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(54) **Device for controlling gemstone polishing assembly movement**

(57) The present invention pertains to a device for controlling polishing assembly movement. The device comprises a vertical rod, a motive power means for lowering and lifting, and rotating, oscillating, or both rotating and oscillating the vertical rod about an axis of rotation

coaxial with the vertical rod. The device also comprises a pin that is offset from the axis of rotation and connected to the vertical rod for mounting the polishing assembly. Optionally, the device may comprise a sensor for activating movement of the vertical rod.

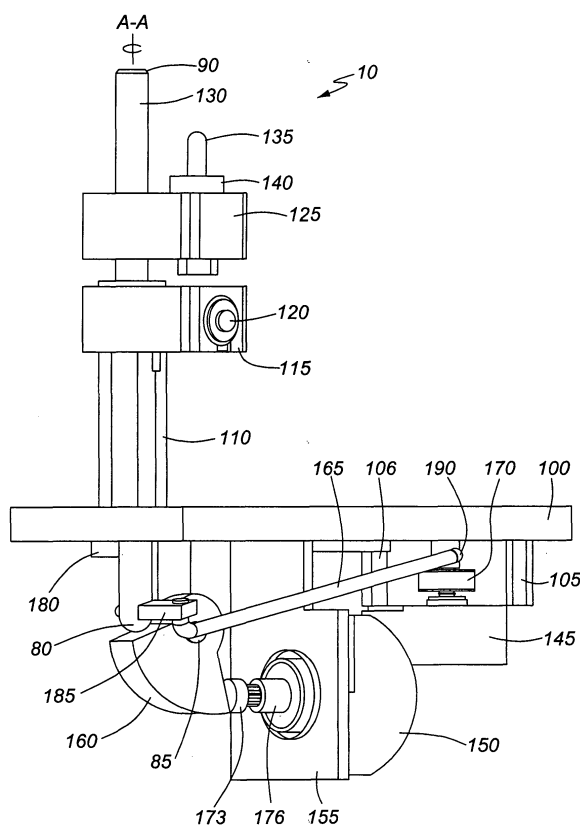


FIG. 1

Description

FIELD OF INVENTION

[0001] The present invention relates to a device for controlling the movement of a polishing assembly during the polishing process of precious stones, gems, semi-precious stones and the like. The present invention also provides a device having an oscillating and lifting mechanism enabling the user to control the movement of polishing assembly during use, ensuring repeatability of the polishing process.

BACKGROUND OF THE INVENTION

[0002] The value of a jewelry gemstones increases as they pass through the fashioning process from rough raw material to finished brilliants. As an example, the gemstone manufacturing process typically comprises one or more of the following steps: cleaving, splitting or sawing of the rough gemstones; bruting of the rough gemstones; grinding of the gemstones and polishing the facets. This invention relates in particular to the two last steps of grinding and polishing.

[0003] During grinding of a gemstone, the gemstone is faceted by using a polishing assembly, also called a tang that comprises an adjustable polishing gemstone holder, or dop fitted at the end of a stylus at one end of the tang. The gemstone to be grinded, or polished is set in a metal collet or in a crown pot and claw assembly set in an adjustable dop, which is set at a given angle, and index (radial position) via the tang onto the scaife, a polishing wheel. A scaife is typically a flat cast-iron wheel coated with, for example, diamond powder. The surface of the scaife may also comprise several sections with different polishing compounds to be used at different stages of the polishing process. This polishing wheel is driven by a motor and revolves about a vertical axis. More than one polishing assembly (tang) can be used at the same time on the same scaife. By oscillating the tang on a given portion of the scaife, a facet of a given shape is produced.

[0004] The grinding of gemstones comprising two steps: first, the cross-work, whereby the table facet, eight pavilion facets and eight crown facets are ground; and followed by the step of brilliantteering, whereby through continuous adjustment of the dop, the remaining facets are placed on the edges of the established main facets. The adjustment of the dop is determined with reference to the position of the previous polished facet and the shape of the gemstone. With current techniques, the polishing process has to be interrupted at regular intervals in order to check the polishing depth reached and the quality of the facet obtained. This task demands great skill in order to obtain the correct polishing depth for a particular facet.

[0005] Grinding and polishing requires that the polishing assembly is moved across the scaife. The move-

ment of the assembly (tang) is controlled by hand, and care must be used to ensure that the correct portion of the tang and dop is being used for a given step in the grinding or polishing process. Furthermore, the proper size of the facet must be determined during the process and the progress of the grinding or polishing operation has to be repeatedly interrupted in order to check the grinding and polishing depth reached.

[0006] Careless grinding and polishing may result in the scaife surface becoming scratched and grooved. A scratched polishing wheel in turn causes deep grooves on the gemstone and possibly subsequent loss of gemstone value. Due to the nature of the manual operation, the results of the grinding and polishing process may be inconsistent, resulting poor repeatability of the operation.

[0007] US 4,603,512 discloses an apparatus for lapping a facet at the tip of a stylus by softly setting the tip down on a rotating scaife, and for determining the correct depth of polishing of the diamond. The stylus having a diamond tip bonded to a metallic dop is placed in contact with the surface of a rotating electrically conducting scaife and a current is established between the stylus and the scaife. A detector coupled to the stylus determines when the diamond tip is sufficiently lapped, and the control signal is used to actuate a mechanism for lifting or removing the stylus tip from contact the scaife and thereby cease lapping the stylus.

[0008] Two devices for controlling movement of a polishing assembly (tang) are commercially available. One involves a lifting device, similar to that described above, but this device does not assist in lower the stylus onto the scaife. The second device controls lateral sliding movement of the tang, and hence the movement of the stylus, across the scaife. Both products can be added to existing polishing equipment. However, two pieces of equipment are needed for controlling movement of a tang (see, for example, product catalogues from Bettonville NV, Antwerp; Rico Tools NV, Herenthout; Adri Diamond Tools, Grobbendonk, all in Belgium).

[0009] US 5,816,896 and WO96/1931 describe a method and device using reference plane to provide precision in polishing gemstones.

[0010] EP 0,299,692 describes an apparatus and method for operating the scaife at a speed above its radial critical frequency to achieve stable operation.

[0011] EP 0945217 describes an apparatus for faceting gems comprising a vertical supporting plate to guide the movement of the gemstone on dop sticks.

[0012] US 4,254,587 relates to a device that holds a stone in contact with an abrading surface for grinding the stone. The stone is moved continuously across the surface of the polishing wheel to avoiding grooving of the abrading surface.

[0013] Automatic polishing tool for accurately setting the angle during diamond polishing may be found at the following site "comdiam.com/octopus.htm."

SUMMARY OF THE INVENTION

[0014] The present invention relates to a device for controlling the movement of a polishing assembly during the grinding process of gemstones. The present invention also provides a device having an oscillating and lifting mechanism enabling the user to control the movement of polishing assembly during use, ensuring repeatability of the of the polishing process.

[0015] It is an object of the invention to provide an improved apparatus for controlling movement of a polishing assembly (tang) during grinding and polishing of a gemstone.

[0016] According to the present invention there is provided a device for controlling movement of a polishing assembly (tang), comprising, a vertical rod; one or more than one motive power means for lowering and lifting, and rotating or oscillating the vertical rod about an axis of rotation coaxial with the vertical rod; a pin offset from the axis of rotation and connected to the vertical rod for mounting the polishing assembly.

[0017] The present invention also pertains to the device defined above, wherein the device controls oscillating movement of the polishing assembly (tang) on a polishing wheel.

[0018] The present invention provides a device as defined above, wherein the pin is attached to an adjustable adaptor, and the adjustable adaptor is fastened to the vertical rod. The adjustable adaptor may be fitted with a spring-loaded collar for gradual transferring of weight of the polishing assembly to a polishing wheel. Furthermore, the device may comprise a guide, the guide defining an opening through which the vertical rod is inserted.

[0019] The present invention also embraces the device defined above, wherein an electronic controller is operatively connected to the one or more than one mechanism. The electronic controller may control lowering and lifting, rotating or oscillating movement of the vertical rod, or the electronic controller may control lifting and lowering movement of the rod. Furthermore, the speed of lowering and raising the vertical rod may be set by the electronic controller.

[0020] The present invention also relates to a device for controlling polishing assembly movement comprising, a vertical rod; one or more than one motive power means for lowering and lifting, and rotating or oscillating the vertical rod about an axis of rotation coaxial with the vertical rod; a pin offset from the axis of rotation and connected to the vertical rod for mounting the polishing assembly, and a sensor for activating movement of the vertical rod.

[0021] The present invention also provides the device as just defined, wherein the sensor is operatively communicating with a dop within the polishing assembly. The sensor may be an electrical circuit, and contact of the dop with a polishing wheel closes the electrical circuit so that the vertical rod is lifted off of the polishing wheel

surface.

[0022] The device for controlling polishing arm movement of the present invention is easy to operate, permits accurate grinding of gemstones, saves time in polishing gemstones, and permits a user to oversee a plurality of active polishing assemblies at the same time. The design ensures consistency and repeatability of the polishing operation. Furthermore, it improves the longevity of the collet and/or claws holding the gemstone in the dop and associated stylus as the tang is lifted off the wheel once the appropriate facet depth is obtained thereby minimizing wear of the collet, claw or both the collet and claw in the dop. The device of the present invention also increases longevity of the polishing wheel, because the gemstone is moved over an optimized surface area of the scaife in a regular manner during polishing, wearing a large surface area of the polishing wheel in a reproducible manner, so that less material needs to be removed during regeneration of the polishing wheel as the scaife stays true for longer periods of time.

[0023] This summary of the invention does not necessarily describe all features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings wherein:

[0025] FIGURE 1 shows a front perspective view of the device in accordance with an embodiment of the present invention.

[0026] FIGURE 2 shows a front view of the device in accordance with an embodiment of the present invention.

[0027] FIGURE 3 shows a top view of the lower portion of the device in accordance with an embodiment of the present invention, with the base plate removed. Showing the motor drives (145, 150), cam (160) and oscillating member (165).

[0028] FIGURE 4 shows a side view of the device in accordance with an embodiment of the present invention.

[0029] FIGURE 5 shows a bottom view of the device in accordance with an embodiment of the present invention.

[0030] FIGURE 6 shows a cross section of a portion of the polishing table (210) and scaife (220), and a side view of the device (10) in accordance with an embodiment of the present invention.

[0031] FIGURE 7 shows a top perspective view of the device (10) in accordance with an embodiment of the present invention in relation to a polishing wheel (220) and part of a polishing table (210).

[0032] FIGURE 8 shows a schematic of a wiring diagram of the device in accordance with an embodiment of the present invention.

[0033] FIGURE 9 shows a non-limiting example of a side view of a polishing assembly (tang; 20).

[0034] FIGURE 10 shows a non-limiting example of a side view of a polishing table with the tang and the device of the present invention removed.

[0035] FIGURE 11 shows a part of the underside of a polishing assembly (tang 20) in accordance with an embodiment of the present invention, having a plurality of recesses each of which may receive the pin (not shown) of the device of the present invention.

[0036] FIGURE 12 shows a modified end of a polishing assembly (tang; 20) in accordance with an embodiment of the present invention, with two wheels.

DETAILED DESCRIPTION

[0037] The present invention relates to a device for controlling the movement of a polishing assembly during the polishing process of gemstones. The present invention also provides a device having an oscillating and lifting mechanism enabling the user to control the movement of grinding and polishing assembly during use, ensuring repeatability of the of the polishing process.

[0038] The following description is of a preferred embodiment.

[0039] The present invention provides a device for controlling movement of a polishing assembly or tang, used during gemstone polishing.

[0040] With reference to Figures 1-3, the device of the present invention, generally shown as 10, comprises a vertical rod (130) with a first end (90) and a second end (80), a mechanism for lifting and lowering the vertical rod, (see for example, but not limited to, elements 150, and 160), and a mechanism for rotating the vertical rod about an axis of rotation (for example, but not limited to 145, 165 and 185). A pin (135), or similar member, is provided for mounting the polishing assembly (not shown, also referred to as a tang, 20; see Figure 9) to the device of the present invention (10). The pin (135) is associated with the vertical rod (130) and is offset from the axis of rotation (shown as line A-A in Figure 1), so that when the vertical rod either rotates, oscillates or both rotates and oscillates, the pin moves accordingly about the same axis.

[0041] The device of the present invention may be used with any tang (20), as is known in the art, for example as shown in Figure 9, and any gemstone polishing table (30; see Figure 10), as is known in the art, with a motor (230); a motor switch (310); a frame (320); a drawer (340); a sleigh (350) and a tang rack (360).

[0042] The pin (135) with its sleeve (140) may be attached to the vertical rod (130) via an adaptor (125). The adaptor (125) may be fixedly attached to the vertical rod (135), and its position along the vertical rod adjustable prior to being engaged with the vertical rod via any suitable mechanism, for example but not limited to a key, bolt, spring clip, snap ring, or other mechanism permitting adjustment of the height, and fixing the position, of

the pin assembly along the rod. The pin may also be continuous with the vertical rod, and the vertical position of the pin adjusted by positioning and registering the shaft of vertical rod with respect to the surface of the table, for example using a sleeve that may be attached to the rod and that abuts the table to determine the height adjustment of the pin.

[0043] Alternate methods of interfacing the pin (135) with the tang include for example, but not limited to, a ball and socket joint, a universal joint, or other mechanism that permits a rotational or oscillatory, as well as a vertical movement of the pin (135) and tang, when the pin is registered with the tang.

[0044] The device (10) may be mounted to a polishing table (see Figure 10) so that the one or more than one motor drive (150 and 145) is housed below the table surface, and the vertical rod (130) extends up through an opening in the table surface, and the offset pin (135) positioned to interface with a polishing assembly (tang). Such an arrangement is shown in Figure 6 and 7. However, alternate arrangements may also be employed, for example which are not to be considered limiting in any manner, the motor drives (150, 145) and the vertical rod (130) may be placed on top of the table, or alternatively, the motor drive may be placed away from the polishing table, and communicate with one or more than one vertical rod by any appropriate linkage elements, for example using a chain, belt or rods as appropriate. As would be understood by one of skill in the art, one or more than one polishing assembly (tang), and associated devices (10) of the present invention, may be mounted to a polishing table. By placing the one or more than one motor drive below or off the table surface, utilization of space on the polishing table is minimized, and permits additional tangs to be used per scaife.

[0045] The device (10) of the present invention may comprise a base plate (100) for supporting component parts of the device as shown in Figures 4 and 5. The base plate may be used for mounting the device (10) to the polishing table (210; Figure 6). Alternatively, the components of the device that are shown attached to the base plate (100), in Figure 1-5, maybe each separately attached to the polishing table, for example the undersurface or top surface of the polishing table. One or more than one motor drive (e.g. 145, 150) or linkages (165) may be attached to the base plate, for example using a bracket (155, 180), elongated nuts (105, 106) or other attachment device.

[0046] The one or more than one motor drive (150,145) may be any suitable motor, powered manually, electrically or via other means for example, compressed air. A non-limiting example of a motor drive is a linear stepper motor. As shown in Figure 1, there may be two motor drives one motor drive (150) that interfaces with the second end (80) of the vertical rod (130) so that when the drive is actuated, the vertical rod moves up and down, and a second drive (145) that imparts an oscillatory or rotational movement to the vertical rod (130)

via linkage (165).

[0047] A non-limiting example of a mechanism for imparting the up and down motion to the vertical rod is shown in Figure 1, where the shaft (176) of the linear step motor (150) is in contact with a pivoting cam (160, via end 173). By extending and retracting the shaft (176), the cam oscillates around a pivot point (85) and raises or lowers the vertical rod, respectively. The cam may be positioned relative to the base (100) via bracket (180). Alternatively, the stepper motor may be placed in direct association with the vertical rod, so that as the shaft (176) of the motor (150) extends and retracts, the vertical rod (130) is raised and lowered, respectively.

[0048] In the non-limiting embodiment shown in Figures 1-5, in operation; the linear stepper motor (150) retracts shaft (176), and the cam (160) rotates towards the stepper motor (150) so that the vertical rod (130) is lowered. When the vertical rod is interfaced with a polishing assembly (tang), via pin (135) the gemstone attached to the stylus of the tang is brought into contact with the scaife in a controlled and gentle manner, thereby eliminating scratching of the polishing wheel. This automatic, gentle lowering process permits the user to attend to other process involved in the polishing process, for example, the polishing assembly may be advanced to a next position, or additional tangs on the polishing table may be adjusted as required.

[0049] Alternate mechanisms to raise and lower the vertical rod may also be used, for example, an eccentric rotating cam, that rotates around the same axis of rotation as a rotating shaft of a stepper motor, may be used to raise and lower the vertical rod; an electrical solenoid that when activated raises and lowers the rod, or an electromagnet that when activated raises or lowers the vertical rod, as would be known to one of skill in the art.

[0050] The adaptor (125) may comprise a spring assembly (not shown), which holds some of the weight of the polishing assembly (the tang) when it is positioned upon the pin. As the tang is lowered and the stylus contacts the scaife, the weight of the load of the tang is gradually transferred from the spring within the adaptor and onto the scaife, providing a gentle motion when the gemstone is brought in contact with the wheel.

[0051] The speed of raising and lowering the vertical rod may be controlled so that when a polishing assembly (tang) that is positioned on pin (135) is lowered onto the scaife, the gemstone positioned at the stylus of the tang meets the scaife in a gradual and controlled manner. Similarly, when the surface of the gemstone is sufficiently polished, it may be desired to raise the vertical rod in an efficient, accelerated manner minimizing any over polishing of a surface of the gemstone.

[0052] The vertical rod (130) also rotates, oscillates, or both rotates and oscillates around a vertical axis (A-A, see Figures 1 and 2), thereby imparting a horizontal movement to pin (135). The second stepper motor (145) can provide the rotational or oscillating movement to the vertical rod (130), through the link (165), and to pin

(135). This movement is further transferred to a polishing assembly, when attached to pin (135), to provide a controlled movement, either rotational or actuate, to the gemstone when the gem stone is in contact with the face of a rotating polishing wheel (scaife). This oscillating movement allows the use of the different zones of the abrasive charged surface of the polishing wheel while at the same time avoiding grooving of the polishing wheel.

[0053] When a polishing assembly (tang (20); an example of a tang is shown in Figure 9) is registered against pin (135), and the pin rotates, oscillates, or both, the tang will move across the surface of a scaife in a similar horizontal manner. The rotational or oscillatory movement of the pin is provided via a motive drive, for example, motor drive (145), which can also be a stepper motor. Rotational or oscillatory movement of the shaft of drive (145) may be imparted to vertical rod (135) either directly, via a direct drive motor drive, or via a linkage mechanism, for example, but not limited to a mechanism shown in the non-limiting Figures 1-4, comprising a first coupler (190), coupling a wheel (170) attached to a shaft of the motor drive (145) to arm (165), and a second coupler (185), coupling the arm (165) to the vertical rod.

[0054] In the embodiment shown in the Figures 1-5, the motor drive (145) may impart an oscillatory movement to the vertical rod (130). However, the drive mechanism can be configured so that a rotational movement is delivered to the vertical rod, for example by placing the motor and linkage assembly (145, 170, 190, 165, 185) below the plane of motor drive (150) and cam (160). The linkage mechanism may also comprise chain or belts that transfer the rotational or oscillatory movement from motor drive (145) to the vertical rod.

[0055] To ensure precise vertical and horizontal movement of the vertical rod (130), the rod may be positioned within a guide (110, Figures 1-4). The guide may be placed on the base plate (100) and pass through the polishing table (210) typically in the proximity of the scaife (220), or it may be affixed to the top surface of the polishing table.

[0056] With reference to Figure 8 there is shown an example, which is not to be considered limiting, of a wiring diagram that may be used with the device of the present invention. In this schematic, an electrical operational controller (260) controls the depth of the grinding and polishing process by detecting the extent of polishing of a non-conductive gemstone surface. For example, which is not to be considered limiting in any manner, diamonds are well known for exhibiting high electrical resistivity (10^{15} Ohm/cm) and low dielectric constant. Other gemstones may also exhibit similar properties. The cast iron scaife (220; also see Figure 6-8 and 10) and the polishing assembly (tang, 20; see Figure 9), on the other hand, are excellent electrical conductors. The polishing wheel (scaife, 220) and the polishing arm assembly (tang; shown schematically in Figure 8 as 20)

may therefore be connected to opposite poles of a power source, for example but not limited to a low voltage (6 to 12 volt) direct current power source, or a regular (110, 210 volt) power source, in such a way that the non-conductive gemstone, mounted on the press pot of the stylus acts as an insulator to keep the circuit open. The tang may be connected to this circuit through vertical rod (130).

[0057] The non-conductive gemstone is polished until a point when the press pot, or other component of the tang makes contact with the iron scaife, thereby closing the electrical circuit. For example which is not to be considered limiting in any manner, in the case of pavilion polishing of a diamond, a collet would be used to hold the diamond in position in the dop. In this case the collet becomes the contact point where the circuit would be closed. For crown polishing, the claw would be set in the appropriate position and the claw would become the contact point for the closing of the circuit.

[0058] The event of closing the circuit is registered by the electrical operational controller (260) that activates a lifting circuit. For example, which is not to be considered limiting in any manner, the lifting circuit may involve stopping the oscillating motor (145), and activating motor drive (150) to extend shaft (176; Figures 1, 3, 4 and 5) to lift the vertical rod (130), pin (135), the interfaced polishing arm assembly (20), and stylus off the scaife (220), and prevent any further polishing of the non-conductive gemstone. The device may also have a home switch (240) to control the overall operation. The lifting, lowering, rotation or oscillation of the vertical rod (130), and associated components may also be effected through activating switch 120 (Figures 1, 2, 4 and 8). For example, after the desired amount of polishing is achieved on a surface of a gemstone and the vertical rod is lifted off of the scaife as described above, the gemstone is reset within the stylus, the vertical rod, and tang may be lowered onto the scaife using activating switch 120, and associated components as described below.

[0059] The electrical operational controller (260) may also be used for controlling the operation of the motor drives (145, 150), including lifting, lowering, and the rate of oscillation. The electrical operational controller may also allow the adjustment of the ratio between the lowering speed and the lifting speed. A gentle, slow lowering speed of vertical rod (130) results in a slow lowering of polishing assembly and ensures a smooth touch down of the gemstone onto the polishing wheel. The lowering speed of the vertical rod (130) may also be controlled via a spring mechanism that is slowly compressed by weight of the polishing assembly (tang) as the cam (160) is pivoted towards the shaft (176) and motor drive (150) body. Similarly, an air piston or other mechanism as would be evident to one of skill in the art, may be used to slow the downward movement of the vertical rod when the polishing assembly (tang) is being lowered and brought into contact with the scaife.

[0060] Also shown in Figures 1 and 2 is a support

member (115) holding an activating switch (120) that activates the lowering and lifting of the vertical rod (130) and interfaced polishing assembly (tang). However, it is to be understood that the activating switch (120) may be positioned anywhere that is convenient for use and where it may be easily actuated. This switch may also be located off the polishing table if desired. When the vertical rod (130) is in a raised position, and the interfaced tang lifted off the scaife, the activating switch (120) may be used to activate the first drive motor (150) to retract shaft (176), cam (160) thereby allowing vertical rod (130) to lower in a controlled manner, as described above, and permit the gemstone in association with the tang to be brought in contact with the scaife. The activating switch (120) may also be used to raise the vertical rod (130) and interfaced tang, by activating motor drive (150) to extend shaft (176), and pivot cam (160), to raise the vertical rod.

[0061] The schematic shown in figure 8 utilizes a sensor that detects the closing or opening of the circuit established between the scaife (220) and the tang (20), when used in conjunction with a non-conductive gemstone, for example but not limited to a diamond. Furthermore, the diamond polishing process utilizes a dry scaife, turning at high speed which helps insure that the circuit is open or closed as the case may be. However, other gemstones may be conductive, or their polishing and grinding process may use water and a lap (scaife) turning at slow speeds. Water, or a conductive gemstone may eliminate the insulating qualities required for this circuit as described above to function. Therefore, alternate methods of sensing the required degree of grinding and polishing may be used. For example, which is not to be considered limiting, a beam of light traveling from a source to a detector may be intercepted, or the light may be reflected to a detector, by the tang frame or other component of the tang, as the component reaches a certain height off the polishing table or scaife. The interception or reflection of the light beam may then active the lifting circuit as described above. Other sensor type mechanism may also be utilized to active movement of the vertical rod (130) as would be known by one of skill in the art, for example activation of the lifting circuit as a result of time. The lifting circuit may also be activated by the user as required using activating switch 120.

[0062] The device (10) of the present invention may be used with any polishing assembly (tang), including but not limited to, a Quickstep Tang (Crown, see Figure 9). Goren Crown tang, Goren Pavilion Tang, Pivot frame Pavillon Tang, Table Tang (claw or Hollow Press Pot type), and a quickstep or traditional collet type pavilion tang, as are known in the art. A tang typically comprises at a first end a stylus comprising a dop that retains the gemstone for polishing, and at the second end a guide or support members that may ride on a sleigh mounted on the polishing table, or the guide may simply ride on the table surface itself.

[0063] Figure 9 shows a non-limiting example of a tang (polishing arm; 20), in this case a Quickstep tang. A tang typically comprises a frame (1); a subframe (2); adjusting legs (3); an adjustable spirit level (5); a height adjuster (10); and an indexed crown dop comprising: an angle adjuster (6); and index adjuster (7); an index wheel (8); a dop assembly (9); an angle gauge (11) and a claw holder (4). However, variations in the components of a tang are common.

[0064] The arm of the tang may be modified to include a plurality of recess, each which may be selected to accept the pin (135) of the device (10) of the present invention. See for example Figure 11, which shows the underside of the arm (1) of a tang comprising four recesses (250). The pin (135) may register with the polishing assembly (tang) at any one of these several recesses (250) in the arm. By using different recesses the movement of the tang across the scaife can be modified. Alternate modifications, as would be evident to one of skill in the art, may also be made to the tang to receive pin (135).

[0065] Modification of the second end of the tang may be desired to ensure that the tang moves freely when interfaced with the device (10) of the present invention. Modification may include replacing the guide (for example the adjusting leg, 3) at the second end of the tang with one or more than one rollers, for example two rollers (270) as shown in Figure 12, to permit smooth movement of the tang across the surface of the polishing table. The rollers may be made of electrical insulator such as plastic, so that the tang is insulated from the polishing table (210) if a control circuit, as outlined in Figure 8, comprising one pole connected to the scaife (220), and a second pole connected to the vertical rod (130), the tang (20), and the stylus is used. One or more than one cylindrical or ball roller may be used for this purpose. However, if the guide or adjusting leg (3) moves freely over the table surface, replacement may not be required. Additionally, as previously described, the tang frame may be modified to receive the pin (135) so that any movement imparted by the pin is effectively transferred to the tang, including both vertical and horizontal movements.

[0066] The device (10) for controlling polishing arm movement of the present invention is easy to operate, permits accurate polishing of gemstones, saves time in polishing gemstones, and permits a user to oversee a plurality of active polishing assemblies at the same time. The design ensures consistency and repeatability of the polishing operation. Furthermore, it improves the longevity of the parts retaining the gemstone as the polishing assembly (tang) is lifted off the wheel once the appropriate depth of polish is obtained, and increase longevity of the polishing wheel, because the gemstone is moved over an optimized area of the scaife during polishing and less material needs to be removed during regeneration of the polishing wheel.

[0067] It will be apparent to those skilled in the art that

the device and the related polishing process described in the preferred embodiments apply to the polishing of precious and semi-precious stones including diamonds, gems and the like.

[0068] The present invention has been described with regard to one or more embodiments. However, it will be apparent to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as defined in the claims.

Claims

1. A device for controlling movement of a polishing assembly on a polishing surface, said device comprising:
 - a rod, said rod being substantially normal to the polishing surface and held in position by a guide;
 - one or more than one motive power means for lowering and lifting, and rotating, oscillating, or both rotating and oscillating the rod about an axis of rotation coaxial with the rod;
 - a pin offset from the axis of rotation and connected to the rod for mounting the polishing assembly.
2. The device according to claim 1, wherein the device controls oscillating movement of the polishing assembly on a polishing wheel.
3. The device according to claim 1, wherein the pin is attached to an adjustable adaptor, the adjustable adaptor is fastened to the rod.
4. The device according to claim 1, wherein the guide defines an opening through which the rod is positioned.
5. The device according to claim 1, wherein an electronic controller is operatively connected to the one or more than one motive power means.
6. The device according to claim 5, wherein the electronic controller controls lowering, lifting and rotating movement of the rod.
7. The device according to claim 5, wherein the electronic controller controls lifting and lowering movement of the rod.
8. The device according to claim 7, wherein the electronic controller sets the speed of lifting and the speed of lowering the rod.

9. The device according to claim 3, wherein the adjustable adaptor is fitted with a spring-loaded collar for gradual transferring of weight of the polishing assembly to a polishing wheel.

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10. A device for controlling movement of a polishing assembly on a polishing surface, said device comprising:

a rod, said rod being substantially normal to the polishing surface and held in position by a guide;

10

one or more than one motive power means for lowering and lifting, and rotating, oscillating, or both rotating and oscillating the rod about an axis of rotation coaxial with the vertical rod;

15

a pin offset from the axis of rotation and connected to the rod for mounting the polishing assembly, and

20

a sensor for activating movement of the rod.

11. The device according to claim 10, wherein the sensor is in operative communication with a dop within the polishing assembly.

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12. The device according to claim 11, wherein the sensor is an electrical circuit.

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13. The device according to claim 12, wherein contact of a claw or a collet within the dop with a polishing wheel closes the electrical circuit and the rod is lifted off of the polishing wheel surface.

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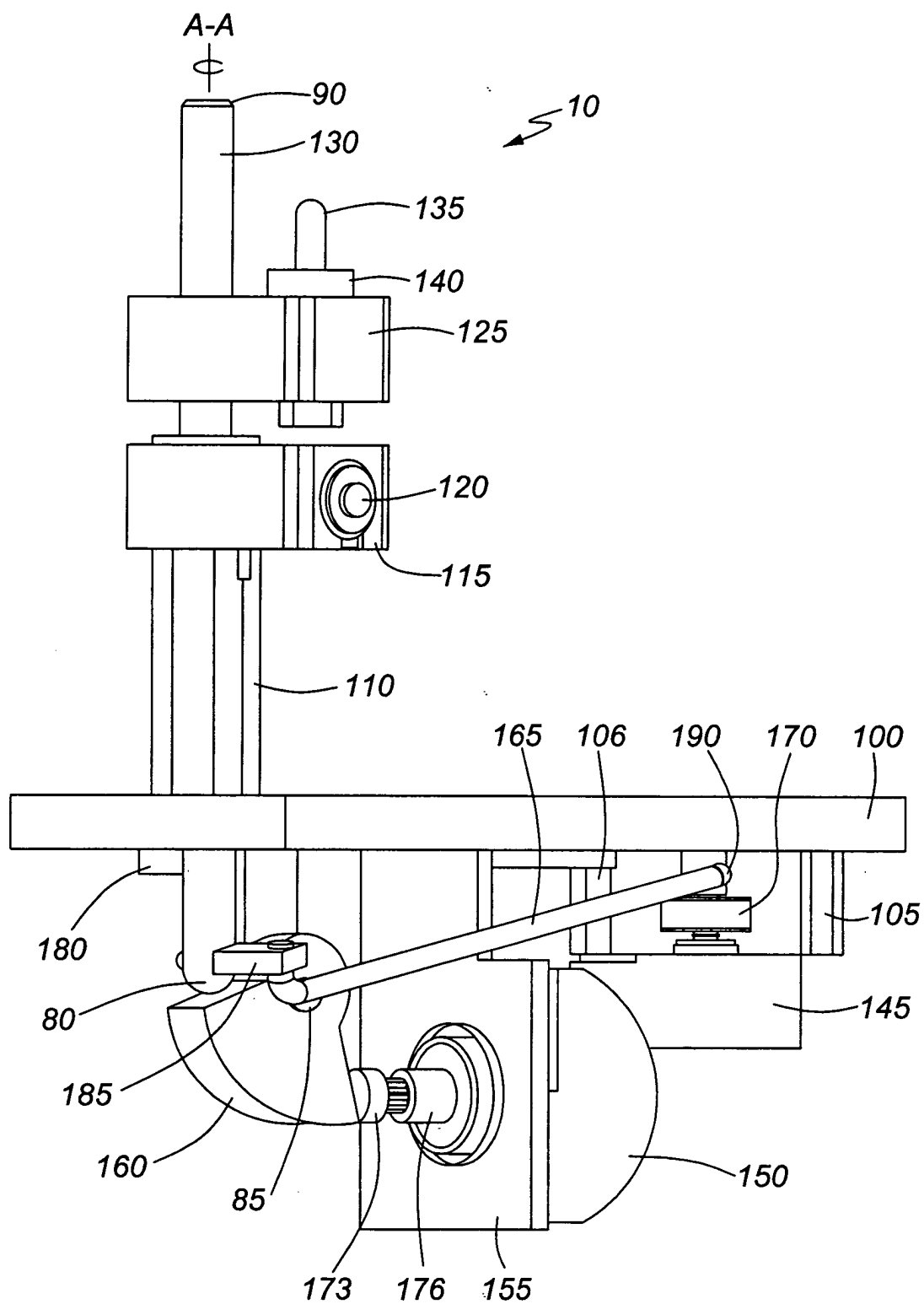
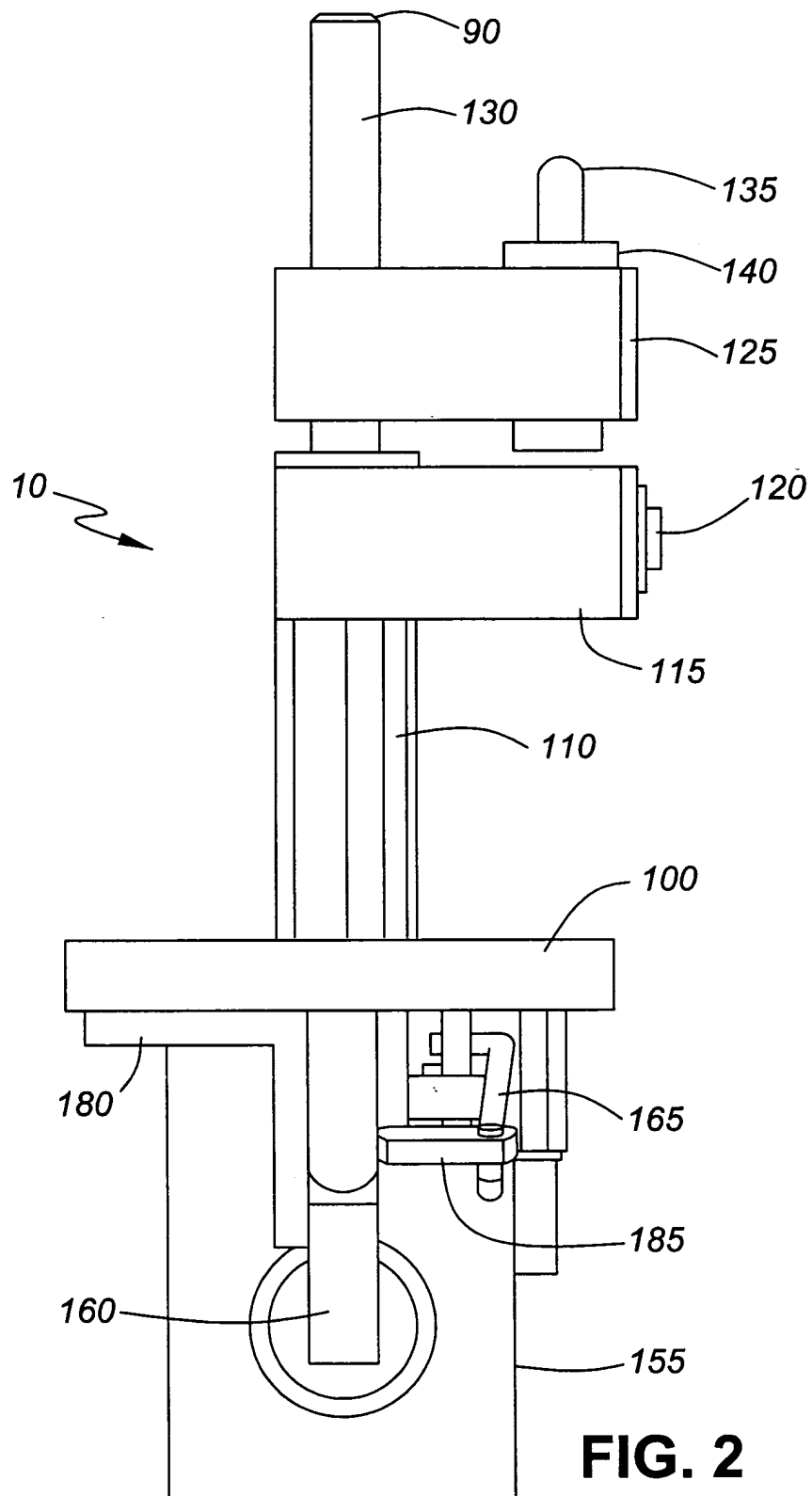


FIG. 1



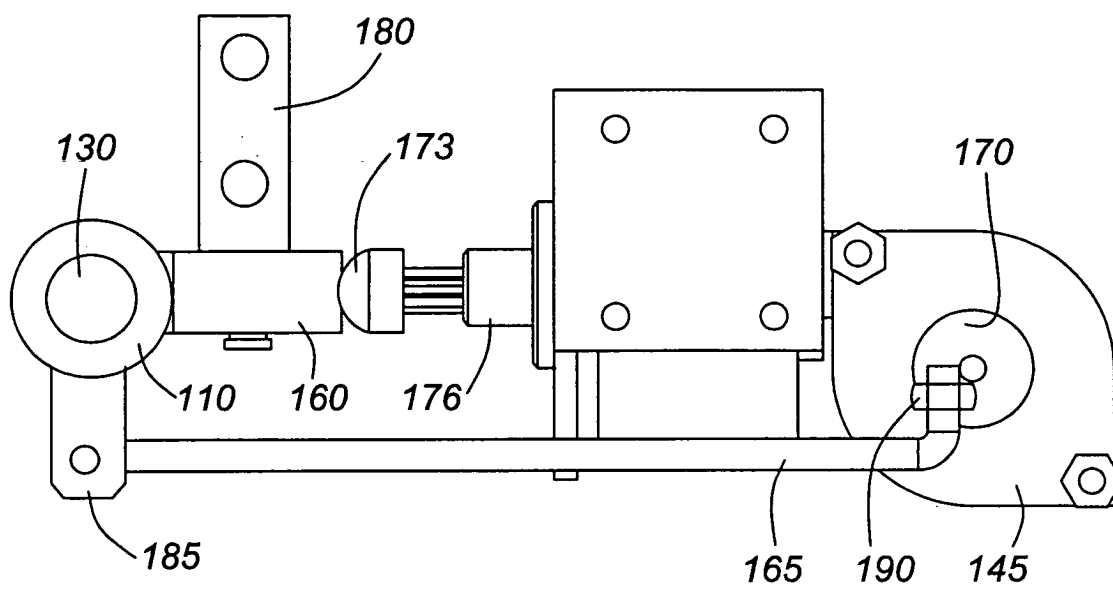


FIG. 3

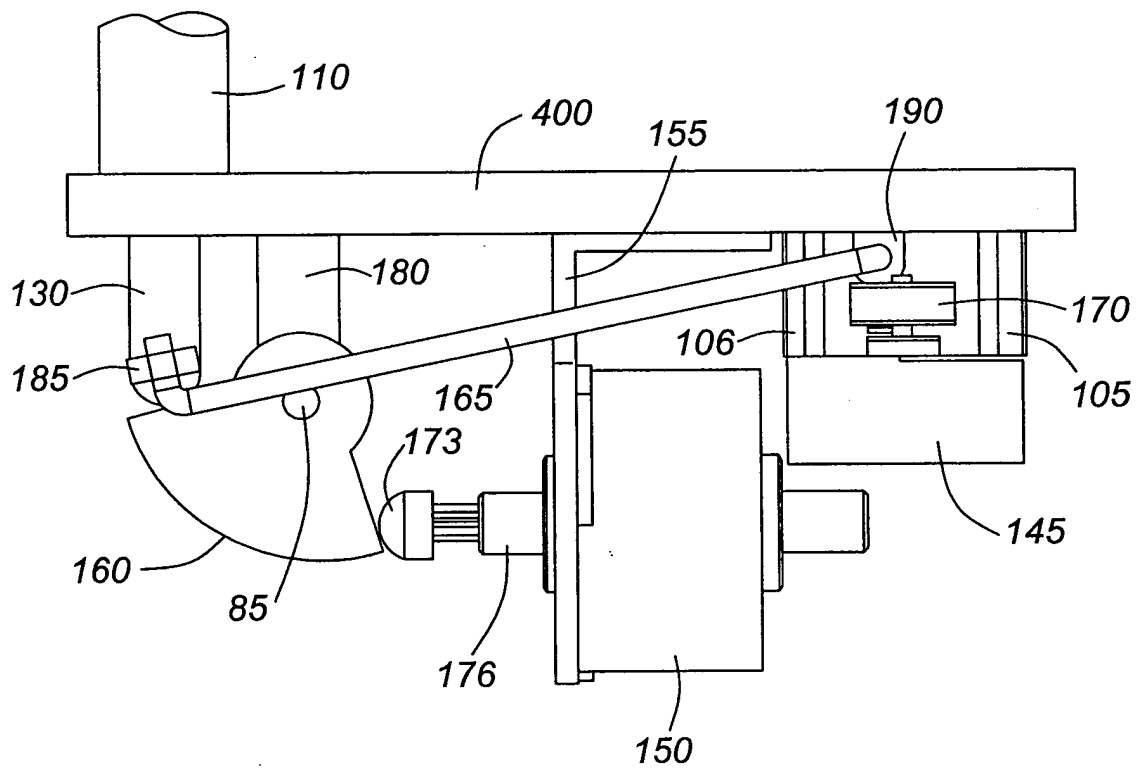


FIG. 4

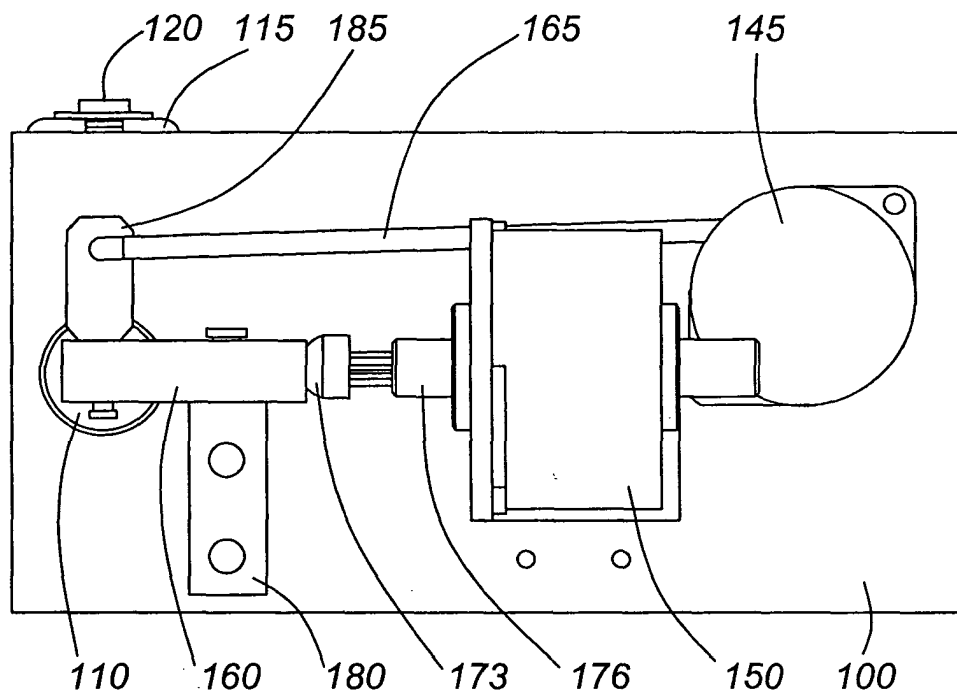


FIG. 5

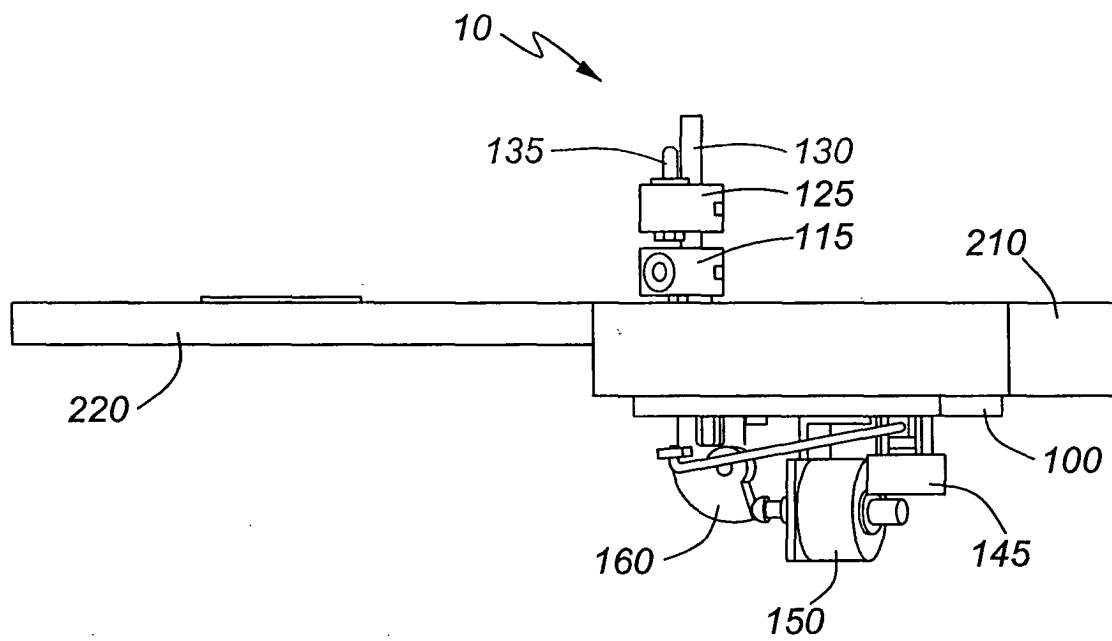


FIG. 6

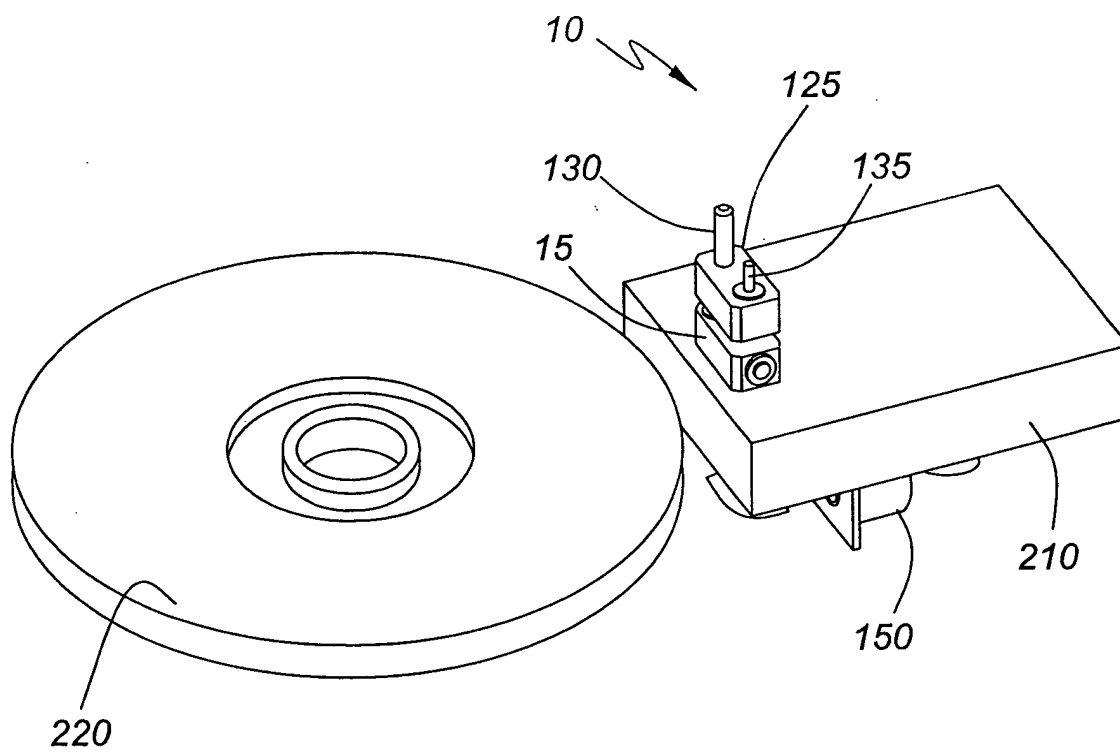


FIG. 7

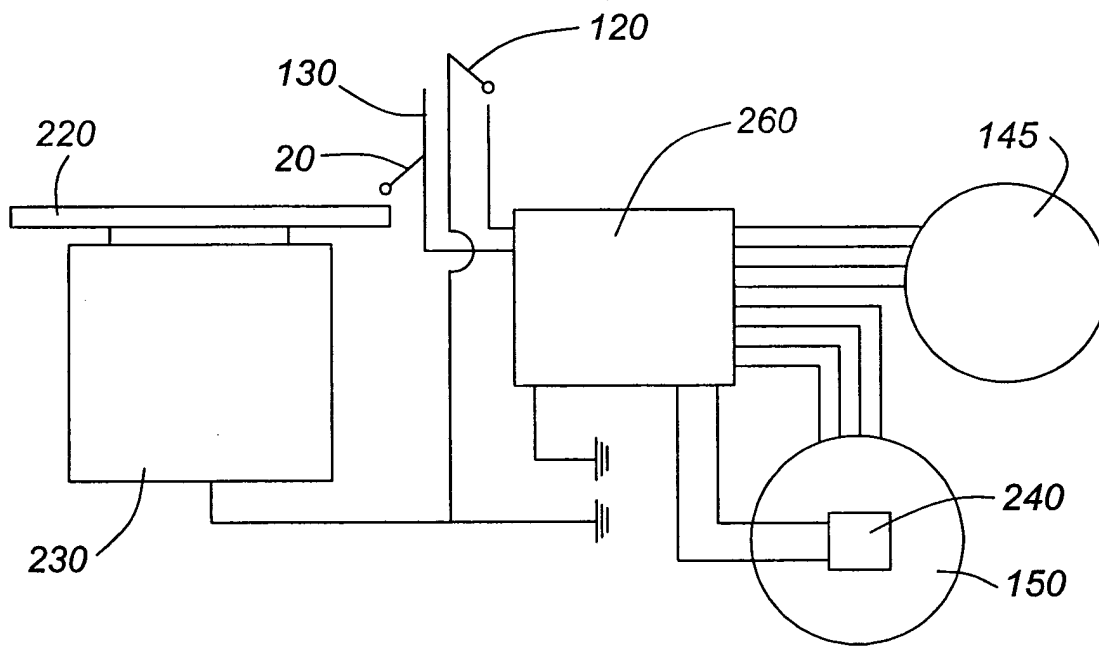


FIG. 8

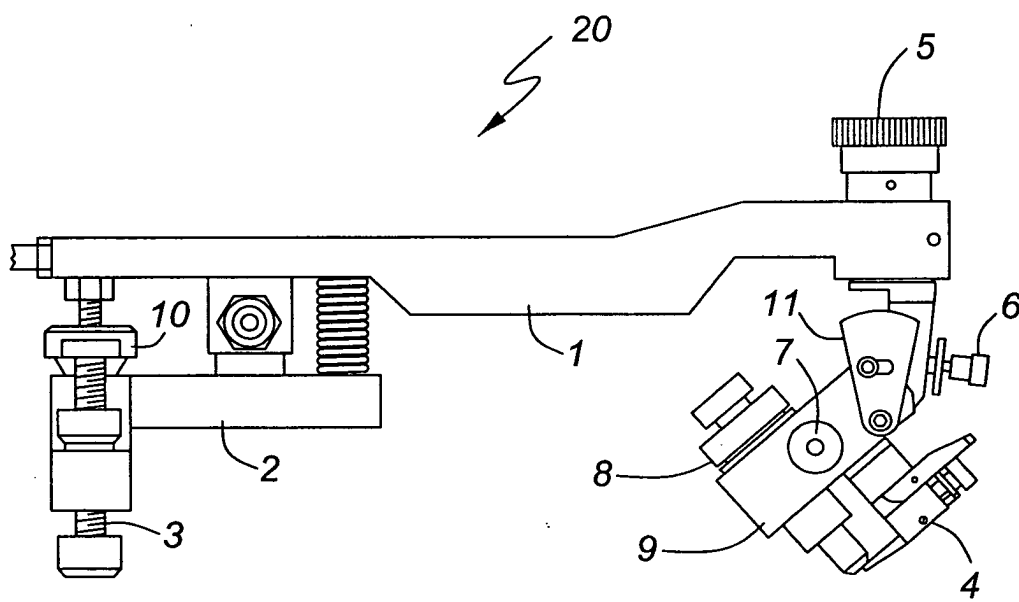


FIG. 9

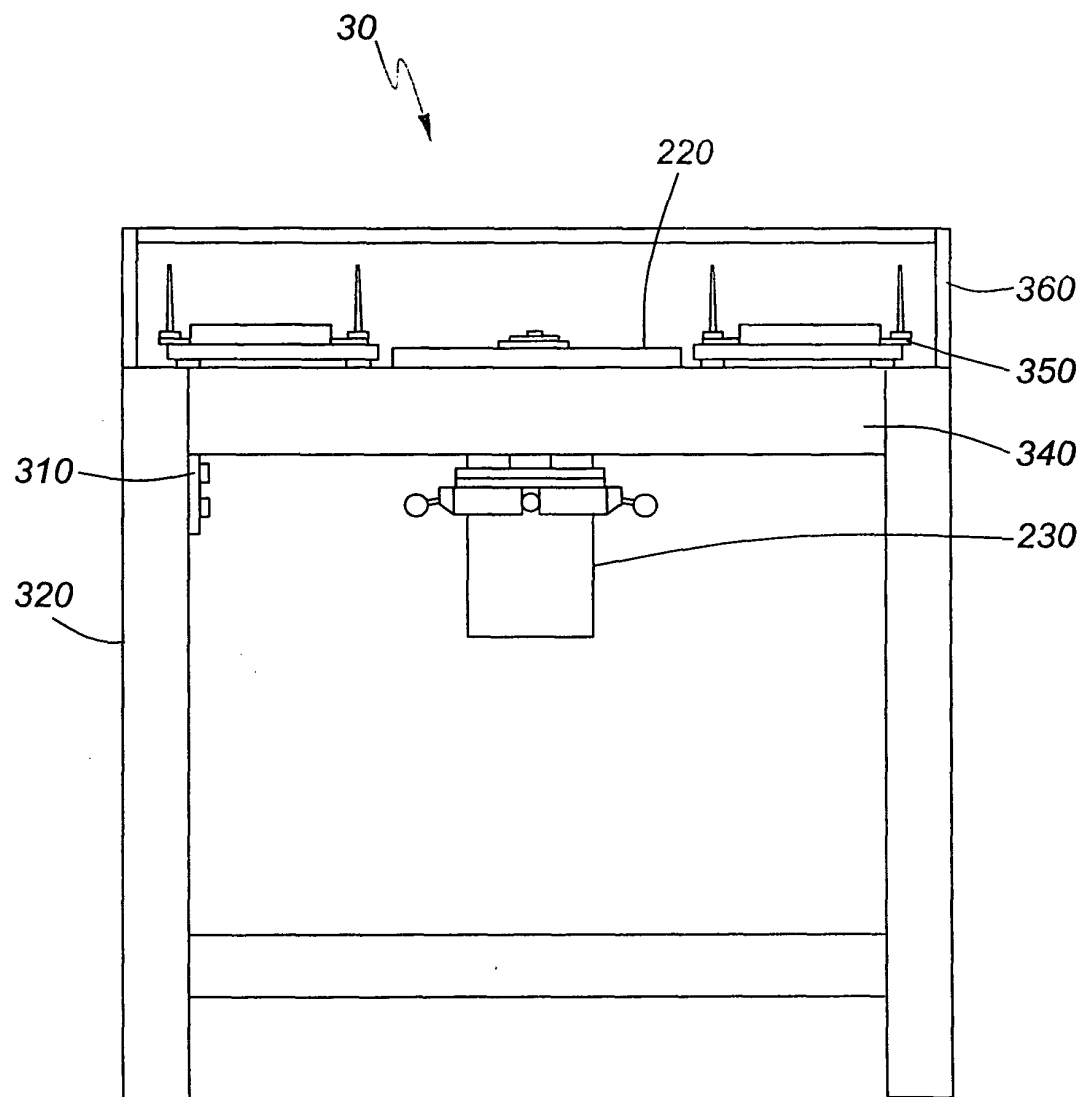


FIG. 10

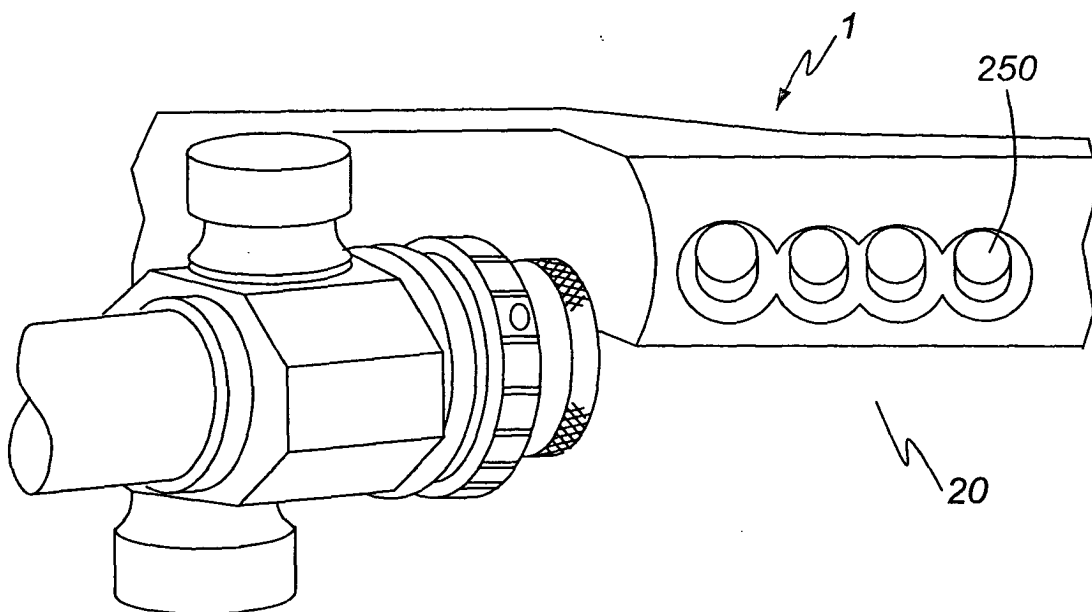


FIG. 11

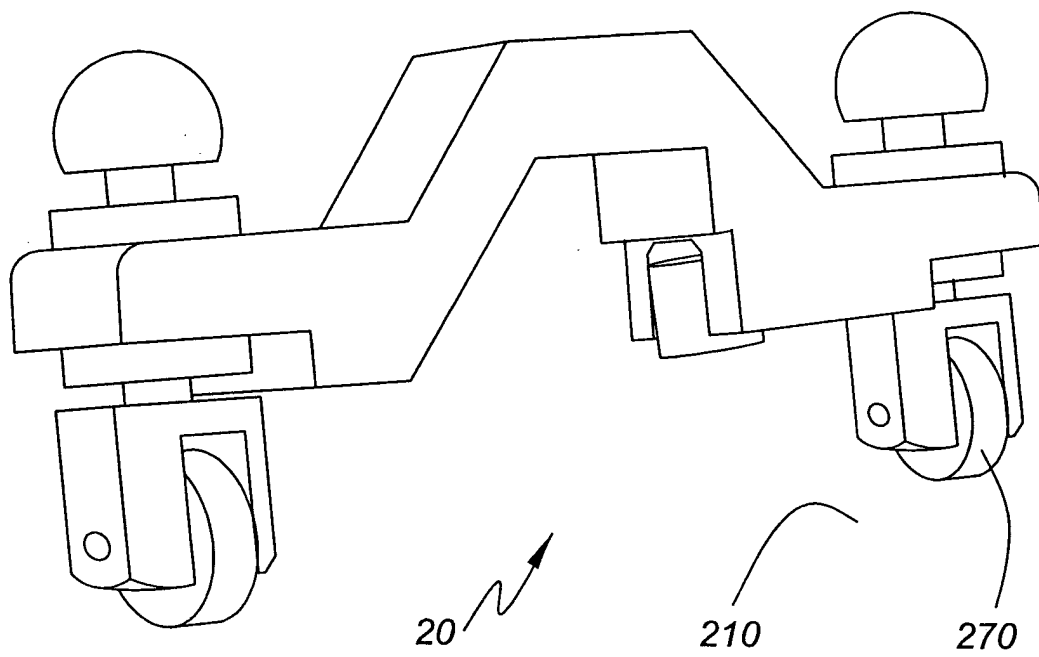


FIG. 12



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 6273

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 284 783 A (* GERSAN ESTABLISHMENT) 21 June 1995 (1995-06-21) * the whole document *	1-13	B24B9/16
X	EP 0 313 369 A (DIMATIC LIMITED; PRODIAMATIC INTERNATIONAL LIMITED) 26 April 1989 (1989-04-26) * column 5, line 52 - column 12, line 3; figures 1-8 *	1-13	
D,A	US 4 603 512 A (CAVE ET AL) 5 August 1986 (1986-08-05)		
A	GB 2 037 196 A (BONAS MACHINE CO LTD) 9 July 1980 (1980-07-09)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B24B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 February 2005	Examiner Koller, S
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 25 6273

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-02-2005

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
GB 2284783	A	21-06-1995	AU	685525 B2	22-01-1998
			AU	8024894 A	22-06-1995
			BE	1008439 A5	07-05-1996
			CA	2137843 A1	14-06-1995
			IL	111903 A	20-06-1999
			IN	187822 A1	29-06-2002
			US	5746645 A	05-05-1998
			ZA	9409665 A	05-09-1996

EP 0313369	A	26-04-1989	ZA	8805545 A	26-04-1989
			AP	72 A	25-02-1990
			AU	2399788 A	04-05-1989
			BE	1002402 A5	29-01-1991
			EP	0313369 A2	26-04-1989
			IL	88018 A	12-12-1991

US 4603512	A	05-08-1986	NONE		

GB 2037196	A	09-07-1980	BE	880678 A	16-04-1980
			IL	59030 A	31-12-1981
			ZA	7906837 A	26-11-1980
			ZA	8003637 A	26-08-1981
