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(54) Tool and method for machining a dovetail

(57) Tools and methods for machining a dovetail 12 are disclosed. The dovetail 12 includes a plurality of tangs 15. In one embodiment, the tool 10 includes a body 20 and a plurality of mount brackets 30, each of the plurality of mount brackets connected to the body 20 and positionable in contact with a crush surface 32 of the dovetail 12. The tool 10 further includes an engagement member 60 connected to the body 20 and adjustable such that contact by the engagement member 60 with the dovetail 12 forces each of the plurality of mount brackets 30 against the associated crush surface 32. The tool 10 further includes a machining assembly 80 for machining one of the plurality of tangs 15 of the dovetail 12, the machining assembly 80 connected to the body 20.

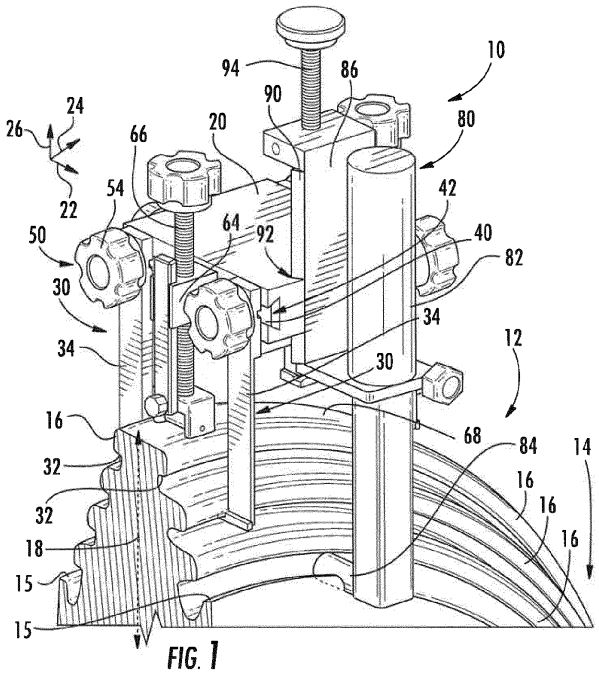

FIG. 1

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Description

[0001] The present disclosure relates in general to dovetails of, for example, rotor wheels, and more particularly to tools and methods for machining such dovetails.

[0002] Steam turbine and gas turbine systems are examples of turbomachines widely utilized in fields such as power generation. A conventional steam or gas turbine system may include a compressor section and a turbine section, each of which may include various stationary and rotary components. Various airfoil components may be included in the stationary and rotary components. For example, a stationary component may include a plurality of buckets, while a rotary component may include a plurality of vanes.

[0003] In many cases, a rotary component or a stationary component may further include a wheel on which the buckets or vanes may be mounted. In typical turbomachines, for example, buckets are disposed in an annular array about a rotor wheel. In many cases, the buckets are mounted to the wheel through the use of mating dovetails and dovetail cavities. The radially outer surface of a wheel may have a cross-sectional dovetail shape, including a plurality of tangs, and the mating buckets may define corresponding dovetail cavities. The buckets may slide onto the dovetail via the dovetail cavities to mount the buckets to the wheel.

[0004] During operation of the turbomachine, the various components thereof may be subject to significant amounts of wear. In particular, wheel dovetails may wear non-uniformly during operation. Such non-uniform wear can cause various issues when replacing the buckets mounted to the wheel. For example, the dovetail cavities of newly formed buckets may no longer match the non-uniform wheel dovetails. Thus, each bucket must be custom fit to the non-uniform wheel dovetail, or the wheel dovetail must be machined to a uniform size and shape.

[0005] In many cases, wheel dovetails are machined to a uniform size and shape. However, methods and apparatus for performing such machining are generally inadequate. For example, hand filing of high spots on a dovetail is inaccurate and time-consuming. Machining of the dovetail in a lathe is expensive and time consuming.

[0006] Accordingly, improved methods and apparatus for machining dovetails, such as rotor wheel dovetails, is desired in the art. For example, methods and apparatus that provide efficient, accurate, and inexpensive machining would be advantageous.

[0007] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0008] In one embodiment, a tool for machining a dovetail is disclosed. The dovetail includes a plurality of tangs. The tool includes a body and a plurality of mount brackets, each of the plurality of mount brackets connected to the body and positionable in contact with a crush surface of the dovetail. The tool further includes an engagement member connected to the body and adjustable such that contact by the engagement member with the dovetail forces each of the plurality of mount brackets against the associated crush surface. The tool further includes a machining assembly for machining one of the plurality of tangs of the dovetail, the machining assembly connected to the body.

[0009] In another embodiment, a method for machining a dovetail is disclosed. The dovetail includes a plurality of tangs. The method includes mounting a plurality of mount brackets in forcible contact with a crush surface of the dovetail, positioning a machining assembly in contact with one of the plurality of tangs of the dovetail, and moving the machining assembly along the dovetail while generally maintaining the forcible contact between the plurality of mount brackets and the crush surface.

[0010] In another embodiment, a tool for machining a dovetail is disclosed. The dovetail includes a plurality of tangs. The tool includes a body and a plurality of mount brackets, each of the plurality of mount brackets connected to the body and positionable in contact with a crush surface of the dovetail. The tool further includes means connected to the body for forcibly engaging each of the plurality of mount brackets with the crush surface, and means connected to the body for machining one of the plurality of tangs of the dovetail.

[0011] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0012] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

FIG. 1 is a perspective view of a tool mounted on a rotor wheel according to one embodiment of the present disclosure;

FIG. 2 is a perspective view of the tool of FIG. 1;

FIG. 3 is a rear view of the tool of FIG. 1;

FIG. 4 is a side view of the tool of FIG. 1;

FIG. 5 is a perspective view of an engagement member connected to a body of the tool of FIG.1;

FIG. 6 is a perspective view of various components of the tool of FIG. 1 with the body removed for visual clarity;

FIG. 7 is a perspective view of a tool mounted on a rotor wheel according to another embodiment of the

present disclosure;

FIG. 8 is a perspective view of the tool of FIG. 7;

FIG. 9 is a side view of the tool of FIG. 7; and

FIG. 10 is a perspective view of mount brackets and a bracket for an engagement member connected to a body of the tool of FIG. 7.

[0013] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0014] FIGS. 1 and 7 illustrate various embodiments of a tool 10 according to the present disclosure mounted to a dovetail 12. The dovetail 12 as shown is a component of a rotor wheel 14 of a turbomachine, such as a steam turbine system or gas turbine system. As shown, the dovetail 12 includes a plurality of tangs 15 and hooks 16. In particular, pairs of opposing tangs 15 and hooks 16 are illustrated. A cross-section of a dovetail 12, as shown, illustrates that each pair of tangs 15 and hooks 16 are opposite one another relative to a central axis 18 that bisects a cross-section of the dovetail 12. A dovetail 12 may include any suitable number of hooks 16, and in particular may include any suitable number of opposing pairs of hooks 16. The dovetail 12, and the hooks 16 and tangs 15 thereof, generally extends circumferentially about at least a portion of the rotor wheel 14 circumference. It should be understood that the present disclosure is not limited to dovetails 12 on rotor wheels 14. Rather, any suitable dovetail 12 having one or more pairs of opposing tangs 15 and/hooks 16 is within the scope of the present disclosure.

[0015] FIGS. 1 through 10 illustrate various embodiments of a tool 10 for machining a dovetail 12. The tool 10 may be generally mounted to the dovetail 12 and then moved along the dovetail 12, such as in a generally circumferential direction. During movement, the tool 10 may machine a tang 15 of the dovetail 12. Such machining may provide the tangs 15 with generally uniform shapes and sizes. In the case of dovetails 12 on rotor wheels 14, this facilitates the use of a plurality of buckets having generally consistently sized dovetail cavities with the dovetail 12. Machining of dovetails 12 using a tool 10 and/or method according to the present disclosure is efficient, accurate, and inexpensive relative to previously known tools and methods.

[0016] As shown, a tool 10 according to the present disclosure includes a main body 20. Various other components of the tool 10 may be connected to the body 20. The body 20 may be a singular component, as shown in FIGS. 1 through 6, or a plurality of distinct components, as shown in FIGS. 7 through 10. The body 20 may further define various axes along or about which various other components of the tool 12 may move. As shown, an x-axis 22, a y-axis 24, and a z-axis 26 may be defined for the body 20.

[0017] The tool 10 may further include a plurality of mount brackets 30. Each mount bracket 30 may be connected to the tool 10, and may be positionable in contact with a mount surface 32 of the dovetail 12. As shown, a crush surface 32 in exemplary embodiments is an underside of a hook 16. It should be understood, however, that any suitable surface of the dovetail 12 to which a mount bracket 30 may be placed in contact is within the scope of the present disclosure. The crush surfaces 32 generally serve as datums, or points of reference, for the tool 10 as the tool 10 is mounted to the dovetail 12, adjusted, and operated to machine the dovetail 12. A mount bracket 30 may include a body 34 and a mount surface 36. The body 34 may extend longitudinally generally along the z-axis 26 relative to the main body 20. As shown, a tool 10 may include a plurality of mount brackets 30. The mount brackets 30 may be spaced apart from one another along the x-axis 22. When mounting the tool 10 to the dovetail 12, each mount bracket 30, such as the mount surface 36 thereof, may be positioned in contact with a crush surface 32 of the dovetail 12. Further, in exemplary embodiments, as shown, one or more mount brackets 30 may be positioned in contact with each of opposing crush surfaces 32 of the plurality of hooks 16. Such positioning of each mount bracket 30 in contact with a crush surface 32 allows the tool 10 to consistently machine the dovetail 12 during operation thereof.

[0018] In exemplary embodiments, the crush surfaces 32 may be generally curvilinear. Thus, in some embodiments, the mount surface 36 of each mount bracket 30 may be generally curvilinear. Such curvilinear shape allows the mount surface 36 to easily ride along the crush surface 32 with which it is in contact during movement of the tool 10 along the dovetail 12. Alternatively, however, the crush surface 32 may be generally linear, have linear and curvilinear portions, or have any other suitable shape.

[0019] A mount bracket 30 according to the present disclosure may further be adjustable along one or more axes. For example, in exemplary embodiments, a mount bracket 30 may be adjustable along the x-axis 22 or the y-axis 24. As shown in FIGS. 1 through 3, 5 through 8, and 10, for example, a mount bracket 30 may include a key member 40. The body 20 may define a corresponding keyway 42. The key member 40 and keyway 42 may have any suitable corresponding shapes and sizes, such that the key member 40 can slide within the corresponding keyway 42. In some exemplary embodiments, as

shown in FIGS. 1 through 3, 5, and 6, a key member 40 may have a generally trapezoidal cross-sectional shape. In other embodiments, as shown in FIGS. 7, 8 and 10, a key-member 40 may have a generally rectangular cross-sectional shape. The corresponding keyway 42 may have a corresponding cross-sectional shape. A shown, a keyway 42 may extend generally longitudinally along the x-axis 22 or the y-axis 24. The key member 40 may thus be allowed to slide within the keyway 42 along the x-axis 22 or y-axis 24, thus adjusting the mount bracket 30 along the x-axis 22 or y-axis 24. Alternatively, any suitable adjustment mechanism which may allow a mount bracket 30 to be adjusted as required is within the scope of the present disclosure.

[0020] In further exemplary embodiments, a mount bracket 30 may additionally be adjustable along the z-axis 26. As shown in FIGS. 7, 8 and 10, for example, a mount bracket 30 may be adjustably connected to the included key member 40 by a male connector 44 of the key member 40 disposed in a corresponding female connection channel 46 of the mount bracket 30. The connector 44 may be movable within the channel 46 generally along the z-axis 26. Thus, the mount bracket 30 may be adjusted along the z-axis 26 via movement of the channel 46 relative to the connector 44. Alternatively, any suitable adjustment mechanism which may allow a mount bracket 30 to be adjusted as required is within the scope of the present disclosure.

[0021] As discussed, a mount bracket 30 according to the present disclosure may be adjusted along one or more axes. In some embodiments, a mount bracket 30 may further include a locking assembly 50. The locking assembly 50 may be configured to selectively restrict adjustment of the mount bracket 30 along one or more of these axes. For example, as shown in FIGS. 1 through 4 and 6, a locking assembly 50 may include a screw 52 connected to the key member 40. The screw 52 may be tightened relative to the key member 40, forcing the key member 40 against the corresponding keyway 42. Such force may cause sufficient friction between the key member 40 and keyway 42 to prevent to the key member 40 from moving within the keyway 42, thus restricting adjustment of the mount bracket 30 until the screw 52 is loosened. A knob 54 may be connected to the screw 52 to facilitate tightening and loosening thereof. Alternatively, any suitable locking mechanism which may allow adjustment of a mount bracket 30 to be restricted as required is within the scope of the present disclosure.

[0022] Thus, as discussed, a tool 10 may be mounted to a dovetail 12 by initially positioning the mount brackets 30 in contact with crush surfaces 32 of the dovetail 12. The mount brackets 30 may be then forced against the crush surfaces 32 such that each mount bracket 30 forcibly engages the crush surface 32 with which it is in contact. As shown, for example, one or more engagement members 60, each of which may be connected to the body 20, may be positionable in contact with the dovetail 12. Further, each engagement member 60 may be adjustable such that contact by that engagement member 60 with the dovetail 12 forces one or more mount brackets 30 against the associated crush surface(s) 32. Such adjustment and resulting force may be generally along the z-axis 26, such that the mount brackets 30 are forced against the associated crush surfaces 32 generally along the z-axis. Such forcible contact and engagement caused by the engagement members 60 may effectively clamp the tool 10 to the dovetail 12. The amount of force utilized may be adjusted such that the tool 10 can, while forcibly engaging the dovetail 12, move along the dovetail 12 to consistently machine the dovetail 12 as required and discussed herein.

[0023] In exemplary embodiments, as shown, an engagement member 60 according to the present disclosure includes a roller 62, a bracket 64, and a screw 66. The roller 62 may contact the dovetail 12, such as a top or outer surface 68 thereof, and may facilitate movement of the tool 10 along the dovetail 12 during machining. The screw 66 may be adjustable relative to the body 20, such as along the z-axis 26, to apply a force against the dovetail 12, thus forcing the mount brackets 30 against the crush surfaces 32. The bracket 64 may connect the engagement member 60 to the body 20, and the screw 66 may be connected to the bracket 64 and the roller 62. Adjustment of the screw 66 along the z-axis 26 may move the screw 66 relative to the body 20 and the bracket 64, and may additionally move the roller 62. After the mount brackets 30 are positioned in contact with the crush surfaces 32, the screw 66 may be adjusted such that the roller 62 contacts and is forced against the dovetail 12, further forcing the mount brackets 30 into forcible engagement with the mount crush 32.

[0024] In some embodiments, an engagement member 60 according to the present disclosure may further include a spring 69, as shown in FIGS. 7 through 10. The spring 69 may be generally resilient in a direction along which force is applied by the engagement member 60, such as along the z-axis 26. Such resilience may thus provide an additional force, further engaging the mount brackets 30 in forcible contact with the crush surfaces 32.

[0025] It should be understood that engagement members 60 according to the present disclosure are not limited to those including rollers 62, brackets 64, and/or screws 66 as discussed above. Rather, any suitable mechanism for engaging the tool 10 with the dovetail 12 as discussed above, such as suitable clamping mechanisms and/or forcing applying mechanisms, are within the scope of the present disclosure. As such, any suitable means for forcibly engaging each of the plurality of mount brackets 30 with the respective crush surfaces 32 is within the scope of the present disclosure.

[0026] An engagement member 60 according to the present disclosure may be adjustable along one or more axes. As discussed, an engagement member 60 may be adjustable along the z-axis. Further, in exemplary embodiments, an engagement member 60 may be adjustable along the x-axis 22 or the y-axis 24. As shown in

FIGS. 1 through 3, 5 through 8, and 10, for example, an engagement member 60 may include a key member 70. The body 20 may define a corresponding keyway 72, which may be the same as or different from a keyway 42. The key member 70 and keyway 72 may have any suitable corresponding shapes and sizes, such that the key member 70 can slide within the corresponding keyway 72. In some exemplary embodiments, as shown in FIGS. 1 through 3, 5, and 6, a key member 70 may have a generally trapezoidal cross-sectional shape. In other embodiments, as shown in FIGS. 7, 8 and 10, a key-member 70 may have a generally rectangular cross-sectional shape. The corresponding keyway 72 may have a corresponding cross-sectional shape. As shown, a keyway 72 may extend generally longitudinally along the x-axis 22 or the y-axis 24. The key member 70 may thus be allowed to slide within the keyway 72 along the x-axis 22 or y-axis 24, thus adjusting the engagement member 60 along the x-axis 22 or y-axis 24. Alternatively, any suitable adjustment mechanism which may allow an engagement member 60 to be adjusted as required is within the scope of the present disclosure.

[0027] In some embodiments, an engagement member 60 may further include a locking assembly (not shown). The locking assembly may be configured to selectively restrict adjustment of the engagement member 60 along one or more of axes, as discussed above with respect to the mount brackets 30. In some embodiments, for example, the locking assembly may include a screw connected to a key member 60, as well as a knob, as discussed above with respect to the mount brackets 30 and key members 40. Alternatively, any suitable adjustment mechanism which may allow adjustment of an engagement member 60 to be restricted as required is within the scope of the present disclosure.

[0028] Once the tool 10 is forcibly engaged to the dovetail 12, the tool 10 may be moved along the dovetail 12 to machine the dovetail, such as the tangs 15 thereof, to provide consistent shapes and sizes. As such, the tool 10 may further include apparatus for machining the dovetail 12, such as the tangs 15 thereof. As shown, a tool 10 according to the present disclosure may include one or more machining assemblies 80. A machining assembly 80 may be provided for machining tangs 15 of the dovetail 12, and may be connected to the body 20. The machining assembly 80 may be operated to machine a tang 15. During operation, the machining assembly 80 may grind or otherwise remove portions of the tang 15, including high spots, warps, etc. During machining, the tool 10 may be moved along the dovetail 12, such as in a generally circumferential or longitudinal direction along the dovetail 12, such that the tang 15 is consistently machined in the desired direction. This may provide the tang 15 with a consistent shape and size, as desired. Further, in exemplary embodiments, after machining of a tang 15, the tool 10 may be dismounted from the dovetail 12, opposedly remounted to the dovetail 12 by reversing the direction that the tool 10 is facing (for example, approximately 180 degrees about the z-axis) and remounting the tool 10 to the dovetail 12, and machining an opposing tang 15 to the tang 15 that was previously machined. This allows both of the opposing tangs 15 to have consistent sizes and shapes, which may be particularly advantageous when, for example, forming or adjusting dovetail channels to correspond to the dovetail 12 and tangs 15 thereof.

[0029] A machining assembly 80 according to the present disclosure may include, for example, a grinder 82 and an abrasive 84. The grinder 82 may be any suitable component operable to rotate or otherwise move the abrasive 84. For example, pneumatic, hydraulic, gear and/or motor driven grinders may be utilized. The abrasive 84 may connected to and rotated or otherwise moved by the grinder 82 to, when in contact with a tang 15, grind or otherwise machine the tang 15. Any suitable abrasive material, such as sandpaper, metal, stone, ceramic, or another suitable material, may be utilized.

[0030] It should be understood that machining assemblies 80 according to the present disclosure are not limited to those including grinders 82 and abrasives 84 as discussed above. Rather, any suitable mechanism for machining the dovetail 12 as discussed above, such as suitable sanding, polishing, or otherwise machining mechanisms, are within the scope of the present disclosure. As such, any suitable means for machining a tang 15 of a dovetail 12 is within the scope of the present disclosure.

[0031] As shown, the abrasive 84 may be positionable in contact with a tang 15. For example, after the tool 10 is mounted to the dovetail 12, the machining assembly 80 may be adjustable such that the abrasive contacts 84 the tang 15 to be machined. In some embodiments, for example, the machining assembly 80 may further include a bracket 86. The bracket 86 may connect the grinder 82, and thus the abrasive 84, to the body 20. The bracket 86 may be adjustable relative to the body 20, such that the abrasive 84 can be adjusted. For example, in exemplary embodiments as shown, the bracket 86 may be adjustable along the z-axis 26. For example, as shown, the machining assembly 80 may include a key member 90, which may be integral with the bracket 86 as shown or separate from the bracket 86. The body 20 may define a corresponding keyway 92. The key member 90 and keyway 92 may have any suitable corresponding shapes and sizes, such that the key member 90 can slide within the corresponding keyway 92. In some exemplary embodiments, as shown in FIGS. 1 through 2, and 6, a key member 90 may have a generally triangular cross-sectional shape. In some embodiments as shown, an opposing key member 90 may additionally have a triangular cross-sectional shape, giving the overall bracket 86 a generally trapezoidal shape. The corresponding keyway 92 may have a corresponding cross-sectional shape. A shown, a keyway 92 may extend generally longitudinally along the z-axis 26. The key member 90 may thus be allowed to slide within the keyway 92 along the z-axis

26, thus adjusting the machining assembly 80 along the z-axis 26. Alternatively, any suitable adjustment mechanism which may allow a machining assembly 80 to be adjusted as required is within the scope of the present disclosure.

[0032] In some embodiments, a screw 94 may further be included in a machining assembly 80 for adjusting the machining assembly 80 relative to the body 20. For example, as shown, the screw 94 may extend longitudinally generally along the z-axis 26. The screw 94 may further connect the bracket 86 and body 20. Rotation of the screw 94 may move the bracket 86 along the z-axis 26 relative to the body 20, thus facilitating adjustment of the machining assembly 80 in general.

[0033] As discussed, a machining assembly 80 according to the present disclosure may be adjusted along one or more axes. In some embodiments, a machining assembly 80 may further include a locking assembly 100. The locking assembly 100 may be configured to selectively restrict adjustment of the machining assembly 80 along one or more of these axes. For example, as shown in FIGS. 2, 4 and 6, a locking assembly 100 may include a screw 102 that presses against the bracket 86. The screw 102 may be tightened relative to the bracket 86 and optional key members 90 thereof, forcing the bracket 86 against the body 20, such as against the corresponding keyway 92. Such force may cause sufficient friction between the bracket 86 and body 20 to prevent to the bracket 86 from moving, such as within the keyway 92, thus restricting adjustment of the machining assembly 80 until the screw 102 is loosened. A knob 104 may be connected to the screw 102 to facilitate tightening and loosening thereof. Alternatively, any suitable locking mechanism which may allow adjustment of a machining assembly 80 to be restricted as required is within the scope of the present disclosure.

[0034] In some embodiments, a tool 10 according to the present disclosure may further include one or more handles 110. A handle 110 may be connected to the body 20, and may allow an operator to easily grasp and move the tool 10 during operation to machine the dovetail 12.

[0035] The present disclosure is further directed to methods for machining a dovetail. A method may include, for example, mounting a plurality of mount brackets 30 in forcible contact with one or more crush surfaces 32 of the dovetail 12. Such mounting may include, for example, positioning each of the plurality of mount brackets 30 in contact with the crush surface 32 of the dovetail 12, and forcing each of the plurality of mount brackets 30 against the crush surface 32 of the dovetail 12, as discussed above. A method may further include, for example, positioning a machining assembly 80 in contact with one of the plurality of tangs 15 of the dovetail 12. Such positioning may include, for example, adjusting the machining assembly 80 along a z-axis 26, as discussed above. A method may further include, for example, moving the machining assembly 80 along the dovetail 12 while generally maintaining the forcible contact between the plurality of mount brackets 30 and the crush surfaces 32, as discussed above.

[0036] In some embodiments, a method according to the present disclosure may further include adjusting each of the plurality of mount brackets 30 along one of an x-axis 22 and a y-axis 24, as discussed above. Further, a method may in some embodiments include selectively restricting adjustment of each of the plurality of mount brackets 30 along the one of the x-axis 22 and the y-axis 24, as discussed above.

[0037] In some embodiments, a method according to the present disclosure may further include, for example, selectively restricting adjustment of the machining assembly 80 along the z-axis 26, as discussed above.

[0038] In some embodiments, a method may further include, for example, dismounting the plurality of mount brackets 30 from the crush surfaces 32 of the dovetail 12, opposedly remounting the plurality of mount brackets 30 in forcible contact with the crush surfaces 32 of the dovetail 12, positioning the machining assembly 80 in contact with an opposite one of the plurality of tangs 15 of the dovetail 12, andmoving the machining assembly 80 along the dovetail 12 while generally maintaining the forcible contact between the plurality of mount brackets 30 and the crush surface 32, as discussed above.

[0039] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

[0040] Various aspects and embodiments of the present invention are defined by the following numbered clauses:

1. A tool for machining a dovetail, the dovetail comprising a plurality of tangs, the tool comprising:

a body;

a plurality of mount brackets, each of the plurality of mount brackets connected to the body and positionable in contact with a crush surface of the dovetail;

an engagement member connected to the body and adjustable such that contact by the engagement member with the dovetail forces each of the plurality of mount brackets against the associated crush surface;

a machining assembly for machining one of the plurality of tangs of the dovetail, the machining assembly connected to the body.

2. The tool of clause 1, wherein the machining assembly comprises a grinder and an abrasive, the abrasive positionable in contact with the one of the plurality of tangs.

3. The tool of any preceding clause, wherein the machining assembly further comprises a bracket connecting the grinder to the body, the bracket adjustable relative to the body.

4. The tool of any preceding clause, wherein the bracket comprises a key member and the body defines a corresponding keyway, the key member slidable within the keyway such that the bracket is adjustable along a z-axis of the body.

5. The tool of any preceding clause, wherein the machining assembly further comprises a locking assembly configured to selectively restrict adjustment of the bracket relative to the main body.

6. The tool of any preceding clause, wherein each of the plurality of mount brackets has a curvilinear surface positionable in contact with the crush surface of the dovetail.

7. The tool of any preceding clause, wherein the engagement member comprises a roller, a bracket connecting the engagement member to the body, and a screw connected to the bracket and roller and adjustable relative to the body.

8. The tool of any preceding clause, wherein the engagement member further comprises a spring.

9. The tool of any preceding clause, wherein the engagement member is a plurality of engagement members.

10. The tool of any preceding clause, wherein each of the engagement member and the plurality of mount brackets comprises a key member and the body defines at least one corresponding keyway, each of the plurality of key members slidable within the at least one keyway such that each of the engagement member and the plurality of mount brackets is adjustable along one of an x-axis and a y-axis of the body.

11. The tool of any preceding clause, wherein each of the plurality of mount brackets further comprises a locking assembly configured to selectively restrict adjustment of the associated one of the plurality of mount brackets relative to the main body.

12. The tool of any preceding clause, further comprising a handle connected to the body.

13. A method for machining a dovetail, the dovetail comprising a plurality of tangs, the method comprising:

mounting a plurality of mount brackets in forcible contact with a crush surface of the dovetail;

positioning a machining assembly in contact with one of the plurality of tangs of the dovetail; and

moving the machining assembly along the dovetail while generally maintaining the forcible contact between the plurality of mount brackets and the crush surfaces.

14. The method of any preceding clause, wherein the mounting step comprises:

positioning each of the plurality of mount brackets in contact with the crush surface of the dovetail; and

forcing each of the plurality of mount brackets against the crush surface of the dovetail.

15. The method of any preceding clause, further comprising adjusting each of the plurality of mount brackets along one of an x-axis and a y-axis.

16. The method of any preceding clause, further comprising selectively restricting adjustment of each of the plurality of mount brackets along the one of the x-axis and the y-axis.

17. The method of any preceding clause, wherein the positioning step comprises adjusting the machining assembly along a z-axis.

18. The method of any preceding clause, further comprising selectively restricting adjustment of the machining assembly along the z-axis.

19. The method of any preceding clause, further comprising:

dismounting the plurality of mount brackets from the crush surface of the dovetail;

opposedly remounting the plurality of mount brackets in forcible contact with the crush surface of the dovetail;

positioning the machining assembly in contact with an opposite one of the plurality of tangs of

the dovetail; and

moving the machining assembly along the dovetail while generally maintaining the forcible contact between the plurality of mount brackets and the mount surface.

20. A tool for machining a dovetail, the dovetail comprising a plurality of tangs, the tool comprising:

a body;

a plurality of mount brackets, each of the plurality of mount brackets connected to the body and positionable in contact with a crush surface of the dovetail;

means connected to the body for forcibly engaging each of the plurality of mount brackets with the crush surface; and

means connected to the body for machining one of the plurality of tangs of the dovetail.

Claims

1. A tool (10) for machining a dovetail (12), the dovetail (12) comprising a plurality of tangs (15), the tool (10) comprising:

a body (20);
a plurality of mount brackets (30), each of the plurality of mount brackets (30) connected to the body (20) and positionable in contact with a crush surface (32) of the dovetail (12);
an engagement member (60) connected to the body (20) and adjustable such that contact by the engagement member (60) with the dovetail forces each of the plurality of mount brackets (30) against the associated crush surface (32);
a machining assembly (80) for machining one of the plurality of tangs (15) of the dovetail (12), the machining assembly (80) connected to the body (20).

2. The tool of claim 1, wherein the machining assembly (80) comprises a grinder (82) and an abrasive (84), the abrasive (84) positionable in contact with the one of the plurality of tangs (15).

3. The tool of claim 2, wherein the machining assembly (80) further comprises a bracket (86) connecting the grinder to the body (20), the bracket (86) adjustable relative to the body (20).

4. The tool of claim 3 or claim 4, wherein the bracket (86) comprises a key member (40) and the body (20) defines a corresponding keyway (42), the key member (40) slidable within the keyway (42) such that the bracket (86) is adjustable along a z-axis of the body (20).

5. The tool of any preceding claim, wherein the machining assembly (80) further comprises a locking assembly (50) configured to selectively restrict adjustment of the bracket (86) relative to the body (20).

6. The tool of any preceding claim, wherein each of the plurality of mount brackets (30) has a curvilinear surface positionable in contact with the crush surface (32) of the dovetail (12).

7. The tool of any preceding claim, wherein the engagement member (60) comprises a roller (62), a bracket (64) connecting the engagement member to the body, and a screw (66) connected to the bracket and roller and adjustable relative to the body, wherein, preferably, the engagement member further comprises a spring (69).

8. The tool of any preceding claim, wherein the engagement member (60) is a plurality of engagement members.

9. The tool of any preceding claim, wherein each of the engagement member (60) and the plurality of mount brackets (30) comprises a key member (40) and the body (20) defines at least one corresponding keyway (42), each of the plurality of key members slidable within the at least one keyway such that each of the engagement member and the plurality of mount brackets (30) is adjustable along one of an x-axis and a y-axis of the body (20).

11. The tool of claim 10, wherein each of the plurality of mount brackets (30) further comprises a locking assembly (50) configured to selectively restrict adjustment of the associated one of the plurality of mount brackets (30) relative to the body (20).

10. A method for machining a dovetail (12), the dovetail (12) comprising a plurality of tangs (15), the method comprising:

mounting a plurality of mount brackets (30) in forcible contact with a crush surface (32) of the dovetail (12);
positioning a machining assembly (80) in contact with one of the plurality of tangs (15) of the dovetail (12); and
moving the machining assembly (80) along the dovetail (12) while generally maintaining the forcible contact between the plurality of mount brackets (20) and the crush surfaces (32).

11. The method of claim 10, wherein the mounting step comprises:

positioning each of the plurality of mount brackets (20) in contact with the crush surface (32) of the dovetail (12); and
forcing each of the plurality of mount brackets (20) against the crush surface (32) of the dovetail (12).

12. The method of claim 10 or claim 11, further comprising adjusting each of the plurality of mount brackets (20) along one of an x-axis and a y-axis.

13. The method of claim 12, further comprising selectively restricting adjustment of each of the plurality of mount brackets (20) along the one of the x-axis and the y-axis.

14. The method of any one of claims 10 to 13, wherein the positioning step comprises adjusting the machining assembly (80) along a z-axis, and, preferably, selectively restricting adjustment of the machining assembly (80) along the z-axis.

15. The method of any one of claims 10 to 14, further comprising:

dismounting the plurality of mount brackets (20) from the crush surface (32) of the dovetail (12);
opposedly remounting the plurality of mount brackets (20) in forcible contact with the crush surface (32) of the dovetail (12);
positioning the machining assembly (80) in contact with an opposite one of the plurality of tangs (15) of the dovetail (12); and
moving the machining assembly (80) along the dovetail (12) while generally maintaining the forcible contact between the plurality of mount brackets (20) and the mount surface.

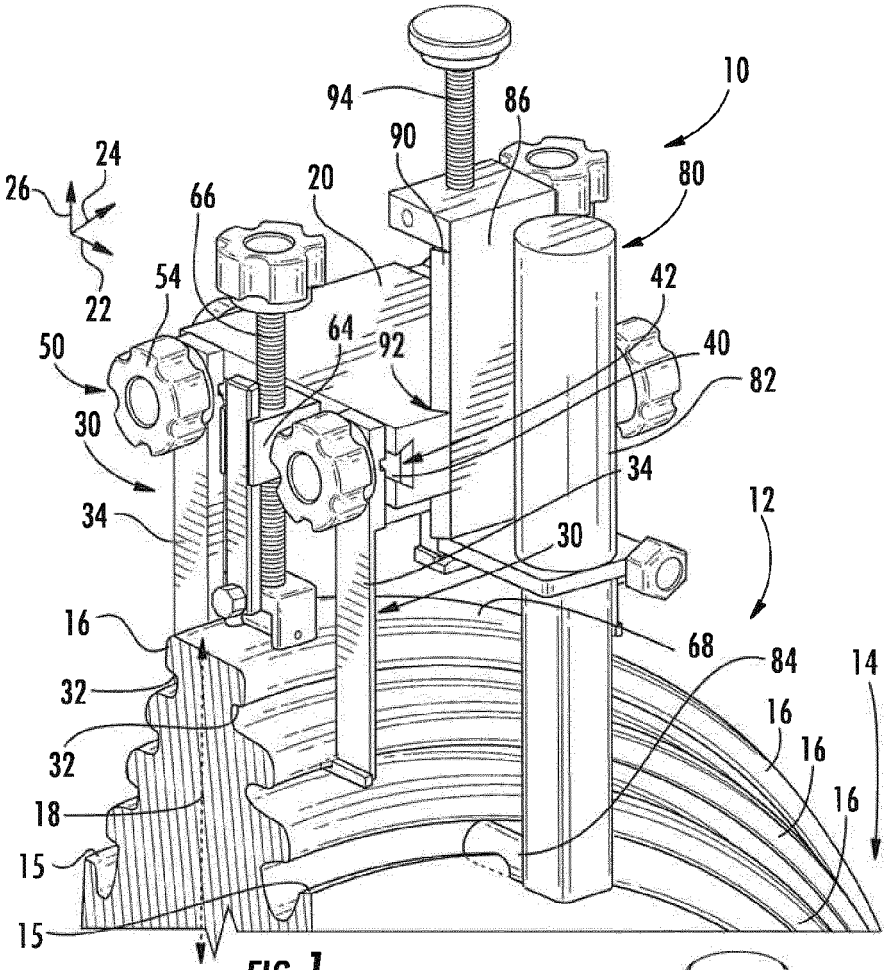
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FIG. 1

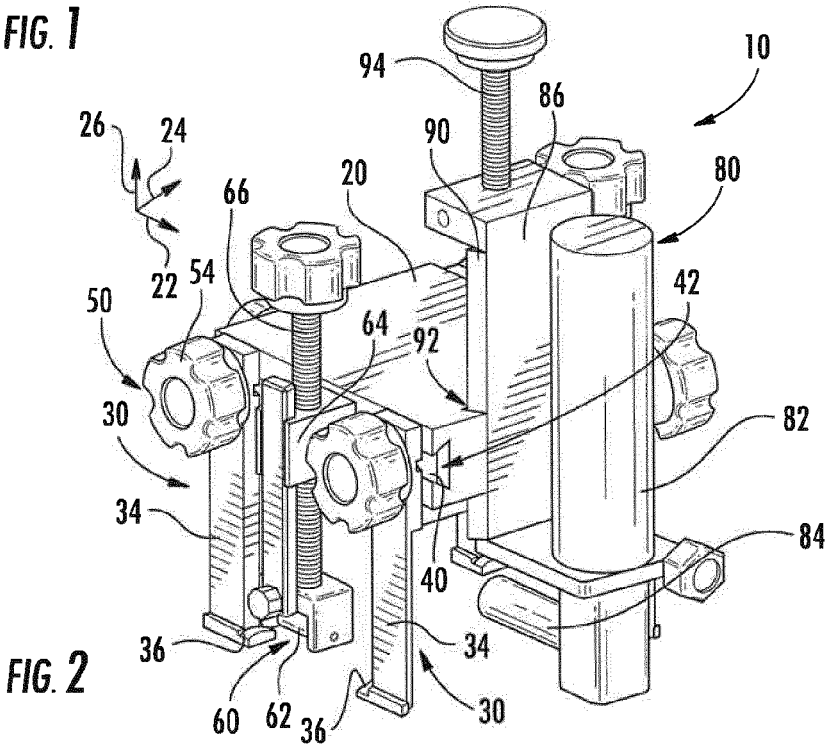
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FIG. 2

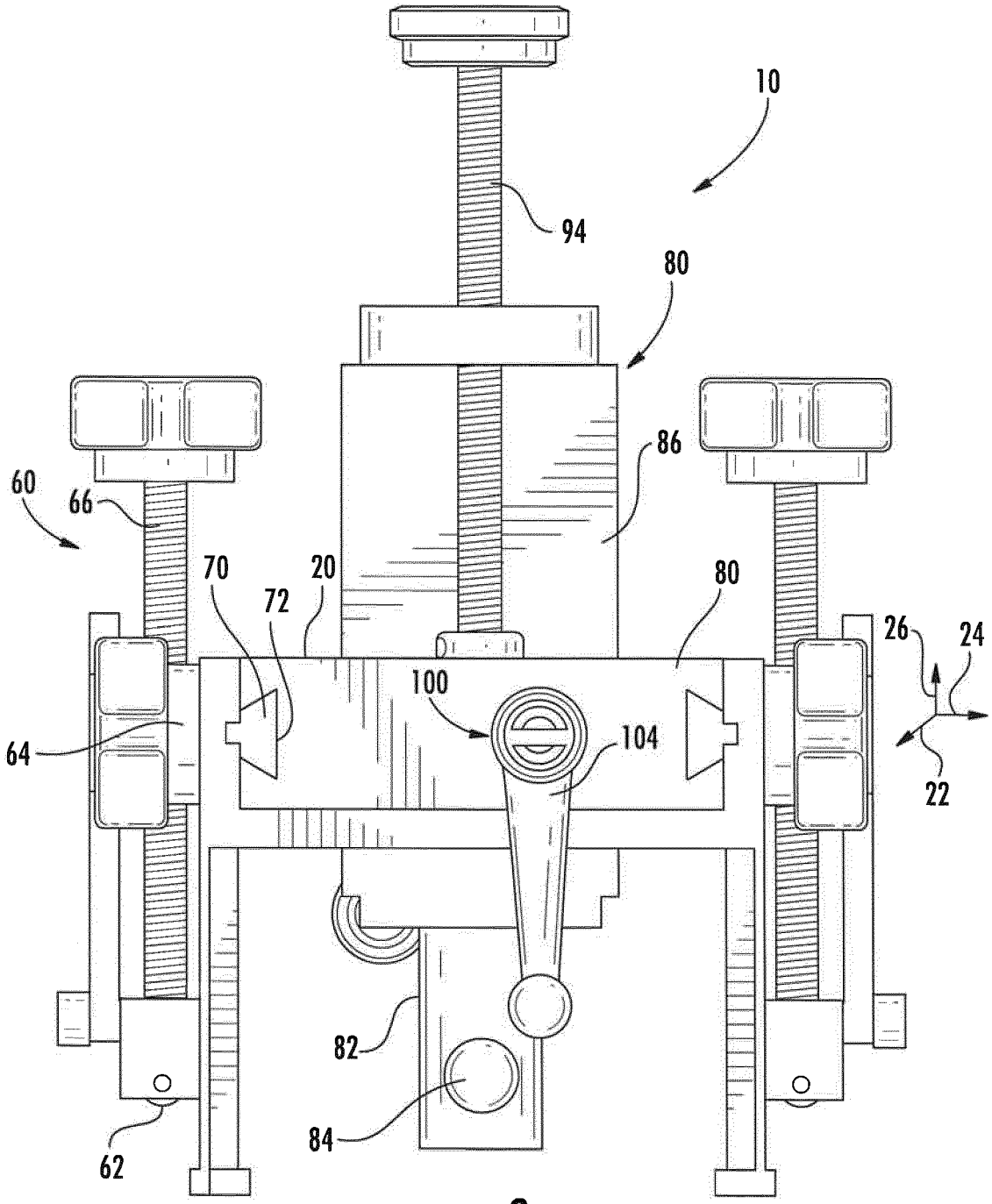

FIG. 3

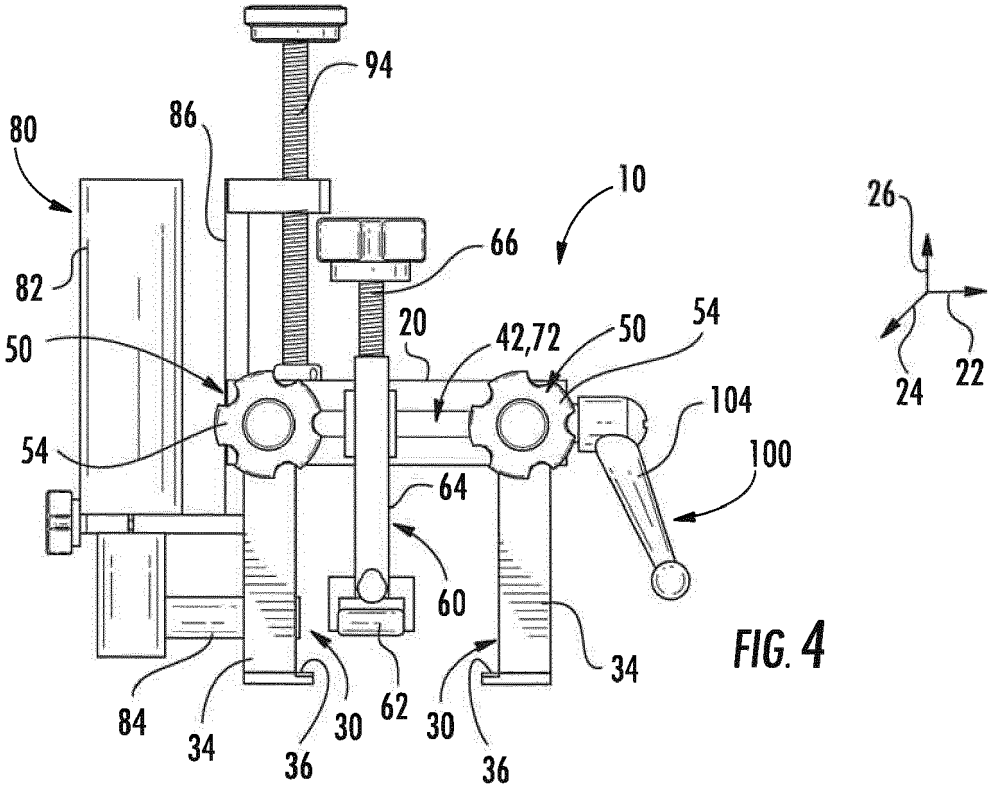
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FIG. 4

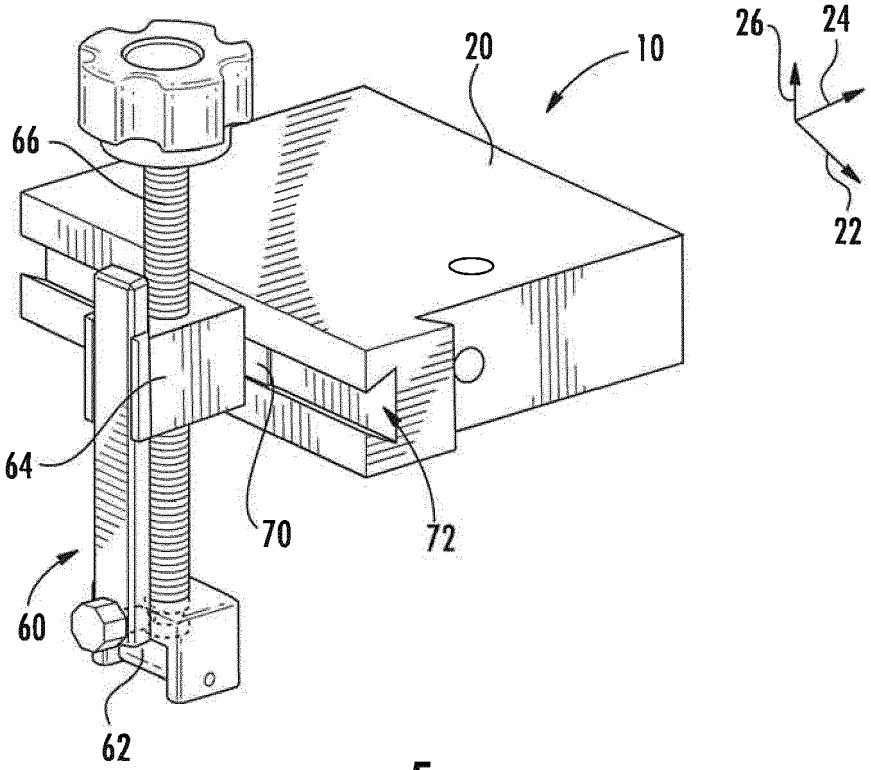
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FIG. 5

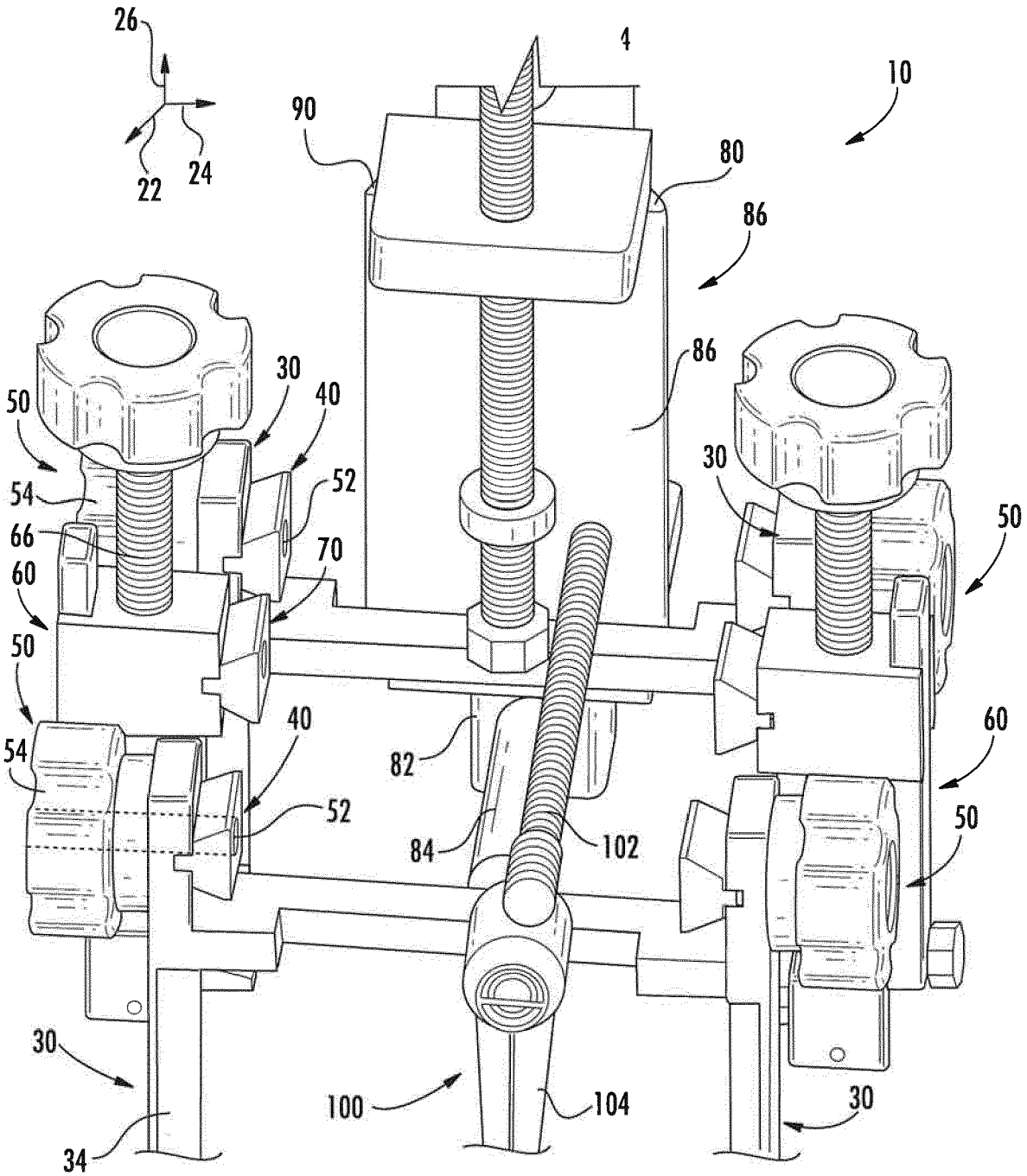
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FIG. 6

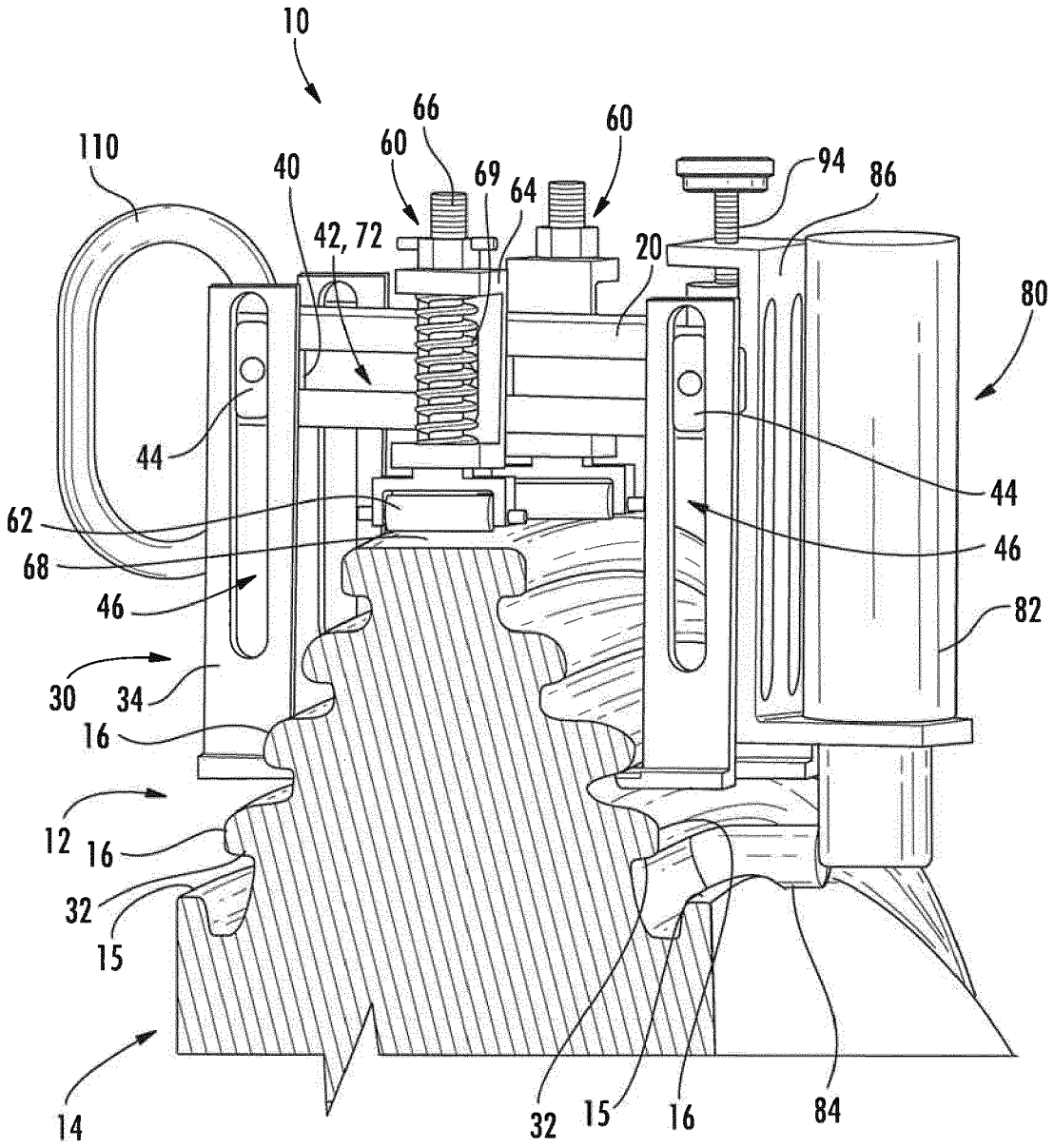
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FIG. 7

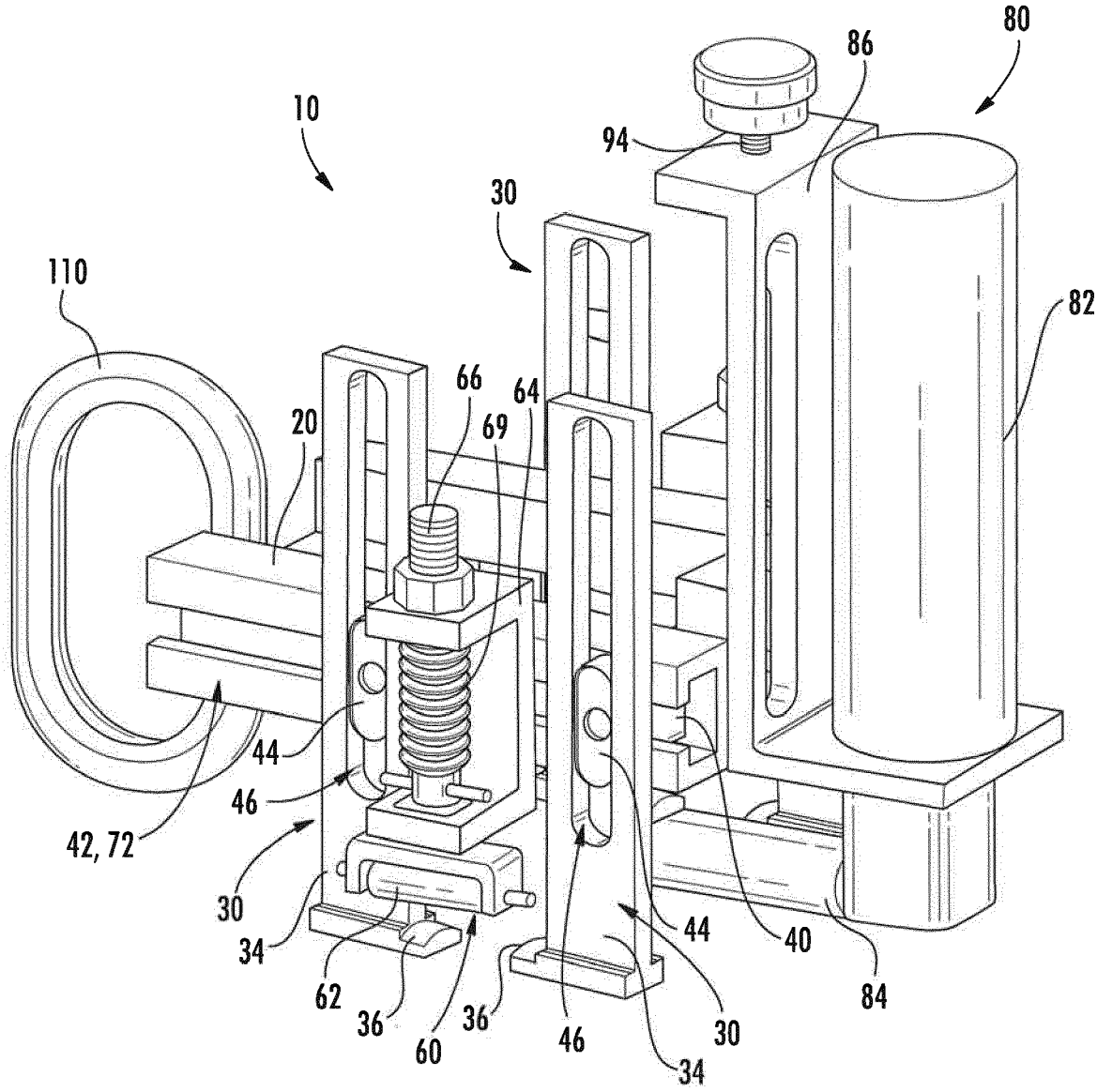
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FIG. 8

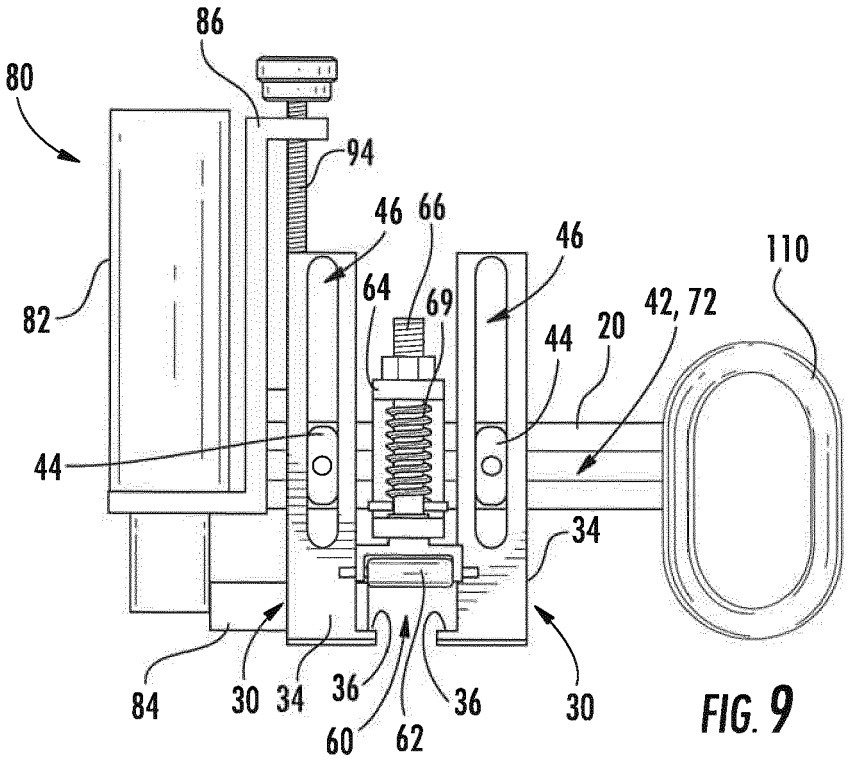
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FIG. 9

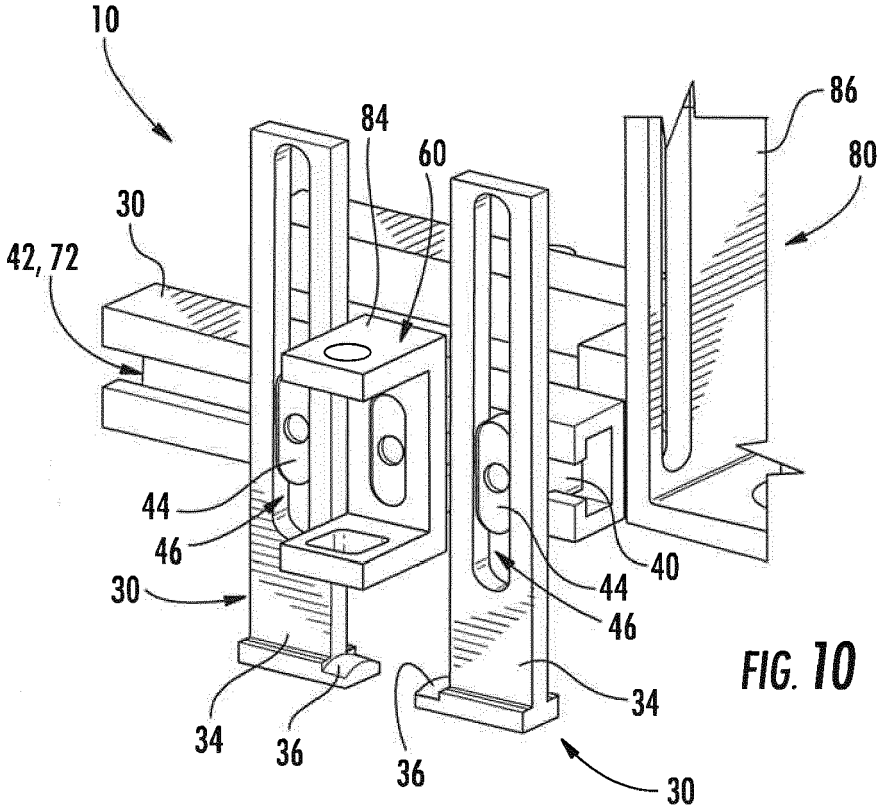
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FIG. 10