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(54) **Pins at the tips of a manual tool**

(57) Pins (6, 6a) at the tip of a manual tool (1, 2), preferably a pliers for opening or closing circlips (3),

wherein the pins (6, 6a) are inclined in the same direction as the operative manoeuvre to be performed by the manual tool (1, 2).

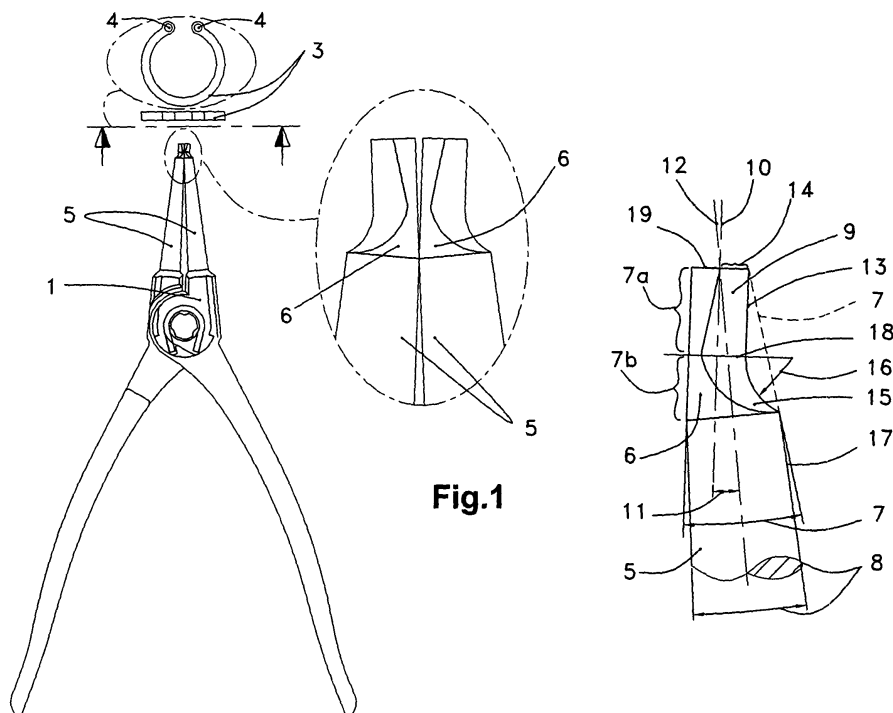


Fig.1

Description

FIELD OF THE INVENTION

[0001] This invention relates to pins at the tip of a manual tool, in particular a pliers for fitting open, resilient washers, where the washers can be of a kind which are fitted externally on a shaft (resilient opening) or internally in an aperture (resilient closure). Such washers are known as circlips or Seeger washers, and shall be referred to as such hereinbelow.

[0002] For external circlips, use is made of external pliers which operate by opening the circlip resiliently so that the circlip can be fitted externally to a shaft, and, for internal circlips, internal pliers are used, which operate by forcing the resilient closure of the circlip so that the circlip can be fitted internally in an aperture. In order to be handled by the pliers, the circlips have apertures at both ends, which apertures are penetrated by the pins which are formed at each end of a pair of conical grippers of the pliers to effect opening or closing the circlip. In use, the circlip is clamped by friction between the edges of its apertures and the pins of the pliers.

PRIOR STATE OF THE ART

[0003] Pliers of the above-described kind must comply with three characteristics, that is, (i) functionality, with reference to the capacity to clamp and manipulate the circlip firmly and reliably, but without causing any permanent deformation which would make the circlip difficult to fit; (ii) strength, with reference to the necessary thinness of the pins, which gives rise to a critical cross-section at its end relative to the conical gripper, such as to prevent breakage caused by the working force; and (iii) accessibility, which is the capacity to reach the working environment and function in that that environment.

[0004] Existing pliers have as a common characteristic, in having conical pins which are formed from the respective conical grippers by means of a mere increase in the conicity of the same or by means of decreasing scale. In all cases, in these known pliers, the cross-section of the pins is always a circular section along the respective length, with the axes coinciding with that of the respective conical or frusto-conical grippers.

[0005] A disadvantage of this known design affects the functionality, since it is necessary to initiate the opening or closure of the pliers, this depending upon whether the pliers are internal or external pliers, in order that, between the pins and the apertures in the circlip, there occurs the wedging which is necessary for efficient clamping of the same. This configuration does not provide reliable, firm clamping, which has a negative effect on the handling of the circlip and can also give rise to twisting and axial deformation of the circlip.

[0006] Another disadvantage concerns the strength in association with accessibility. In fact, in order to facilitate accessibility, the pins have to be as fine as possible. How-

ever, taking into account the fact that the length of the pins has to be limited, as otherwise there would be an adverse effect on accessibility, the pins can only be made finer by reducing their strength and vice versa, that is, if it is wished to guarantee greater strength, the pins must be enlarged. There would consequently be a loss in the ability to access smaller working environments, and, in addition, the pliers could not be used with circlips smaller than a specific size because of the difficulty of getting the pins to penetrate reliably in the apertures in the circlips.

EXPLANATION AND ADVANTAGES OF THE INVENTION

[0007] The subject of the present invention is a manual tool or pliers for fitting and removing circlips, which pliers have a specific design in which the pins are inclined in the same direction as the operative manoeuvre to be performed by the pliers, that is, in opposition with one another towards the outside in the case of the opening pliers or facing one another in the case of the closure pliers.

[0008] The pins have a transverse cross-section of varying configuration, which is constituted by a first cone with an angle which is smaller than a second cone as defined by the conical grippers, where the first cone has two differentiated parts, that is, an active front part and a rear part which is connected to the second cone.

[0009] The active front part, on the side which faces in the direction of the operative manoeuvring of the pliers, has a configuration wherein the first cone has a recess provided by the connection with a cylindrical surface, with its axis being inclined by an angle relative to the axis of the pins, and the generatrix being spaced from the axis by the same distance as the radius which corresponds to the end circle of the first cone, and the rear part has, as a continuation of the recess, a surface with a concave curved profile with a radius, with the generatrix of the cylindrical surface being connected to the generatrix of the conical gripper at a critical section.

[0010] This design is advantageous for all of the aforementioned basic characteristics of this type of product, as will be explained in more detail hereinafter.

[0011] As far as functionality is concerned, the design of the present invention is characterised in that the pins have an inclination in the direction of manoeuvring which makes it possible to guarantee correct clamping of a circlip, thus preventing any slippage and ensuring that the contact between the pins and the apertures in the circlip is secure and firm. This inclination of the pins facilitates the handling of a circlip, such that the circlip is secured reliably simply by introducing the pins into the apertures, without needing to initiate the opening or closure of the pliers, in order to achieve this objective, as was the case hitherto. In addition, the geometry of the pins continues to provide a cylindrical surface with reference to the part which exerts the working pressure on the apertures in the circlip.

[0012] As far as strength is concerned, the design of the pins has a section of material which, in relation to the part of the cylindrical surface which exerts pressure on the apertures in the circlip, is enlarged progressively, on the part opposite the cylindrical surface which applies the pressure, as its end is approached, that is, the section which is most critical or prone to breakage. This configuration provides for increased strength for the same kind of circlip.

[0013] The accessibility of the pins is interrelated with their strength, since, for the same size of circlip, the pins according to the invention are stronger, and thus it is consequently possible to make the pins thinner, in order to increase the accessibility to uses where the known designs could not be applied since their lack of strength would be a risk.

[0014] In a preferred embodiment, in the first cone, the recess which determines the cylindrical surface extends around the entire axis and has the same radius thereas, thus providing a pin which is totally cylindrical, and which on its base is surrounded by a ring of material which corresponds to the surface with a concave curved profile which forms the meeting point of the conical gripper with the cylindrical pin.

[0015] In this embodiment the part of the apertures in the circlip which is situated on the side opposite that of the manoeuvre for opening and closure of the grippers is supported on the ring of material which surrounds the cylindrical pin, whilst the part on the side towards which this manoeuvre is performed is supported against the opposite part of the apertures and on the mouth of the same which faces opposite the ring of material. With this configuration, when the circlip is subjected to the considerable resilient force of its opening or closure, there are no possible components of transverse force which could detract from the planarity of the circlip and give rise to deformation which, without preventing the latter from being fitted, would lead to a loss of efficiency and reliability in the work to be performed, which could result in faults in the unit or mechanism in which a deformed circlip is installed, or could lead to the circlip escaping from its receptacle when subjected to the above-described force, with the consequent risk for human safety. In the previously-described alternative embodiment, this part of the apertures in the circlip which faces opposite the direction of the manoeuvre is supported against the oblique wall which constitutes the non-recessed conical surface of the pin.

DRAWINGS AND REFERENCES

[0016] In order to improve understanding of the present invention, the attached drawings represent a preferred industrial embodiment, which is in the nature of a purely illustrative and non-limiting example.

Figure 1 shows opening pliers 1 in accordance with a first embodiment of the present invention, which

are positioned in relation to a circlip 3 seen in profile. This figure includes an enlarged detail of the pins 6, and a further enlarged detail of one of the pins 6, in order to illustrate the geometric elements which define the same. The figure also incorporates a detail which shows the lower plan view of the circlip 3.

Figure 2 is a perspective view of the right-hand pin 6 as shown in Figure 1.

Figures 3 and 4 are both transverse cross-sections of the pin 6 in Figure 2, illustrating the varying configuration of the same.

Figure 5 represents the vertical, end section corresponding to Figure 2.

Figure 6 represents the vertical, end cross-section corresponding to Figure 4.

Figure 7 is a perspective view illustrating the operative application of the opening pliers 1 of Figure 1.

Figure 8 is a view of the pins 6 of a closure pliers 2 in accordance with the first embodiment of the present invention.

Figure 9 is the same view as Figure 7, but relates to the closure pliers 2 of Figure 8.

Figure 10 shows an opening pliers 1 in accordance with a second embodiment of the present invention. This figure incorporates an enlarged detail which relates to the right-hand pin 6a in the drawing of the opening pliers 1.

Figure 11 is a perspective view of the pin 6a which is shown in the enlarged detail in Figure 10.

Figure 12 is a fragmentary view of a circlip 3 seen in profile in cross-section through both apertures 4, in which there are inserted the cylindrical pins 6a of the opening pliers 1 of Figure 10.

Figure 13 shows closure pliers 2 in accordance with the first embodiment of the present invention.

[0017] These following references are used in the specification:

1. Manual tool or opening pliers
2. Manual tool or closure pliers
3. Circlip
4. Circlip (3) apertures
5. Conical grippers of the manual tool or pliers (1, 2)
6. Conical gripper (5) shank or pin
- 6a. Cylindrical shank or pin
7. First cone

- 7a. Active front part of the first cone (7)
- 7b. Rear part of the first cone (7)
- 8. Second cone
- 9. Cylindrical surface
- 10. Cylindrical surface (9) axis
- 11. Angle
- 12. Axis of pin (6)
- 13. Generatrix of cylindrical surface (9)
- 14. First Radius
- 15. Surface of concave curved profile
- 16. Second Radius
- 17. Generatrix of conical grippers (5)
- 18. Critical section
- 19. End circle of pins (6)
- 20. Ring

DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Figures 1 to 9 illustrate a manual tool, in this embodiment a pliers 1, 2 in accordance with a first embodiment of the present invention, which is designed for fitting circlips 3 which have apertures 4 at each of their ends.

Figures 1 to 7 illustrate opening pliers 1, and Figures 8 and 9 illustrate closure pliers 2.

[0019] The pliers 1, 2 comprise a pair of conical grippers 5, which each include a shank or pin 6 at the end thereof for insertion into respective ones of the apertures 4 in the ends of a circlip 3.

[0020] The pins 6 are each inclined in the same direction as the operative movement of the pliers 1, 2, that is, oppositely, outwardly facing in the case of opening pliers 1 and opposed, inwardly facing, towards one another, in the case of closure pliers 2.

[0021] The pins 6 have a transverse cross-section of varying configuration, and are constituted by a first cone with an angle 7 which is smaller than a second cone with an angle 8 as defined by the conical gripper 5, which first cone has two differentiated parts, that is, an active front part 7a and a rear part 7b which is connected to the second cone.

[0022] The active front part 7a, on the side which faces in the direction of the operative movement of the pliers 1, 2, has a configuration wherein the first cone has a recess provided by connection with a cylindrical surface 9, with the axis 10 of the cylindrical surface 9 being inclined by an angle 11 relative to the axis 12 of the pin 6 and the generatrix 13 of the cylindrical surface 9 being spaced from the axis 10 of the cylindrical surface 9 by the same distance as a first radius 14 which corresponds to the end circle 19 of the first cone of the pin 6, and the rear part 7b, as a continuation of the recess, includes a surface with a concave curved profile 15 with a second radius 16, wherein the generatrix 13 of the cylindrical surface 9 is connected to the generatrix 17 of the conical gripper 5 at a critical section 18.

[0023] The functional advantage of the above-described inclined pins 6, in relating to the reliability and

firmness of clamping of the circlip 3, is illustrated clearly in Figure 7.

[0024] Figures 2 to 6 illustrate clearly the variation of the form of the transverse cross-section of the pin 6 from the tip (Figures 2 and 5) to the critical cross-section 18 (Figures 4 and 6), passing through other, intermediate cross-sections, such as that in Figure 3.

[0025] As clearly illustrated, the end, initial cross-section (Figures 2 and 5) is enlarged progressively until it reaches (Figures 4 and 6) the critical cross-section 18. From this progressive enlargement, there can be deduced the above-described advantages relating to the basic characteristics of strength and accessibility, that is, greater strength than the designs known at present, in relation to the same kind of circlip 3, or greater accessibility and applicability, since the device permits production of finer pins 6 having the same strength as others which are thicker, according to these known designs.

[0026] Figures 10 to 13 illustrate a manual tool, in this embodiment pliers 1, 2 in accordance with a second embodiment of the present invention. Figures 10 to 12 illustrate opening pliers 1, and Figure 13 illustrates closure pliers 2.

[0027] In this embodiment the recess which defines the cylindrical surface 9 extends around the entire axis 10 and has the same radius 14 thereas, and provides a pin 6a which is totally cylindrical, and is surrounded at its base by a ring 20 of material which corresponds to the surface with a concave curved profile 15, which forms the meeting point of the conical gripper 5 with the cylindrical pin 6a.

[0028] Figure 10 illustrates opening pliers 1, that is, the type as used for fitting external circlips 3 onto shafts, and Figure 12 illustrates closure pliers 2, that is, the type as used for fitting internal circlips 3 into holes.

[0029] Figure 11 is a perspective view which illustrates the cylindrical pin 6a, both for opening pliers 1 and for closure pliers 2, where the pins 6a would be rotated through 180°.

[0030] In this embodiment a cylindrical pin 6a is formed which emerges from the interior of the end of the conical gripper 5 and is surrounded by a ring 20 of material. By this means, the operative position of the circlip 3 relative to the cylindrical pins 6a is that illustrated in Figure 12, wherein the edge of the lower mouths of the apertures 4 is supported on the ring 20 at the base of the cylindrical pins 6a, and the upper mouth of the apertures 4 is supported against the upper end part of the cylindrical pins 6a. This support is balanced, such that, when the force of resilient stretching or compression is applied to the circlip 3, the occurrence of inclined forces, which detract from the planarity of the circlip 3 and can deform the circlip 3, is prevented, thus resulting in more efficient and reliable work.

[0031] Finally, it will be understood that the present invention has been described in its preferred embodiments and can be modified in many different ways without departing from the scope of the invention as defined by

the appended claims.

[0032] For example, it should be understood that, although the present invention has been described in relation to a pliers 1, 2, the pins 6, which are the subject of the present invention, could be applied to any manual tool which supports the same, such as an adjustable spanner, a crimping tool or the like.

Claims

1. Pins (6) at the tip of a manual tool (1, 2), preferably a pliers for opening or closing circlips (3), wherein the pins (6) are inclined in the same direction as the operative manoeuvre to be performed by the tool (1, 2), and each have a transverse cross-section with a varying configuration which is constituted by a first cone with an angle (7) which is smaller than an angle (8) of a second cone as defined by a conical gripper (5), wherein the first cone has an active front part (7a) and a rear part (7b) which is connected to the second cone of the conical gripper (5), with the active front part (7a), on the side which faces in the direction of the operative manoeuvre of the tool (1, 2), including a recess provided by the connection with a cylindrical surface (9), the cylindrical surface (9) having an axis (10) inclined by an angle (11) relative to the axis (12) of the pin (6) and the generatrix (13) of the cylindrical surface (9) being spaced from the axis (10) of the cylindrical surface (9) by the same distance as a first radius (14) which corresponds to the end circle (19) of the first cone of the pin (6), and the rear part (7b), as a continuation of the recess, including a surface with a concave curved profile (15) with a second radius (16), and the generatrix (13) of the cylindrical surface (9) is connected to the generatrix (17) of the conical gripper (5) at a critical section (18).
2. Pins (6a) at the tip of a manual tool (1, 2), preferably a pliers for opening or closing circlips (3), wherein the pins (6a) are inclined in the same direction as the operative manoeuvre to be performed by the manual tool (1, 2), and each comprise a cylindrical surface (9) which at its base is surrounded by a ring (20) of material which forms the meeting point of a conical gripper (5).
3. Pins (6) at the tip of a manual tool (1, 2), preferably a pliers for opening resilient washers for internal or external uses, which are known as circlips (3) and have apertures (4) at each of their ends in order to permit penetration of the pins (6) which are formed at the end of each of the conical grippers (5) of the tool (1, 2) for opening (1) or closure (2) of the circlip (3), respectively, **characterised in that** the pins (6) are inclined in the same direction as the operative manoeuvre to be performed by the tool (1, 2), that is, in opposition with one another towards the outside

in the case of the opening pliers (1) or facing one another in the case of the closure pliers (2), and which pins (6) have a transverse cross-section with a variable configuration which is constituted by the cone with an angle (7) which is smaller than the cone with the angle (8) of the conical gripper (5), which cone with the angle (7) has two differentiated parts, that is, an active front part (7a) and a rear part (7b) which is connected to the cone with the angle (8), which active front part (7a), on the side which faces in the direction of the operative manoeuvring of the tool (1, 2), has a configuration wherein the cone with an angle (7) has a recess provided by the connection with a cylindrical surface (9) wherein its axis (10) is inclined by an angle (11) relative to the axis (12) of the pin (6), and wherein the generatrix (13) is spaced from the axis (10) by the same distance as the radius (14), which corresponds to the end circle (19) of the cone with the angle (7) of the pin (6), and the rear part (7b) of which has a continuation of the recess, by means of a surface with a concave curved profile (15) with a radius (16), wherein the generatrix (13) is connected to the generatrix (17) of the conical gripper (5) at a critical section (18).

4. Pins (6a) at the tips of a manual tool (1, 2), preferably a pliers for opening resilient washers for internal or external uses, which are known as circlips (3) and have apertures (4) at each of their ends in order to permit penetration of the pins (6a) which are formed at the end of each of the conical grippers (5) of the tool (1, 2) for opening (1) or closure (2) of the circlip (3), respectively, **characterised in that**, in a cone with an angle (7), a recess which determines the cylindrical surface (9) extends around the entire axis (10) and has the same radius (14) as the latter, thus providing a pin which is totally cylindrical (6a), and which on its base is surrounded by a ring (20) of material which corresponds to the surface with a concave curved profile (15) which forms the meeting point of the conical gripper (5) with the cylindrical pin (6a).
5. Pins (6, 6a) at the tip of a manual tool (1, 2), preferably a pliers for opening or closing circlips (3), wherein the pins (6, 6a) are inclined in the same direction as the operative manoeuvre to be performed by the manual tool (1, 2).
6. The pins (6, 6a) of any of claims 1 to 5, wherein the tool (1) is an opening tool and the pins (6, 6a) are inclined outwardly away from one another.
7. The pins (6, 6a) of any of claims 1 to 5, wherein the tool (2) is a closure tool and the pins (6, 6a) are inclined inwardly towards one another.
8. A manual tool (1, 2) incorporating the pins (6, 6a) of

any of claims 1 to 7, wherein the manual tool (1, 2)
is preferably a pliers.

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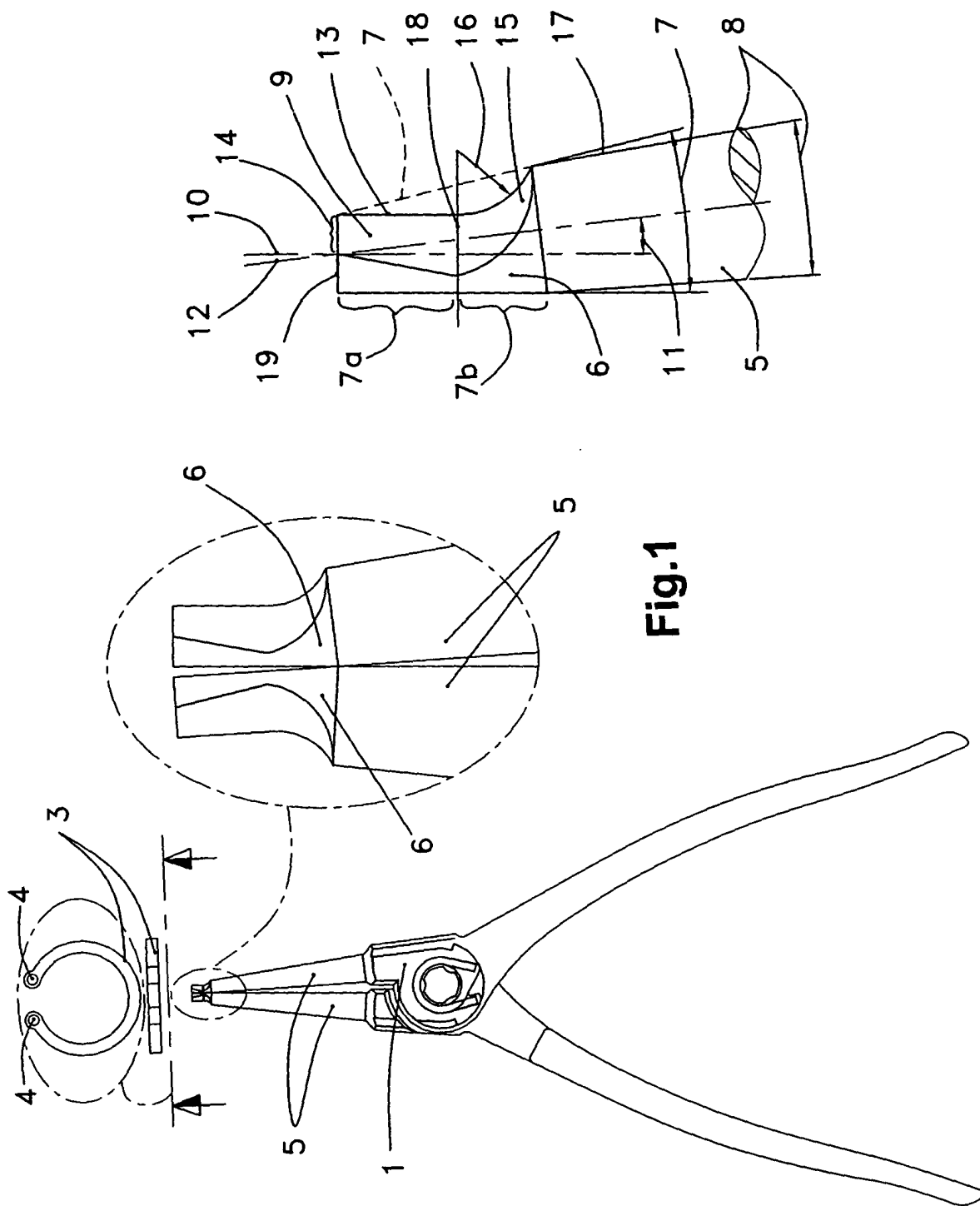
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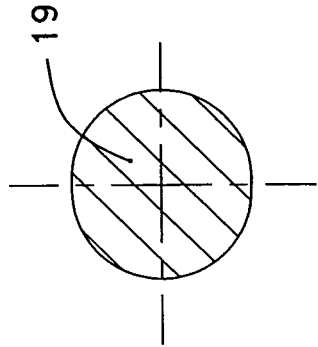


Fig. 5

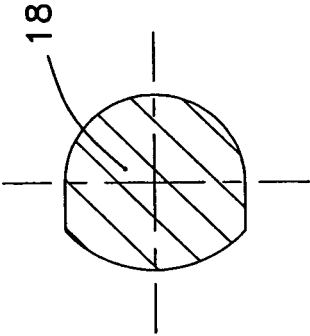


Fig. 6

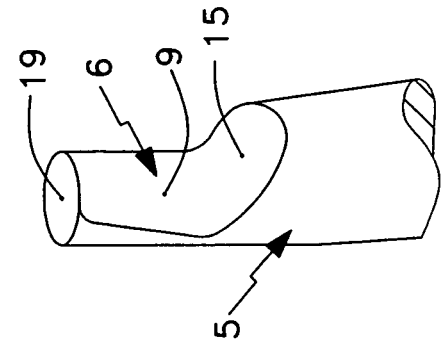


Fig. 2

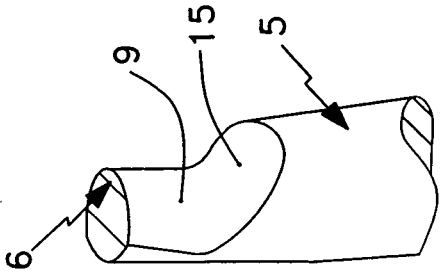


Fig. 3

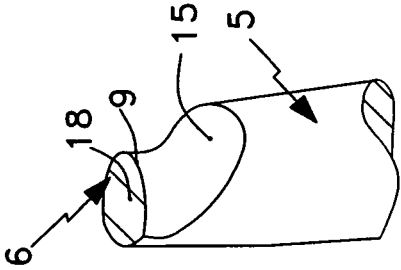


Fig. 4

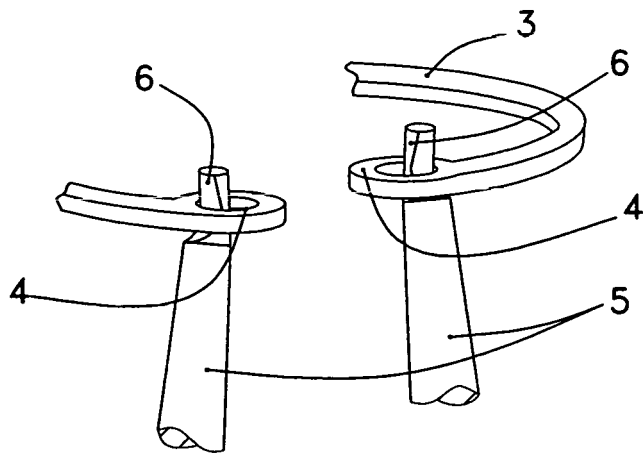


Fig.7

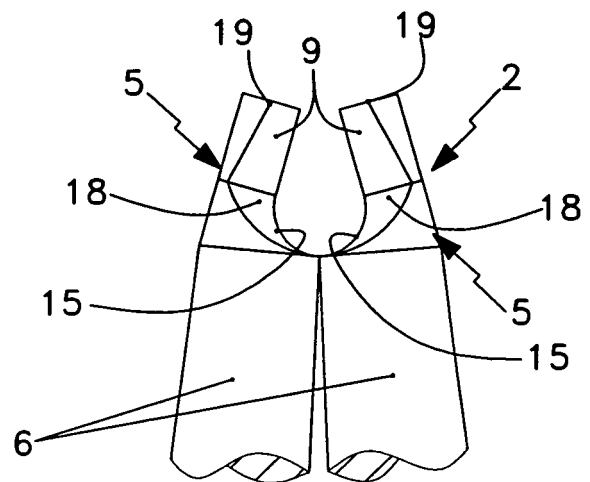


Fig.8

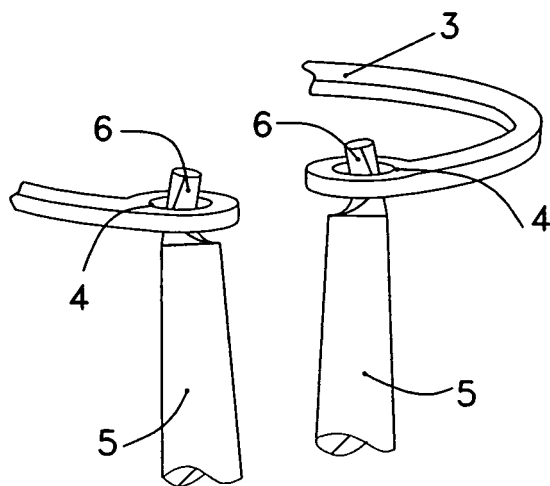
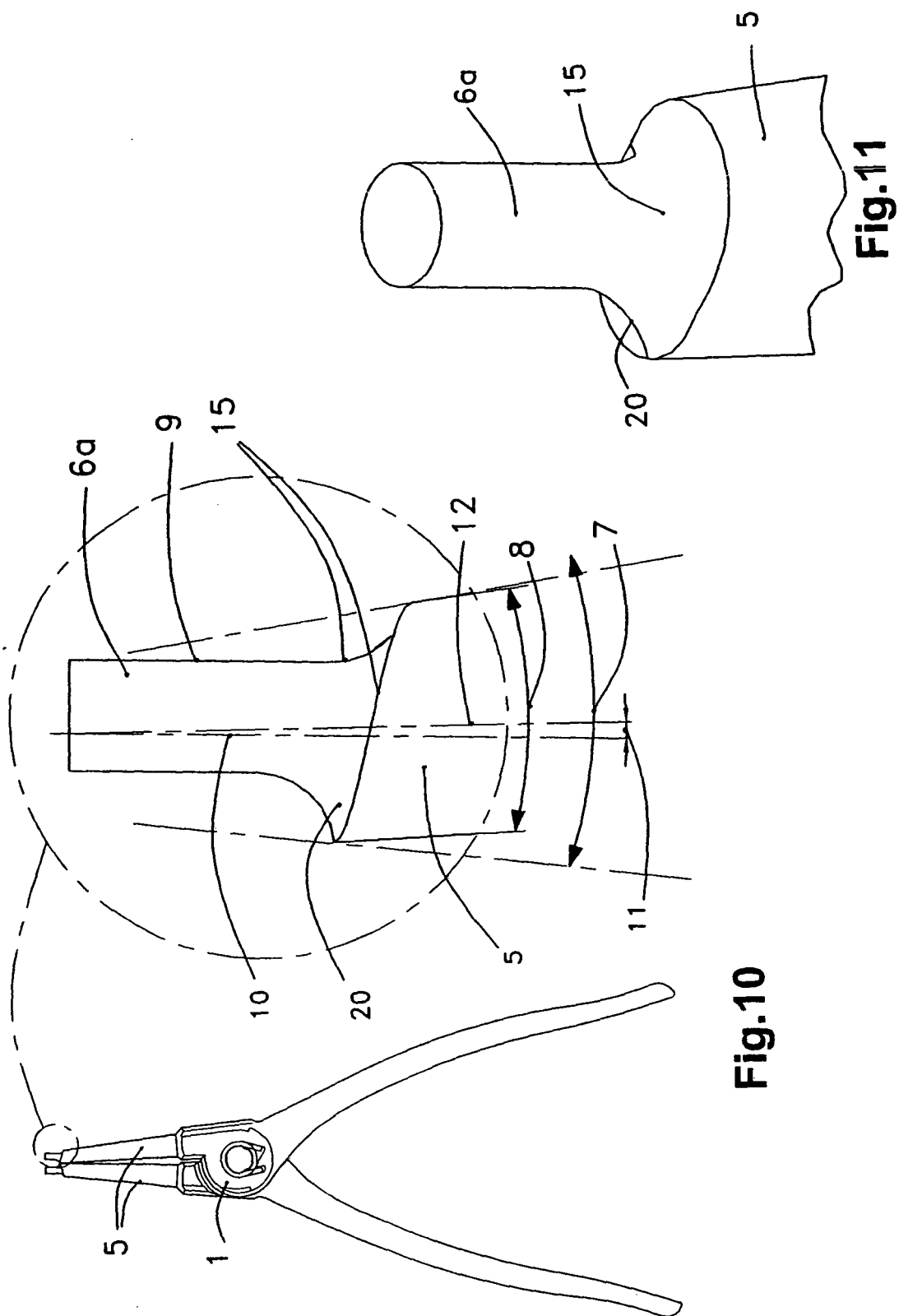


Fig.9



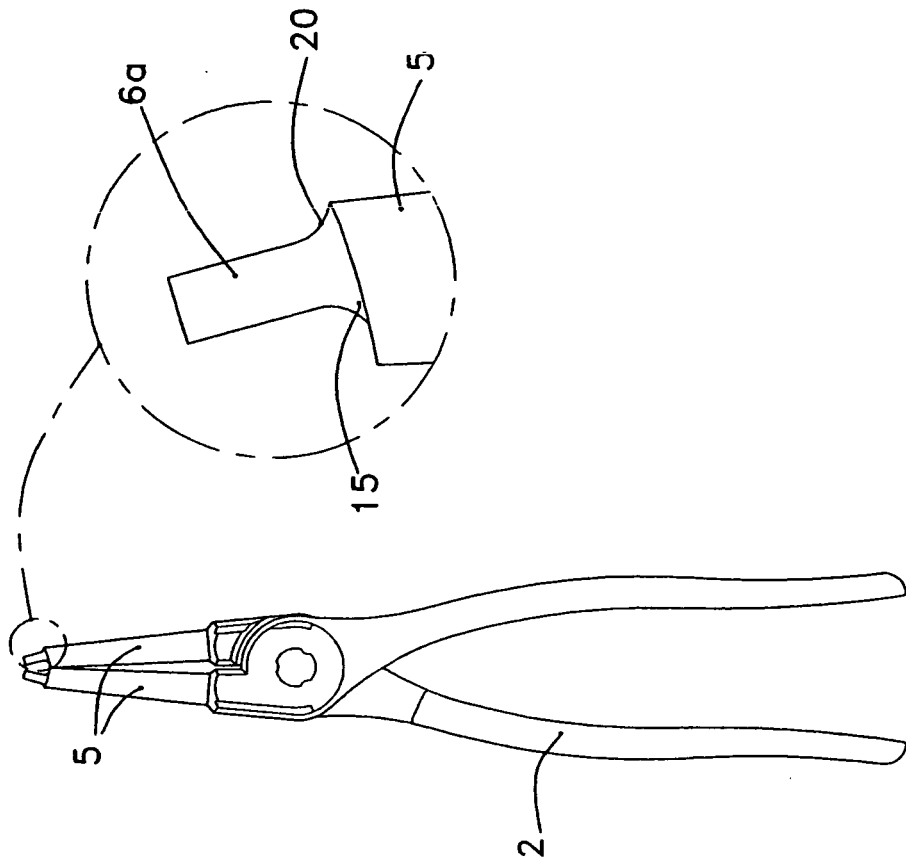


Fig.13

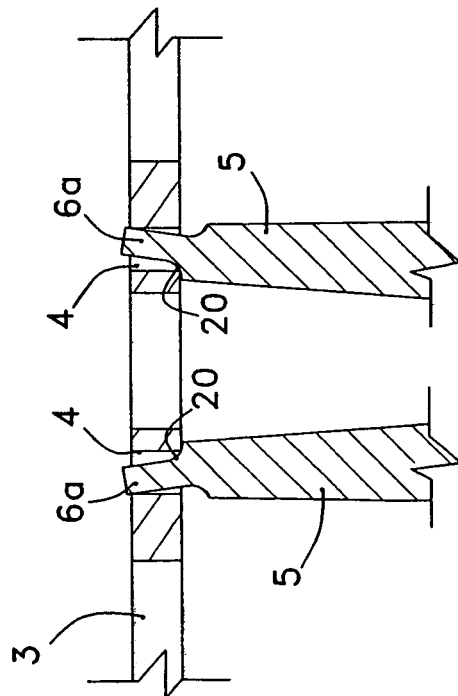


Fig.12