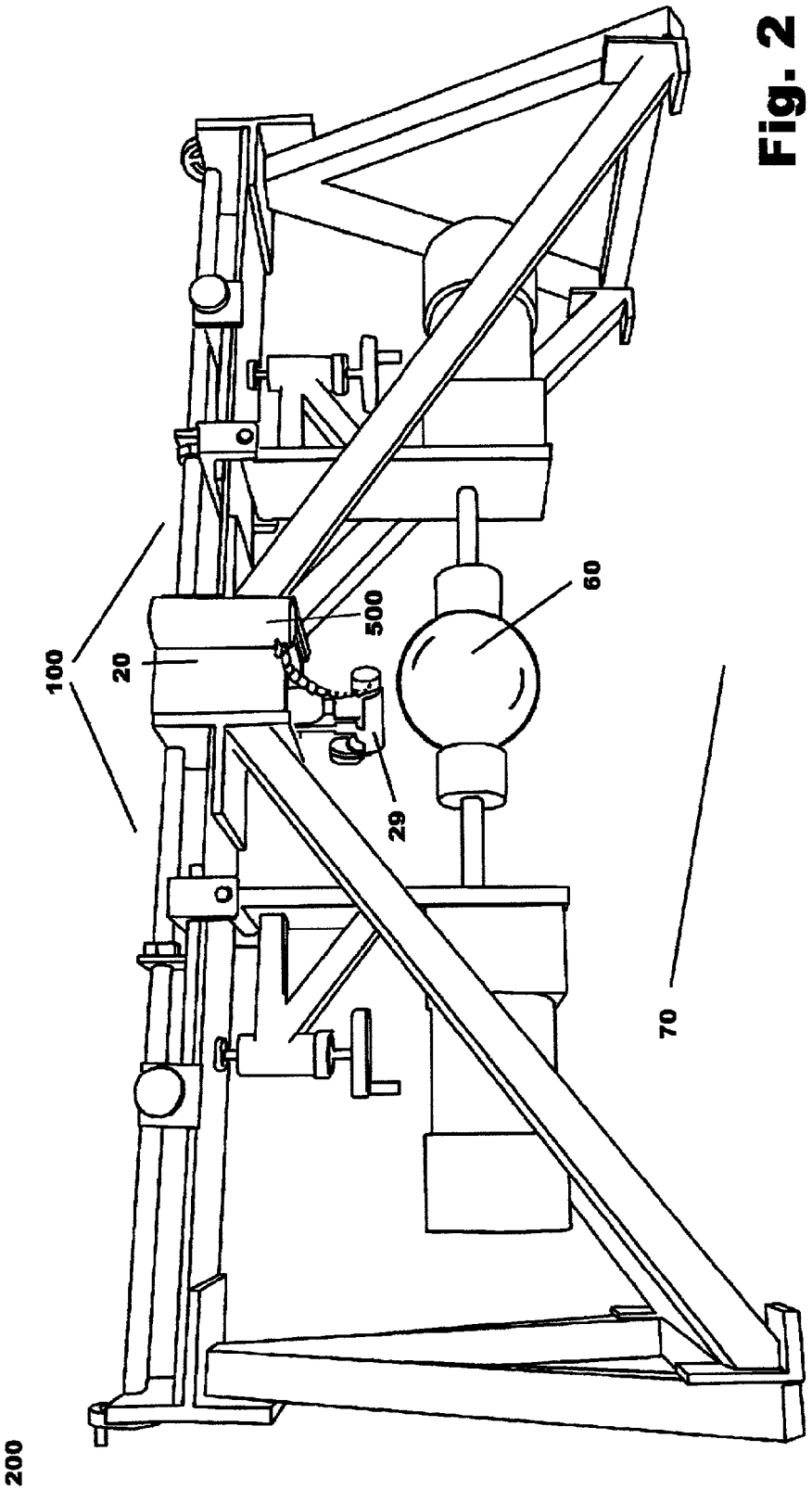
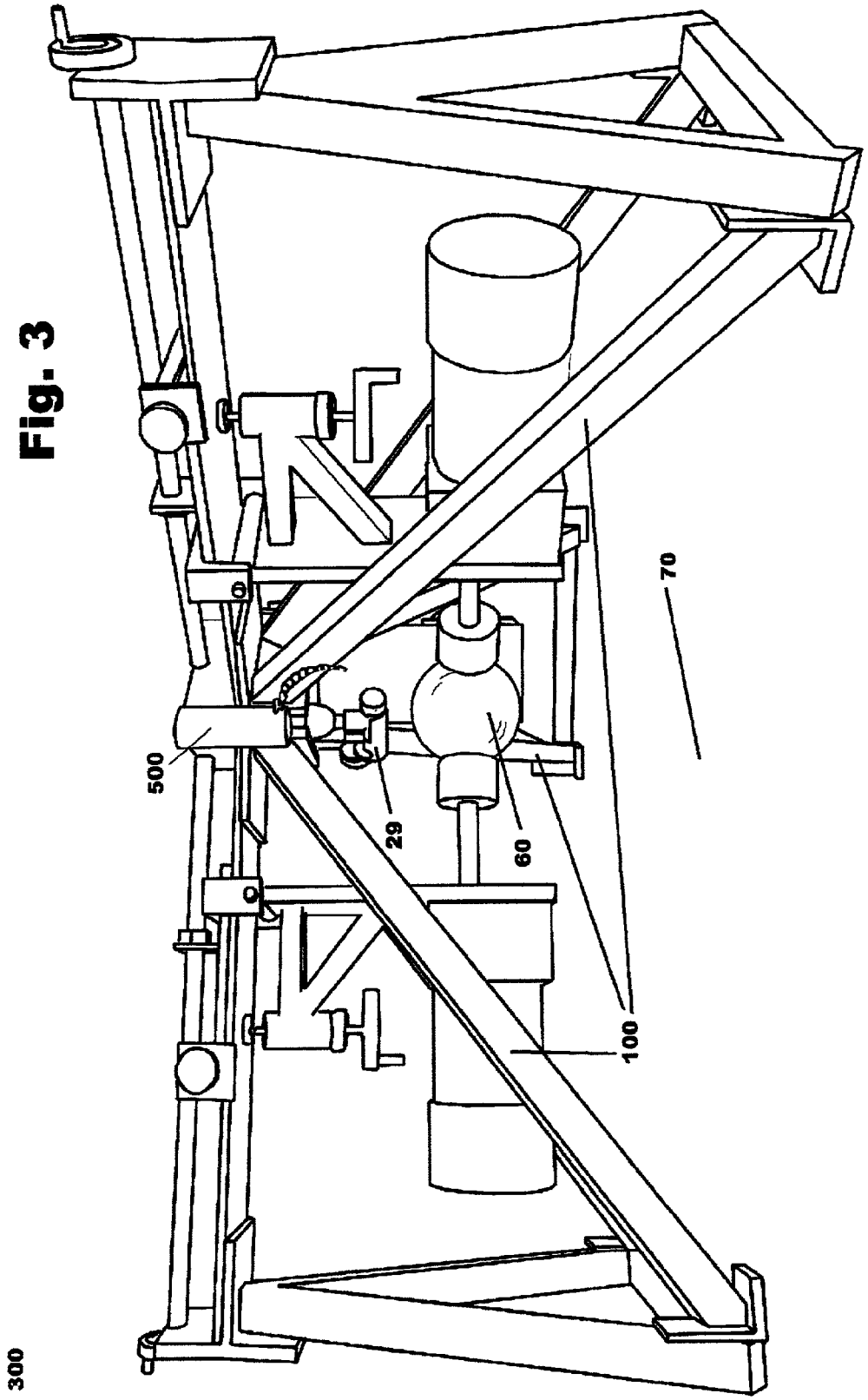


Fig. 2

Fig. 3



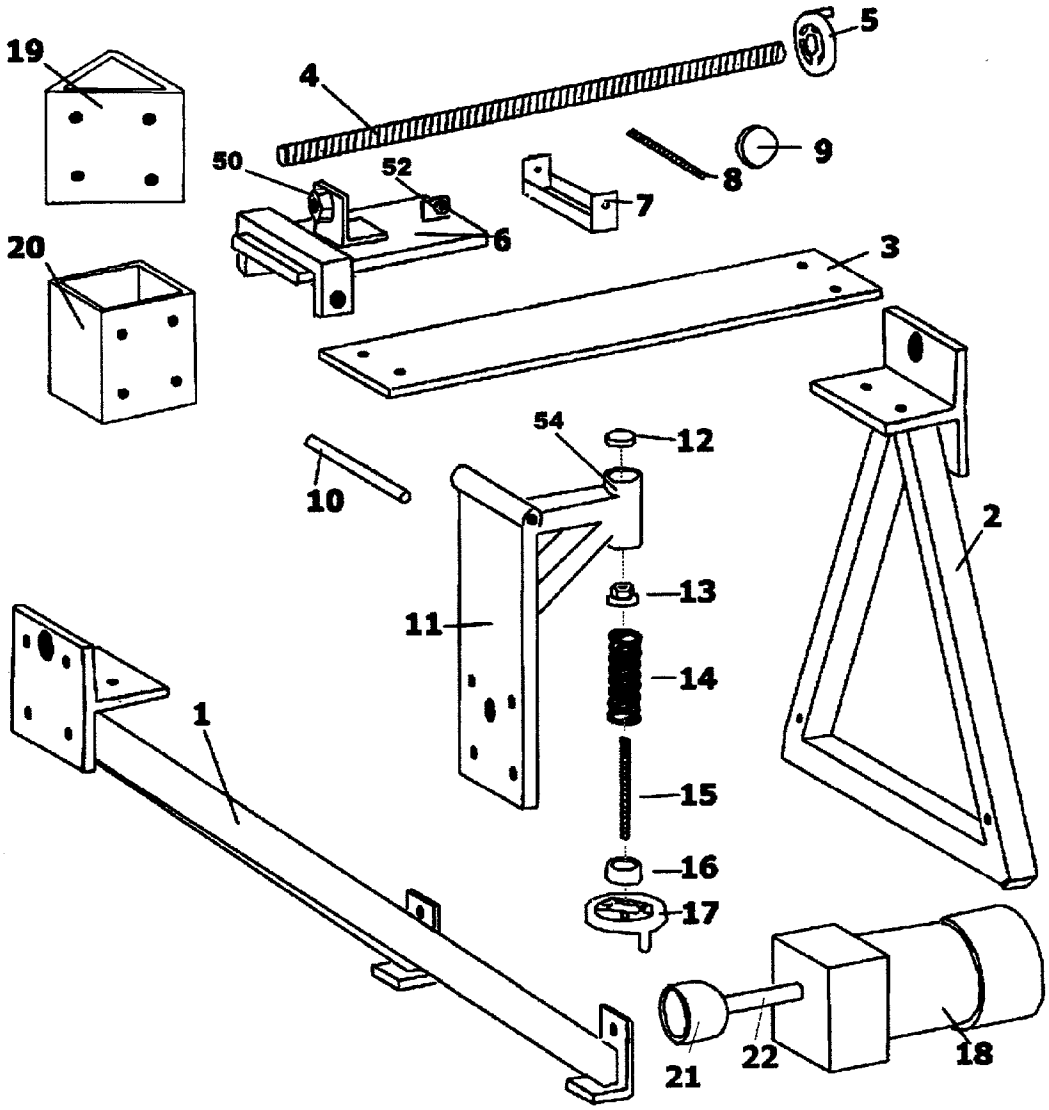


Fig. 4

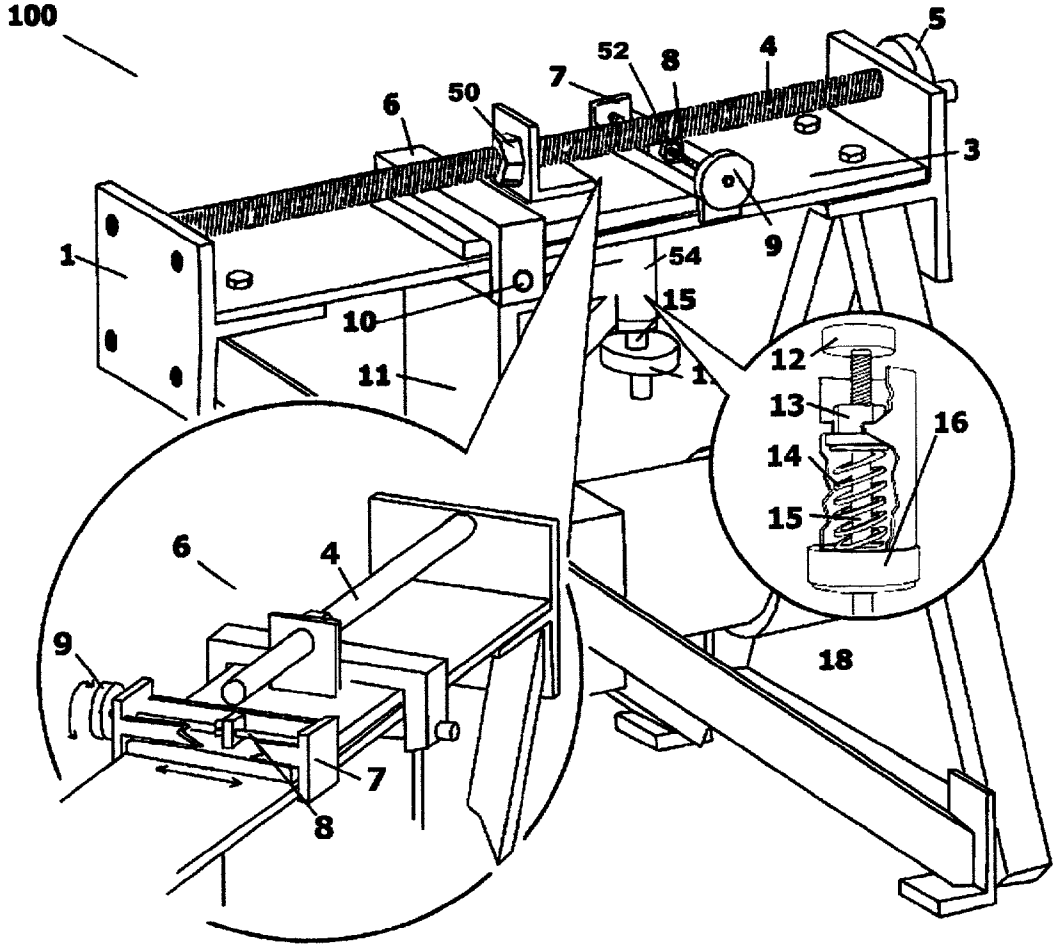


Fig. 5

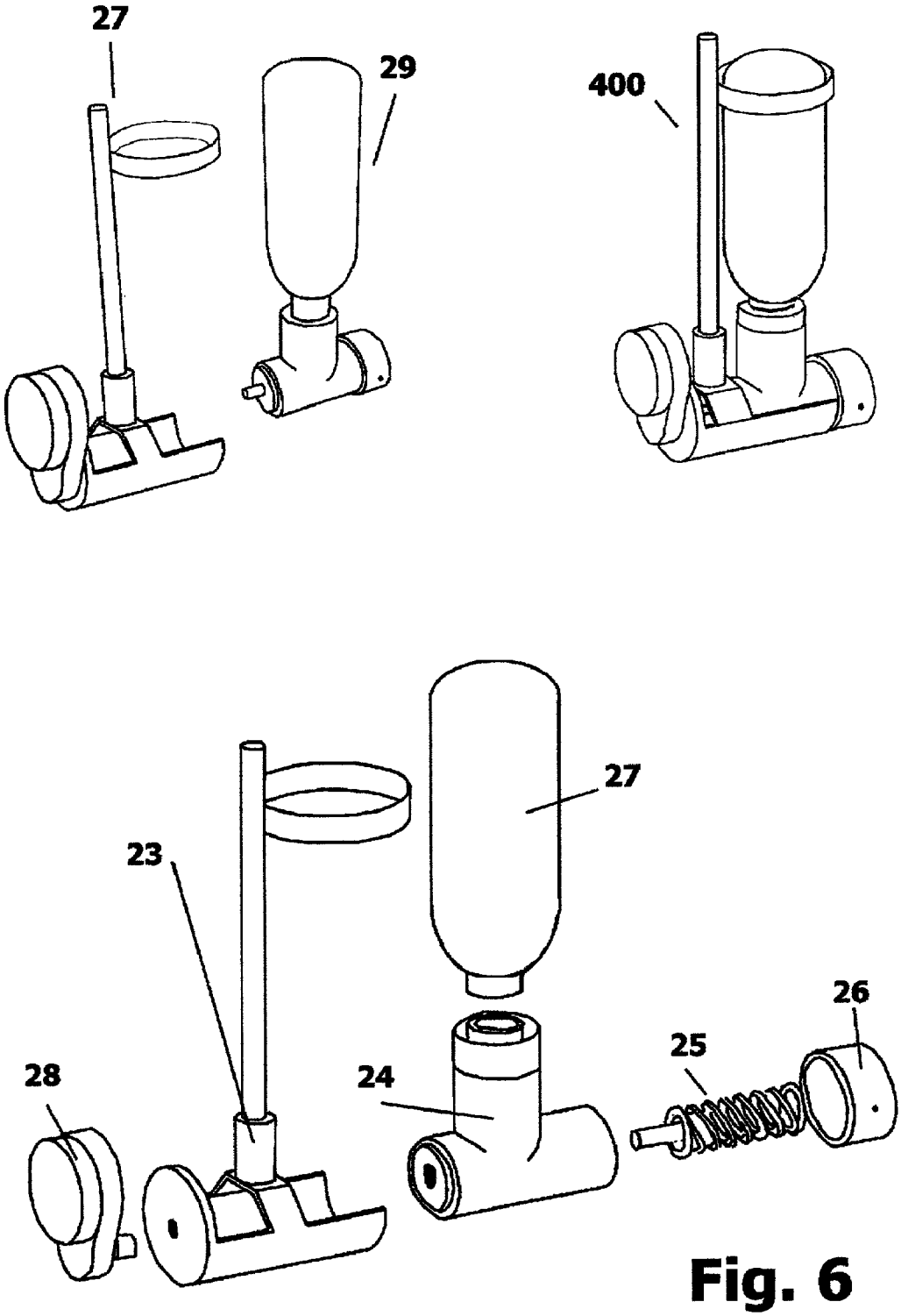


Fig. 6

APPARATUS AND METHODS FOR GEMSTONE AND MINERAL SPHERE GRINDING AND POLISHING

BACKGROUND OF INVENTION

[0001] 1. Field of the Invention

[0002] The invention generally relates to the field of lapidary, and to apparatus and methods of abrading and polishing rough materials into a generally spherical shape. More specifically, such abrasion and polishing is affected by rotation of surface treating members, such as grinding cups and the like, which receive and support said rough material.

[0003] 2. Related Art

[0004] U.S. Patent Documents

[0005] U.S. Pat. No. 2,405,344 August, 1946 Cloutier 51/56

[0006] U.S. Pat. No. 3,024,578 March, 1962 Mushkin 51/117

[0007] U.S. Pat. No. 3,110,987 November, 1963 Arneson 451/268

[0008] U.S. Pat. No. 3,167,884 February, 1965 Thompson 51/3

[0009] U.S. Pat. No. 3,609,918 October, 1971 Hillman 451/268

[0010] U.S. Pat. No. 3,961,448 June, 1976 Akahane 51/117

[0011] U.S. Pat. No. 3,971,164 July, 1976 Albin et al. 51/129

[0012] U.S. Pat. No. 5,299,394 April, 1994 Surdacki 51/289

[0013] U.S. Pat. No. 5,484,329 January, 1996 Engelbrekston 451/523

[0014] U.S. Pat. No. 5,613,896 March, 1997 Haus et al. 451/50

[0015] U.S. Pat. No. 6,186,875 February, 2001 Cook et al. 451/268; 451/50

[0016] Foreign Patent Documents

[0017] 3121759 May, 1991 JP 451/50

[0018] 4269157 September, 1992 JP 451/50

[0019] 1122484 November, 1984 SU 451/50

[0020] In general, prior art lapidary machines may be characterized as having three essential elements: (1) a plurality of concave sanding blocks or abrading cups; (2) a motor or motors to rotate the sanding blocks or abrading cups; and (3) support structure for the preceding elements. Additional or less typical components include mechanical adjustments, electrical controls, slurry systems, and pneumatic cleaning devices. Of these, four examples (U.S. Pat. Nos. 3,024,578, 3,110,987, 3,167,884 and 3,961,448) are related more specifically toward lapidary sphere grinding. The remainder are generally related more closely with the resurfacing of bowling balls.

[0021] Regarding the first element, some form of concave sanding blocks, grinding cups, or standard pipe reducer fittings is usual, but not universal, to the field of sphere abrading devices.

[0022] Regarding motors for rotating the concave abrasion blocks, various configurations are disclosed in the related art, and are particular to the scale and requirements of said art.

[0023] Cloutier (U.S. Pat. No. 2,405,344) discloses a single motor connected by a belt to an elliptical gear which imparts "reciprocation and rotation" to the bottom one of the six "bowl-shaped members". Similarly, Mushkin (U.S. Pat. No. 3,024,578) and Thompson (U.S. Pat. No. 3,167,884) each drive only one shaft and concave abrasion block, imparting all motion to the object through that single propulsion.

[0024] Regarding support structures of related art, each of the inventions referenced here is configured to accommodate its particular method and components. In all cases however, the machines are designed such that the support structure for the motors and grinding cups are attached directly to a base, table, or framework that extends the motors and grinding cups in an upward fashion, generally using a hinge, where the force of gravity would naturally tend to try to pull the grinding cups away from the center of the material being worked on, and therefore typically employ additional devices to hold the motor mounts perpendicular, and to apply grinding pressure against the rough sphere material. Additionally, in all cases, machines are designed as a single device without independent components capable of being reconfigured.

SUMMARY OF INVENTION

[0025] The present invention is directed to apparatus and methods of grinding, shaping, and polishing a workpiece, including rock, gemstone, minerals, crystals and other materials, into a generally spherical shape. The inventive apparatus and methods disclosed herein have application to a variety of fields, including lapidary work, and the general manufacture of spherical objects, such as bowling balls and the like.

[0026] In one aspect, an apparatus in accordance with the invention includes a frame having a laterally-projecting elongated member, and a support member slideably engaged with the elongated member. A motor is coupled to the support member and pivotably suspended below the elongated member. A surface treating member is attached to the shaft of the motor and is adapted to engage the workpiece. The inventive apparatus advantageously allows gravity to naturally force the surface treating member toward the workpiece, thereby improving the engagement of the surface treating member toward the workpiece.

[0027] In alternate aspects, embodiments of apparatus in accordance with the invention may include multiple grinding-head modules, a configuration (or mounting) hub, and a grit dispenser. In one alternate aspect, an apparatus includes two laterally-projecting elongated members and a pair of surface treating modules that engage the workpiece from opposite sides. In yet another aspect, an apparatus includes three laterally-projecting elongated members and three surface treating modules that engage the workpiece from approximately equidistant directions.

BRIEF DESCRIPTION OF DRAWINGS

[0028] **FIG. 1** is a perspective view of a grinder-head module in accordance with an embodiment of the invention.

[0029] **FIG. 2** is a perspective view of two grinder-head modules combined by a rectangular hub into a two-headed machine in accordance with another embodiment of the invention.

[0030] **FIG. 3** is a perspective view of three grinder-head modules combined by a triangular hub into a three-headed machine in accordance with yet another embodiment of the invention.

[0031] **FIG. 4** is an exploded view of the grinder-head module and component pieces of **FIG. 1**.

[0032] **FIG. 5** is a detail view of the grinder-head module of **FIG. 1** with inset details of an embodiment of a motor slide mount, and an embodiment of a shock-absorbing tension adjustment.

[0033] **FIG. 6** is a detail and exploded view of an embodiment of a Grit-Feeding System.

DETAILED DESCRIPTION

[0034] Description of the Preferred Embodiments

[0035] The present invention is generally directed to apparatus and methods of grinding, shaping, and polishing a workpiece, including rock, gemstone, minerals, crystals and other materials, into a generally spherical shape. Many specific details of certain embodiments of the invention are set forth in the following description and in FIGS. **1-6** to provide a thorough understanding of such embodiments. One skilled in the art will understand, however, that the present invention may have additional embodiments, or that the present invention may be practiced without several of the details described in the following description.

[0036] Referring to **FIGS. 1 and 4**, there is presented an embodiment of a grinder head module **100**. The grinder head module **100** comprises a framework **1** and **2**, which are fastened together and support a machine slide **3**, which rests on top of, and is fastened to the framework **1** and **2**.

[0037] In the embodiment shown in **FIG. 1, a** motor slide **6** rests on top of the machine slide **3**, and a main leadscrew **4** passes through a main leadnut **50** fixed to the motor slide **6**, and is rotatably supported at either end by the framework **1** and **2** with suitable collar-nuts, bearings, or other suitable devices. A handwheel **5** is attached to the main leadscrew **4** and for controlling the rotation of the main leadscrew **4**.

[0038] As further shown in **FIGS. 1 and 4**, a horizontal adjustment slide **7** rests on top of the motor slide **6**, and the vertical metal tabs on the horizontal adjustment slide **7** extend below, and on either side of the outside edges of the machine slide **3**. A secondary leadscrew **8** passes through a secondary leadnut **52** at the rear of the motor slide **6** and is secured with a shaft collar or other suitable support at either end of the horizontal adjustment slide **7**. An adjustment knob **9** is attached to the secondary leadscrew **8**, and controls the rotation of the secondary leadscrew **8**, which in turn imparts horizontal motion to the rear portion of the motor slide **6** by exerting force against the edge of the machine slide **3** by the vertical metal tabs on the horizontal adjustment slide **7**.

[0039] A motor mount **11** is attached to the motor slide **6** by means of a pivot pin **10**, which passes through a forward mounting bracket of the motor slide **6**, and a top hinge hole in the motor mount **11**, thus suspending the motor mount **11** entirely from the forward mounting bracket of the motor slide **6**. In this way, the motor mount **11** and the motor slide **6** are slideably coupled to the machine slide **3**. During operation, rotation of the handwheel **5** causes rotation of the main leadscrew **4** which in turn causes forward and backward motion of the motor slide **6** and the motor mount **11** along the machine slide **3**. Similarly, rotation of the adjustment knob **9** causes rotation of the secondary leadscrew **8** for controlling the angle of the motor slide **6** and the motor mount **11**.

[0040] As shown in **FIG. 4**, the embodiment of the machine **100** further includes shock-absorbing tension adjustment device **58** that includes a Delrin block **12** attached to a vertical leadscrew **15**. The vertical leadscrew **15** passes through a shock-absorber cylinder **54** at the rear of the motor mount **11**, and is threaded through a collar nut **13**. Now referring to **FIG. 5**, in the assembled position, the collar nut **13** rests against a flange inside the shock-absorber cylinder **54** at the rear of the motor mount **11**. The vertical leadscrew **15** the passes through a compression spring **14**, and a shock-absorber cap **16**. The compression spring **14** rests against the collar nut **13**, inside the shock-absorber cylinder **54**, and is held in place and under compression by the shock-absorber cap **16**. An auxiliary handwheel **17** is attached to the vertical leadscrew **15**, and controls rotation of the vertical leadscrew **15**. The rotation of the vertical leadscrew **15** in turn increases or decreases the vertical attack angle of the motor mount **11** by placing pressure on the underside of the motor slide **3**, thereby increasing the angle between the motor slide **3** and the shock-absorber cylinder **54**, and raising or lowering the vertical attack angle of a grinding cup **21** relative to the sphere material, as described more fully below.

[0041] The shock-absorbing tension adjustment device **50** advantageously permits adjustment of the vertical attack-angle of the grinding cup **21** for each grinder head module **100**. The shock-absorbing tension adjustment device **50** may additionally act as a locking mechanism to secure the sliding motor mount **6** in place on the machine slide **3** during grinding operation.

[0042] In the machine embodiment **100** shown in **FIGS. 1 and 4**, a gearmotor **18** is attached to the motor mount **11**, and a grinding Cup **21** is attached to the gearmotor **18** by means of a threaded motor shaft **22**, which passes through a hole in the motor mount **11**. A variety of grinding cups **21** may be used, including a diamond sintered cup for coarse grinding, or a standard plumbing pipe reducer used during a grinding process with abrasive grit and water in a slurry, according to the operator's needs and preferences.

[0043] **FIG. 2** is a perspective view of a two-headed machine **200** in accordance with an embodiment of the invention. As shown in **FIG. 2, a** pair of grinder head modules **100** of the type described above are attached to a configuration (or mounting) hub **20**. In this embodiment, the configuration hub **20** is a rectangular hub **20**, however, any suitable hub configuration may be employed. When attached to the mounting hub **20**, the grinding-head modules **100** and hub **20** become an integral framework for the assembled

machine **200**, leaving an open central area **70** beneath the machine, accommodating the operators choice of method to catch and dispose of waste materials, including abraded materials from the workpiece **60**, slurry and excess abrasive grit. Water is dripped onto the workpiece by means of water dripping system **500**.

[**0044**] **FIG. 3** is a perspective view of a three-headed machine **300** in accordance with yet another embodiment of the invention. As shown in **FIG. 3**, the three-headed machine **300** includes three grinder head modules **100** (described above with reference to **FIGS. 1 and 4**) attached to a configuration hub **19** which, in this embodiment, is a triangular hub. As set forth above, alternate embodiments of the hub **19** may be employed. Again, an open central area **70** is located beneath the machine **300** to accommodate the operators choice of method to catch and dispose of waste materials. Water is dripped onto the workpiece by means of water dripping system **500**. Water dripping systems of the type shown in **FIGS. 2 and 3** are known in the art and are commercially available as "Snap-lock", or "Snap-flow" coolant tubing with flow-control valve. Such coolant tubing is commonly used in both lapidary and machine-tool operations to dispense water, or oil onto a workpiece according to need. Water is stored in a suitable plastic container that is removably suspended from Hubs **19** or **20** by means of a hanger bracket.

[**0045**] The machine embodiments **200**, **300** shown in **FIGS. 2 and 3** may further include an abrasive (or grit) delivery system. **FIG. 6** shows an embodiment of a grit-feeding system **400** suitable for use with the machine embodiments **200**, **300**. As shown in **FIG. 6**, the grit-feeding system **400** includes a frame **23** which may be attached to the configuration hub **19**, **20** of the machine, thus suspending the grit-feeding system **400** above the work area. A feed motor **28** is bolted to the frame **23** and a shaft from the feed motor **28** extends through a center hole of the frame **23**, with a fixed shaft-coupling device.

[**0046**] A grit-dispenser module **29** is coupled to the frame **23** and includes a grit bottle **27**, a grit-dispenser head **24**, a grit auger **25**, and a grit cap **26**. The grit-dispenser module **29** may be changed according to operator preference by pulling the grit-dispenser module **29** from the frame **23**, thereby disconnecting the grit auger **25** from the feed motor **28**, and the entire unit may be replaced with another module containing a different grit particle. The top of the bottle **27** is inserted through the retaining ring at the top of the frame **23**, and the grit-dispenser head **24** is snapped into place, thus securing the grit auger **25** to the motor shaft of the feed motor **28**. In comparison with the prior art grit dispenser, the grit-dispenser module **29** simplifies the grit-changing process and eliminates the need to clean a multi-use grit tube.

[**0047**] Generally, the operation of the two-headed machine **200** and the three-headed machine **300** are similar, and will be described below with reference to the singular "machine **200**, **300**." First, the machine **200**, **300** is operated by closing the grinding cups **21** upon a workpiece **60** (shown in **FIGS. 2 and 3**), typically a rough sphere of material, by turning the main handwheel **5** and auxiliary handwheel **17** for each grinder head module **100**. The machine slides **3** are arranged to position the grinding cups **21** at angles of 120 degrees, or 180 degrees respective to the workpiece **60** when configured as a three-headed machine **300**, or a two-headed machine **200**, respectively.

[**0048**] After positioning the workpiece **60** within the grinding cups **21**, the handwheels **5**, **17** are turned to secure each motor slide **6** into position, and the grinding operation may begin by activating the motors **18**. The amount of abrasive grit being dispensed by the turning grit auger **25**, and manual adjustment of the location of the grit dispensing hole on the grit cap **26**, are determined by rotating the grit cap **26** until the desired rate of abrasive grit flow is achieved. As the independently-driven grinding cups **21** turn, the motion of each grinding cup **21** is frictionally imparted to the workpiece **60**. The workpiece **60** is randomly oscillated through all three rotational axes during the grinding process, which abrades and removes excess asymmetrical "high" areas of the workpiece until such areas are removed and the material becomes generally spherical. If desired, this operation may be repeated with progressively finer grit particles and grinding cup selections until a spherical object with a gem-like surface luster is achieved.

[**0049**] One may note that the machines **200**, **300** employ motor mounts **11** which suspend the motors **18** and grinding cups **21** beneath the machine slide **3**, rather than resting above it on the frame **2** or a table or other base. This aspect of the invention allows gravity to work in favor of the operation, holding the workpiece **60** more precisely in the center of the rotating cups **21**, and reducing stress on the overall structure. The machine slides **3** and leadscrews **4**, **8**, **15** provide precise adjustment in all three axes for precise fine-tuning of grinding and polishing operations by turning knobs **9**, or handwheels **5**, **17**. In addition, the framework **1**, **2** accommodates conversion from tabletop to a floor model by attachment of leg extensions (not shown).

[**0050**] The machines **200**, **300** may be used for a variety of different surfacing/polishing applications, including but not limited to lapidary work. For example, bowling balls, large granite and marble spheres, and other materials and workpieces may be accommodated by adjustment of the motor mounts and/or by use of variously-sized cutting heads/abrasion blocks and motor shafts lengths. Larger, heavier objects may be accommodated by simply scaling up the size of the apparatus, and by the addition of heavy duty gear motors of varying torque and rpm as required.

[**0051**] The machines **200**, **300** in accordance with the invention exhibit several advantages over the prior art. For example, the machines **200**, **300** advantageously permit the position of the grinding cups to be precisely adjusted in three axes. Each motor mount **100** includes a shock-absorbing tension adjustment device **58** that permits adjustment of the vertical attack-angle of the grinding cup **21**, as well as a horizontal adjustment screw **7** that allows minute adjustments in horizontal attack-angle relative to the workpiece **60**. Thus, the position of the grinding cups **21** may be precisely adjusted in three axes by means of the main and auxiliary handwheels **5**, **17** and the adjustment knob **9** on each grinding-head module **100**.

[**0052**] Another advantage of the inventive apparatus and methods disclosed herein is that each motor **18** and grinding cup **21** are suspended below the machine slide **3** on a pivoting pin **10** that allows gravity to naturally pull the grinding cups **21** toward the workpiece **60**. This aspect of the invention employs the force of gravity to maintain and improve the frictional engagement of the grinding cups **21** with the workpiece **60**.

[0053] Yet another advantage of the inventive apparatus and methods disclosed herein is that most of the moving machine parts are located above the workpiece **60**, allowing waste debris, grit, and slurry to fall away from, rather than into, the machine parts. As a result, generally spherical objects may be formed faster because the improved design allows a more automated process that requires less cleaning and maintenance. Operation efficiency is further improved because slurry-catching systems may be easily exchanged, or cleaned while the machine is in operation resulting in less down-time during grinding, and grit-changing operations are much simplified by eliminating the need to clean a multi-use grit tube.

[0054] Additional advantages of the inventive apparatus and methods disclosed herein over related art include: (1) a modular design of the machine, unique in the industry, allows flexibility of configuration according to need. (2) a much improved design and configuration of the motor mount brackets (and, therefore, the motors and abrasion blocks or grinding cups) and means for their adjustment; (3) "shock-absorber" tension adjustment, allows precise adjustments of grinding cup vertical attack angle that additionally acts as a brake on the machine slide to secure the motor mount in position during operation, and may also absorb bumps and shocks caused in initial grinding operations due to less-than-perfectly spherical rough material; and (4) modular grit-feed system allows for a quick change of abrasive grit with no need for cleanup as with a single fixed grit-feed tube which must be disassembled and cleaned thoroughly in order to change to a finer grit particle.

[0055] The detailed descriptions of the above embodiments are not exhaustive descriptions of all embodiments contemplated by the inventor to be within the scope of the invention. Indeed, persons skilled in the art will recognize that certain elements of the above-described embodiments may variously be combined or eliminated to create further embodiments, and such further embodiments fall within the scope and teachings of the invention. It will also be apparent to those of ordinary skill in the art that the above-described embodiments may be combined in whole or in part to create additional embodiments within the scope and teachings of the invention.

[0056] Thus, although specific embodiments of, and examples for, the invention are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize. The teachings provided herein can be applied to other apparatus and methods of grinding, shaping, and polishing a workpiece into a generally spherical shape, and not just to the embodiments described above and shown in the accompanying figures. Accordingly, the scope of the invention should be determined from the following claims.

I claim:

1. An apparatus for forming a generally spherical object from a workpiece, comprising:

a frame including a laterally-projecting elongated member;

a support member slideably engaged with the elongated member;

a motor coupled to the support member and pivotably suspended below the elongated member, the motor including a shaft projecting therefrom; and

a surface treating member attached to the shaft and adapted to engage the workpiece.

2. The apparatus according to claim 1 wherein the support member includes a threaded nut oriented approximately along a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the frame and extending through the threaded nut such that rotation of the threaded member in a first rotational direction drives the support member in a first direction along the elongated member, and rotation of the first threaded member in a second rotational direction drives the support member in a second direction along the elongated member.

3. The apparatus according to claim 1 wherein the support member includes a threaded nut oriented along an axis that is approximately laterally perpendicular to a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the support member and extending through the threaded nut such that rotation of the threaded member in a first rotational direction changes an angular orientation of the support member in a first lateral direction with respect to the elongated member, and rotation of the threaded member in a second rotational direction changes the angular orientation of the support member in a second lateral direction with respect to the elongated member.

4. The apparatus according to claim 1 wherein the support member includes a threaded nut oriented along an axis that is approximately perpendicular to a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the support member and adapted to engage the frame and extending through the threaded nut such that rotation of the threaded member in a first rotational direction changes an angular orientation of the support member in a first vertical direction with respect to the elongated member, and rotation of the threaded member in a second rotational direction changes the angular orientation of the support member in a second vertical direction with respect to the elongated member.

5. The apparatus according to claim 1 wherein the support member includes a slide member positioned above the elongated member, and a motor mount pivotally coupled to the slide member and suspended below the elongated member, the motor being coupled to the motor mount.

6. The apparatus according to claim 1 wherein the support member includes a slide member positioned above the elongated member, and a motor mount pivotally coupled to the slide member and suspended below the elongated member, the motor mount including a shock absorbing device having an engagement member adapted to engage the elongated member when the motor mount is pivoted, and a spring operatively associated with the engagement member such that the spring is at least partially compressed when the engagement member engages the elongated member.

7. The apparatus according to claim 1, further comprising an abrasive delivery system coupled to the frame and adapted to deliver an abrasive proximate the surface treating member, the abrasive delivery system including

a support structure coupled to the frame;

an abrasive feed device coupled to the support structure; and

an abrasive container removeably coupled to the support structure and to the abrasive feed device, the abrasive container being removeable without disassembly of the support structure and the abrasive feed device.

8. The apparatus according to claim 7 wherein the abrasive container includes a rotatable cover having an aperture disposed therein, a rate of delivery of the abrasive being selectively controlled by a rotational position of the rotatable cover.

9. An apparatus for forming a generally spherical object from a workpiece, comprising:

a mounting hub;

at least two surface treating modules coupled to the mounting hub, each surface treating module including:

a frame including a laterally-projecting elongated member;

a support member slideably engaged with the elongated member;

a motor coupled to the support member and pivotably suspended below the elongated member, the motor including a shaft projecting therefrom; and

a surface treating member attached to the shaft and adapted to engage the workpiece.

10. The apparatus according to claim 9 wherein the at least two surface treating modules comprises first and second surface treating modules, the first and second surface treating modules being coupled to opposite sides of the mounting hub.

11. The apparatus according to claim 9 wherein the at least two surface treating modules comprises first, second, and third surface treating modules, the first, second, and third surface treating modules being spaced apart by approximately 120 degrees angles around the mounting hub.

12. The apparatus according to claim 9 wherein, for at least one surface treating module, the support member includes a threaded nut oriented approximately along a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the frame and extending through the threaded nut such that rotation of the threaded member in a first rotational direction drives the support member in a first direction along the elongated member, and rotation of the first threaded member in a second rotational direction drives the support member in a second direction along the elongated member.

13. The apparatus according to claim 9 wherein, for at least one surface treating module, the support member includes a threaded nut oriented along an axis that is approximately laterally perpendicular to a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the support member and extending through the threaded nut such that rotation of the threaded member in a first rotational direction changes an angular orientation of the support member in a first lateral direction with respect to the elongated member, and rotation of the threaded member in a second rotational direction changes the angular orientation of the support member in a second lateral direction with respect to the elongated member.

14. The apparatus according to claim 9 wherein, for at least one surface treating module, the support member includes a threaded nut oriented along an axis that is approximately perpendicular to a longitudinal axis of the elongated member, further comprising a threaded member rotatably coupled to the support member and adapted to engage the frame and extending through the threaded nut such that rotation of the threaded member in a first rotational direction changes an angular orientation of the support member in a first vertical direction with respect to the elongated member, and rotation of the threaded member in a second rotational direction changes the angular orientation of the support member in a second vertical direction with respect to the elongated member.

15. The apparatus according to claim 9 wherein, for at least one surface treating module, the support member includes a slide member positioned above the elongated member, and a motor mount pivotally coupled to the slide member and suspended below the elongated member, the motor being coupled to the motor mount.

16. The apparatus according to claim 9 wherein, for at least one surface treating module, the support member includes a slide member positioned above the elongated member, and a motor mount pivotally coupled to the slide member and suspended below the elongated member, the motor mount including a shock absorbing device having an engagement member adapted to engage the elongated member when the motor mount is pivoted, and a spring operatively associated with the engagement member such that the spring is at least partially compressed when the engagement member engages the elongated member.

17. The apparatus according to claim 9, further comprising an abrasive delivery system adapted to deliver an abrasive proximate at least one of the surface treating members, the abrasive delivery system including

a support structure coupled to at least one of the mounting hub and the at least two surface treating modules;

an abrasive feed device coupled to the support structure; and

an abrasive container removeably coupled to the support structure and to the abrasive feed device, the abrasive container being removeable without disassembly of the support structure and the abrasive feed device.

18. The apparatus according to claim 17 wherein the abrasive container includes a rotatable cover having an aperture disposed therein, a rate of delivery of the abrasive being selectively controlled by a rotational position of the rotatable cover.

19. An apparatus for forming a generally spherical object from a workpiece, comprising:

a frame;

a motor coupled to the frame, the motor including a shaft projecting therefrom;

a surface treating member attached to the shaft and adapted to engage the workpiece; and

an abrasive delivery system coupled to the frame and adapted to deliver an abrasive proximate the surface treating member, the abrasive delivery system including a support structure coupled to the frame;

an abrasive feed device coupled to the support structure; and

an abrasive container removeably coupled to the support structure and to the abrasive feed device, the abrasive

container being removeable without disassembly of the support structure and the abrasive feed device.

20. The apparatus according to claim 19 wherein the abrasive container includes a rotatable cover having an aperture disposed therein, a rate of delivery of the abrasive being selectively controlled by a rotational position of the rotatable cover.

21. The apparatus according to claim 19 wherein the frame includes a laterally-projecting elongated member and a slide member slideably engaged with the elongated member, the motor being coupled to the slide member and pivotably suspended below the elongated member.

22. The apparatus according to claim 21 wherein the slide member includes a motor mount pivotally coupled to the slide member and suspended below the elongated member, the motor being coupled to the motor mount.

23. The method of forming a generally spherical object from a workpiece, comprising:

providing at least one laterally-projecting elongated member;

pivotally suspending at least one surface treating mechanism below the at least one elongated member, the surface treating mechanism including a surface treating member;

rotating the surface treating member; and

employing a gravitational force to bias the surface treating member into engagement with the workpiece.

24. The method according to claim 23 wherein providing at least one laterally-projecting elongated member comprises providing a first elongated member and a second elongated member, the first and second elongated members being approximately aligned along respective longitudinal axes thereof, and wherein pivotally suspending at least one surface treating mechanism comprises pivotally suspending a first surface treating mechanism below the first elongated member and pivotally suspending a second surface treating mechanism below the second elongated member, the first and second surface treating mechanisms including first and second surface treating members, the first and second surface treating members engaging the workpiece from approximately opposite sides.

25. The method according to claim 23 wherein providing at least one laterally-projecting elongated member comprises providing first, second, and third elongated members oriented at approximately equidistant positions about the workpiece, and wherein pivotally suspending at least one surface treating mechanism comprises pivotally suspending first, second, and third surface treating mechanisms below the first, second, and third elongated members, respectively, the first, second, and third surface treating mechanisms including first, second, and third surface treating members, the first, second, and third surface treating members engaging the workpiece from approximately equidistant positions about the workpiece.

26. The method according to claim 23, further comprising adjustably controlling a position of the surface treating mechanism along a longitudinal axis of the elongated member.

27. The method according to claim 23, further comprising adjustably controlling a horizontally-angular orientation of the surface treating mechanism with respect to the elongated member.

28. The method according to claim 23, further comprising adjustably controlling a vertically-angular orientation of the surface treating mechanism with the elongated member.

29. The method according to claim 23, further comprising delivering an abrasive proximate the surface treating member.

30. The method according to claim 29, further comprising adjusting a rate of delivery of the abrasive by a rotating a cover of an abrasive container.

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