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Adjustable Diameter Step Pin Apparatus

Abstract

Embodiments of the present disclosure provide an adjustable diameter step pin apparatus. The adjustable diameter step pin apparatus includes a body element and a head element having a thumb screw portion and a threaded portion. The body element includes a plurality of threaded finish structures. The body element may be configured to receive a collet along a longitudinal slot of the adjustable diameter step pin apparatus. The thumb screw portion may be configured to rotate to alter the collet and the threaded portion may be configured to engage with the plurality of threaded finish structures when assembled with the body element. In an embodiment, the head element may be rotatable to engage the threaded portion of the head element into the plurality of threaded finish structures to alter the collet while keeping the body element sturdy.

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Background/Summary

TECHNICAL FIELD

[0001] This disclosure generally relates to step pins and, more specifically, to an adjustable diameter step pin apparatus.

BACKGROUND

[0002] Existing apparatuses and systems face many challenges in performing proper tooling methodologies. For example, current tooling methodologies use precision ground step pins that may face challenges in locating parts and assemblies for performing tooling of jigs and fixates/fixtures. One of the traditional assemblies includes an outside procurement (OP) vendor to produce parts that allow the vendor to manufacture the parts with loose tolerances. When designing a match drill fixture for these parts, precision step pins may need to be used to ensure the proper alignment of these parts to the tooling parts. The use of precision step pins ensures positional and angular engineering requirements to meet the boring of these tooling parts. Boring of the tooling parts involves challenges as they are fracture-critical assemblies.

[0003] The incoming boring parts in the existing assemblies include a hole location tolerance of +/−0.010″ (0.020″ total allowable per hole). The step pin (or pins) fits into the fixture using large step fits, and the size of the step pin does not change, as the fixture is the final size. The step pin then fits into the bore part (with the application of a small step fit).

SUMMARY OF PARTICULAR EMBODIMENTS

[0004] According to some embodiments, an adjustable diameter step pin may be disclosed. The adjustable diameter step pin includes a solid body, a thumb screw, a double angle (DA) collet, and a gauge pin set. In an embodiment, to use an adjustable diameter step pin, a collet of the desired size is loaded into the body; for example, a 0.375″ (⅜) collet may collapse accurately up to 8% (0.345″), providing an increment range of 0.345″ to 0.375″ for this collet size. In an embodiment, the collet size may include a feature for stepping up or down to get the desired size This stepping up or down feature enables the use of any gauge pin of any diameter size. For example, the gauge pin may be of any size precision step pin desired and may be inserted instantly into the collet size. Using the adjustable diameter step pin allows a user to select a diameter of 0.001″ or 0.0005″ increments. Accordingly, one tool may be used with different sizes and with precision accuracy instead of machining many precision ground pins.

[0005] According to some embodiments, an adjustable diameter step pin apparatus is disclosed. The adjustable diameter step pin apparatus includes a body element, and a head element having a thumb screw portion and a threaded portion. The body element includes a plurality of threaded finish structures. The body element may be configured to receive a collet along a longitudinal slot of the adjustable diameter step pin apparatus. The thumb screw portion may be configured to rotate to alter the collet and the threaded portion may be configured to engage with the plurality of threaded finish structures when assembled with the body element. In an embodiment, the head element may be rotatable to engage the threaded portion of the head element into the plurality of threaded finish structures to alter the collet while keeping the body element sturdy.

[0006] According to some embodiments, an adjustable diameter step pin system is disclosed. The adjustable diameter step pin system includes a collet, a body element, and a head element. The collet includes a collet inside diameter (ID). The body element includes a knob and a precision ground shaft element. The knob of the body element includes a plurality of threaded finish structures, and the precision ground shaft element may be attached to the knob. The knob and the precision ground shaft element define a longitudinal slot of the adjustable diameter step pin system. The head element includes a thumb screw portion, a threaded portion, and a collet chamber. The thumb screw portion may be configured to rotate to alter or compress a predetermined size of the collet about the collet inside diameter. The threaded portion may be configured to engage with the plurality of threaded finish structures when assembled with the body element. The collet chamber may be configured to couple to the collet. The collet coupled to the collet chamber may be received

by the body element along the longitudinal slot. The collet inside diameter of the collet may be altered/compressed by rotating the thumb screw portion of the head element to engage the threaded portion of the head element into the plurality of threaded finish structures while keeping the body element sturdy.

[0007] According to some embodiments, a method of assembling an adjustable diameter step pin apparatus is disclosed. The method includes coupling a collet to the adjustable diameter step pin apparatus. The adjustable diameter step pin apparatus includes a body element having a plurality of threaded finish structures. The body element may be configured to receive the collet along a longitudinal slot. The adjustable diameter step pin apparatus includes a head element that includes a thumb screw portion configured to rotate to alter or compress the collet and a threaded portion configured to engage with the plurality of threaded finish structures when assembled with the body element. The method further includes rotating the thumb screw portion of the head element to engage the threaded portion of the head element into the plurality of threaded finish structures while keeping the body element sturdy.

[0008] According to some embodiments, the method may be performed using components of an adjustable diameter step pin system.

[0009] Technical advantages of certain embodiments include providing the collet size with a feature for stepping up or down to get the desired size. This stepping-up or down feature enables the use of any gauge pin of any diameter size. For example, the gauge pin may be of any size precision step pin desired and may be inserted instantly into the collet size. Using the adjustable diameter step pin allows a user to select a diameter of 0.001″ or 0.0005″ increments. Accordingly, one tool may be used with different sizes and with precision accuracy instead of machining many precision ground pins. The present disclosure allows for many options of using the step pins to fit any size of the gauge set sturdily. The manufacturing of the precision grind step pins takes a considerable amount of time and material. With this reusable tool, any suitable number of sizes may be adjusted immediately without any manufacturing downtime.

[0010] Other technical advantages of certain embodiments include Adjustable Diameter Pin (ADP) that provide a quick remedy solution to shortcomings of the traditional tooling and boring methods at a lower cost. For example, a manufacturing scenario may be required to create the ADP. To condition a potential variation of the tooling parts and fix loose Geometrical Dimensioning and Tolerancing (GD&T), over eighty (80) precision ground step pins may need to be made to bore four holes. The ADP may be used to reduce the amount of precision ground step pins to complete the boring task. One or more ways may be applied to match drill components with a fixture properly, and the ways may include a) locating, indexing, and securing fixtures to a part (by applying a method that uses precision ground step pins, performing large step fits snuggly in tooling bore, and securing small step fits snuggly into the undersized bore in part), and b) forming boreholes one at a time, which involves pinning a fixture to a part after a final diameter is achieved. These ways of matching drill components achieve an alignment between the fixture and tool. To make a match drill fixture, a machined hole pattern needs to be established in the fixture that determines the final location of the holes to be transferred into the part. In some examples, a minimum of two (2) pins may be used to (a) locate a part or assembly to tooling jig or fixture to ensure alignment or position of the boring parts/entities with each other, and (b) prevent movement between the bore parts/entities during the manufacturing process. This keeps the fixture and bore part completely aligned and “locked” during boring to prevent the fixture from moving. Typically, a precision ground step is ground 0.001″ to 0.0005″ undersized for the hole it is pinning into. The hole location tolerance and necessary pin-to-part tolerance contribute to the need for many precision ground pins and ADP provides tolerance of the tooling parts.

[0011] Other technical advantages will be readily apparent to one skilled in the art from the following figures, descriptions, and claims. Moreover, while specific advantages have been

enumerated above, various embodiments may include all, some, or none of the enumerated advantages.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** illustrates different parts of an adjustable diameter step pin apparatus, according to certain embodiments.

[0013] FIG. **2***a* illustrates an assembled view of an adjustable diameter step pin apparatus, according to certain embodiments.

[0014] FIG. **2***b* illustrates an isometric view of the assembled adjustable diameter step pin apparatus, according to certain embodiments.

[0015] FIG. **2***c* illustrates a transparent view of an adjustable diameter step pin apparatus, according to certain embodiments.

[0016] FIG. **3** illustrates a sectional view of an adjustable diameter step pin apparatus, according to certain embodiments.

[0017] FIG. **4** illustrates a side view of an assembly of an adjustable diameter step pin apparatus, according to certain embodiments.

[0018] FIG. **5** illustrates a body element (body view) of an adjustable diameter step pin apparatus, according to certain embodiments.

[0019] FIG. **6** illustrates a head element (head view) of an adjustable diameter step pin apparatus, according to certain embodiments.

[0020] FIG. **7** illustrates assembled views of different adjustable diameter step pin according to certain embodiments.

[0021] FIG. **8** illustrates different gauge pin sets showing the sizing capability of an adjustable diameter step pin apparatus, according to certain embodiments.

[0022] FIG. **9** illustrates a flowchart for assembling various components and parts to form an adjustable diameter step pin apparatus and system, according to certain embodiments.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[0023] Existing apparatuses and systems face many difficult challenges in providing proper tooling in a quick time frame to support adjustable diameter pins (ADP). One of the traditional assembly approaches includes using an outside procurement (OP) vendor to produce parts that allow the vendor to manufacture the parts with loose tolerances. When designing a match drill fixture for these parts, precision step pins may need to be used to ensure proper boring of these parts as they are fracture-critical assemblies. Because of loose geometrical dimensioning and tolerance (GD&T), over eighty (80) precision ground step pins may need to be made to bore four holes. To reduce the amount of precision ground step pins needed to complete the boring task, an Adjust Diameter Step Pin may be needed. One or more ways may be applied to match drill components with a fixture properly. The ways may include a) locating, indexing, and securing fixtures to a part (by applying a method that uses precision ground step pins, performing large step fits snuggly in tooling bore, and securing small step fits snuggly into the undersized bore in part), and b) forming boreholes one at a time that involves pinning a fixture to a part after a final diameter is achieved. These ways of matching drill components achieve an alignment between the fixture and tool. To make a match drill fixture, a machined hole pattern needs to be established in the fixture that determines the final location of the holes to be transferred into the part. The incoming parts in the existing assemblies include a hole location tolerance of +/−0.010″ (0.020″ total allowable per hole). The step pin fits (or pins) into the fixture (using the large step fits), and the size of the step pin does not change, as the fixture is the final size, and then fits (or pins) into the part (with the application of small step). This keeps the fixture and part completely aligned and “locked” during boring to prevent the

fixture from moving. Typically, a precision ground step is ground 0.001″ to 0.0005″ undersized for the hole it is pinning into. The hole location tolerance and necessary pin-to-part tolerance contribute to the need for many precision ground pins.

[0024] To address these and other problems, the teachings of the disclosure provide collapsing a collet of any collet size accurately. For example, a collet of any desired size may be loaded into the body element, and the collet of size 0.375″ (⅜) may collapse accurately up to 8% (0.345″), achieving an increment range of 0.345″-0.375″ for this collet size. In an embodiment, the collet size may include a feature for stepping up or down to get the desired size. This stepping-up or down feature enables the use of any gauge pin of any diameter size. For example, the gauge pin may be of any size precision step pin desired and may be inserted instantly into the collet size. Using the adjustable diameter step pin allows a user to select a diameter of 0.001″ or 0.0005″ increments. Accordingly, one tool may be used with different sizes and with precision accuracy instead of machining many precision ground pins. The diameter increments allow one tool to have numerous sizes with precision accuracy instead of machining eighty (80) precision ground pins to support the effort. The present disclosure allows for many options of using the step pins to fit any size of the gauge set with instant results of sturdiness. The manufacturing of the precision grind step pins takes a considerable amount of time and material. With this reusable tool, practically infinite sizes with high precision accuracy can be adjusted on the spot without waiting for more shop/manufacturing time to produce the end-line product.

[0025] The following examples of certain embodiments are given to facilitate a better understanding of the present disclosure. In no way should the following examples be read to limit or define the scope of the disclosure. Embodiments of the present disclosure and its advantages may be best understood by referring to the included FIGURES, where like numbers are used to indicate like and corresponding parts.

[0026] FIG. **1** illustrates different parts of an adjustable diameter step pin apparatus **100**, according to certain embodiments. In an embodiment, different components, elements, and parts of the adjustable diameter step pin apparatus **100** may be made of any metal, for example, aluminum, steel, or any other metallic component that may be lightweight. The quality of the metal may be 4140 or 4340 or any other suitable quality. The adjustable diameter step pin apparatus includes a collet **102**, a body element **110**, and a head element **120**.

[0027] In an embodiment, the collet **102** may include a double-angle (DA) collet. For example, a DA **200** collet (DA **200** series collet) may be used. In some embodiments, DA collets **102** may have the same outer mold line (OML) dimensions, and only the inside diameter changes. For example, DA **200** of size 0.375 may be a 3.8″ ID and a DA **200** of size 0.250 may be a 1.4″ ID. The collets may be interchangeable within the ADP that provides a single tool ranging from 0.001″ to 0.4375″ from COTS DA **200** collets. In an embodiment, the collet of size 0.375″ (⅜) may be utilized to collapse accurately by 8% (down to 0.345″), achieving an increment range of “0.345”-0.375″ for this collet size. The collet size may be stepped up or down to get any desired size to receive and couple any size and diameter of gauge set. In an embodiment, the collet **102** may include a plurality of threaded tapering sides **106**. A top portion **104** of the collet **102** defines a hole and enables the collet **102** to receive a gauge pin set. When the collet **102** is collapsed (into any desired size) by rotating the head element **120** into a plurality of threaded finish structures (**304** of **110**) of the body element **110**, the collet **102** may be configured to sturdily couple the gauge pin set of any size and any structure. The collet **102** includes a collet base **108** that can be placed in the head element **120**.

[0028] In an embodiment, the body element **110** includes a knob portion **118** and an elongated portion **116**. In an embodiment, the knob portion **118** may include knurled finish structure outside diameter (O.D.). The interior diameter portion of the knob portion **118** includes a plurality of threaded finish structures (**304** in FIG. **3**). The plurality of threaded finish structures (**304**) may be configured to receive and couple with a threaded portion (**126**) of the head element **120** to tighten into or loosen from the body element **110** to achieve collapsing the collet size of the collet **102** or

expanding the collet size of the collet **102**. The knob portion **118** may be joined with the elongated portion **116** of the body element **110**. This helps in aligning the ADP **200** to the tool jig or fixture. Additionally the gauge pin may locate to the bore part or assembly. The three elements together, that is, ADP, tool, and bore part, encompass the use and alignment of the ADP. In an embodiment, both interior and exterior diameters of the elongated portion **116** may be polished finish structures. The interior diameter of the elongated portion **116** may be configured to receive and couple with the collet **102** when the collet **102** may be inserted into a longitudinal slot **112** via the knob portion **118**. The longitudinal slot **112** may be formed or created during the manufacturing process and may be uniform throughout the interior portion of the body element **110**. In an embodiment, the collet **102** may be configured to be placed on the interior portion of the elongated portion **116** when the threaded portion (**126**) is coupled with the plurality of threaded finish structures (**304**) of the body element **110**. In some embodiments, a top part **114** of the elongated portion **116** may be configured in a circular fashion to match the collet **102**. The circular portion of the top part **114** may be configured with any radius dimension at the circumference as shown. For example, FIG. **1** shows a part of the radius of the top part **114** to become part of the longitudinal slot **112**. In some embodiments, the radius measurement of the top part **114** may be configured differently for different kinds of adjustable diameter step pin apparatuses. For example, FIG. **7** shows a top parts (**702**, **704**) for a different kind of adjustable diameter step pin apparatus (**300**-A in FIG. **7**) with a different radius portion at the top parts **702**, **704** that creates a different dimension of the longitudinal slot.

[0029] In an embodiment, the head element **120** may be a thumb screw. The head element **120** includes a collet chamber **122**, a hollow center portion **124**, a threaded portion **126** at the exterior diameter of the head element **120**, and a thumb screw portion (head knob) **128**. The collet chamber **122** may be any polished or knurled surface and configured to couple to the collet base **108** of the collet **102**. The hollow center portion **124** may be concentric to the longitudinal slot **112** to form a slotted path with the body element **110**, for example, the slotted path may be throughout the interiors of both head element **120** and the body element **110** including the collet **102** having an open hole (in its interior as well) beginning from a base part of the head element **120** toward the top part **114** of the body element **110**. The threaded portion **126** may be formed at the exterior part of the head element **120**, as shown in FIG. **1**. The threaded portion **126** may be configured to couple or engage with the plurality of threaded finish structures (**304**) when assembled or coupled to the body element **110**. The thumb screw portion (head knob) **128** may be configured to be held by a user to rotate into or out from the plurality of threaded finish structures (**304**) configured on the interior portion of the knob portion **118** of the body element **110**. For example, a collapsing act includes the user holding the thumb screw portion **128** and rotating the thumb screw portion **128** into the plurality of threaded finish structures (**304**) to collapse the collet size. Another example is an expansion act that may be achieved by rotating the thumb screw portion **128** out of the plurality of threaded finish structures (**304**) (in reverse rotation direction compared to collapsing act), the collet size can be expanded. In this way, the thumb screw portion **128** of the head element **120** may be rotatable to engage the threaded portion **126** of the head element **120** into or out of the plurality of threaded finish structures (**304**) to alter or compress the collet by its dimension and diameter size. In an embodiment, the inside diameters of both the head element **120** and body element **110** may be “threaded” on the mating perspective male and female part ends. Both pieces may be configured with “knurled” outside diameter surface finishes to provide grip to the user during set up “tightening” and “loosing” of the ADP assembly. Both the collapsing act and expansion act may be achieved by rotating the thumb screw portion **128** while holding/keeping the body element **110** sturdy and fixed.

[0030] FIG. **2***a* illustrates an assembled view **200** of an adjustable diameter step pin apparatus, according to certain embodiments. As shown in FIG. **2***a*, as a first step of assembling, the collet base **108** may be placed or coupled to the collet chamber **122** of the head element **120**. The

assembled portion **202** of the collet **102** with the head element **120** is depicted as **202**. The assembled portions **202** may be inserted into the body element **110** via the longitudinal slot **112** at the base part **204** of the body element **110**. After inserting the assembled portion **202** into the longitudinal slot **112**, the collet **102** may be coupled to the interior portion of the elongated portion **116** and the threaded portion **126** may couple with the plurality of threaded finish structures (**304**) on the interior portion of the knob portion **118**.

[0031] FIG. **2***b* illustrates an isometric view **206** of assembled adjustable diameter step pin apparatus **100** or assembly **100**, according to certain embodiments. The isometric view **206** includes the assembling of the head element **120** coupled with the collet **102** and the body element **110** having collet base **108** placed on the collet chamber **122** and extending the insertion of the collet **102** into the elongated portion **116** of the body element **110**.

[0032] FIG. **2***c* illustrates a transparent view **208** of the adjustable diameter step pin apparatus **100** after assembling, according to certain embodiments. After assembling the head element **120** coupled with the collet **102** and the body element **110** having collet base **108** placed on the collet chamber **122** and extending the insertion of the collet **102** into the elongated portion **116** of the body element **110**, the slotted path **302** (in FIG. **3**) may be formed by the hollow center portion **124** of the head element **120** that may be concentric with the longitudinal slot **112** of the body element **110**.

[0033] FIG. **3** illustrates a sectional view **300** of the adjustable diameter step pin apparatus **100** after assembling, according to certain embodiments. The slotted path **302** is formed by the hollow center portion **124** of the head element **120** and may be concentric with the longitudinal slot **112** of the body element **110**. The sectional view **300** also shows the engaging or coupling of the threaded portion **126** of the head element **120** with the plurality of knurled finish structures **304** of the body element **110**.

[0034] FIG. **4** illustrates a side view **300** of an assembly of the adjustable diameter step pin apparatus **100** after assembling, according to certain embodiments. The side view **300** shows engaging or coupling of the threaded portion **126** of the head element **120** with the plurality of threaded finish structures **304** of the body element **110**. The threaded portion **126** on the exterior part of the head element **120**. The plurality of threaded finish structures **304** may be configured or crafted in the interior portion of the knob portion **118**, which may be the knurled structure on the outside of the body element **110**. The slotted path **302** is also shown in FIG. **4**. By rotating (for the collapsing act) the thumb screw portion **128**, the threaded portion **126** may be screwed/tightened into the plurality of threaded finish structures **304** that collapse the collet size of the collet **102** to hold or fit any size of gauge pin set securely.

[0035] FIG. **5** illustrates a body element **110** (body view) of the adjustable diameter step pin apparatus **100**, according to certain embodiments. The body element **110** holds the collet and gauge pin to keep the assembly **300** concentric.

[0036] FIG. **6** illustrates a head element **120** (head view) of the adjustable diameter step pin apparatus **100**, according to certain embodiments. The head element **120** compresses the collet, gripping the gauge pin.

[0037] FIG. **7** illustrates assembled views of different adjustable diameter step pin systems (**300** and **300**-A), according to certain embodiments. ADP system **300** has a large inside diameter **702** and ADP system **300**A has a smaller inside diameter **704**. The larger inside diameter **702** allows a larger gauge pin and larger associated DA **200** collet inside diameter to be used.

[0038] FIG. **8** illustrates different gauge pin sets showing the sizing capability of the adjustable diameter step pin apparatus/systems that may include any of **300** and **300**-A, according to certain embodiments. In an embodiment, both systems **300** and **300**-A may be configured to fit, or couple with any gauge pin sets that enable both systems **300** and **300**-A to be versatile for any gauge pin size **802**, as shown in FIG. **8**.

[0039] FIG. **9** illustrates a flowchart or method **900** for assembling various components and parts to

form adjustable diameter step pin apparatus and system (**300** or **300**-A), according to certain embodiments. For example, the method **900** may be described for apparatus **300**. The method **900** may be applied to form the apparatus **300**-A.

[0040] At step **902**, the method includes coupling the collet **102** to the adjustable diameter step pin apparatus **300**. The adjustable diameter step pin apparatus **300** includes the body element **110**, which includes the plurality of threaded finish structures **304**. In an embodiment, the plurality of threaded finish structures **304** may be formed in the interior portion of the body element **110**. The body element **110** may be configured to receive the collet **102** along the longitudinal slot **112** (for example, concentric bore). The adjustable diameter step pin apparatus **300** includes the head element **120**, including the thumb screw portion **128** that may be configured to rotate to alter the collet **102**, and the threaded portion **126** configured to engage with the plurality of threaded finish structures **304** when assembled with the body element **110**.

[0041] In some embodiments, the head element **120** may be a thumb screw and includes the collet chamber **122** configured to couple to the collet **102**. The method further includes receiving the collet **102** coupled to the collet chamber **122** by the body element **110** along the longitudinal slot **112** (for example, concentric bore). In an embodiment, the collet **102** may be configured to receive a gauge pin set after assembling and forming the apparatus **300**.

[0042] At step **904**, the method includes rotating the thumb screw portion **128** of the head element **120** to engage the threaded portion **126** of the head element **120** into the plurality of threaded finish structures **304** while keeping the body element **110** sturdy. In an embodiment, the head element **120** includes the hollow center portion **124** that may be concentric to the longitudinal slot **112** to form the slotted path **302** with the body element **110**. This enables the apparatus **300** to fit or couple with any gauge pin sets of any size **802** as shown in FIG. **8**.

[0043] Herein, “or” is inclusive and not exclusive, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, “A or B” means “A, B, or both,” unless expressly indicated otherwise or indicated otherwise by context. Moreover, “and” is both joint and several, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, “A and B” means “A and B, jointly or severally,” unless expressly indicated otherwise or indicated otherwise by context.

[0044] The scope of this disclosure encompasses all changes, substitutions, variations, alterations, and modifications to the example embodiments described or illustrated herein that a person having ordinary skill in the art would comprehend. The scope of this disclosure is not limited to the example embodiments described or illustrated herein. Moreover, although this disclosure describes and illustrates respective embodiments herein as including particular components, elements, functions, operations, or steps, any of these embodiments may include any combination or permutation of any of the components, elements, functions, operations, or steps described or illustrated anywhere herein that a person having ordinary skill in the art would comprehend. Furthermore, reference in the appended claims to an apparatus or system or a component of an apparatus or system being adapted to, arranged to, capable of, configured to, enabled to, operable to, or operative to perform a particular function encompasses that apparatus, system, component, whether or not it or that particular function is activated, turned on, or unlocked, as long as that apparatus, system, or component is so adapted, arranged, capable, configured, enabled, operable, or operative.

Claims

1. An adjustable diameter step pin apparatus, comprising: a body element comprising a plurality of threaded finish structures, wherein the body element is configured to receive a collet along a longitudinal slot; and a head element comprising: a thumb screw portion configured to rotate to alter the collet; and a threaded portion configured to engage with the plurality of threaded finish

structures when assembled with the body element; wherein the head element is rotatable to engage the threaded portion of the head element into the plurality of threaded finish structures to alter the collet while keeping the body element sturdy.

2. The adjustable diameter step pin apparatus of claim 1, wherein the plurality of threaded finish structures is formed in an interior portion of the body element.

3. The adjustable diameter step pin apparatus of claim 1, wherein the head element comprises a collet chamber configured to couple to the collet, wherein the collet coupled to the collet chamber is received by the body element along the longitudinal slot.

4. The adjustable diameter step pin apparatus of claim 1, wherein the collet comprises a plurality of threaded tapering sides.

5. The adjustable diameter step pin apparatus of claim 1, wherein the head element comprises a hollow center portion concentric at the longitudinal slot to form a slotted path with the body element.

6. The adjustable diameter step pin apparatus of claim 1, wherein the collet is configured to receive a gauge pin set.

7. The adjustable diameter step pin apparatus of claim 1, wherein the head element is a thumb screw.

8. An adjustable diameter step pin system, comprising: a collet having a collet inside diameter; a body element comprising: a knob comprising a plurality of threaded finish structures; and a precision ground shaft element attached to the knob, the knob and the precision ground shaft element define a longitudinal slot; and a head element comprising: a thumb screw portion configured to rotate to alter a predetermined size of the collet about the collet inside diameter; a threaded portion configured to engage with the plurality of threaded finish structures when assembled with the body element; and a collet chamber configured to couple to the collet, wherein the collet coupled to the collet chamber is received by the body element along the longitudinal slot; wherein the collet inside diameter of the collet is altered by rotating the thumb screw portion of the head element to engage the threaded portion of the head element into the plurality of threaded finish structures while keeping the body element sturdy.

9. The adjustable diameter step pin system of claim 8, wherein the collet comprises a plurality of threaded tapering sides.

10. The adjustable diameter step pin system of claim 8, wherein the collet is configured to receive a gauge pin set.

11. The adjustable diameter step pin system of claim 8, wherein the plurality of threaded finish structures is formed in an interior portion of the knob of the body element.

12. The adjustable diameter step pin system of claim 8, wherein the head element comprises a hollow center portion concentric at the longitudinal slot to form a slotted path with the knob and the precision ground shaft element of the body element.

13. The adjustable diameter step pin system of claim 8, wherein the head element is a thumb screw.

14. A method of assembling an adjustable diameter step pin apparatus, the method comprising: coupling a collet to the adjustable diameter step pin apparatus, wherein the adjustable diameter step pin apparatus comprising: a body element comprising a plurality of threaded finish structures, wherein the body element is configured to receive the collet along a longitudinal slot; a head element comprising: a thumb screw portion configured to rotate to alter the collet; and a threaded portion configured to engage with the plurality of threaded finish structures when assembled with the body element; and rotating the thumb screw portion of the head element to engage the threaded portion of the head element into the plurality of threaded finish structures while keeping the body element sturdy.

15. The method of claim 14, wherein the plurality of threaded finish structures is formed in an interior portion of the body element.

16. The method of claim 14, wherein the head element comprises a collet chamber configured to

couple to the collet, and the method further comprising receiving the collet coupled to the collet chamber by the body element along the longitudinal slot.

17. The method of claim 14, wherein the collet comprises a plurality of threaded tapering sides.

18. The method of claim 14, wherein the head element comprises a hollow center portion concentric at the longitudinal slot to form a slotted path with the body element.

19. The method of claim 14, wherein the collet is configured to receive a gauge pin set.

20. The method of claim 14, wherein the head element is a thumb screw.