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(54) **Rotary tool for high speed machining of wood, plastics or light metals.**

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Courier Press, Leamington Spa, England.

Description

This invention concerns a rotary tool for high-speed machining of wood, plastics or light metals.

In particular, this invention is concerned with the problem of clamping inserts in rotary tools which are employed advantageously for the processing of wood or plastics, or, in any case, in tools which rotate at high speed.

It is known that the clamping of inserts is a grave problem for the safety of machine operatives and for the accurate alignment and balancing of the tools themselves.

Lastly, the clamping of the tools is reflected in the quality of the finished product.

At the speed at which the tools rotate nowadays, their clamping has become an important feature in that the inserts have been standardized and have reached an optimum level of performance.

The problem to be overcome in up-to-date clamping means are manifold and indeed it is necessary to be able to obtain clamping means which are strong and stable enough to withstand all kinds of vibration.

It is desirable to provide clamping means which do not need to be removed during assembly and dismantling.

Clamping means should preferably to provided which align and secure the insert automatically.

It is desirable to provide clamping means which, owing to their very nature, constrain the insert with an action that opposes centrifugal force.

It is also desirable to provide clamping means which do not leave their housing even if they have been badly secured.

Patent CH—A—619.880 discloses a system for fixture of inserts by which the insert is retained by a clamping element provided with means able to retain the insert positively. The clamping element in its turn is thrust by a resisting element with a wedge-wise action. The clamping force is provided by an adjustment screw acting between the resisting element and the body of the tool.

All these purposes together with further purposes and advantages are pursued by our present invention according to this description.

According to the invention a housing space is envisaged which has the shape substantially of a truncated cone and which widens towards the middle of the tool holder.

At the side of the housing space is envisaged a suitable seating space for the tool, and such seating is dimensioned and positioned perfectly in relation to the middle of the tool itself so that, when such seating supports the tool or insert, the tool or insert is located perfectly in relation to the middle of the tool holder and therefore in relation to the plurality of other tools or inserts.

Into such housing space are introduced at least two bodies which cooperate with each other by means of screw means, whereby the reciprocal action carried out by the screw means is such as to thrust one body towards an opposing wall, whereas the other body, the so-called clamping body, is thrust towards the insert.

At the same time the insert is pushed by the latter body with a thrust substantially towards the middle of the tool holder.

According to a first embodiment of the invention the clamping body has two clamping surfaces that cooperate with resisting blocks on which a regulating or adjusting screw having a righthand thread and a lefthand thread acts.

By turning the screw such resisting blocks can be brought nearer to or farther from each other.

The action of the resisting blocks on the opposing surfaces causes a sideways thrust towards the middle of the tool holder. This is so because, by pressing against the opposing wall, such blocks constrain the clamping body to move sideways towards the insert and substantially towards the middle of the tool holder.

According to this preferred embodiment the regulating screw comprises in an intermediate position a ring which provides lengthwise anchorage and which can cooperate with an anchorage hollow that may possibly be included in the clamping body. Substitute means can also be visualized.

Such anchorage ring can cooperate with a safety pin which holds the regulating screw onto the clamping body and which can exert at the same time on the clamping body an outwards thrust that constrains the clamping body to be embedded in the housing space.

According to another embodiment the anchorage ring has an intermediate hollow within which the safety pin is made to pass.

According to a further embodiment the opposing surfaces are not linear but have a substantially rounded development so as to reduce to a minimum the necessity for accurate mating.

This makes it possible to maintain at the same time a thrust strong enough to obtain an almost irreversible clamping condition when the forces in question are taken into account.

Moreover, the area of contact between the resisting blocks and the opposing wall may possibly be suitably shaped.

According to a further embodiment the resisting block cooperates with a screw located in an almost radial position and acting on both the resisting block and the clamping body at the same time.

Thus, by acting on such screw the two elements are moved towards each other or one of them is moved in a direction opposite to the other, thus constraining the clamping body to thrust the insert downwards and sideways and keeping it in the right position in relation to the seating of the tool.

According to yet another embodiment the resisting block comprises a slit such that the walls of the block itself are made elastic.

When a screw is caused to act on such walls, a union substantially with the shape of a truncated cone between the resisting block and the clamp-

ing body forces the clamping body itself to move sideways and downwards and thus constrains the insert to be secured perfectly within the seating of the tool.

The invention provides a rotary tool for high-speed machining of wood, plastics or light metals, comprising a tool holder and a plurality of replaceable cutting inserts, the tool holder having a plurality of housing spaces that widen peripherally in the direction of the centre of the tool holder, each housing space including a stepped seating for an insert in the trailing direction relative to the normal direction of rotation of the tool: a clamp body located in each housing space and cooperating with means to retain each insert positively in the radially outward direction: at least one resisting block located in each housing space: an adjusting screw for providing movement between each resisting block and its associated clamp body such that by reaction with the walls of the housing space there is produced a thrust in the peripheral direction of the tool holder to constrain the resisting block against an opposing wall of the housing space and to constrain the clamp body against the insert; characterized in that each adjusting screw is operable to cause a separating movement between a said clamp body and at least one said resisting block to produce firstly the said thrust and secondly a component of force directed generally inwardly towards the middle of the tool holder and applied to the insert by means of at least the retaining means so as positively to retain the insert radially against the step of the stepped seating.

Let us now see some preferred lay-outs of the invention with the help of the attached figures, which give some non-restrictive examples.

The figures contain the following:—

Fig. 1 gives a vertical section of a possible embodiment of the invention;

Fig. 2 shows the embodiment of Fig. 1 according to a lengthwise section;

Fig. 3 shows a variant evolved from Fig. 1;

Fig. 4 shows an evolutive variant of the regulating screw;

Fig. 5 shows the embodiment of another variant;

Fig. 6 shows the embodiment of another variant in relation to Fig. 5;

Figs. 7 and 8 show a section and a side view of another variant.

With reference to the figures, a tool holder 10 comprises a housing space 11 with an opposing wall 12 and a supporting wall 13; a lateral seating 14 for a tool is provided in the supporting wall 13.

The seating 14 for a tool includes a supporting corner 15 and a wall 16 supporting an insert.

The conformation of the housing 11 substantially like a truncated cone has the effect that, as the wall 16 supporting an insert 23 is substantially parallel to a plane passing through the axis of the tool holder 10, the opposing wall 12 will cut such plane at a position a great deal above the middle of the tool holder 10.

The wall 16 supporting the insert and the supporting corner of the seating 14 for a tool are positioned perfectly in relation to the centre of rotation of the tool holder 10.

A clamping body 17 is introduced within the housing 11 and, in the example of Fig. 1, comprises a lengthwise hollow 32 in which are located two resisting blocks 18—118 cooperating with a regulating screw 19 having a righthand and a left-hand thread.

The regulating or adjusting screw 19 includes a ring 20 for lengthwise anchorage, and such ring 20 cooperates with a hollow 21 for lengthwise anchorage formed in the clamping body 17.

Opposing surfaces 22 are provided in the lengthwise hollow 32 of the clamping body 17 and cooperate with respective resisting surfaces 122 formed on the resisting blocks 18.

Thus, when the regulating screw 19 is turned, the resisting blocks 18 are, for instance, drawn towards each other and the respective resisting surfaces 122 press on the opposing surfaces 22 of the clamping body 17.

This pressure constrains the resisting blocks 18 to move sideways until they rest against the opposing wall 12.

As soon as the resisting blocks 18 rest against the opposing wall 12, they constrain the clamping body 17 to move in its turn.

The position of the opposing wall 12 conditions the characteristics of the movement of the clamping body 17.

When the clamping body 17 moves, it acts on the insert 23 or tool having a re-usable and replaceable tip.

The tool 23 comprises one or more holes 24 which cooperate with appropriate pins 25 solidly fixed to the clamping body 17.

Owing to the action of the resisting blocks 18 against the clamping body 17 the pin 25 rests against the bottom of the hole 24 and engages the insert 23.

This action constrains the insert 23 to rest perfectly against the wall 16 and at the same time against the corner 15 and to be positioned perfectly in relation to the middle of the tool holder 10 and to the other tools.

The clamping body 17 is advantageously envisaged as comprising a protective outlet 26 which cooperates with the cutting edge of the insert 23 lying against the supporting corner 15.

So as to prevent the regulating screw 19, and therefore the resisting blocks 18, from becoming detached possibly from the clamping body 17 during movement, it is possible to visualize a safety pin 27 which engages the clamping body 17 and the regulating screw 19.

It is possible to obtain an auxiliary safety function with the safety pin 27 if such safety pin protrudes from the lower side of the body 17 and cooperates with the bottom of the housing 11.

In such a case, if the safety pin 27 is elastic enough and is made to work by bending against the bottom of the housing 11, it will constrain the clamping body 17 with an outward thrust.

This makes it possible to ensure a grip and

security which could not be obtained otherwise in the case of imperfect clamping by the resisting blocks 18.

The safety pin 27 can be single, as in Fig. 1, or double, as in Fig. 3, or can have other suitable shapes according to the requirements of the design.

According to a variant the ring 20 providing lengthwise anchorage and comprised in the regulating screw 19 can have an intermediate hollow 28 within which the safety pin 27 is made to lodge; in this way the hollow 21 providing lengthwise anchorage is rendered unnecessary.

The embodiment now shown entails a movement substantially parallel to the axis of rotation of the tool holder 10.

With the invention, however, it is also possible to obtain clamping of the inserts 23 by making use of an action of the resisting blocks 218 in a substantially radial direction.

This too is due to the reciprocal disposition of the wall 12 and wall 13 in relation to the centre of rotation of the tool holder 10.

Indeed, as can be seen in Figs. 5 and 6, a clamping action can be obtained which is in principle substantially the same as that of Fig. 1 but which is substantially different as an embodiment to be applied.

According to such variants the resisting block 218 is thrust towards the opposing wall 12 by screw means 119, which also have a righthand and a lefthand thread and which engage the resisting block 218 and the clamping body 117 at one and the same time.

In this way the clamping body 117 is thrust not only towards the supporting wall 13 but also towards the insert 23 and constrains the insert 23 to rest against the supporting corner 15.

The difference between the lay-outs of Figs. 5 and 6 lies substantially in greater security of the invention in the example of Fig. 6.

In fact, the twofold inclination permits safer and longer-lasting anchorage in the long term even when there are vibrations.

Indeed, the reciprocal sliding wall 31 of Fig. 5 is substantially parallel to the wall 13, whereas there is an angle between such walls in Fig. 6.

In the examples of Figs. 7 and 8 the resisting block 318 comprises a hollow which enables the two sides A and B of the block itself to bend in relation to each other, whereby the side B is able to lodge the head 30 of the screw 230, whereas the side A can lodge the threaded part 130 thereof.

When the screw 219 is turned, the two sides A and B of the resisting block 218 tend to come nearer to each other.

This action is opposed by the presence of the body 217, which is thrust towards the insert 23, whereas the resisting block 318 is thrust towards the wall 12, the two oblique sides 131 acting as wedge means.

We have described herein some preferred embodiments, but variants are possible and it can be seen that some embodiments are suitable for wide tools and others for narrow tools, whereas others again are suitable for very narrow tools.

Thus, the proportions, sizes and parts can be varied and various parts can be combined together according to the invention, within the scope of the claims.

It is possible to visualize that the opposing surfaces 22—122 are rounded or crown-shaped; it can be envisaged that the sliding surfaces 31 between the body 218 and body 217 may possibly have a special shape, and so forth.

Claims

1. A rotary tool for high-speed machining of wood, plastics or light metals, comprising a tool holder (10) and a plurality of replaceable cutting inserts (23), the tool holder having a plurality of housing spaces (11) that widen peripherally in the direction of the centre of the tool holder (10), each housing space including a stepped seating (14) for an insert in the trailing direction relative to the normal direction of rotation of the tool: a clamp body (17, 117, 217) located in each housing space and cooperating with means (25) to retain each insert positively in the radially outward direction: at least one resisting block (18, 118, 218, 318) located in each housing space: an adjusting screw (19, 119, 130) for providing movement between each resisting block and its associated clamp body such that by reaction with the walls of the housing space there is produced a thrust in the peripheral direction of the tool holder to constrain the resisting block against an opposing wall (12) of the housing space and to constrain the clamp body against the insert; characterized in that each adjusting screw is operable to cause a separating movement between a said clamp body and at least one said resisting block to produce firstly the said thrust and secondly a component of force directed generally inwardly towards the middle of the tool holder and applied to the insert by means of at least the retaining means so as positively to retain the insert radially against the step of the stepped seating.

2. Rotary tool as claimed in Claim 1, in which the clamp body (17) comprises lengthwise hollow means (32) substantially normal to the opposing wall (12) and having two opposing inclined surfaces (22) disposed as counterparts of each other.

3. Rotary tool as claimed in Claims 1 and 2, in which two resisting blocks (18) in the lengthwise hollow (32) cooperate with opposed surfaces (122) and with an adjustment screw (19) having a righthand and a lefthand thread.

4. Rotary tool as claimed in Claim 3, in which the clamp body (17) cooperates with resilient safety pin means (27, 127), which secure the adjustment screw (19) and protrude advantageously into the lower part of the clamp body (17) so as to cooperate with the bottom of the housing space (11).

5. Rotary tool as claimed in Claim 4, in which the safety pin means (27) cooperate with anchorage ring means (20) located on the adjustment screw (19).

6. Rotary tool as claimed in Claim 3, in which the adjustment screw (19) cooperates at its side with lengthwise anchorage hollow means (21) included in the clamp body (17).

7. Rotary tool as claimed in Claim 1, in which the resisting block (218) is one in number and cooperates in an advanced position in the direction of motion with the clamp body (117) by means of the adjustment screw (119) and with facing and slidable sides (31) (Figs. 5 and 6).

8. Rotary tool as claimed in Claim 1, in which the resisting block (318) comprise two sides (A — B) having a hollow (29) between them and constrained together by the adjusting screw (219) and having oblique sides (131) cooperating wedgewise with the clamp body (217) (Figs. 7 and 8).

Revendications

1. Outil rotatif pour l'usinage à grande vitesse du bois, des matières plastiques ou métaux légers, comprenant un porte-outil (10) et une pluralité d'éléments rapportés coupants interchangeables (23), le porte-outil présentant une pluralité d'espaces de logement (11) qui s'élargissent à leur périphérie en direction du centre du porte-outil (10), chaque espace de logement comprenant une portée épaulée (14) pour un élément rapporté, vers l'arrière relativement au sens normal de rotation de l'outil; un corps de serrage (17, 117, 217) logé dans chaque espace de logement et coopérant avec des moyens (25) pour retenir positivement chaque élément rapporté dans le sens allant radialement vers l'extérieur; au moins un bloc résistant (18, 118, 218, 318) logé dans chaque espace de logement; une vis de réglage (19, 119, 130) destinée à fournir un mouvement entre chaque bloc résistant et son corps de serrage respectif de manière que, par réaction sur les parois de l'espace de logement, une poussée se produise dans la direction périphérique du porte-outil, pour appliquer le bloc résistant contre une paroi opposée (12) de l'espace de logement et appliquer le corps de serrage contre l'élément rapporté; caractérisé en ce que chaque vis de réglage peut être manoeuvrée pour provoquer un mouvement d'écartement entre un corps de serrage précité et au moins un bloc résistant précité, pour produire, premièrement, ladite poussée et, deuxièmement, une composante de force dirigée généralement vers l'intérieur, vers le centre du porte-outil, et appliquée à l'élément rapporté au moyen d'au moins les moyens de retenue, de façon à retenir positivement l'élément rapporté radialement contre l'épaulement de la portée épaulée.

2. Outil rotatif selon la revendication 1, dans lequel le corps de serrage (17) comprend un évidement longitudinal (32) sensiblement normal à la paroi opposée (12) et présentant deux surfaces inclinées opposées (22) disposées en contre contrepartie l'une de l'autre.

3. Outil rotatif selon les revendications 1 et 2, dans lequel deux blocs résistants (18) logés dans l'évidement longitudinal (32) coopèrant avec des surfaces opposées (122) et avec une vis de réglage (19) qui possède un filetage à droite et un filetage à gauche.

4. Outil rotatif selon la revendication 3, dans lequel le corps de serrage (17) coopère avec des moyens du type épingle de sécurité (26, 127), qui fixent la vis de réglage (19) et font avantageusement saillie dans la partie inférieure du corps des serrage (17) pour coopérer avec le fond de l'espace de logement (11).

5. Outil rotatif selon la revendication 4, dans lequel les moyens formant épingle de sécurité (27) coopèrent avec des moyens annulaires d'ancrage (20) prévus sur la vis de réglage (19).

6. Outil rotatif selon la revendication 3, dans lequel la vis de réglage (19) coopère, sur son côté avec des moyens (21) formant un évidement d'ancrage longitudinal qui sont ménagés dans le corps de serrage (17).

7. Outil rotatif selon la revendication 1, dans lequel le bloc résistant (218) est prévu an nombre d'un et coopère, dans une position avancée dans le sens du mouvement, avec le corps de serrage (17) sous l'action de la vis de réglage (119), et avec des côtés (31) disposés face à face et coulissants (Figures 5 et 6).

8. Outil rotatif selon la revendication 1, dans lequel le bloc résistant (318) comprend deux côtés (A—B) présentant entre eux un évidement (29) et qui sont rapprochés l'un de l'autre par la vis de réglage (219), et possède des côtés obliques (131) coopérant avec le corps de serrage 217) à la façon de coins (figures 7 et 8).

Patentansprüche

1. Rotierendes Werkzeug zur schnellaufenden Bearbeitung von Holz, Plastik oder Leichtmetallen, das einen Werzeughalter (10) und eine Merzahl auswechselbarer schneidender Einsätze (23) enthält, wobei der Werkzeughalter eine Mehrzahl Aufnahmeräume (11) aufweist, die sich peripher in der Richtung der Mitte des Werzeughalters (10) verbreitern, wobei jeder Aufnahmeraum einen stufenförmigen Sitz (14) für einen Einsatz in der der normalen Drehungsrichtung des Werkzeugs entsprechenden Ausgangsrichtung enthält: einen Festspannkörper (17, 117, 217), der in jedem Aufnahmeraum angeordnet ist und mit Mitteln zum positiven Zurückhalten jedes Einsatzes in der radialen Richtung nach außen mitwirkt: mindestens eine festen Block (18, 118, 218, 318), der in jedem Aufnahmeraum angeordnet ist: eine Stellschraube (19, 119, 130) zum Versehen der Bewegung zwischen jeden festen Block und seinem verbunden Festspannkörper, so daß aus Reaktion mit den Wänden des Aufnahmeraumes einen Druck in der peripheren Richtung des Werkzeughalters erzeugt wird, um den festen Block gegen eine Kontrastwand (12) des Aufnahmeraumes zu drücken und um den Festspannkörper gegen den Einsatz zu drücken; dadurch gekennzeichnet, daß jede Stellschraube betätigbar ist, um eine Trennbewegung zwischen einem

genannten Festspannkörper und mindestens einem genannten festen Körper zu verursachen, um erstens den genannten Druck und zweitens eine Kraftkomponente zu erzeugen, die gewöhnlich zur Mitte des Werkzeughalters gewandt ist und mindestens durch die Zurückhaltemittel am Einsatz angebracht ist, so daß sie den Einsatz radial gegen die Stufe des stufenförmigen Sitzes positiv zurückhält.

2. Rotierendes Werkzeug nach Anspruch 1, bei dem der Festspannkörper (17) Mittel mit longitudinalem Hohlraum (32) enthält, die wesentlich senkrecht zur Kontrastwand (12) sind, und zwei geneigte gegenüberliegende Flächen (22) aufweist, die spiegelbildlich zueinander angeordnet sind.

3. Rotierendes Werkzeug nach Anspruch 1 und 2, bei dem zwei feste Blöcke (18) im longitudinalen Hohlraum (32) mit Kontrastflächen (122) und mit einer Stellschraube (19) mitwirken, die ein rechtes Gewinde und ein linkes Gewinde aufweist.

4. Rotierendes Werkzeug nach Anspruch 3, bei dem der Festspannkörper (17) mit elastischen Mitteln mit Sicherheitsbolzen (27, 127) mitwirkt, die die Stellschraube (19) befestigen und vorteilhaft in die untere Wand des Festspannkörpers (17) hinausragen, so daß sie mit dem Boden des Aufnahmeraumes (11) mitwirken.

5. Rotierendes Werkzeug nach Anspruch 4, bei dem die Mittel mit Sicherheitsbolzen (27) mit Mitteln mit Ankerring (20) mitwirken, die auf der Stellschraube (19) angeordnet sind.

6. Rotierendes Werkzeug nach Anspruch 3, bei dem die Stellschraube (19) seitlich mit Mitteln mit longitudinalem Ankerhohlraum (21) mitwirkt, die im Festspannkörper (17) enthalten sind.

7. Rotierendes Werkzeug nach Anspruch 1, bei dem der feste Block (218) einzig ist und in einer vorgeschobenen Stellung in der Bewegungsrichtung durch die Stellschraube (119) mit dem Festspannkörper (117) und mit den gegenüberliegenden und verschiebbaren Seiten (31) mitwirkt (Fig. 5 und 6).

8. Rotierendes Werkzeug nach Anspruch 1, bei dem der feste Block (318) zwei Seiten (A—B) enthält, die einen Hohlraum dazwischen aufweisen und von der Stellschraube (219) zusammen gedrückt sind, und schräge Seiten (131) aufweist, die keilartig mit dem Festspannkörper (217) mitwirken (Fig. 7 und 8).

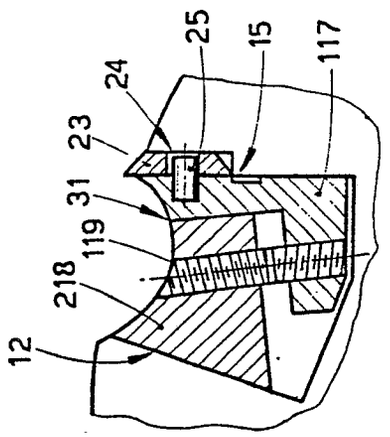


fig.6

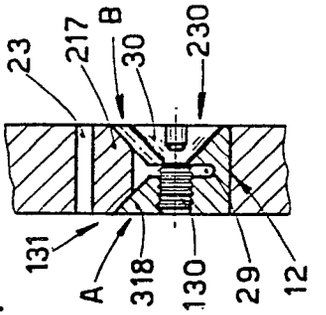


fig.7

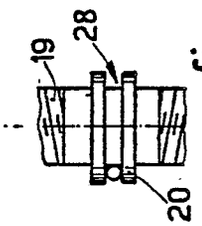


fig.4

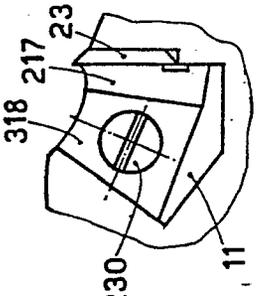


fig.8

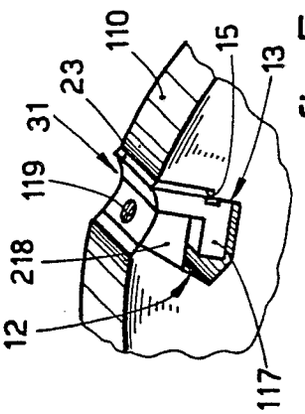


fig.5

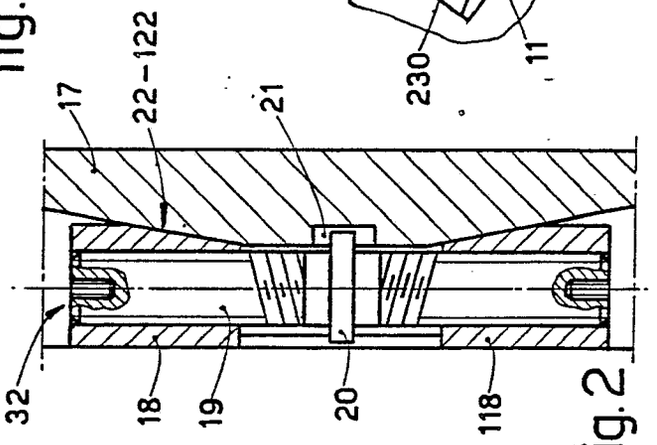


fig.2

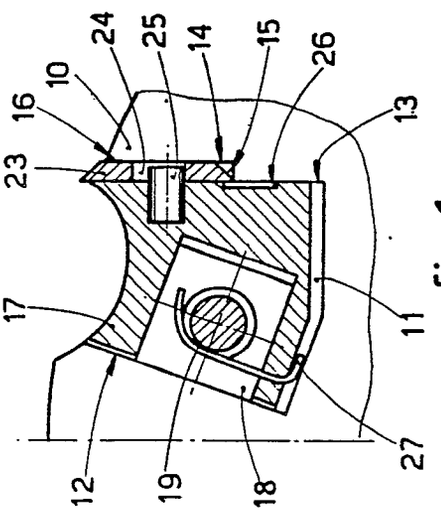


fig.1

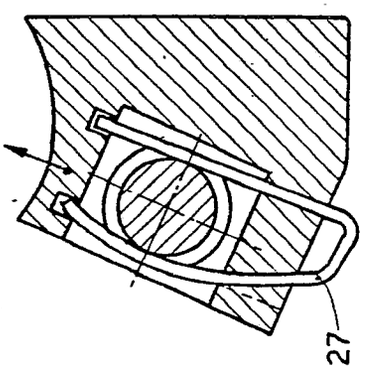


fig.3