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Ford

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(54) **GIN BLADE SHARPENING SYSTEM AND METHOD OF USE**

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(51) **Int. Cl.**

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B24B 3/58	(2006.01)
B24B 27/00	(2006.01)
B24B 41/02	(2006.01)
B24B 53/00	(2006.01)

(52) **U.S. Cl.**

CPC ***B23D 63/14*** (2013.01); ***B24B 3/46*** (2013.01); ***B24B 3/58*** (2013.01); ***B24B 27/0023*** (2013.01); ***B24B 27/0076*** (2013.01); ***B24B 41/02*** (2013.01); ***B24B 53/005*** (2013.01); *B24B 27/0046* (2013.01)

(58) **Field of Classification Search**

CPC B24B 27/0023; B24B 27/0046; B24B 27/0076; B24B 27/0015; B24B 27/0038; B24B 27/0084; B24B 3/58; B24B 3/40; B24B 3/46; B24B 3/463; B24B 3/466; B23D 63/14; B26D 7/12

USPC 451/340, 224, 234, 254

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,565,916 A *	8/1951	Frusher	B24B 3/466	76/85
3,952,616 A *	4/1976	Varley	B24B 25/00	451/236
4,173,846 A *	11/1979	Steiner	B26D 7/12	451/422
4,846,023 A *	7/1989	Emter	B23D 63/123	76/41
6,109,137 A *	8/2000	Lenard	B24B 3/00	76/43
6,332,375 B1 *	12/2001	Randl	B23D 63/12	76/43
9,233,428 B2 *	1/2016	Williams	B23D 63/123	

(Continued)

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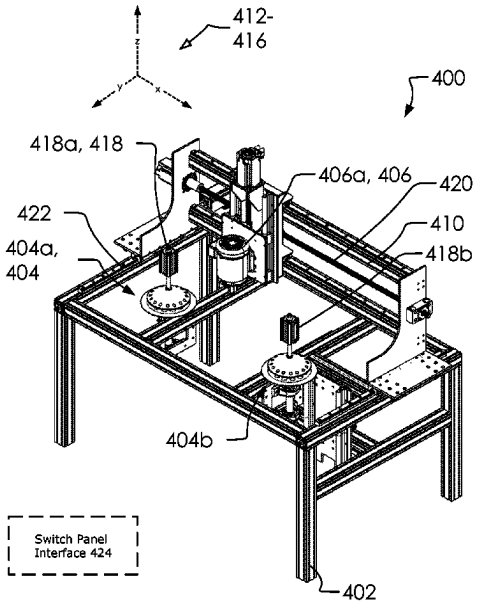
(57) **ABSTRACT**

A gin blade sharpening system for sharpening a blank into a blade disk. The gin blade sharpening system comprises two or more grinding stations, a controller, and one or more upper grinders. The one or more upper grinders comprise at least a first upper grinder. The two or more grinding stations comprise at least a first grinding station and a second grinding station. Each among the two or more grinding stations comprise a clamp assembly configured to selectively hold the blade disk in a substantially horizontal position. A portion of the one or more upper grinders can be configured to sharpen an outer perimeter edge of the blade disk using an abrasive pad.

14 Claims, 11 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

11,752,591	B2 *	9/2023	Vasko	B24B 49/16 451/5
2011/0237166	A1 *	9/2011	Chang	B23D 63/005 451/279
2012/0309266	A1 *	12/2012	Schroeder	B24B 49/12 451/6
2014/0331838	A1 *	11/2014	Baker	B24B 3/46 451/529
2015/0068378	A1 *	3/2015	Barsotti Giovanni	B26D 7/12 451/263
2020/0171615	A1 *	6/2020	Chiocchetti	B26D 7/12

* cited by examiner

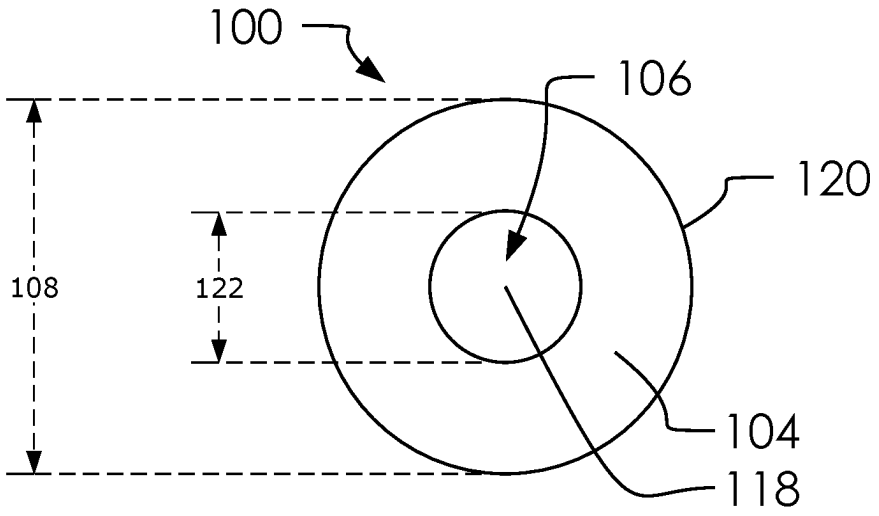


FIG. 1A

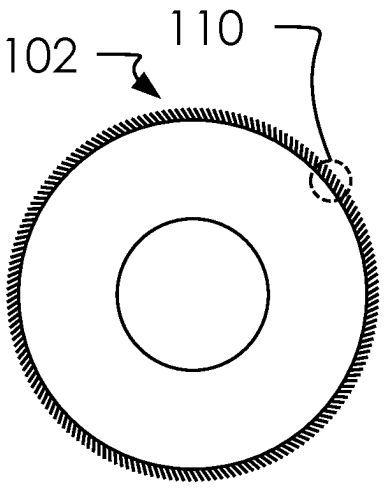


FIG. 1B

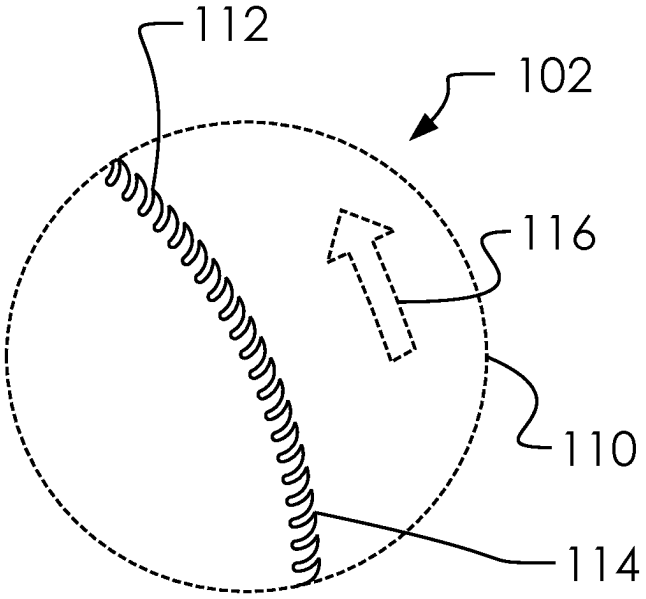


FIG. 1C

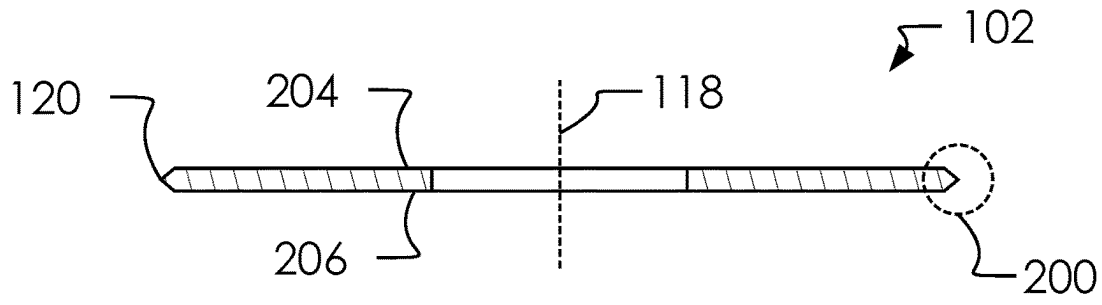


FIG. 2A

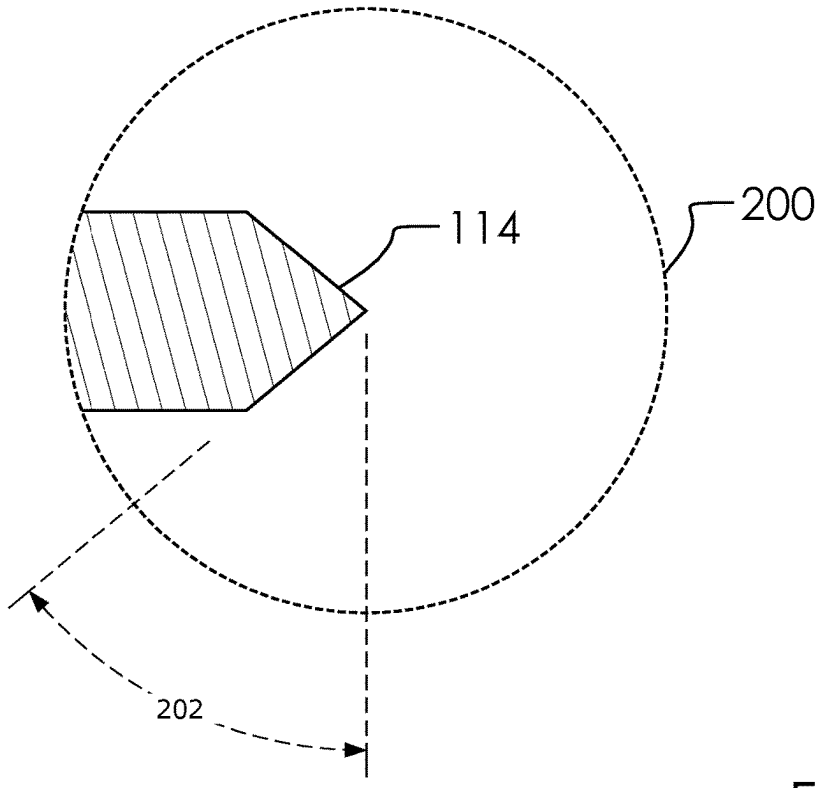


FIG. 2B

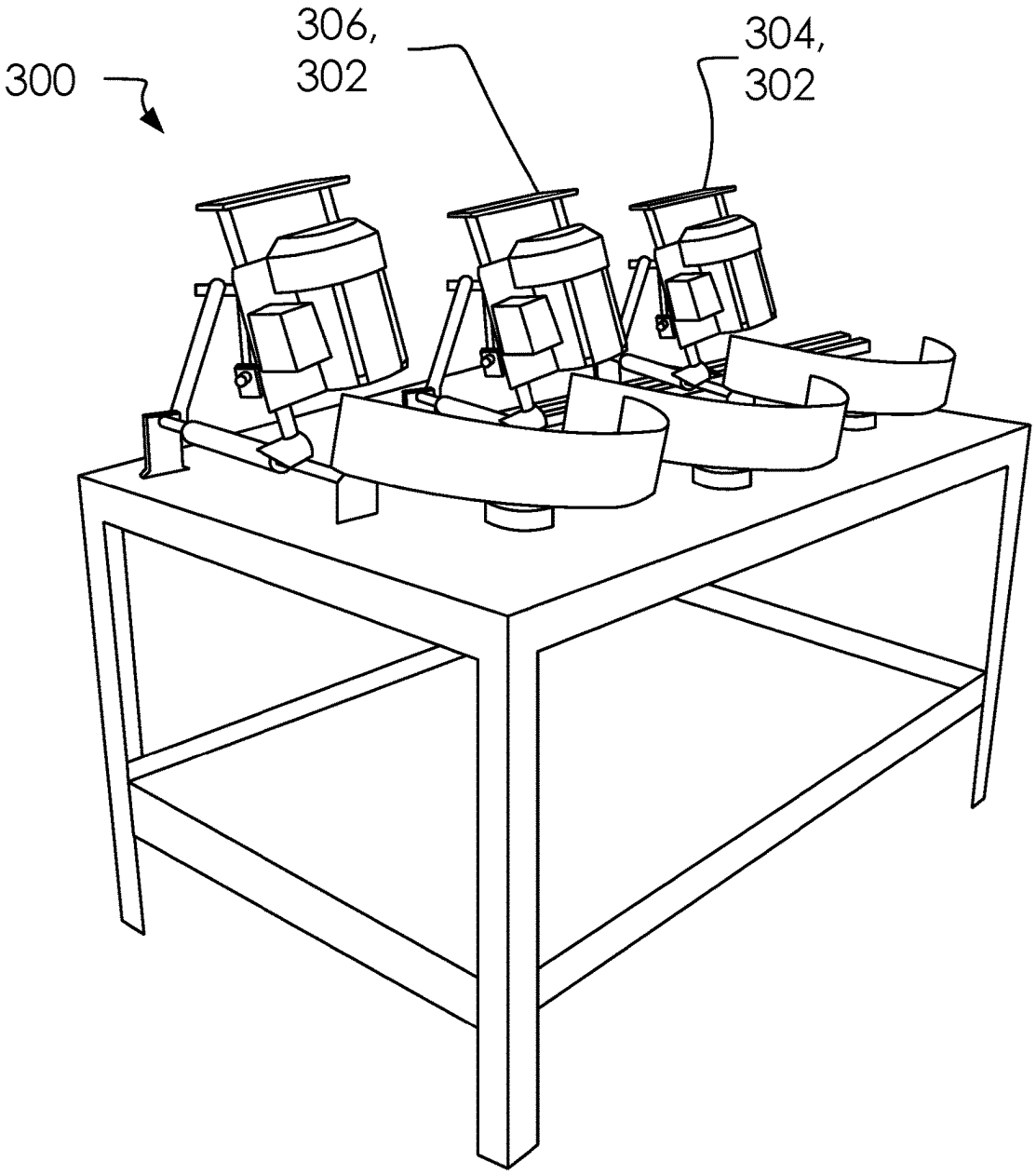


FIG. 3

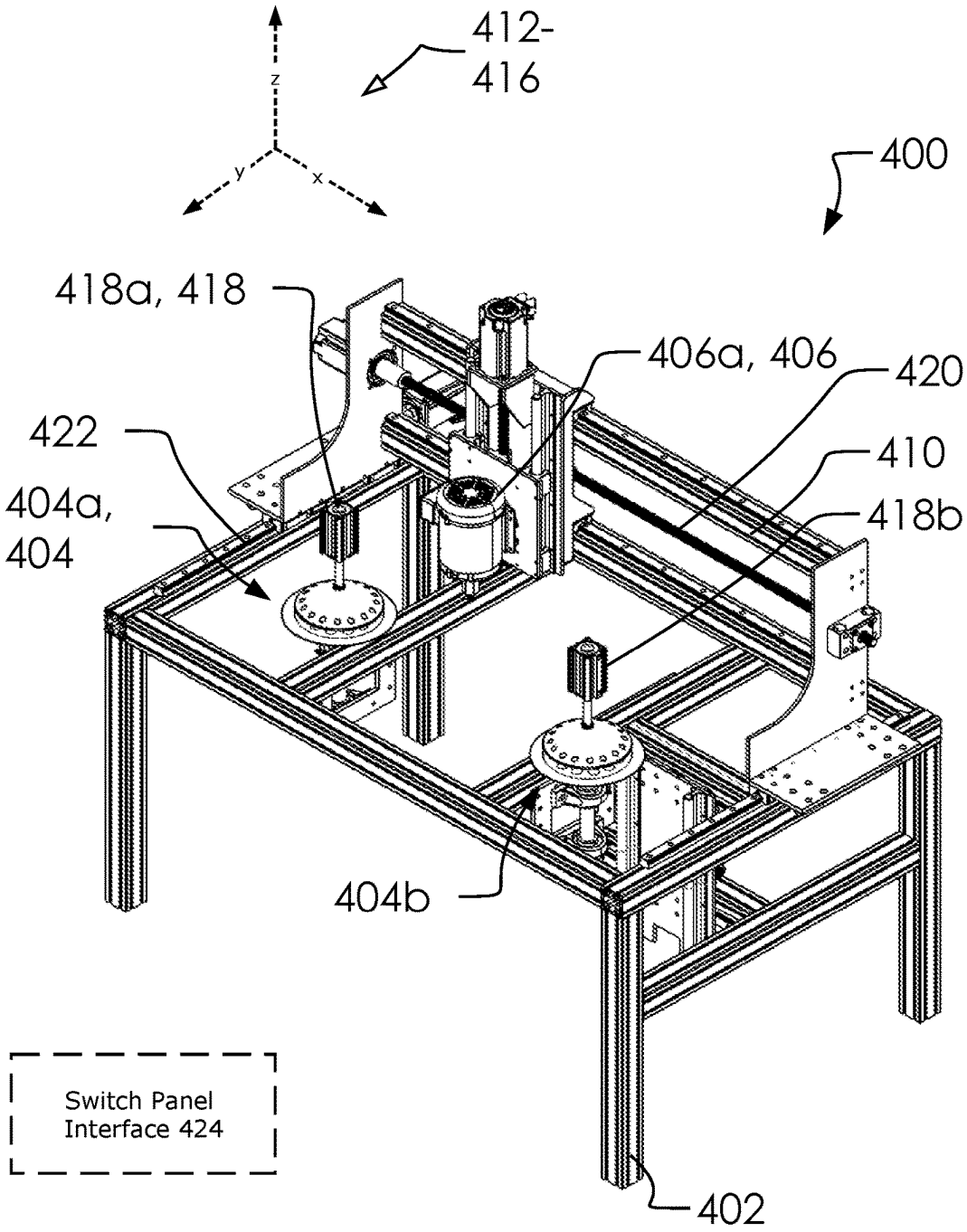

412-416
z
y
x
400
418a, 418
406a, 406
420
422
410
404a, 404
418b
404b
Switch Panel Interface 424
402

FIG. 4

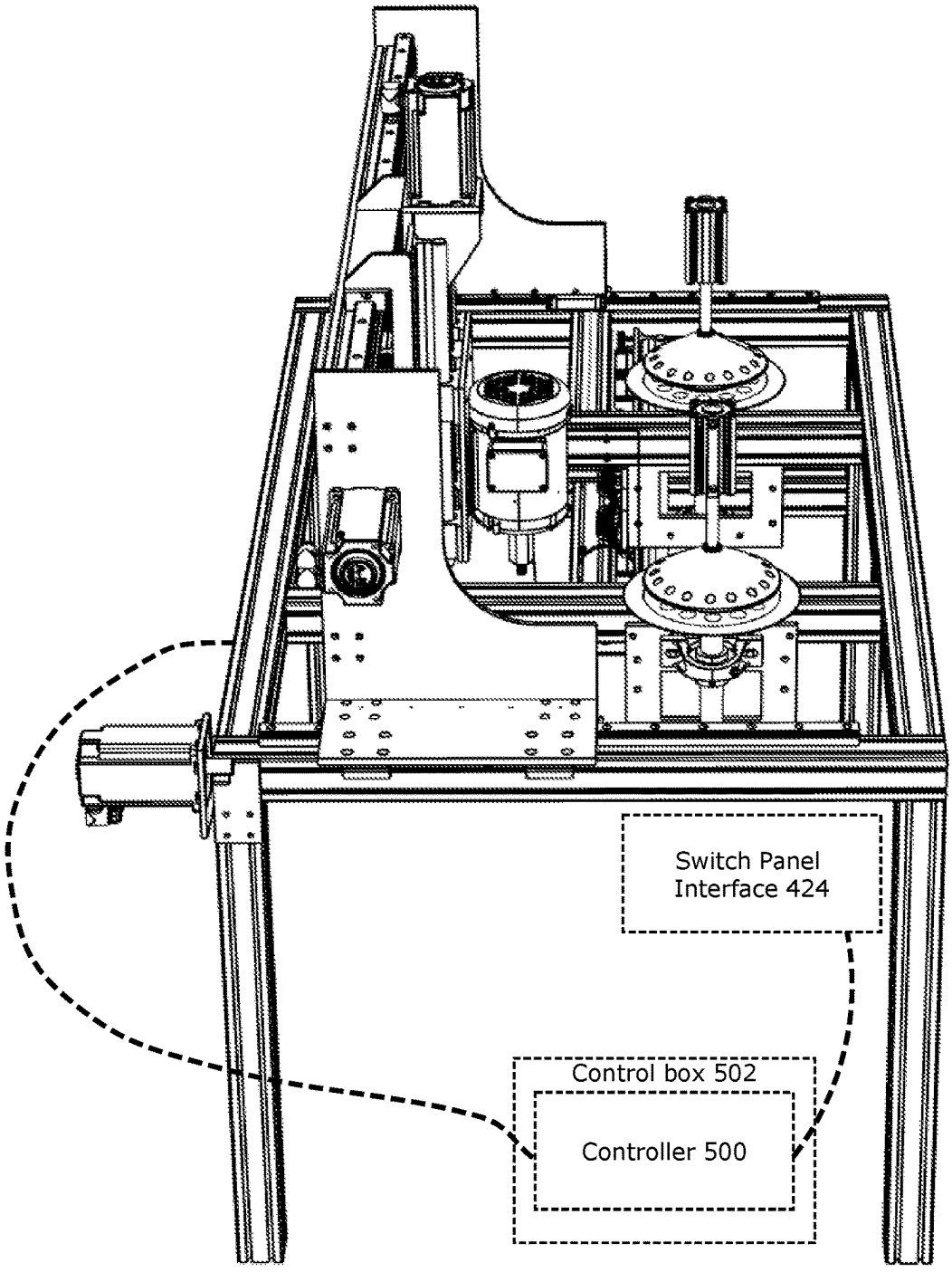


FIG. 5

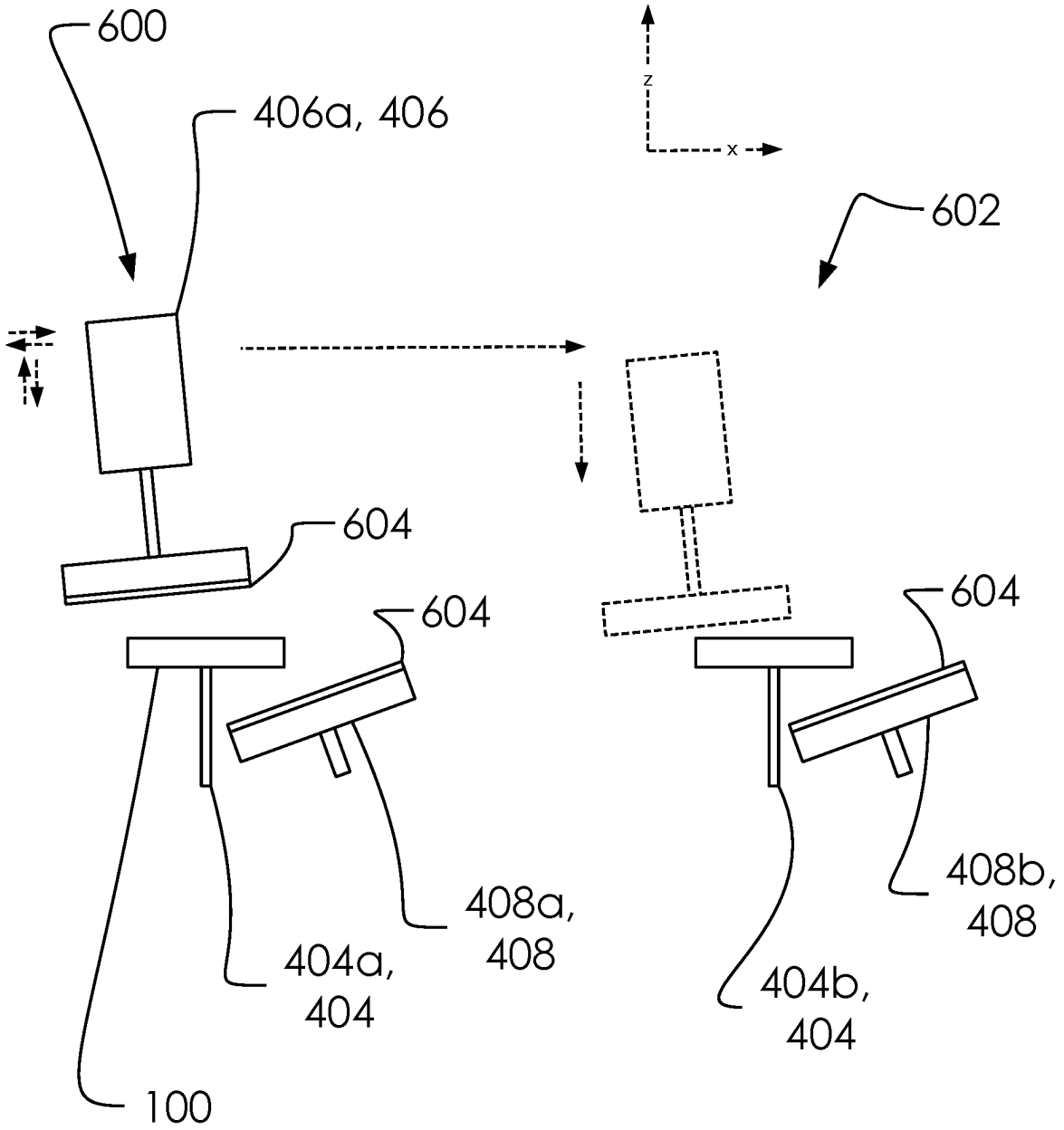

600
406a, 406
z
x
602
604
604
604
408a,
408
404a,
404
100
408b,
408
404b,
404

FIG. 6

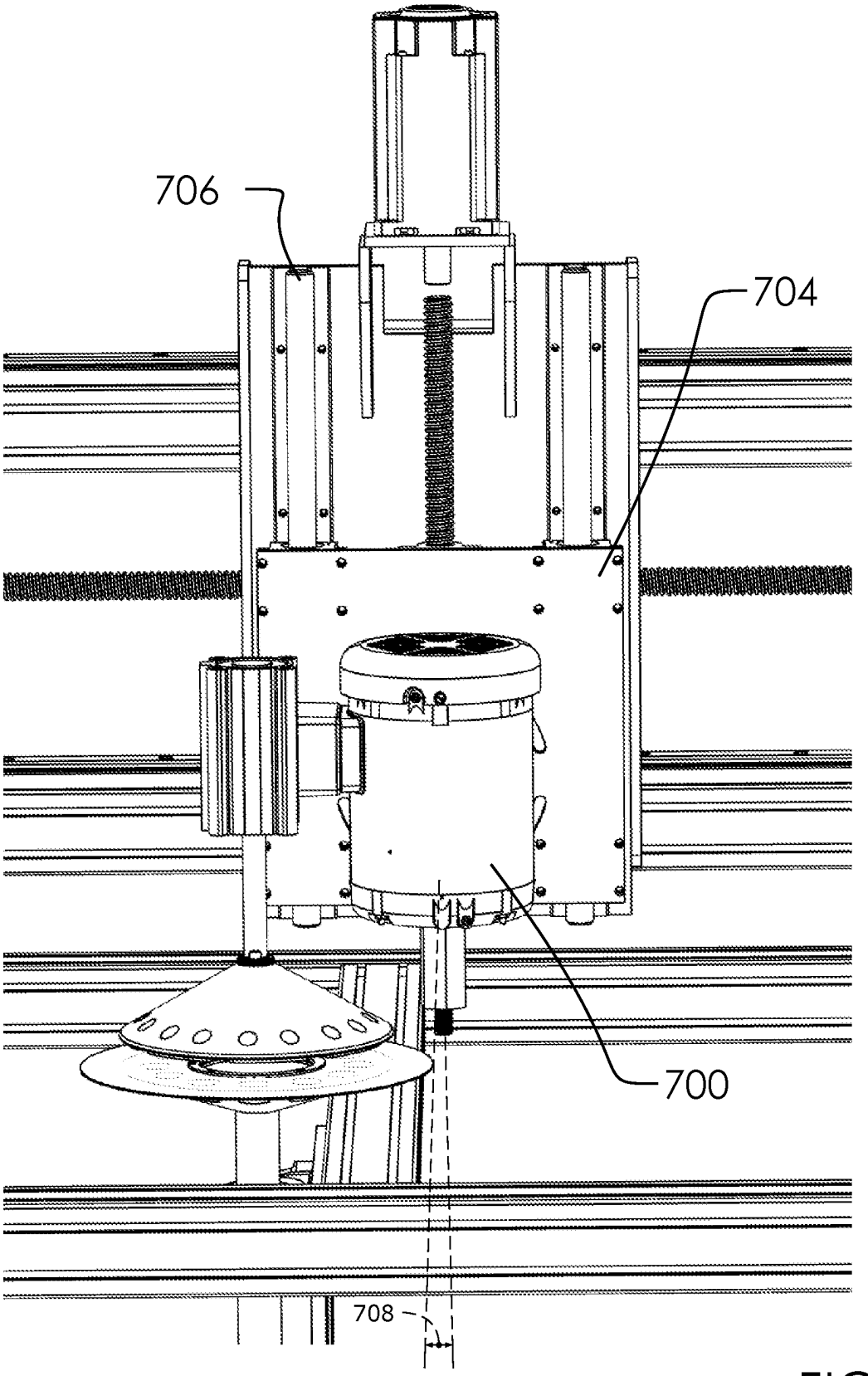


FIG. 7

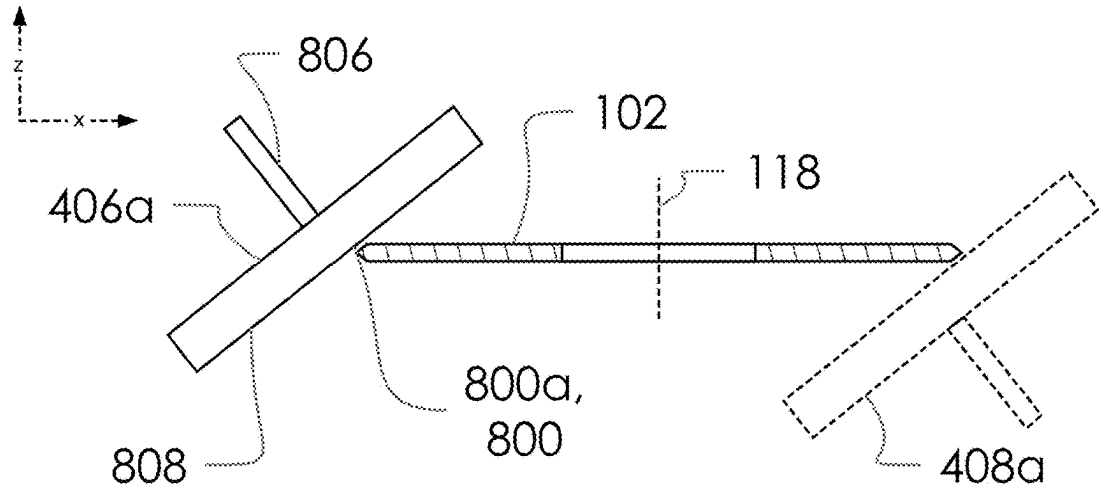


FIG. 8A

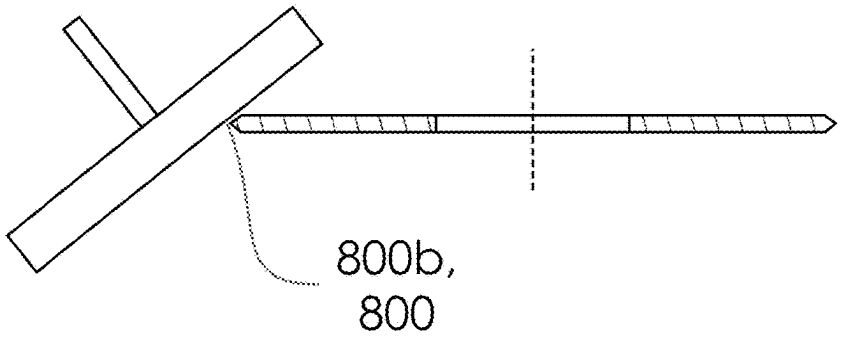


FIG. 8B

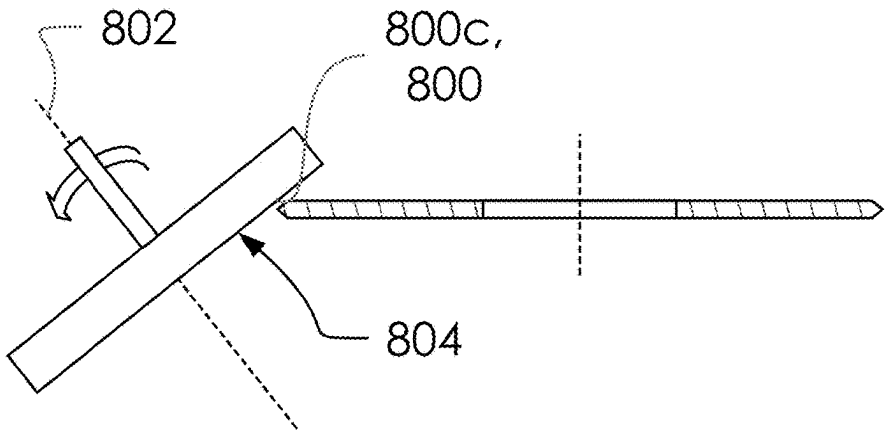


FIG. 8C

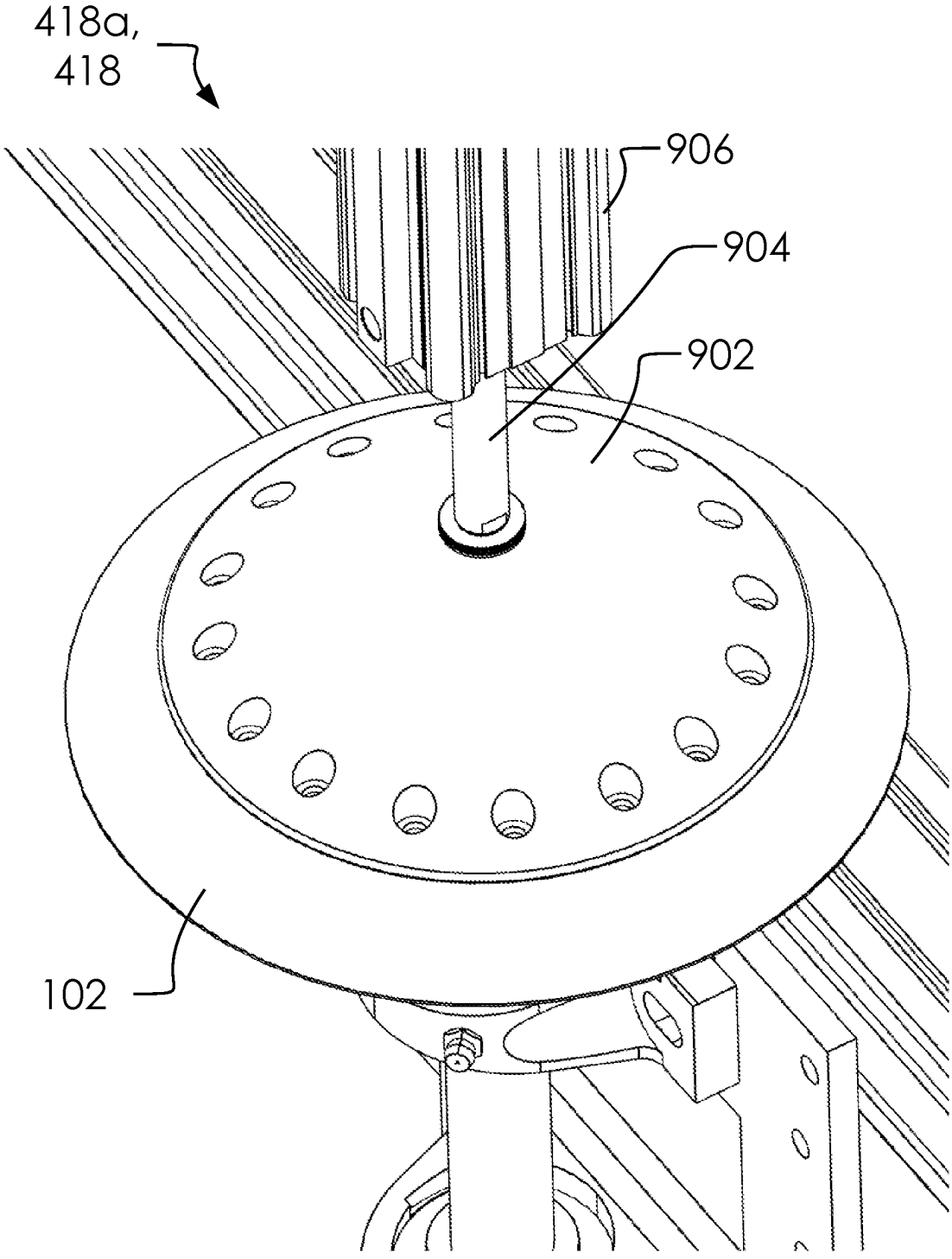


FIG. 9

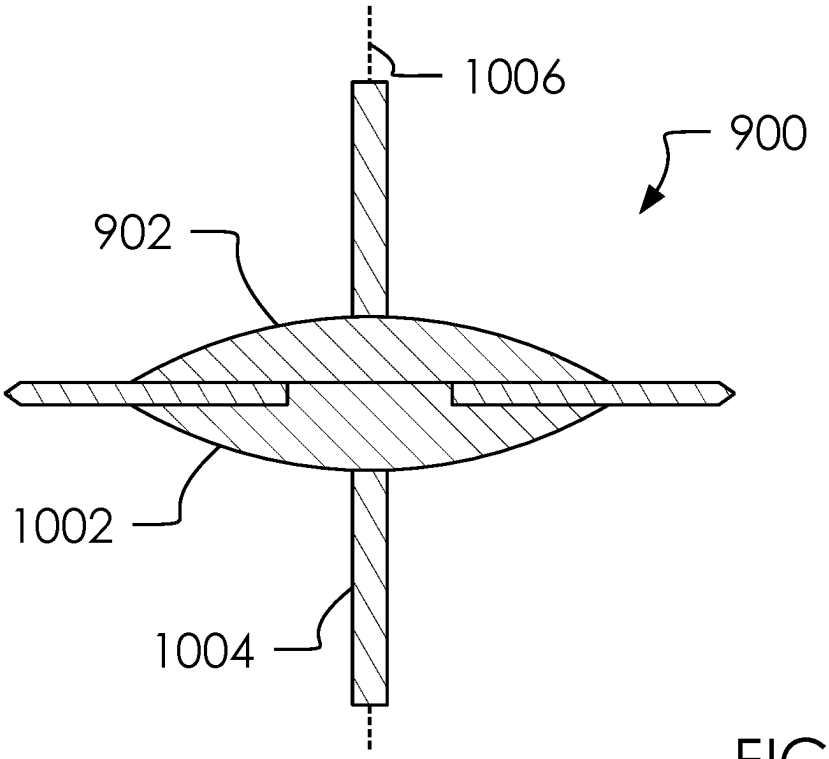


FIG. 10A

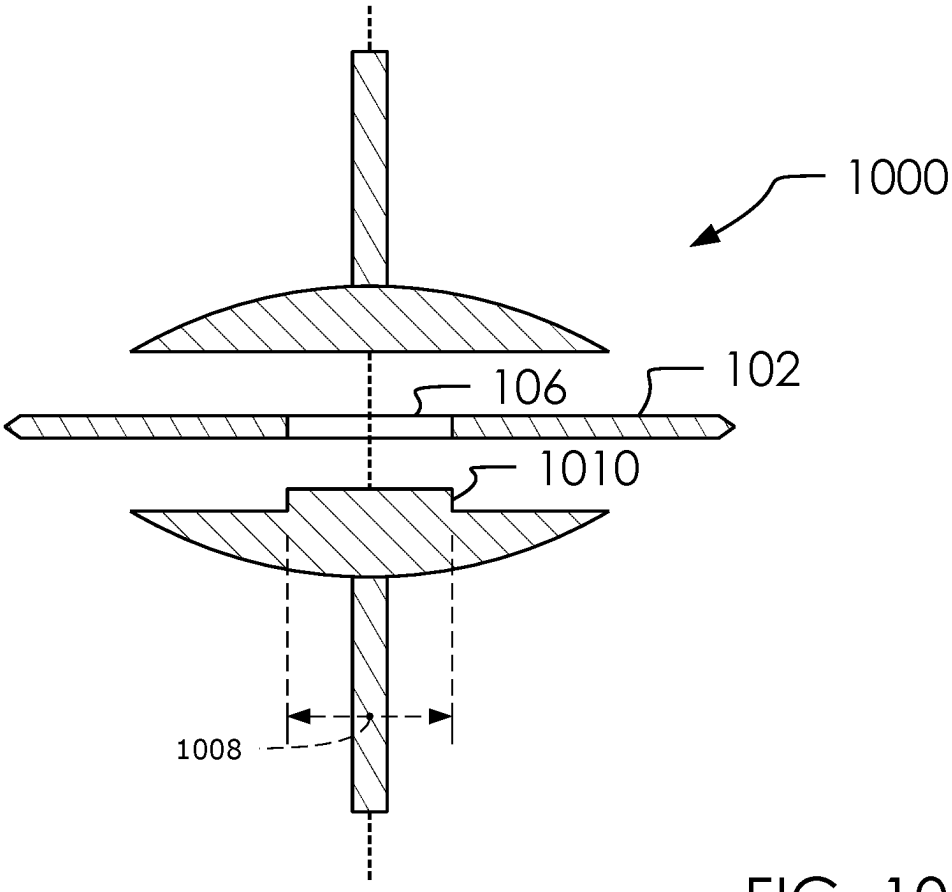


FIG. 10B

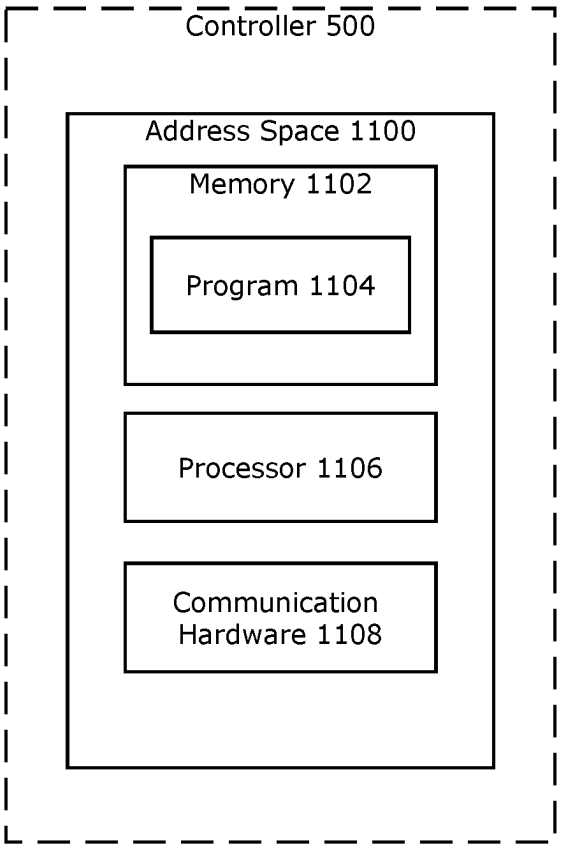

Controller 500
Address Space 1100
Memory 1102
Program 1104
Processor 1106
Communication Hardware 1108

FIG. 11

GIN BLADE SHARPENING SYSTEM AND METHOD OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims benefit to U.S. provisional patent application No. 42/835,443 filed 2021 May 27.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT (IF APPLICABLE)

Not applicable.

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX (IF APPLICABLE)

Not applicable.

BACKGROUND OF THE INVENTION

No prior art is known to the Applicant.

BRIEF SUMMARY OF THE INVENTION

A prior art grinding assembly a gin blade sharpening system for sharpening a blank into a blade disk. Said gin blade sharpening system comprises two or more grinding stations, a controller, and one or more upper grinders. Said one or more upper grinders comprise at least a first upper grinder. Said two or more grinding stations comprise at least a first grinding station and a second grinding station. each among said two or more grinding stations comprise a clamp assembly configured to selectively hold said blade disk in a substantially horizontal position. A portion of said one or more upper grinders are configured to sharpen an outer perimeter edge of said blade disk using an abrasive pad. Said controller is configured to selectively operate said two or more grinding stations, said one or more upper grinders and one or more lower grinders using a device program. Said gin blade sharpening system comprises an upper grinder position control assembly configured to move said one or more upper grinders between said two or more grinding stations. Said one or more upper grinders are configured to travel between a first x-axis location and a second x-axis location using said upper grinder position control assembly. Said first x-axis location and said second x-axis location correspond to said first grinding station and said second grinding station. Said device program is configured to schedule use of said one or more upper grinders as between said two or more grinding stations. At least two among said two or more grinding stations are configured to rotate in an advantageous direction to avoid grinding into a tooth orientation. Said gin blade sharpening system is configured to sharpen a top surface, and a bottom surface separately in said first grinding station and said second grinding station. By sharpening said top surface and said bottom surface separately, said blank results in a flatter said blade disk, with lower consumption of said abrasive pad.

Said gin blade sharpening system for sharpening said blade disk with improved manufacturing characteristics and higher quality output of said blade disk. Said gin blade sharpening system comprises said two or more grinding stations, said controller, and said one or more upper grinders. Said one or more upper grinders comprise at least said first upper grinder. Said two or more grinding stations comprise at least said first grinding station and said second grinding station. Each among said two or more grinding stations comprise said clamp assembly configured to selectively hold said blade disk in a substantially horizontal position. a portion of said one or more upper grinders are configured to sharpen said outer perimeter edge of said blade disk using said abrasive pad. Said controller is configured to selectively operate said two or more grinding stations, said one or more upper grinders and said one or more lower grinders using said device program. At least two among said two or more grinding stations are configured to rotate in an advantageous direction to avoid grinding into said tooth orientation. Said gin blade sharpening system is configured to sharpen said top surface, and said bottom surface separately in said first grinding station and said second grinding station. By sharpening said top surface and said bottom surface separately, said blank results in a flatter said blade disk, with lower consumption of said abrasive pad. A mounting bracket is configured to receive and hold an upper grinder motor with said abrasive pad on a vertical movement assembly. Each among said one or more upper grinders further comprise said mounting bracket. Said mounting bracket is configured to allow said upper grinder motor and said abrasive pad to mount at an upper grind angle. Each among said one or more upper grinders are adjusted to a pitch relative to said blank in order to adjust a grind angle in a sharpened edge of said blank. Said upper grind angle of said one or more upper grinders are adjusted automatically or by adjusting a mounting position of said upper grinder motor to accomplish said upper grind angle. Said mounting bracket is configured to move in a z-direction on said vertical movement assembly to adjust a height and engagement of said abrasive pad with said blank.

Said gin blade sharpening system for sharpening said blade disk with improved manufacturing characteristics and higher quality output of said blade disk. Said gin blade sharpening system comprises said two or more grinding stations, said controller, and said one or more upper grinders. Said one or more upper grinders comprise at least said first upper grinder. Said two or more grinding stations comprise at least said first grinding station and said second grinding station. Each among said two or more grinding stations comprise said clamp assembly configured to selectively hold said blade disk in a substantially horizontal position. A portion of said one or more upper grinders are configured to sharpen said outer perimeter edge of said blade disk using said abrasive pad. Said controller is configured to selectively operate said two or more grinding stations, said one or more upper grinders and said one or more lower grinders using said device program.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIGS. **1**A, **1**B and **1**C illustrate an elevated top view of a blank **100**, and an elevated top view and detailed view of a blade disk **102**.

FIGS. **2**A, and **2**B illustrate an elevated cross-section side overview and detailed view of said blade disk **102**.

FIG. **3** illustrates a perspective overview of a prior art grinding assembly **300**.

FIG. **4** illustrates a perspective overview of a gin blade sharpening system **400**.

FIG. **5** illustrates a perspective side view of said gin blade sharpening system **400**.

FIG. **6** illustrates a block diagram of one or more upper grinders **406** moving in an x-direction **412** and a z-direction **416** between two or more grinding stations **404**.

FIG. **7** illustrates a perspective overview of a first upper grinder **406***a* on an upper grinder position control assembly **410**.

FIGS. **8**A, **8**B, and **8**C illustrate a block diagram of said blade disk **102** with said first upper grinder **406***a* and a first lower grinder **408***a*.

FIG. **9** illustrates a perspective overview of a first clamp assembly **418***a* with said blade disk **102** in an engaged configuration **900**.

FIGS. **10**A and **10**B illustrate an elevated cross-section side view of said engaged configuration **900**, a disengaged configuration **1000**, and a detailed view of lower portion **1002**.

FIG. **11** illustrates a block diagram of an address space **1100** associated with a controller **500**.

DETAILED DESCRIPTION OF THE INVENTION

The following description is presented to enable any person skilled in the art to make and use the invention as claimed and is provided in the context of the particular examples discussed below, variations of which will be readily apparent to those skilled in the art. In the interest of clarity, not all features of an actual implementation are described in this specification. It will be appreciated that in the development of any such actual implementation (as in any development project), design decisions must be made to achieve the designers' specific goals (e.g., compliance with system- and business-related constraints), and that these goals will vary from one implementation to another. It will also be appreciated that such development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the field of the appropriate art having the benefit of this disclosure. Accordingly, the claims appended hereto are not intended to be limited by the disclosed embodiments, but are to be accorded their widest scope consistent with the principles and features disclosed herein.

FIGS. **1**A, **1**B and **1**C illustrate an elevated top view of a blank **100**, and an elevated top view and detailed view of a blade disk **102**.

Said blank **100** can comprise an unpunched and unsharpened version of said blade disk **102**, as described herein and known in the art.

Said blank **100** and said blade disk **102** can comprise a round disc having a body portion **104**, a center aperture **106**, a diameter **108**, and a center aperture diameter **122**. Said body portion **104** can be a metal disk.

As shown in a detailed call-out **110** of said blade disk **102**, said blank **100** can be punched to create a plurality of punched teeth **112** and a sharpened edge **114** (illustrated below). In one embodiment, said plurality of punched teeth **112** can be aligned in a tooth orientation **116** being relative to a center point **118** of said body portion **104** and on an outer perimeter edge **120** of said body portion **104**.

Once punched said plurality of punched teeth **112** can be distributed evenly around said outer perimeter edge **120**, as is known in the art.

In one embodiment, said blank **100** can be punched so as to add said plurality of punched teeth **112** to form an unsharpened punched blank, which needs to be sharpened as discussed below in order to create said blade disk **102**.

FIGS. **2**A, and **2**B illustrate an elevated cross-section side overview and detailed view of said blade disk **102**.

As shown in a call-out **200**, said outer perimeter edge **120** can be ground to said sharpened edge **114** at a grind angle **202**.

Said blank **100** and said blade disk **102** can comprise a top surface **204** and a bottom surface **206**.

FIG. **3** illustrates a perspective overview of a prior art grinding assembly **300**.

Said prior art grinding assembly **300** comprised a plurality of spinning stations **302** configured for receiving said unsharpened punched blank in a first station **304** among said plurality of spinning stations **302**, spinning, sharpening on said top surface **204**, and then flipped onto a second station **306** for the reverse treatment to sharpen said bottom surface **206**. One shortcoming of this approach comprises constant manpower input and disproportionate wear of abrasive pads between said plurality of spinning stations **302**. This is caused by griding against said tooth orientation **116** on one station and with said tooth orientation **116** at another station. In one use case, the abrasive pad used against said tooth orientation **116** require diamond grade abrasive, which raises the cost of griding by a factor of six.

FIG. **4** illustrates a perspective overview of a gin blade sharpening system **400**.

In one embodiment, said gin blade sharpening system **400** can comprise a frame structure **402**, two or more grinding stations **404**, one or more upper grinders **406**, one or more lower grinders **408**, an upper grinder position control assembly **410**.

Each among said two or more grinding stations **404** can comprise a clamp assembly **418**.

Said two or more grinding stations **404** can comprise a first grinding station **404***a*, a second grinding station **404***b*, and a third grinding station **404***c*. Said one or more upper grinders **406** can comprise a first upper grinder **406***a*, and a second upper grinder **406***b*. Said one or more lower grinders **408** can comprise a first lower grinder **408***a*, and a second lower grinder **408***b*.

Where said two or more grinding stations **404** comprises three stations, said clamp assembly **418** can be referred to as a first clamp assembly **418***a*, a second clamp assembly **418***b*, and a third clamp assembly **418***c*.

In one embodiment, said upper grinder position control assembly **410** can move said one or more upper grinders **406** in an x-direction **412**, a y-direction **414** or a z-direction **416**.

In one embodiment, said one or more lower grinders **408** are positioned relative to said clamp assembly **418** for use on said bottom surface **206** and said outer perimeter edge **120** of said blank **100**.

In one embodiment, said one or more upper grinders **406** and said one or more lower grinders **408** can be driven by a motor, such as an electric motor, as is known in the art.

Said gin blade sharpening system **400** can further comprise an x-axis threaded shaft **420** and a y-axis threaded shaft **422**. Portions of said upper grinder position control assembly **410** can travel on said x-axis threaded shaft **420** and said y-axis threaded shaft **422** to adjust a location of said one or more upper grinders **406** according to an operator's preference.

Said gin blade sharpening system **400** can comprise a switch panel interface **424** for operator interaction with said gin blade sharpening system **400**.

FIG. **5** illustrates a perspective side view of said gin blade sharpening system **400**.

In one embodiment, said gin blade sharpening system **400** can comprise a controller **500** in a controller box **502**, and

an HMI **504** (not illustrated here) for interactions between said gin blade sharpening system **400** and its operators.

As is known in the art, said HMI **504** can stand for Human Machine Interface. In one embodiment, said switch panel interface **424** can suffice for control of said gin blade sharpening system **400**, but in another embodiment, said gin blade sharpening system **400** can be controlled by a software system with a user interface.

FIG. **6** illustrates a block diagram of said one or more upper grinders **406** moving in said x-direction **412** and said z-direction **416** between said two or more grinding stations **404**.

As shown, said one or more upper grinders **406** can travel between a first x-axis location **600** and a second x-axis location **602** using said upper grinder position control assembly **410**. Wherein, said first x-axis location **600** and said second x-axis location **602** correspond to said first grinding station **404***a* and said second grinding station **404***b*. Accordingly, said controller **500** can schedule use of said one or more upper grinders **406** within the context of said gin blade sharpening system **400** and said two or more grinding stations **404**.

One advantage of moving said one or more upper grinders **406** between said two or more grinding stations **404** can involve saving on equipment costs in purchasing said one or more upper grinders **406**, another can involve allowing said blank **100** to be addressed one side at a time. That is, to grind on said top surface **204** with said one or more upper grinders **406** at said first grinding station **404***a* and said bottom surface **206** with said second lower grinder **408***b* at said second grinding station **404***b*, then move said first upper grinder **406***a* to said second x-axis location **602** and grind on said top surface **204** at said second grinding station **404***b* and said bottom surface **206** at said first grinding station **404***a*.

Consequently, warping and overheating said blank **100** can be avoided by separating treatment of said top surface **204** and said bottom surface **206**. Additionally, each of said two or more grinding stations **404** can be rotated in an advantageous direction to avoid grinding into said tooth orientation **116**. Thus, multistage treatment of said blank **100** can result in truer, flatter versions of said blade disk **102**, with lower consumption of an abrasive pad **604** and said one or more lower grinders **408**.

FIG. **7** illustrates a perspective overview of said first upper grinder **406***a* on said upper grinder position control assembly **410**.

In one embodiment, each among said one or more upper grinders **406** can comprise an upper grinder motor **700**, said abrasive pad **604**, a mounting bracket **704**, and a vertical movement assembly **706**. Said upper grinder motor **700** can selectively drive said abrasive pad **604**. Said mounting bracket **704** can receive and hold said upper grinder motor **700** with said abrasive pad **604** on said vertical movement assembly **706**.

As illustrated, said abrasive pad **604** and is removed from said upper grinder motor **700**.

In one embodiment, said mounting bracket **704** can allow said upper grinder motor **700** and said abrasive pad **604** to mount at an upper grind angle **708**. Wherein, each among said one or more upper grinders **406** can be adjusted to a pitch relative to said blank **100** to adjust said grind angle **202** in said sharpened edge **114** of said blank **100**.

In one embodiment, said upper grind angle **708** of said one or more upper grinders **406** can be adjusted automatically or by adjusting a mounting position of said upper grinder motor **700** to accomplish said upper grind angle **708**.

In one embodiment, said mounting bracket **704** can move in said z-direction **416** on said vertical movement assembly **706** to adjust a height and engagement of said abrasive pad **604** with said blank **100**.

FIGS. **8**A, **8**B, and **8**C illustrate a block diagram of said blade disk **102** with said first upper grinder **406***a* and said first lower grinder **408***a*.

By moving said one or more upper grinders **406** in said x-direction **412**, said y-direction **414** and said z-direction **416**, said gin blade sharpening system **400** can grind said top surface **204** at said outer perimeter edge **120** using different parts of each of said one or more upper grinders **406**. In one embodiment, the portion of said one or more upper grinders **406** which touches said blade disk **102** during grinding can be referred to as a plurality of abrasive grinding points **800**. As illustrated, said one or more upper grinders **406** can move to alter the location of said plurality of abrasive grinding points **800**, which gives rise to the designations of a first abrasive grinding point **800***a*, a second abrasive grinding point **800***b*, and a third abrasive grinding point **800***c*.

In one embodiment, said one or more upper grinders **406** can rotate around a spinning axis **802**. A distance between said spinning axis **802** and an outer edge of said one or more upper grinders **406** can comprise an interfacing portion **804** of said one or more upper grinders **406**.

Each among said one or more upper grinders **406** can comprise a shaft **806** which can be attached to said upper grinder motor **700**, and an abrasive pad **808** which can be attached to said shaft **806**. In one embodiment, said abrasive pad **808** can comprise a round disk shaped consumable item, as is known in the art. Wherein, said interfacing portion **804** can comprise a radius of said abrasive pad **808**.

In one embodiment, said controller **500** can measure usage of said abrasive pad **808** and move said one or more upper grinders **406** to ensure even wear of said abrasive pad **808** throughout all said plurality of abrasive grinding points **800**. Said controller **500** can be configured to measure pad life, pressure applied, time applied, pad interface usage, RPM of said one or more upper grinders **406** as it spins.

Likewise, grinding duration can be measured to modify said grind angle **202**.

FIG. **9** illustrates a perspective overview of said first clamp assembly **418***a* with said blade disk **102** in an engaged configuration **900**.

In one embodiment, each among said clamp assembly **418** can comprise an upper portion **902**, an upper pressing shaft **904**, and an upper press **906**.

FIGS. **10**A and **10**B illustrate an elevated cross-section side view of said engaged configuration **900**, a disengaged configuration **1000**, and a detailed view of lower portion **1002**.

In one embodiment, each among said clamp assembly **418** can further comprise said lower portion **1002**, a lower shaft **1004**, and a center axis **1006**.

In one embodiment, said clamp assembly **418** can be configured to transition between said engaged configuration **900** and said disengaged configuration **1000** either manually or through a command generated within said controller **500**.

Said engaged configuration **900** can comprise said blade disk **102** pressed between said upper portion **902** and said lower portion **1002**; and said disengaged configuration **1000** can comprise said upper portion **902** and said lower portion **1002** separated to release said blade disk **102**.

In one embodiment, either said upper portion **902** or said lower portion **1002** can comprise an aperture base **1010** having a base diameter **1008** being substantially equal to said center aperture diameter **122**. Accordingly, with said

clamp assembly **418** in said engaged configuration **900**, a portion of said aperture base **1010** can fit within said center aperture **106** of said blade disk **102** so as to keep said blade disk **102** centered with said center point **118** at said center axis **1006** of said clamp assembly **418**.

FIG. **11** illustrates a block diagram of an address space **1100** associated with said controller **500**.

Said address space **1100** can comprise a memory **1102** storing a device program **1104**, one or more processors **1106**, and a communication hardware **1108**.

In one embodiment, said device program **1104** can be configured to control said two or more grinding stations **404**, said one or more upper grinders **406**, said one or more lower grinders **408**, and said upper grinder position control assembly **410** of said gin blade sharpening system **400**.

The following is a summary of the enumerated parts in the specification and drawings:

said blank **100**,
Said blade disk **102**,
Said body portion **104**,
Said center aperture **106**,
Said diameter **108**,
Said center aperture diameter **122**,
Said detailed call-out **110**,
Said plurality of punched teeth **112**,
Said sharpened edge **114**,
Said tooth orientation **116**,
Said center point **118**,
Said outer perimeter edge **120**,
Said unsharpened punched blank,
Said call-out **200**,
Said grind angle **202**,
Said top surface **204**,
Said bottom surface **206**,
Said prior art grinding assembly **300**,
Said plurality of spinning stations **302**,
Said first station **304**,
Said second station **306**,
Said gin blade sharpening system **400**,
Said frame structure **402**,
Said two or more grinding stations **404**,
Said one or more upper grinders **406**,
Said one or more lower grinders **408**,
Said upper grinder position control assembly **410**,
Said clamp assembly **418**,
Said first grinding station **404***a*,
Said second grinding station **404***b*,
Said third grinding station **404***c*,
Said first upper grinder **406***a*,
Said second upper grinder **406***b*,
Said first lower grinder **408***a*,
Said second lower grinder **408***b*,
Said first clamp assembly **418***a*,
Said second clamp assembly **418***b*,
Said third clamp assembly **418***c*,
Said x-direction **412**,
Said y-direction **414**,
Said z-direction **416**,
Said x-axis threaded shaft **420**,
Said y-axis threaded shaft **422**,
Said switch panel interface **424**,
Said controller **500**,
Said controller box **502**,
Said HMI **504**,
Said first x-axis location **600**,
Said second x-axis location **602**,
Said abrasive pad **604**,
Said upper grinder motor **700**,
Said mounting bracket **704**,
Said vertical movement assembly **706**,
Said upper grind angle **708**,
Said plurality of abrasive grinding points **800**,
Said first abrasive grinding point **800***a*,
Said second abrasive grinding point **800***b*,
Said third abrasive grinding point **800***c*,
Said spinning axis **802**,
Said interfacing portion **804**,
Said shaft **806**,
Said abrasive pad **808**,
Said engaged configuration **900**,
Said upper portion **902**,
Said upper pressing shaft **904**,
Said upper press **906**,
Said disengaged configuration **1000**,
Said lower portion **1002**,
Said lower shaft **1004**,
Said center axis **1006**,
Said aperture base **1010**, Said base diameter **1008**,
Said address space **1100**,
Said memory **1102**,
Said device program **1104**,
Said one or more processors **1106**, and
said communication hardware **1108**.

The following is a summary of the claims to ensure a matching disclosure with the claims:

Said prior art grinding assembly **300** said gin blade sharpening system **400** for sharpening said blank **100** into said blade disk **102**. Said gin blade sharpening system **400** comprises said two or more grinding stations **404**, said controller **500**, and said one or more upper grinders **406**. Said one or more upper grinders **406** comprise at least said first upper grinder **406***a*. Said two or more grinding stations **404** comprise at least said first grinding station **404***a* and said second grinding station **404***b*. Each among said two or more grinding stations **404** comprise said clamp assembly **418** configured to selectively hold said blade disk **102** in a substantially horizontal position. a portion of said one or more upper grinders **406** can be configured to sharpen said outer perimeter edge **120** of said blade disk **102** using said abrasive pad **604**. Said controller **500** can be configured to selectively operate said two or more grinding stations **404**, said one or more upper grinders **406** and said one or more lower grinders **408** using said device program **1104**. Said gin blade sharpening system **400** comprises said upper grinder position control assembly **410** configured to move said one or more upper grinders **406** between said two or more grinding stations **404**. Said one or more upper grinders **406** can be configured to travel between said first x-axis location **600** and said second x-axis location **602** using said upper grinder position control assembly **410**. Said first x-axis location **600** and said second x-axis location **602** correspond to said first grinding station **404***a* and said second grinding station **404***b*. Said device program **1104** can be configured to schedule use of said one or more upper grinders **406** as between said two or more grinding stations **404**. At least two among said two or more grinding stations **404** can be configured to rotate in an advantageous direction to avoid grinding into said tooth orientation **116**. Said gin blade sharpening system **400** can be configured to sharpen said top surface **204**, and said bottom surface **206** separately in said first grinding station **404***a* and said second grinding station **404***b*. By sharpening said top surface **204** and said bottom

surface **206** separately, said blank **100** results in a flatter said blade disk **102**, with lower consumption of said abrasive pad **604**.

Said prior art grinding assembly **300** said gin blade sharpening system **400** for sharpening said blank **100** into said blade disk **102**. Said gin blade sharpening system **400** comprises said two or more grinding stations **404**, said controller **500**, and said one or more upper grinders **406**. Said one or more upper grinders **406** comprise at least said first upper grinder **406***a*. Said two or more grinding stations **404** comprise at least said first grinding station **404***a* and said second grinding station **404***b*. Each among said two or more grinding stations **404** comprise said clamp assembly **418** configured to selectively hold said blade disk **102** in a substantially horizontal position. a portion of said one or more upper grinders **406** can be configured to sharpen said outer perimeter edge **120** of said blade disk **102** using said abrasive pad **604**. Said controller **500** can be configured to selectively operate said two or more grinding stations **404**, said one or more upper grinders **406** and said one or more lower grinders **408** using said device program **1104**. Said gin blade sharpening system **400** comprises said upper grinder position control assembly **410** configured to move said one or more upper grinders **406** between said two or more grinding stations **404**. Said one or more upper grinders **406** can be configured to travel between said first x-axis location **600** and said second x-axis location **602** using said upper grinder position control assembly **410**. Said first x-axis location **600** and said second x-axis location **602** correspond to said first grinding station **404***a* and said second grinding station **404***b*. Said device program **1104** can be configured to schedule use of said one or more upper grinders **406** as between said two or more grinding stations **404**. at least two among said two or more grinding stations **404** can be configured to rotate in an advantageous direction to avoid grinding into said tooth orientation **116**. Said gin blade sharpening system **400** can be configured to sharpen said top surface **204**, and said bottom surface **206** separately in said first grinding station **404***a* and said second grinding station **404***b*. by sharpening said top surface **204** and said bottom surface **206** separately, said blank **100** results in a flatter said blade disk **102**, with lower consumption of said abrasive pad **604**.

Said gin blade sharpening system **400** for sharpening said blade disk **102** with improved manufacturing characteristics and higher quality output of said blade disk **102**. Said gin blade sharpening system **400** comprises said two or more grinding stations **404**, said controller **500**, and said one or more upper grinders **406**. Said one or more upper grinders **406** comprise at least said first upper grinder **406***a*. Said two or more grinding stations **404** comprise at least said first grinding station **404***a* and said second grinding station **404***b*. Each among said two or more grinding stations **404** comprise said clamp assembly **418** configured to selectively hold said blade disk **102** in a substantially horizontal position. a portion of said one or more upper grinders **406** can be configured to sharpen said outer perimeter edge **120** of said blade disk **102** using said abrasive pad **604**. Said controller **500** can be configured to selectively operate said two or more grinding stations **404**, said one or more upper grinders **406** and said one or more lower grinders **408** using said device program **1104**.

Each among said clamp assembly **418** comprises said upper portion **902**, said upper pressing shaft **904**, said upper press **906**, said lower portion **1002**, said lower shaft **1004**, and said center axis **1006**. Said clamp assembly **418** can be configured to transition between said engaged configuration **900** and said disengaged configuration **1000** either manually or through a command generated within said device program **1104**. Said engaged configuration **900** comprises said blade disk **102** pressed between said upper portion **902** and said lower portion **1002**. Said disengaged configuration **1000** comprises said upper portion **902** and said lower portion **1002** separated to allow said blank **100** to be removed from said clamp assembly **418**. Either said upper portion **902** or said lower portion **1002** comprises said aperture base **1010** having said base diameter **1008** being substantially equal to said center aperture diameter **122**. with said clamp assembly **418** in said engaged configuration **900**, a portion of said aperture base **1010** fit within said center aperture **106** of said blade disk **102** to keep said blade disk **102** centered with said center point **118** at said center axis **1006** of said clamp assembly **418**.

Said gin blade sharpening system **400** comprises said upper grinder position control assembly **410** configured to move said one or more upper grinders **406** between said two or more grinding stations **404**. Said one or more upper grinders **406** can be configured to travel between said first x-axis location **600** and said second x-axis location **602** using said upper grinder position control assembly **410**. Said first x-axis location **600** and said second x-axis location **602** correspond to said first grinding station **404***a* and said second grinding station **404***b*. Said device program **1104** can be configured to schedule use of said one or more upper grinders **406** as between said two or more grinding stations **404**.

Said upper grinder position control assembly **410** comprises said x-axis threaded shaft **420** and said y-axis threaded shaft **422**. Said gin blade sharpening system **400** can be configured to selectively rotate said x-axis threaded shaft **420** and said y-axis threaded shaft **422** to move said upper grinder position control assembly **410**.

At least two among said two or more grinding stations **404** can be configured to rotate in an advantageous direction to avoid grinding into said tooth orientation **116**. Said gin blade sharpening system **400** can be configured to sharpen said top surface **204**, and said bottom surface **206** separately in said first grinding station **404***a* and said second grinding station **404***b*. By sharpening said top surface **204** and said bottom surface **206** separately, said blank **100** results in a flatter said blade disk **102**, with lower consumption of said abrasive pad **604**.

Said gin blade sharpening system **400** further comprises said one or more lower grinders **408**. Said one or more lower grinders **408** can be positioned relative to said clamp assembly **418** for use on said bottom surface **206** and said outer perimeter edge **120** of said blank **100**.

Said one or more upper grinders **406** and said one or more lower grinders **408** can be driven by a motor, such as an electric motor.

Said gin blade sharpening system **400** comprises said switch panel interface **424** for operator interaction with said gin blade sharpening system **400**.

Each among said one or more upper grinders **406** comprises said upper grinder motor **700**, said abrasive pad **604**, and said vertical movement assembly **706**. Said upper grinder motor **700** can be configured to selectively drive said abrasive pad **604**.

Said mounting bracket **704** can be configured to receive and hold said upper grinder motor **700** with said abrasive pad **604** on said vertical movement assembly **706**. Each among said one or more upper grinders **406** further comprise said mounting bracket **704**. Said mounting bracket **704** can be configured to allow said upper grinder motor **700** and said

abrasive pad **604** to mount at said upper grind angle **708**. Each among said one or more upper grinders **406** can be adjusted to a pitch relative to said blank **100** to adjust said grind angle **202** in said sharpened edge **114** of said blank **100**. Said upper grind angle **708** of said one or more upper grinders **406** can be adjusted automatically or by adjusting a mounting position of said upper grinder motor **700** to accomplish said upper grind angle **708**. Said mounting bracket **704** can be configured to move in said z-direction **416** on said vertical movement assembly **706** to adjust a height and engagement of said abrasive pad **604** with said blank **100**.

Said controller **500** can be configured to measure usage of said abrasive pad **808** and move said one or more upper grinders **406** to ensure even wear of said abrasive pad **808** throughout all said plurality of abrasive grinding points **800**. Said controller **500** can be configured to measure a pad life, a pressure applied, a time applied, a pad interface usage, a RPM of said one or more upper grinders **406** as it spins.

By moving said one or more upper grinders **406** in said x-direction **412**, said y-direction **414** and said z-direction **416**, said gin blade sharpening system **400** can be configured to grind said top surface **204** at said outer perimeter edge **120** using different parts of each of said one or more upper grinders **406**. The portions of said one or more upper grinders **406** which touch said blade disk **102** during grinding can be referred to as said plurality of abrasive grinding points **800**. Said one or more upper grinders **406** can be configured to move to alter the location of said plurality of abrasive grinding points **800**. Said one or more upper grinders **406** can be configured to rotate around said spinning axis **802**. A distance between said spinning axis **802** and an outer edge of said one or more upper grinders **406** comprises said interfacing portion **804** of said one or more upper grinders **406**.

Each among said one or more upper grinders **406** comprises said shaft **806** which can be attached to said upper grinder motor **700**, and said abrasive pad **808** which can be attached to said shaft **806**. Said abrasive pad **808** comprises a round disk shaped consumable item, as can be known in the art. Said interfacing portion **804** comprises a radius of said abrasive pad **808**.

Said gin blade sharpening system **400** further comprises said one or more lower grinders **408**. Said one or more lower grinders **408** can be positioned relative to said clamp assembly **418** for use on said bottom surface **206** and said outer perimeter edge **120** of said blank **100**. Said controller **500** can be configured to track and alter said plurality of abrasive grinding points **800** of said one or more lower grinders **408** to preserve said one or more lower grinders **408** in the manner of said one or more upper grinders **406**.

Said gin blade sharpening system **400** for sharpening said blade disk **102** with improved manufacturing characteristics and higher quality output of said blade disk **102**. Said gin blade sharpening system **400** comprises said two or more grinding stations **404**, said controller **500**, and said one or more upper grinders **406**. Said one or more upper grinders **406** comprise at least said first upper grinder **406***a*. Said two or more grinding stations **404** comprise at least said first grinding station **404***a* and said second grinding station **404***b*. Each among said two or more grinding stations **404** comprise said clamp assembly **418** configured to selectively hold said blade disk **102** in a substantially horizontal position. A portion of said one or more upper grinders **406** can be configured to sharpen said outer perimeter edge **120** of said blade disk **102** using said abrasive pad **604**. Said controller **500** can be configured to selectively operate said two or more grinding stations **404**, said one or more upper grinders **406** and said one or more lower grinders **408** using said device program **1104**. At least two among said two or more grinding stations **404** can be configured to rotate in an advantageous direction to avoid grinding into said tooth orientation **116**. Said gin blade sharpening system **400** can be configured to sharpen said top surface **204**, and said bottom surface **206** separately in said first grinding station **404***a* and said second grinding station **404***b*. By sharpening said top surface **204** and said bottom surface **206** separately, said blank **100** results in a flatter said blade disk **102**, with lower consumption of said abrasive pad **604**. Said mounting bracket **704** can be configured to receive and hold said upper grinder motor **700** with said abrasive pad **604** on said vertical movement assembly **706**. Each among said one or more upper grinders **406** further comprise said mounting bracket **704**. Said mounting bracket **704** can be configured to allow said upper grinder motor **700** and said abrasive pad **604** to mount at said upper grind angle **708**. Each among said one or more upper grinders **406** can be adjusted to a pitch relative to said blank **100** in order to adjust said grind angle **202** in said sharpened edge **114** of said blank **100**. Said upper grind angle **708** of said one or more upper grinders **406** can be adjusted automatically or by adjusting a mounting position of said upper grinder motor **700** to accomplish said upper grind angle **708**. Said mounting bracket **704** can be configured to move in said z-direction **416** on said vertical movement assembly **706** to adjust a height and engagement of said abrasive pad **604** with said blank **100**.

Each among said clamp assembly **418** comprises said upper portion **902**, said upper pressing shaft **904**, said upper press **906**, said lower portion **1002**, said lower shaft **1004**, and said center axis **1006**. Said clamp assembly **418** can be configured to transition between said engaged configuration **900** and said disengaged configuration **1000** either manually or through a command generated within said device program **1104**. Said engaged configuration **900** comprises said blade disk **102** pressed between said upper portion **902** and said lower portion **1002**. Said disengaged configuration **1000** comprises said upper portion **902** and said lower portion **1002** separated to allow said blank **100** to be removed from said clamp assembly **418**. either said upper portion **902** or said lower portion **1002** comprises said aperture base **1010** having said base diameter **1008** being substantially equal to said center aperture diameter **122**. With said clamp assembly **418** in said engaged configuration **900**, a portion of said aperture base **1010** fit within said center aperture **106** of said blade disk **102** to keep said blade disk **102** centered with said center point **118** at said center axis **1006** of said clamp assembly **418**.

Said gin blade sharpening system **400** comprises said upper grinder position control assembly **410** configured to move said one or more upper grinders **406** between said two or more grinding stations **404**. Said one or more upper grinders **406** can be configured to travel between said first x-axis location **600** and said second x-axis location **602** using said upper grinder position control assembly **410**. Said first x-axis location **600** and said second x-axis location **602** correspond to said first grinding station **404***a* and said second grinding station **404***b*. Said device program **1104** can be configured to schedule use of said one or more upper grinders **406** as between said two or more grinding stations **404**. Said upper grinder position control assembly **410** comprises said x-axis threaded shaft **420** and said y-axis threaded shaft **422**. Said gin blade sharpening system **400** can be configured to selectively rotate said x-axis threaded

shaft **420** and said y-axis threaded shaft **422** to move said upper grinder position control assembly **410**.

Each among said one or more upper grinders **406** comprises said upper grinder motor **700**, said abrasive pad **604**, and said vertical movement assembly **706**. Said upper grinder motor **700** can be configured to selectively drive said abrasive pad **604**.

Various changes in the details of the illustrated operational methods are possible without departing from the scope of the following claims. Some embodiments may combine the activities described herein as being separate steps. Similarly, one or more of the described steps may be omitted, depending upon the specific operational environment the method is being implemented in. It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments may be used in combination with each other. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein."

The invention claimed is:

1. A gin blade sharpening system for sharpening a blade disk with improved manufacturing characteristics and higher quality output of said blade disk, wherein:

said gin blade sharpening system comprises two or more grinding stations, a controller, and one or more upper grinders;

said one or more upper grinders comprise at least a first upper grinder;

said two or more grinding stations comprise at least a first grinding station and a second grinding station;

each among said two or more grinding stations comprise a clamp assembly configured to selectively hold said blade disk in a substantially horizontal position;

a portion of said one or more upper grinders are configured to sharpen an outer perimeter edge of said blade disk using an abrasive pad; and

said controller is configured to selectively operate said two or more grinding stations, said one or more upper grinders, and one or more lower grinders using a device program;

each among said one or more upper grinders comprises an upper grinder motor, said abrasive pad, and a vertical movement assembly;

said upper grinder motor is configured to selectively drive said abrasive pad;

a mounting bracket is configured to receive and hold said upper grinder motor with said abrasive pad on said vertical movement assembly;

each among said one or more upper grinders further comprise said mounting bracket;

said mounting bracket is configured to allow said upper grinder motor and said abrasive pad to mount at an upper grind angle;

each among said one or more upper grinders are adjusted to a pitch relative to a blank to adjust a grind angle in a sharpened edge of said blank;

said upper grind angle of said one or more upper grinders are adjusted automatically or by adjusting a mounting position of said upper grinder motor to accomplish said upper grind angle;

said mounting bracket is configured to move in a z-direction on said vertical movement assembly to adjust a height and engagement of said abrasive pad with said blank;

by moving said one or more upper grinders in an x-direction, a y-direction and said z-direction, said gin blade sharpening system is configured to grind a top surface at said outer perimeter edge using different parts of each of said one or more upper grinders;

the portions of said one or more upper grinders which touch said blade disk during grinding are referred to as a plurality of abrasive grinding points;

said one or more upper grinders are configured to move to alter the location of said plurality of abrasive grinding points;

said one or more upper grinders are configured to rotate around a spinning axis; and

a distance between said spinning axis and an outer edge of said one or more upper grinders comprises an interfacing portion of said one or more upper grinders.

2. The gin blade sharpening system of claim **1**, wherein:

each among said clamp assemblies comprise

an upper portion, an upper pressing shaft, an upper press, a lower portion, a lower shaft, and a center axis;

wherein each among said clamp assemblies are configured to transition between an engaged configuration and a disengaged configuration either manually or through a command generated within said device program;

said engaged configuration comprises said blade disk pressed between said upper portion and said lower portion;

said disengaged configuration comprises said upper portion and said lower portion separated to allow said blank to be removed from said clamp assembly;

either said upper portion or said lower portion comprises an aperture base having a base diameter being substantially equal to a center aperture diameter; and

with said clamp assembly in said engaged configuration, a portion of said aperture base fit within a center aperture of said blade disk to keep said blade disk centered with a center point at said center axis of said clamp assembly.

3. The gin blade sharpening system of claim **1**, wherein:

said gin blade sharpening system comprises an upper grinder position control assembly configured to move said one or more upper grinders between said first and second grinding stations;

said one or more upper grinders are configured to travel between a first x-axis location and a second x-axis location using said upper grinder position control assembly;

wherein said first grinding station is located at said first x-axis location, and said second grinding station is located at said second x-axis location; and

said device program is configured to schedule use of said one or more upper grinders between said first and second grinding stations.

4. The gin blade sharpening system of claim **3**, wherein:

said upper grinder position control assembly comprises an x-axis threaded shaft and a y-axis threaded shaft; and

said gin blade sharpening system is configured to selectively rotate said x-axis threaded shaft and said y-axis threaded shaft to move said upper grinder position control assembly.

5. The gin blade sharpening system of claim 1, wherein:
the first grinding station and the second grinding station are each configured to rotate to avoid grinding into a tooth orientation;
said gin blade sharpening system is configured to sharpen said top surface in said first grinding station and sharpen a bottom surface in said second grinding station; and
by sharpening said top surface and said bottom surface separately, said blank results in a flatter said blade disk, with lower consumption of said abrasive pads.

6. The gin blade sharpening system of claim 1, wherein:
said gin blade sharpening system further comprises said one or more lower grinders; and
for each among said two or more grinding stations,
said one or more lower grinders are positioned relative to said clamp assembly for use on a bottom surface and said outer perimeter edge of said blank.

7. The gin blade sharpening system of claim 1, wherein:
each among said one or more upper grinders is driven by said corresponding upper grinder motor, and each among said one or more lower grinders is driven by a corresponding lower grinder motor.

8. The gin blade sharpening system of claim 1, wherein:
said gin blade sharpening system comprises a switch panel interface for operator interaction with said gin blade sharpening system.

9. The gin blade sharpening system of claim 1, wherein:
said controller is configured to measure usage of said abrasive pad and move said one or more upper grinders to ensure even wear of said abrasive pad throughout all of said plurality of abrasive grinding points; and
said controller is configured to measure a pad life, a pressure applied, a time applied, a pad interface usage, an RPM of said one or more upper grinders while said one or more upper grinders rotate.

10. The gin blade sharpening system of claim 1, wherein:
each among said one or more upper grinders comprises a shaft which is attached to said upper grinder motor, and said abrasive pad is attached to said shaft;
said abrasive pad comprises a round disk shaped consumable item; and
said interfacing portion comprises a radius of said abrasive pad.

11. The gin blade sharpening system of claim 1, wherein:
said gin blade sharpening system further comprises said one or more lower grinders;
said one or more lower grinders are positioned relative to said clamp assembly for use on said bottom surface and said outer perimeter edge of said blank;
said controller is configured to track and alter a plurality of lower abrasive grinding points of said one or more lower grinders to preserve said one or more lower grinders;
wherein said controller preserves said one or more lower grinders by measuring usage of said abrasive pad and moving said one or more lower grinders to ensure even wear of said abrasive pad throughout all of said plurality of lower abrasive grinding points; and
said controller is configured to measure a pad life, a pressure applied, a time applied, a pad interface usage, an RPM of said one or more lower grinders while said one or more lower grinders rotate.

12. A gin blade sharpening system for sharpening a blade disk with improved manufacturing characteristics and higher quality output of said blade disk, wherein:
said gin blade sharpening system comprises two or more grinding stations, a controller, and one or more upper grinders;
said one or more upper grinders comprise at least a first upper grinder;
said two or more grinding stations comprise at least a first grinding station and a second grinding station;
each among said two or more grinding stations comprise a clamp assembly configured to selectively hold said blade disk in a substantially horizontal position;
a portion of said one or more upper grinders are configured to sharpen an outer perimeter edge of said blade disk using an abrasive pad;
said controller is configured to selectively operate said two or more grinding stations, said one or more upper grinders, and one or more lower grinders using a device program;
each among said one or more upper grinders comprises an upper grinder motor, said abrasive pad, and a vertical movement assembly;
said upper grinder motor is configured to selectively drive said abrasive pad;
a mounting bracket is configured to receive and hold said upper grinder motor with said abrasive pad on said vertical movement assembly;
each among said one or more upper grinders are adjusted to a pitch relative to a blank to adjust a grind angle in a sharpened edge of said blank;
said upper grind angle of said one or more upper grinders are adjusted automatically or by adjusting a mounting position of said upper grinder motor to accomplish said upper grind angle;
said mounting bracket is configured to move in a z-direction on said vertical movement assembly to adjust a height and engagement of said abrasive pad with said blank;
by moving said one or more upper grinders in an x-direction, a y-direction and said z-direction, said gin blade sharpening system is configured to grind a top surface at said outer perimeter edge using different parts of each of said one or more upper grinders;
the portions of said one or more upper grinders which touch said blade disk during grinding are referred to as a plurality of upper abrasive grinding points;
said one or more upper grinders are configured to move to alter the location of said plurality of upper abrasive grinding points;
said one or more upper grinders are configured to rotate around a spinning axis;
a distance between said spinning axis and an outer edge of said one or more upper grinders comprises an interfacing portion of said one or more upper grinders;
said gin blade sharpening system further comprises said one or more lower grinders;
said one or more lower grinders are positioned relative to said clamp assembly for use on a bottom surface and said outer perimeter edge of said blank;
said controller is configured to track and alter a plurality of lower abrasive grinding points of said one or more lower grinders to preserve said one or more lower grinders; and
by measuring usage of said abrasive pad and move said one or more lower grinders to ensure even wear of said abrasive pad throughout all of said plurality of lower abrasive grinding points.

13. The gin blade sharpening system of claim 12, wherein said controller is configured to measure a pad life, a pressure

applied, a time applied, a pad interface usage, an RPM of said one or more lower grinders while said one or more lower grinders rotate.

14. The gin blade sharpening system of claim **12**, wherein

each among said one or more upper grinders comprises a shaft which is attached to said upper grinder motor, and said abrasive pad is attached to said shaft;

said abrasive pad comprises a round disk shaped consumable item; and

said interfacing portion comprises a radius of said abrasive pad.

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