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United States Patent Application Publication 20250262719
Kind Code A1
Publication Date August 21, 2025
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A HOLDING DEVICE FOR ABRASIVE STRIPS AND USE OF A HOLDING DEVICE

Abstract

Disclosed is a holding device (**1**) for abrasive strips (**2**). The holding device (**1**) comprises a drum (**3**) being substantially cylindrical and including a number of undercut axial grooves (**4**) extending from a first axial drum end (**5**) of the drum (**3**) toward a second axial drum end (**6**) of the drum (**3**), wherein one or more stops (**7**) are arranged to block at least a part of each of the number of undercut axial grooves (**4**) at the second axial drum end (**6**), wherein the drum (**3**) comprises a blind hole (**8**) in the centre of the first axial drum end (**5**), and wherein a non-circular engagement indentation (**9**) is formed in the centre of the bottom (**10**) of the blind hole (**8**). The holding device (**1**) also comprises a shaft (**11**) arranged coaxially with the drum (**3**), wherein the shaft (**11**) comprises a main shaft part (**12**) including a first axial shaft end (**13**) extending from the drum (**3**) and arranged for being connected to rotation drive means. The shaft (**11**) further comprises an external non-circular engagement structure (**14**) arranged at a second axial shaft end (**15**) of the main shaft part (**12**), wherein the external non-circular engagement structure (**14**) is arranged in the non-**15** circular engagement indentation (**9**) to rotatably lock the shaft (**11**) to the drum (**3**), and wherein the greatest radial extent (GES) of the external non-circular engagement structure (**14**) is greater than the greatest radial extent (GEM) of the main shaft part (**12**). Furthermore, the holding device (**1**) comprises an end plug (**16**) being releasably connected to the drum (**3**), wherein the end plug (**16**) comprises a centre protrusion (**17**) extending into the blind hole (**8**) to restrict axial displacement of the external non-circular engagement structure (**14**) to substantially fixate an axial position of the shaft (**11**) in relation to the cylindrical drum (**3**) and wherein the end plug (**16**) further comprises groove blocking means (**18**) arranged to block at least a part of each of the number of undercut axial grooves (**4**) at the first axial drum end (**5**). Use of a holding device (**1**) is also disclosed.

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Appl. No.: **18/858487**

Filed (or PCT Filed): **April 18, 2023**

PCT No.: **PCT/DK2023/050096**

Foreign Application Priority Data

DK PA 2022 70212 Apr. 22, 2022

Publication Classification

Int. Cl.: **B24D13/06** (20060101)

U.S. Cl.:

CPC **B24D13/06** (20130101);

Background/Summary

BACKGROUND OF THE INVENTION

[0001] The invention relates to a holding device for abrasive strips. The holding device comprises a drum being substantially cylindrical and including a number of undercut axial grooves in which abrasive strips may be inserted. The invention also relates use of a holding device.

DESCRIPTION OF THE RELATED ART

[0002] Abrasive tools—such as abrasive discs, drums, cones, sheets or cubs—are know in many shapes and sizes and used for many different purposes such as grinding, polishing, lapping, sanding and other.

[0003] From the international patent applications WO 2003/95148 A1 and WO 2009/71092 A1 it is known to form an abrasive tool by means of a drum having undercut grooves extending axially in which abrasive strips are inserted. Once the abrasive strips are worn, they may be pulled out of the axial grooves and replace by new ones. During use the drum rotates at high speed while being pressed firmly against and moved across the surface to be grided. These tools are therefore typically made very sturdy and are therefore also relatively expensive.

[0004] An object of the invention is therefore to provide for a simpler and more inexpensive holding device for abrasive strips.

THE INVENTION

[0005] The invention provides for a holding device for abrasive strips. The holding device comprises a drum being substantially cylindrical and including a number of undercut axial grooves extending from a first axial drum end of the drum toward a second axial drum end of the drum, wherein one or more stops are arranged to block at least a part of each of the number of undercut axial grooves at the second axial drum end, wherein the drum comprises a blind hole in the centre of the first axial drum end, and wherein a non-circular engagement indentation is formed in the centre of the bottom of the blind hole. The holding device also comprises a shaft arranged coaxially with the drum, wherein the shaft comprises a main shaft part including a first axial shaft end extending from the drum and arranged for being connected to rotation drive means. The shaft further comprises an external non-circular engagement structure arranged at a second axial shaft end of the main shaft part, wherein the external non-circular engagement structure is arranged in

the non-circular engagement indentation to rotatably lock the shaft to the drum, and wherein the greatest radial extent of the external non-circular engagement structure is greater than the greatest radial extent of the main shaft part. Furthermore, the holding device comprises an end plug being releasably connected to the drum, wherein the end plug comprises a centre protrusion extending into the blind hole to restrict axial displacement of the external non-circular engagement structure to substantially fixate an axial position of the shaft in relation to the cylindrical drum and wherein the end plug further comprises groove blocking means arranged to block at least a part of each of the number of undercut axial grooves at the first axial drum end.

[0006] Forming the undercut axial grooves with a fixed stop at one end and a removable groove blocking means at the other end is advantageous in that this ensures that the grooves may easily be accessed. And forming the groove blocking means as a part of the removable end plug is advantageous in that this entails a simple and cost-efficient design comprising fewer and bigger parts that are easier to handle. Furthermore, connecting the shaft to the drum through an external non-circular engagement structure arranged in a corresponding non-circular engagement indentation and maintaining the external non-circular engagement structure axially in place in the corresponding non-circular engagement indentation by means of the centre protrusion of the end plug is advantageous in that this ensures that the needed torque is better transferred from the shaft to the drum during use in a simple, efficient and inexpensive manner which furthermore simplifies manufacturing. Furthermore, this design entails that the drum and the end plug may be formed of weaker and more inexpensive material while the shaft may be made of a stronger material in the shaft is connected to the drum through interlocking geometry. This design also enables that the drum and the end plug may be manufactured in different processes where the drum and the end plug e.g. could be made by 3D-printing or moulding and the shaft could e.g. be forged.

[0007] It should be emphasised that the term “blocking means” is to be understood as any kind of blocker capable of blocking at least a part of each of the number of undercut axial grooves at the first axial drum end. I.e. the term includes any kind of stop, plate, protrusion, pin, rails, forks, bars or similar.

[0008] Furthermore, in this context the term “rotation drive means” is to be understood as any kind of rotation driver capable of rotating the shaft and thereby the drum. I.e., the term includes any kind of power drill, angle grinder, electrical screwdriver, a dedicated motor or any other device comprising a motor or a similar device capable of being connected to the shaft and rotating it.

[0009] Even further it should be noted that the non-circular engagement indentation may be any kind of non-circular hole. I.e. the non-circular engagement indentation may have the form of a hole with an inner structure, e.g. a polygonal shaped hole, a star shaped hole, a rectangular hole, a hole with one or more depressions in a cylindrical inner face or other or any combination thereof. The external non-circular engagement structure may likewise be any kind of non-circular protrusion. I.e. the external non-circular engagement structure may have the form of a protrusion with an external polygonal shape, a star shape, a rectangular shape, a cylindrical shape with one or more protrusions from the cylindrical outer face or other or any combination thereof. The non-circular engagement indentation matches the external non-circular engagement structure in a way so that the external non-circular engagement structure can be inserted via an axial displacement in the non-circular engagement indentation.

[0010] When inserted, the non-circular engagement indentation and the external non-circular engagement structure are mutually locked so that they will rotate together. I.e. it is understood that non-circular refers to any cross-sectional shape of the hole of the non-circular engagement indentation and the rod of the external non-circular engagement structure which deviates from a geometric circle. For example, the internal and external engagement structures may be in the form of inner and outer gears, respectively, have a cross-sectional shape in the form of a corrugated circle, i.e. non-circular. Accordingly, the function of the non-circular shape is to rotatably lock the non-circular engagement indentation and the external non-circular engagement structure. That is,

the engagement structures can be seen as deviations from a circle shape which prohibits rotation of the drum with respect to the inserted shaft end.
[0011] In an aspect of the invention, at least a part of the centre protrusion of the removable end plug is cylindrical and comprises external threading, wherein at least a part of the coaxial blind hole is cylindrical and comprises internal threading, and wherein the end plug is releasably connected to the drum by the internal threading meshing with the external threading.
[0012] Connecting the end plug to the drum by means of external threading on the end plug meshing with internal threading in the blind hole in the end of the drum is advantageous in that this ensures a strong hold of the end plug which at the same time enables easy removal of the end plug without additional parts-such as screws, bolts, nuts or other—that may be dropped or get lost in the removal and remounting process.
[0013] In an aspect of the invention, the end plug comprises grip indentation or grip protrusions.
[0014] Providing the end plug with grip indentation and/or grip protrusions is advantageous in that these indentations and/or protrusions makes it easier to get a grip on the end plug which enables easier removal and remounting of the end plug.
[0015] In an aspect of the invention, the drum and the end plug are made of a plastic material and wherein the shaft is made of metal.
[0016] Plastic is inexpensive, light and easy to mould and it is therefore advantageous to form the drum and the end plug of a plastic material. This also enables that the more complex parts—i.e. the drum and the end plug—may be formed e.g. by 3D printing. However, during use the shaft is heavily strained and it therefore advantageous to make the shaft of metal to ensure sufficient strength to transfer the necessary torque and to accept the transversal forces generated during use when the rotating drum is pressed firmly against a surface.
[0017] In an aspect of the invention, the first axial shaft end is arranged to extend from the first axial drum end and wherein the main shaft part is extending through a centre through plug hole in the end plug.
[0018] By designing the holding device so that the first axial shaft end is extending from the first axial drum end, the end plug and thereby the groove blocking means are thereby located at the end of the drum closest to the rotation drive means—i.e. opposite the free end (the second axial drum end) of the drum during use. This is advantageous in that the end plug and particularly the groove blocking means are better protected against hitting objects during use and coming lose or being damaged—or damaging the surface being grinded. Furthermore, by forming a centre through plug hole in the end plug—through which the main shaft part extends—is advantageous in that the end plug thereby also can provide radial support to the shaft during use.
[0019] In an aspect of the invention, the first axial shaft end is arranged to extend from the second axial drum end and wherein the main shaft part is extending through a centre through drum hole in the drum.
[0020] Forming the holding device so that the first axial shaft end is extending from the second axial drum end is advantageous in that the end plug hereby is placed in the free end (the first axial drum end) of the drum during use and the end plug can therefore be removed from the drum without having to first release the shaft from the rotation drive means. Furthermore, by forming a centre through drum hole in the drum-through which the main shaft part extends—is advantageous in that the drum thereby also can provide radial support to the shaft during use.
[0021] In an aspect of the invention, the non-circular engagement indentation comprises one or more radially extending engagement features and wherein the external non-circular engagement structure comprises one or more radially protruding engagement features arranged to engage the one or more radially extending engagement features.
[0022] Providing the non-circular engagement indentation with radially extending engagement features and providing the external non-circular engagement structure with corresponding radially protruding engagement features is a simple and efficient way of geometrically locking the two parts

together against mutual rotation.
[0023] In an aspect of the invention, the one or more stops are formed integrally with the drum.
[0024] Forming the one or more stops integrally with the drum is advantageous in that this simplifies production and subsequent handling and operation of the holding device.
[0025] In an aspect of the invention, the holding device further comprises fixation means arranged to fixate the external non-circular engagement structure in the non-circular engagement indentation.
[0026] When the end plug is removed—e.g. to change the abrasive strips—the shaft is no longer locked against axial movement at least in one direction. Thus, it is advantageous to provide the holding device with fixation means to fixate the external non-circular engagement structure in the non-circular engagement indentation even when the end plug is removed to enable easier handling and operation.
[0027] In this context the term “fixation means” is to be understood as any kind of fixator capable of fixating the external non-circular engagement structure in the non-circular engagement indentation. I.e., the term includes any kind of adhesive, clamping mechanism, interlocking geometry, screws, bolts, rivets or other or any combination thereof.
[0028] In an aspect of the invention, the greatest radial extent of the groove blocking means is greater than the outer diameter of the drum.
[0029] Forming the groove blocking means so that at least parts of the groove blocking means extends further out than the greatest radial extent of the drum is advantageous in that it hereby is easier to get a hold on the groove blocking means and thereby the end plug which enables easier removal and remounting of the end plug.
[0030] The invention further relates to use of a holding device according to any of the previously discussed holding devices for holding abrasive strips in the number of undercut axial grooves in the drum.
[0031] Hereby is achieved an advantageous embodiment of the invention.

Description

FIGURES
[0032] The invention will be described in the following with reference to the figures in which
[0033] FIG. **1** illustrates a drum with a shaft and a first embodiment of an external non-circular engagement structure arranged in a non-circular engagement indentation, as seen from the side,
[0034] FIG. **2** illustrates a second embodiment of an external non-circular engagement structure arranged in a non-circular engagement indentation, as seen in from the side,
[0035] FIG. **3** illustrates a third embodiment of an external non-circular engagement structure arranged in a non-circular engagement indentation, as seen in from the side,
[0036] FIG. **4** illustrates a drum, as seen in an isometric view,
[0037] FIG. **5** illustrates an end plug, as seen from the side,
[0038] FIG. **6** illustrates an end plug, as seen from the top,
[0039] FIG. **7** illustrates a holding device, as seen from the top,
[0040] FIG. **8** illustrates a cross section through the middle of a holding device with the shaft extending from the first axial drum end, as seen from the top, and
[0041] FIG. **9** illustrates a cross section through the middle of a holding device with the shaft extending from the second axial drum end, as seen from the top.
DETAILED DESCRIPTION OF RELATED ART
[0042] FIG. **1** illustrates a drum **3** with a shaft **11** and a first embodiment of an external non-circular engagement structure **14** arranged in a non-circular engagement indentation **9**, as seen from the side, FIG. **2** illustrates a second embodiment of an external non-circular engagement structure **14** arranged in a non-circular engagement indentation **9**, as seen in from the side and FIG. **3**

illustrates a third embodiment of an external non-circular engagement structure **14** arranged in a non-circular engagement indentation **9**, as seen in from the side.

[0043] In this embodiment of the invention the drum **3** is substantially cylindrical and the outer surface is in this embodiment provided with twelve undercut axial grooves **4** arranged to accommodate abrasive strips **2**. However, in another embodiment the drum **3** could also or instead be provided with a polygonal cross section—e.g. eight sided, twelve sided, twenty sided or more—and/or the drum **3** could be provided with fewer undercut axial grooves **4**—such as ten, eight, six or even less—or the drum **3** could be provided with more undercut axial grooves **4**—such as fifteen, twenty, twenty-five or even more.

[0044] In this embodiment the undercut axial grooves **4** are formed as tracks that are wider at the bottom of the tracks than at the outer surface of the drum **3** and in this embodiment the base **28** of the abrasive strips **2** have substantially the same shape as the undercut axial grooves **4** so that the abrasive strips **2** may be slid into the undercut axial grooves **4** from one end of the drum **3** and so that the abrasive strips **2** are substantially locked against radial displacement when mounted in the undercut axial grooves **4**. However, in another embodiment the undercut axial grooves **4** and/or the base **28** of the abrasive strips **2** could have another shape, such as dovetail shape, an undercut circle, the bottom of the tracks could be wider or have another shape or the undercut axial grooves **4** and/or the base **28** of the abrasive strips **2** could be formed in numerous other ways ensuring that the strips **2** are radially locked in the undercut axial grooves **4**.

[0045] In this embodiment the drum is illustrated with only one abrasive strip **2** in one undercut axial groove **4**, however during normal use of the holding device **1** as an abrasive tool, abrasive strips **2** would be provided in all the undercut axial grooves **4**.

[0046] In this embodiment the abrasive strip **2** comprises an abrasive cloth **29** which on the backside is supported by bristles **30** made of a plastic material and the abrasive cloth **29** and the bristles **30** are mounted in and connected to a base **28** comprising bend sheet metal. However, in another embodiment the abrasive strip **2** could also or instead comprise abrasive paper, wire brushes or other, the bristles **30** could be made from natural hair, metal, or the bristles **30** could be omitted and/or the base could be moulded plastic, an extruded aluminium rail or other or any combination thereof.

[0047] As shown in FIGS. **7-9** the holding device **1** comprises the drum **3** and a shaft **11** rotatably locked to the drum **3** by means of an external non-circular engagement structure **14** of the shaft **11** engaging a non-circular engagement indentation **9** arranged in the centre at the bottom of a blind hole **8** arranged in one of the end faces of the drum **3**. The holding device **1** further comprises an end plug **16** releasably connected to the drum **3**, wherein the end plug **16** comprises a centre protrusion **17** extending into the blind hole **8** to restrict axial displacement of the external non-circular engagement structure **14**. However, in the embodiments disclosed in FIGS. **1-3**, the holding device **1** is disclosed without the end plug **16** so that the external non-circular engagement structure **14** of the shaft **11** can be seen engaging the non-circular engagement indentation **9** of the drum **3**.

[0048] In all the embodiments disclosed in FIGS. **1-3** the non-circular engagement indentation **9** comprises radially extending engagement features **25** and the external non-circular engagement structure **14** comprises corresponding radially protruding engagement features **26**. In FIG. **1** the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** are formed as a bolt-head—i.e. the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** has a hexagonal shape where the radially extending engagement features **25** and the radially protruding engagement features **26** are the sides and corners of the hexagon. In the embodiment disclosed in FIG. **2** the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** are formed as an elongated rectangle—i.e. the he radially extending engagement features **25** and the corresponding radially protruding engagement features **26** are the transversal protruding ends of the elongated rectangle—and in the embodiment disclosed in FIG. **3** the external non-circular

engagement structure **14** and the corresponding non-circular engagement indentation **9** are formed as an irregularly sided circle shape—i.e. the radially extending engagement features **25** are in this case indentations in the sidewall of the non-circular engagement indentation **9** and the radially protruding engagement features **26** are the protrusions of the external non-circular engagement structure **14** of the shaft **11**. However, in another embodiment the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** could be provided with numerous other non-circular shapes ensuring that the shaft **11** would be rotatably locked in relation to the drum **3**. In another embodiment only parts of the external non-circular engagement structure **14** would correspond to the non-circular engagement indentation **9** as long as the external non-circular engagement structure **14** and the non-circular engagement indentation **9** are locked against mutual rotation.

[0049] In all the embodiments disclosed in FIGS. **1**-**3** the greatest radial extent GES of the external non-circular engagement structure **14** is greater than the greatest radial extent GEM of a main shaft part **12** of the shaft **11** to ensure that the shaft **11** can be locked against axial displacement in relation to the drum **3** as will be further discussed in relation to FIGS. **7**-**9**.

[0050] FIG. **4** illustrates a drum **3**, as seen in an isometric view.

[0051] In this embodiment the undercut axial grooves **4** are extending from a first axial drum end **5** of the drum **3** toward a second axial drum end **6** of the drum **3**. I.e. in this embodiment the undercut axial grooves **4** are open and freely accessible at the first axial drum end **5** of the drum **3**.

[0052] In this embodiment the drum **3** is provided with stops **7** at the end of undercut axial grooves **4** at the second axial drum end **6** of the drum **3**. The stops **7** are provided to block each of the undercut axial grooves **4** to thereby restrict axial movement of the abrasive strips **2** in one direction when the abrasive strips **2** are mounted in the undercut axial grooves **4**. In this embodiment the stops **7** are formed integrally with the drum **3** but in another embodiment the stops **7** could be formed as individual removable stops **7** or as a single e.g. removable part connected to the drum **3**.

[0053] In this embodiment the drum **3** comprises a blind hole **8** coaxially arranged in the centre of the first axial drum end **5** and as disclosed in FIGS. **1**-**3** the non-circular engagement indentation **9** is located in the centre of the bottom **10** of the blind hole **8**. In this embodiment the coaxial blind hole **8** is cylindrical and the sidewalls are provided with internal threading **20** enabling that the end plug **16** may be removably connected to the drum **3** through the threading as will discussed more in relation to FIGS. **5**-**6**. However, if the end plug **16** was removably connected to drum **3** through other means than threading the blind hole **8** and/or the centre protrusion **17** of the end plug **16** could be non-circular—such as square, oval, polygonal or other.

[0054] FIG. **5** illustrates an end plug **16**, as seen from the side and FIG. **6** illustrates an end plug **16**, as seen from the top.

[0055] In this embodiment the end plug **16** comprises a centre protrusion **17** adapted to correspond to the blind hole **8** of the drum **3**, so that when the end plug **16** is connected to the drum **3**, the centre protrusion **17** will substantially protrude all the way to the bottom of the blind hole **8**. However, e.g. if the external non-circular engagement structure **14** of the shaft **11** was extending up and out of the non-circular engagement indentation **9**, the centre protrusion **17** could be adapted to extend down to the external non-circular engagement structure **14**.

[0056] In this embodiment the outer cylindrical surface of the centre protrusion **17** is provided with external threading **19** matching the internal threading **20** in the blind hole of the drum **3**. I.e. in this embodiment the end plug **16** is releasably connected to the drum **3** through the matching threading **19**, **20** but in another embodiment the end plug **16** could be releasably connected to the drum **3** through flexible flaps on the end plug **16** engaging corresponding slits or indentations in the drum **3** or vice versa or through another embodiment of a click-lock solution, the drum **3** or the end plug **16** could be provided with an O-ring engaging a matching groove in the opposite part, the end plug **16** could be releasably connected to the drum **3** through screws or other or the end plug **16** could be releasably connected to the drum **3** in a number of other ways.

[0057] In this embodiment the end plug **16** is also provided with groove blocking means **18** arranged to block the undercut axial grooves **4** at the first axial drum end **5** of the drum when the end plug **16** is connected to the drum **3**—as also disclosed in FIGS. **7**-**9**. In the embodiment disclosed in FIGS. **5**-**6** the end plug **16** comprises grip indentation **21** enabling that a user may get a better grip on the end plug **16** when connecting or disconnecting the end plug **16** and in FIG. **6** the end plug **16** further comprises grip protrusions **22** arranged for the same purpose. However, in another embodiment the end plug **16** could also or instead comprise a high friction coating, a surface profile or other or any combination hereof for the same purpose.
[0058] FIG. **7** illustrates a holding device **1**, as seen from the top and FIG. **8** illustrates a cross section through the middle of a holding device **1** with the shaft **11** extending from the first axial drum end **5**, as seen from the top.
[0059] In this embodiment the substantially cylindrical drum **3** comprising the undercut axial grooves **4** includes the blind hole **8** in the centre of the first axial drum end **5** and the non-circular engagement indentation **9** is formed in the centre of the bottom of the blind hole **8**. The shaft **11** comprises a main shaft part **12** having a first axial shaft end **13** is in this embodiment extending from the first axial drum end **5** of the drum **3** and the main shaft part **12** is extending through a centre through plug hole **23** in the end plug **16**. In this embodiment the diameter of the centre through plug hole **23** is only a few tenths of a millimetre bigger than the outer diameter of the main shaft part **12** to enable that the end plug **16** may support the shaft **11** during use by preventing bending or deflection of the part of the shaft **11** extending through the end plug **16**.
[0060] In this embodiment the shaft **11** further comprises an external non-circular engagement structure **14** arranged at the second axial shaft end **15** of the main shaft part **12** and the external non-circular engagement structure **14** is arranged in the non-circular engagement indentation **9** to rotatably lock the shaft **11** to the drum **3**. In this embodiment the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** have a hexagonal shape as disclosed in FIG. **1** but as previously discussed in another embodiment the external non-circular engagement structure **14** and the corresponding non-circular engagement indentation **9** could have numerous other corresponding non-circular shapes.
[0061] In this embodiment the first axial shaft end **13** of the shaft **11** is connected to rotation drive means **31** in the form of a handheld power drill but in another embodiment the rotation drive means **31** could be any other kind of device capable of rotating the holding device **1**.
[0062] In this embodiment the end plug **16** is releasably connected to the drum **3** by means of threading **19**, **20** and the centre protrusion **17** of the end plug **16** is extending into the blind hole **8** to restrict axial displacement of the external non-circular engagement structure **14** in that the greatest radial extent GES of external non-circular engagement structure **14** is greater than the greatest radial extent GEM of the main shaft part **12** and in that the centre through plug hole **23** in the end plug **16** is only slightly bigger than the main shaft part **12** so that the centre protrusion **17** of the end plug **16** will press down on the external non-circular engagement structure **14** to substantially fixate the external non-circular engagement structure **14** in the non-circular engagement indentation **9** to maintain the axial position of the shaft **11** in relation to the drum **3**.
[0063] In this embodiment the end plug **16** further comprises groove blocking means **18** arranged to block the undercut axial grooves **4** at the first axial drum end **5** and in this embodiment the greatest radial extent GEB of the groove blocking means **18** is greater than the outer diameter ODD of the drum **3** to ensure that at least parts of the groove blocking means **18** are wider than the drum **3** so that a used may more easily get a hold on the end plug **16** to unscrew the end plug **16** if the abrasive strips (not disclosed in these FIGS.) needed to be changed.
[0064] To reduce material use, weight, number of parts and cost the stops **7** at the second axial drum end **6** are in this embodiment formed integrally with the drum **3** and to enable this, the drum **3** is in this embodiment made by 3D printing of a plastic material. And given the relatively complex shape of the end plug **16**, the end plug **16** is in this embodiment also made by 3D printing

of a plastic material. However, in another embodiment the drum **3** and/or the end plug **16** could be made by moulding, machining or another process or any combination thereof.
[0065] In this embodiment the shaft **11** is made of metal in the form of steel to be able to transfer the torque and bending moments during use but in another embodiment the shaft could be made of brass, stainless steel, a fibre reinforces resin material, a composite material or other or any combination thereof.
[0066] In this embodiment the holding device **1** further comprises fixation means **27** in the form of adhesive arranged between the external non-circular engagement structure **14** and the non-circular engagement indentation **9** to hold them together so that the shaft **11** does not release from the drum **3** when the end plug **16** is removed. However, in another embodiment the fixation means **27** could comprise a radially extending set screw engaging the external non-circular engagement structure **14**, an axially extending head screw, a dedicated holding device, a bayonet coupling device or other or any combination thereof.
[0067] FIG. **9** illustrates a cross section through the middle of a holding device **1** with the shaft **11** extending from the second axial shaft end **6**, as seen from the top.
[0068] In this embodiment the first axial shaft end **13** is arranged to extend from the second axial drum end **6** of the drum **3** and in this embodiment the main shaft part **12** is therefore extending through a centre through drum hole **24** in the drum **3**.
[0069] In this embodiment the diameter of the centre through drum hole **24** is only a few tenths of a millimetre bigger than the outer diameter of the main shaft part **12** to enable that the drum **3** may support the shaft **11** during use by preventing bending or deflection of the part of the shaft **11** extending through the drum **3**.
[0070] The invention has been exemplified above with reference to specific examples of drums **3**, shafts **11**, end plugs **16** and other. However, it should be understood that the invention is not limited to the particular examples described above but may be designed and altered in a multitude of varieties within the scope of the invention as specified in the claims.
LIST
[0071] **1**. Holding device [0072] **2**. Abrasive strip [0073] **3**. Drum [0074] **4**. Undercut axial groove [0075] **5**. First axial drum end [0076] **6**. Second axial drum end [0077] **7**. Stop [0078] **8**. Blind hole [0079] **9**. Non-circular engagement indentation [0080] **10**. Bottom of blind hole [0081] **11**. Shaft [0082] **12**. Main shaft part [0083] **13**. First axial shaft end [0084] **14**. External non-circular engagement structure [0085] **15**. Second axial shaft end [0086] **16**. End plug [0087] **17**. Centre protrusion of end plug [0088] **18**. Groove blocking means [0089] **19**. External threading [0090] **20**. Internal threading [0091] **21**. Grip indentation [0092] **22**. Grip protrusion [0093] **23**. Centre through plug hole in end plug [0094] **24**. Centre through drum hole in drum [0095] **25**. Radially extending engagement feature [0096] **26**. Radially protruding engagement feature [0097] **27**. Fixation means [0098] **28**. Base of abrasive strip [0099] **29**. Abrasive cloth [0100] **30**. Brush [0101] **31**. Rotation drive means [0102] GES. Greatest radial extent of external non-circular engagement structure [0103] GEM. Greatest radial extent of main shaft part [0104] GEB. Greatest radial extent of groove blocking means [0105] ODD. Outer diameter of drum

Claims

1. A holding device for abrasive strips, said holding device comprising, a drum being substantially cylindrical and including a number of undercut axial grooves extending from a first axial drum end of said drum toward a second axial drum end of said drum, wherein one or more stops are arranged to block at least a part of each of said number of undercut axial grooves at said second axial drum end, wherein said drum comprises a blind hole in the centre of said first axial drum end, and wherein a non-circular engagement indentation is formed in the centre of the bottom of said blind hole, a shaft arranged coaxially with said drum, wherein said shaft comprises a main shaft part

including a first axial shaft end extending from said drum and arranged for being connected to a rotation driver, wherein said shaft further comprises an external non-circular engagement structure arranged at a second axial shaft end of said main shaft part, wherein said external non-circular engagement structure is arranged in said non-circular engagement indentation to rotatably lock said shaft to said drum, and wherein the greatest radial extent of said external non-circular engagement structure is greater than the greatest radial extent of said main shaft part, and an end plug being releasably connected to said drum, wherein said end plug comprises a centre protrusion extending into said blind hole to restrict axial displacement of said external non-circular engagement structure to substantially fixate an axial position of said shaft in relation to said cylindrical drum and wherein said end plug further comprises a groove blocker arranged to block at least a part of each of said number of undercut axial grooves at said first axial drum end.

2. The holding device according to claim 1, wherein at least a part of said centre protrusion of said removable end plug is cylindrical and comprises external threading, wherein at least a part of said coaxial blind hole is cylindrical and comprises internal threading, and wherein said end plug is releasably connected to said drum by said internal threading meshing with said external threading.

3. The holding device according to claim 1, wherein said end plug comprises grip indentation or grip protrusions.

4. The holding device according to claim 1, wherein said drum and said end plug are made of a plastic material and wherein said shaft is made of metal.

5. The holding device according to claim 1, wherein said first axial shaft end is arranged to extend from said first axial drum end and wherein said main shaft part is extending through a centre through plug hole in said end plug.

6. The holding device according to claim 1, wherein said first axial shaft end is arranged to extend from said second axial drum end and wherein said main shaft part is extending through a centre through drum hole in said drum.

7. The holding device according to claim 1, wherein said one or more stops are formed integrally with said drum.

8. The holding device according to claim 1, wherein said holding device further comprises a fixator arranged to fixate said external non-circular engagement structure in said non-circular engagement indentation.

9. The holding device according to claim 1, wherein the greatest radial extent of said groove blocker is greater than the outer diameter of said drum.

10. A method of holding abrasive strips, wherein said method comprises forming the holding device according to claim 1, removing said end plug from said drum, placing abrasive strips in said number of undercut axial grooves in said drum, and reconnecting said end plug to said drum.

11. The holding device according to claim 2, wherein said end plug comprises grip indentation or grip protrusions.