

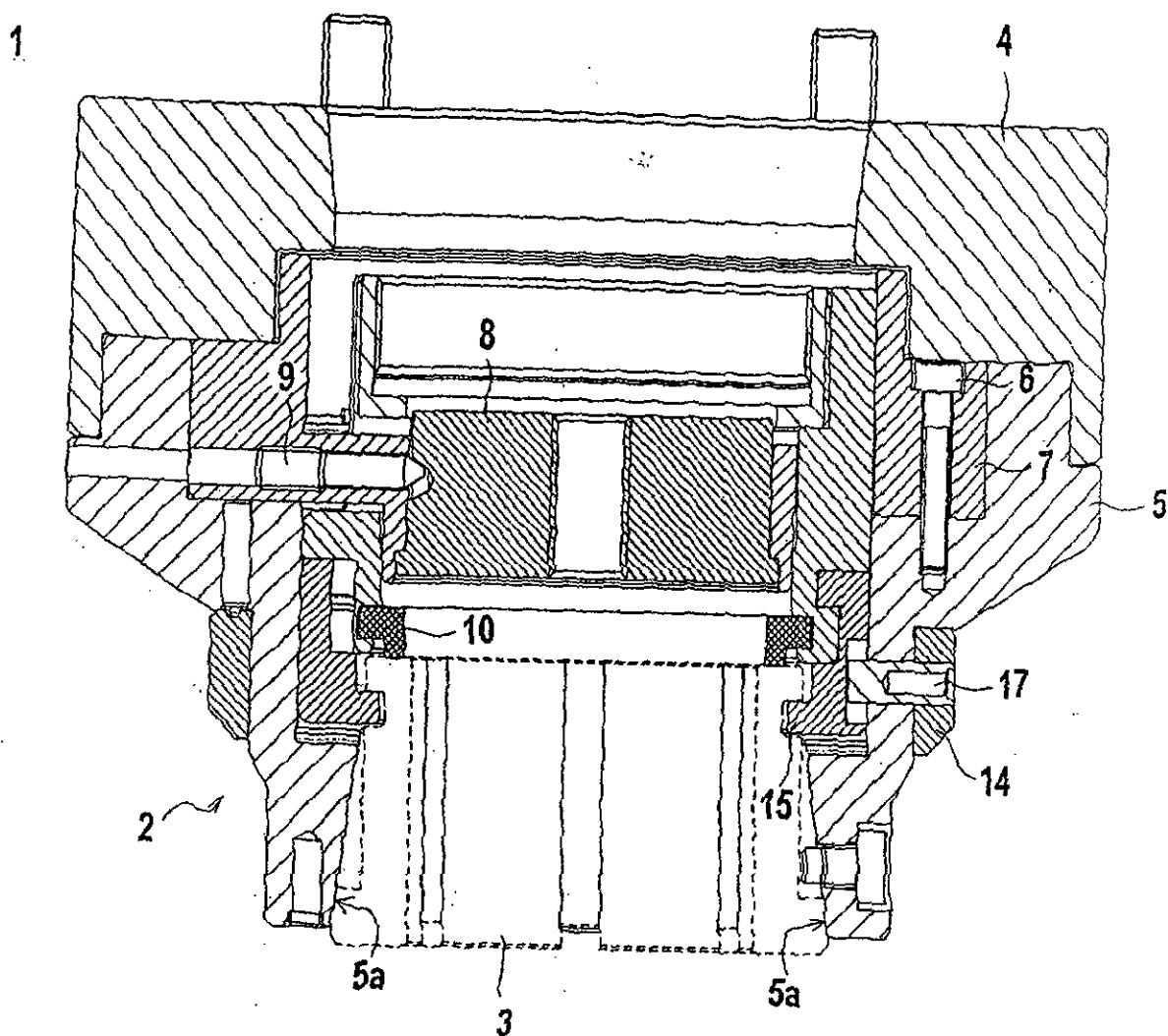
ABSTRACT

Title : Clamping Device

The clamping device (1) according to the invention is used for the clamping of a work piece and comprises a chuck (2) and a collet (3) that is positioned inside the chuck (2). A bayonet fastener is provided for mounting the collet in or dismounting it from the chuck (2) without the aid of tools.

To,
The Controller of Patents,
The Patent Office
Mumbai

[Fig.1]



WE CLAIM :

1. A clamping device (1) for the clamping of a work piece, comprising a chuck (2) and a collet (3) which is positioned inside the chuck (2), characterized in that a bayonet fastener is provided by means of which the collet (3) can be fastened in the chuck (2) and/or can be removed from it again without the use of tools.
2. The clamping device according to claim 1, characterized in that the bayonet fastener is provided with an activation ring (14) that can be manually operated, as well as a bayonet ring (15) which is operatively connected to the activation ring (14), by means of which the collet (3) can be secured to the chuck (2).
3. The clamping device according to claim 2, characterized in that the activation ring (14) and the bayonet ring (15) are arranged concentrically on the chuck (2), wherein the bayonet ring (15) is arranged inside the activation ring (14).
4. The clamping device according to one of the claims 2 or 3, characterized in that by rotating the activation ring (14), the bayonet ring (15) can be moved between a closed position in which the bayonet ring (15) secures the collet (3) on the chuck (2) and an opened position in which the bayonet ring (15) releases the collet (3) on the chuck (2).
5. The clamping device according to claim 4, characterized in that pins (17) are provided which project in radial direction from the inside of the activation ring (14) and engage in grooves (16) of the bayonet ring (15), thereby transmitting a rotational movement of the activation ring (14) to the bayonet ring (15).

6. The clamping device according to one of the claims 2 to 5, characterized in that provided on one front face of the bayonet ring (15) are brackets (18) which extend radially toward the inside into the cavity enclosed by the bayonet ring (15) and which form means for securing the collet (3).
7. The clamping device according to claim 6, characterized in that webs (19) are provided which end at the outer surface of the collet (3), are separated by grooves (20) and form a ring-shaped arrangement, and that in the closed position of the bayonet ring (15) its brackets (18) rest against the webs (19), thereby securing the collet (3) inside the chuck (2), and that in the opened position of the bayonet ring (15) its brackets (18) are located in the regions of the grooves (20), so that the collet (3) can be removed from the chuck (2).
8. The clamping device according to claim 7, characterized in that the webs (19) and the grooves (20) adjoin the front face of the collet (3) by means of which the collet (3) is inserted into the chuck (2).
9. The clamping device according to one of the claims 1 to 8, characterized in that the collet (3) is composed of several identical collet segments (3a), wherein respectively adjacent collet segments (3a) are connected via an elastic element (11) that extends in axial direction of the collet (3).
10. The clamping device according to claim 9, characterized in that during the closing of the bayonet fastener, the collet segments (3a) are moved uniformly in radial direction over their complete length and that the elastic elements (11) are compressed uniformly over their complete length.
11. The clamping device according to one of the claims 1 to 10, characterized in that a locking device is provided for locking in place the bayonet fastener once the fastener has secured the collet (3) inside the chuck (2).

12. The clamping device according to claim 11, characterized in that the locking device comprises means for securing the position of the activation ring (14) once the bayonet ring (15) is in the locked position.

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HIRAL CHANDRAKANT JOSHI
AGENT FOR
NARR BETEILIGUNGS GMBH

The invention relates to a clamping device as defined in the preamble to claim 1.

Clamping devices of this type are generally used for the clamping of a work piece. The clamping device thus comprises a chuck and a collet which is positioned inside the chuck. The collet is used to fasten the respective work piece. For this operation, the collet is advantageously operated with the aid of a pull rod which is in particular moved, meaning displaced, with the aid of a drive unit. The collet in this case preferably consists of several collet segments which can carry out the adjustment movements and thus can clamp in the work piece and can also release it again.

If the clamping device is to be used for the clamping of different types of work pieces, the collet on the chuck of the clamping device must be replaced. One problem with the known clamping devices is that the replacement requires the use of special auxiliary tools which are necessary to loosen the collet to be replaced on the chuck, so that it can be removed from the chuck. The auxiliary tools must be used in a corresponding manner to secure the new collet inside the chuck.

The use of auxiliary tools represents an undesirable additional structural expenditure for embodying the clamping device. A further disadvantage is that the auxiliary tools form loose parts which must be stored separately. The auxiliary tools frequently are not available if a collet on the chuck must be replaced, which results in additional expenditure for conducting a search or for procuring the auxiliary tool.

It is therefore the object of the invention to provide a clamping device of the aforementioned type which has a high functionality with low structural expenditure.

This object is solved with the features disclosed in claim 1. Advantageous embodiments and useful modifications of the invention are described in the dependent claims.

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The clamping device according to the invention is used for clamping in a work piece and comprises a chuck and a collet positioned inside the chuck. A bayonet fastener is provided by means of which the collet can be fastened without tools inside the chuck and can also be removed again.

One essential advantage of the clamping device according to the invention is that the collet can be mounted in the chuck without the use of auxiliary tools and, if necessary, can also be removed from the chuck. In order to secure the collet in the bayonet fastener, an operator only needs to manually operate the bayonet fastener.

The bayonet fastener forms an integral component of the clamping device and is thus attached permanently to the clamping device. A single operator can easily and quickly operate the bayonet fastener, so that the times for the installation and removal of the collet can be kept very low.

It is particularly advantageous if the bayonet fastener is provided with an activation ring that can be operated manually, as well as with a bayonet ring that is operatively connected to the activation ring and functions to secure the collet in the chuck.

The bayonet fastener embodied in this way has a structurally simple design. The components of the bayonet fastener can be integrated into the clamping device without resulting in a significant increase in the structural size.

The activation ring and the bayonet ring are advantageously arranged concentrically on the chuck, wherein the bayonet ring is positioned inside the activation ring. Pins are provided which radially project from the inside of the activation ring and which engage in bores provided in the bayonet ring, thereby transmitting a rotational movement of the activation ring to the bayonet ring.

By rotating the activation ring, the bayonet ring can thus be moved between a closed position in which the bayonet ring secures the collet in the chuck and an open position in which the bayonet ring releases the collet from the chuck.

The activation ring is positioned on the outside of the clamping device and can thus be turned easily by an operator. This rotational movement of the activation ring is transmitted via the pins to the bayonet ring which then locks the collet in place and/or releases the collet from the chuck. As a result, a structurally easy and simultaneously robust design of the bayonet fastener is realized.

The position of the collet remains unchanged during the activation of the bayonet fastener, which is achieved with an anti-locking device that secures the collet in a fixed, radial position inside the chuck.

According to one advantageous embodiment of the invention, brackets are provided on a front face of the bayonet ring, which extend radially toward the inside and into the cavity enclosed by the bayonet ring, wherein these brackets function as means for securing the collet. Furthermore provided are webs that end at the outer surface of the collet, are separated by grooves, and form a ring-shaped arrangement. In the closed position of the bayonet ring, its brackets fit against the webs and thus connect the collet to the chuck. In the opened position of the bayonet ring, its brackets are located in the region of the grooves, so that the collet can be removed from the chuck.

The webs and grooves usefully adjoin the front face of the collet by means of which the collet is inserted into the chuck.

In this way, a particularly simple and yet reliable locking mechanism is obtained which makes it possible to secure the collet in the chuck and release it again as needed.

The collet is composed of several identical collet segments, wherein respectively adjacent collet segments are connected via an elastic element that extends in axial direction across the collet.

The elastic elements generally are preforms that are composed of rubber mixtures. These elastic elements in general make possible a relative movement of the individual collet segments. The elastic elements furthermore form sealing elements, meaning the elastic elements meet a dual function.

The inventive design of this arrangement achieves that during the closing of the bayonet fastener, the collet segments are moved over their complete length in a uniform manner in radial direction. The elastic elements are compressed uniformly over their complete lengths.

This represents a considerable advantage as compared to the known clamping devices where the collet must be mounted in and/or dismounted from the chuck with the aid of auxiliary tools. The collet segments of known devices carry out tilting movements during the mounting of the collet, as a result of which the elastic elements that connect the collet segments are not compressed uniformly. Rather, the elastic elements are locally compressed very strongly, meaning the elastic elements are subjected to extremely high stresses at those locations, thereby resulting in increased wear of the elastic elements and an undesirable reduction in the service life of the collet. This disadvantage is avoided with the arrangement according to our invention since the bayonet fastener causes a uniform, radial movement of the collet segments which results in a uniform pressure load on the elastic elements.

According to one advantageous modification, a locking device is provided for locking in place the bayonet fastener once the collet has been fastened inside the chuck with the aid of the bayonet fastener.

In particular, the locking device comprises means for securing the position of the activation ring if the bayonet ring is in the closed position.

This locking device ensures that the bayonet fastener is not released in an uncontrolled manner during the operation of the clamping device. A locking device of this type can be realized by using a spring element to generate spring forces that act in axial direction of the clamping device upon the activation ring and keep at least one locking element, provided on the activation ring, in an associated receptacle of the chuck. To activate the bayonet fastener, the activation ring is initially moved in axial direction and can then be rotated. Following the activation with the activation ring, the locking element again automatically engages in an associated receptacle as a result of the spring force, so that the bayonet fastener is secured.

The invention is explained in the following with the aid of the drawings, which show in:

- Figure 1 A partial view of the exemplary embodiment of the clamping device according to the invention, with a bayonet fastener for securing a collet in a clamping device.
- Figure 2 Representations of the individual components of the clamping device shown in Figure 1.
- Figure 3 A sectional view of the clamping device according to Figure 1 with the bayonet fastener in the opened position.
- Figure 4 A sectional view of the clamping device according to Figure 1 with the bayonet fastener in the closed position.

Figure 1 contains a partial view of an exemplary embodiment of the clamping device 1 according to the invention which is used for the clamping of a work piece. Figure 1 shows the chuck 2 and the collet 3 for the clamping device 1. Not shown are the means for activating the collet 3 that is positioned inside the chuck 2 and which function to move the collet 3 and thus to clamp in or release the work piece, which is also not shown herein. These means can comprise a drive unit, in a manner known per se, for generating a linear movement of a pull rod which serves to activate the collet 3. Components of the arrangement shown in Figure 1 are shown as separate components in Figure 2.

As can be seen in Figure 1, the chuck 2 of the clamping device 1 is composed of a chuck flange 4 and a chuck body 5 which is also shown separately in Figure 2. The chuck flange 4 and the chuck body 5 are connected via cap screws 6 while a stopper holder 7, which is positioned between the chuck flange 4 and the chuck body 5, is screwed with the aid of cap screws 6 to the chuck body 5.

A reversible stop 8 is positioned on the inside of the chuck 2 and is secured in place with a locking pin 9. The reversible stop 8 functions as a replaceable reference element which, together with axial stops, makes it possible to adapt to different work pieces positioned in the collet 3.

The chuck body 5 comprises an opening on the front which is delimited by conically extending contact surfaces 5a into which the collet 3 is inserted. Figure 1 illustrates the collet 3 that is inserted into this opening, wherein it is provided with a sealing ring 10 at the back edge that is inserted into the opening and is positioned inside the chuck body 5. This sealing ring protects a locking area in which the collet 3 is secured inside the chuck 2 against penetrating shavings or other types of contamination.

As can be seen in particular in Figure 2, the collet 3 is composed of six identically embodied collet segments 3a, wherein respectively adjacent collet segments 3a are

connected via elastic elements 11 that extend in axial direction of the collet 3. The elastic elements 11 are embodied as preforms that are composed of rubber mixtures. These elastic elements 11 form elastic couplings between the collet elements 3a, so that the elastic elements 11 are compressed when pressure forces act upon the outer surface of the collet 3, so that the collet segments 3a can be pushed together in radial direction.

The collet 3 is positioned non-rotating inside the chuck body 5. As a means for preventing rotation, grooves 12 which extend in axial direction are provided in the outer surface of the collet 3. In the present case, a groove 12 is provided on each collet segment 3a. Cap screws 13 that are positioned in the chuck body 5 engage in these grooves 12 and ensure a non-rotating positioning of the collet 3 in the chuck body 5.

According to the invention, the collet 3 is secured tool-less with the aid of a bayonet fastener and thus without any auxiliary tools inside the chuck 2. The bayonet fastener comprises an activation ring 14, positioned on the outside of the chuck body 5, which can be activated, meaning rotated, by an operator. The bayonet fastener furthermore comprises a bayonet ring 15, arranged concentric to and within the activation ring 14, which functions to lock in place or unlock the collet 3.

The bayonet ring 15 is provided on its outside surface with grooves 16 in which pins 17 engage that are positioned on the activation ring 14 and project radially from its inside surface. A rotational movement of the activation ring 14 is thus transmitted to the bayonet ring 15.

To secure the collet 3 inside the chuck 2, the bayonet ring 15 is provided with brackets 18 on a front face, which extend in radial direction into the cavity enclosed by the bayonet ring 15. The brackets 18 are embodied identically and are respectively separated by intermediate spaces. The intermediate spaces are also formed

identically, so that the brackets 18 are positioned equidistant in circumferential direction of the bayonet ring 15.

Corresponding to the brackets 18 on the bayonet ring 15, webs 19 are provided in the back region of the collet 3 which leads into the chuck 2, wherein these webs end at the outer surface of the collet 3 as seen in radial direction. Six webs 19 which are separated by grooves 20 are provided in the present case. A total of six webs 19 are provided, wherein respectively one web 19 is provided on each collet segment 3a. The individual webs 19 are embodied identical. The grooves 20 between the webs 19 are also embodied identical, so that the webs 19 are arranged equidistant in circumferential direction of the collet 3. The lengths of the webs 19, meaning the extensions in circumferential direction, are adapted to the lengths of the brackets 18 for the bayonet ring 15.

By rotating the activation ring 14 by 30° , the bayonet ring 15 can be moved between an opened position and a closed position. During the insertion of the collet 3 into the chuck 2, the bayonet ring 15 is in the opened position. As soon as the collet 3 has been inserted to the desired position inside the chuck 2, the brackets 18 of the bayonet ring 15 are located in the region of the grooves 20 because the bayonet ring 15 is in the opened position. To secure the collet 3 inside the chuck 2, the activation ring 14 is then rotated by 30° until the bayonet ring 15 is in the locked position. In the locked position, the brackets 18 of the bayonet ring 15 are positioned on the tops of the webs 19 on the collet 3 and thus prevent the collet 3 from being removed from the chuck 2. If the collet 3 is to be removed once more from the chuck 2, the bayonet ring 15 is again moved to the opened position. The removal of the collet 3 can be aided by using a spring or in general a spring mechanism.

The sectional view according to Figure 3 shows the bayonet ring 15 in the opened position while the sectional view according to Figure 4 shows the bayonet ring 15 in the closed position. As can be seen in Figure 3, the brackets 18 on the bayonet ring 15 are in the opened position while in the region of the grooves 20 between the webs 19

on the collet 3, thus covering some of the elastic elements 11. When in the closed position shown in Figure 4, the brackets 18 are pushed in front of the webs 19 and are therefore no longer visible in Figure 4, but the elastic elements 11 are now exposed.

Reference Number List

- (1) clamping device
- (2) chuck
- (3) collet
- (3a) collet segment
- (4) chuck flange
- (5) chuck body
- (5a) contact surface
- (6) cap screw
- (7) stop holder
- (8) reversible stop
- (9) clamping pins
- (10) sealing ring
- (11) elastic element
- (12) groove
- (13) cap screw
- (14) activation ring
- (15) bayonet ring
- (16) groove
- (17) pin
- (18) bracket
- (19) webs
- (20) groove

WE CLAIM :

1. A clamping device (1) for the clamping of a work piece, comprising a chuck (2) and a collet (3) which is positioned inside the chuck (2), characterized in that a bayonet fastener is provided by means of which the collet (3) can be fastened in the chuck (2) and/or can be removed from it again without the use of tools.
2. The clamping device according to claim 1, characterized in that the bayonet fastener is provided with an activation ring (14) that can be manually operated, as well as a bayonet ring (15) which is operatively connected to the activation ring (14), by means of which the collet (3) can be secured to the chuck (2).
3. The clamping device according to claim 2, characterized in that the activation ring (14) and the bayonet ring (15) are arranged concentrically on the chuck (2), wherein the bayonet ring (15) is arranged inside the activation ring (14).
4. The clamping device according to one of the claims 2 or 3, characterized in that by rotating the activation ring (14), the bayonet ring (15) can be moved between a closed position in which the bayonet ring (15) secures the collet (3) on the chuck (2) and an opened position in which the bayonet ring (15) releases the collet (3) on the chuck (2).
5. The clamping device according to claim 4, characterized in that pins (17) are provided which project in radial direction from the inside of the activation ring (14) and engage in grooves (16) of the bayonet ring (15), thereby transmitting a rotational movement of the activation ring (14) to the bayonet ring (15).

6. The clamping device according to one of the claims 2 to 5, characterized in that provided on one front face of the bayonet ring (15) are brackets (18) which extend radially toward the inside into the cavity enclosed by the bayonet ring (15) and which form means for securing the collet (3).
7. The clamping device according to claim 6, characterized in that webs (19) are provided which end at the outer surface of the collet (3), are separated by grooves (20) and form a ring-shaped arrangement, and that in the closed position of the bayonet ring (15) its brackets (18) rest against the webs (19), thereby securing the collet (3) inside the chuck (2), and that in the opened position of the bayonet ring (15) its brackets (18) are located in the regions of the grooves (20), so that the collet (3) can be removed from the chuck (2).
8. The clamping device according to claim 7, characterized in that the webs (19) and the grooves (20) adjoin the front face of the collet (3) by means of which the collet (3) is inserted into the chuck (2).
9. The clamping device according to one of the claims 1 to 8, characterized in that the collet (3) is composed of several identical collet segments (3a), wherein respectively adjacent collet segments (3a) are connected via an elastic element (11) that extends in axial direction of the collet (3).
10. The clamping device according to claim 9, characterized in that during the closing of the bayonet fastener, the collet segments (3a) are moved uniformly in radial direction over their complete length and that the elastic elements (11) are compressed uniformly over their complete length.
11. The clamping device according to one of the claims 1 to 10, characterized in that a locking device is provided for locking in place the bayonet fastener once the fastener has secured the collet (3) inside the chuck (2).

12. The clamping device according to claim 11, characterized in that the locking device comprises means for securing the position of the activation ring (14) once the bayonet ring (15) is in the locked position.

Dated this 24th day of February, 2014



HIRAL CHANDRAKANT JOSHI
AGENT FOR
NARR BETEILIGUNGS GMBH