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Description

In powered portable machine tools with rotating tool, such as for example angle grinders or the like, there is the known problem of the difficulty of loosening the ring nut locking the tool to the power shaft of the machine

Indeed the ring nut is generally screwed onto the threaded end of said shaft so as to clamp the tool between a surface thereof and a complementary surface projecting radially from the shaft. Because of the resistance to rotation exerted on the periphery of the tool during use and sudden changes of peripheral speed, e.g. upon starting, the ring nut tends to tighten progressively and this requires a relatively strong force to unscrew it subsequently but this is made difficult by the idling rotation of the shaft when the machine is turned off.

Contrarily, insufficient manual tightening of the ring nut during assembly of the tool can cause accidental unscrewing thereof due to the effect of the forces impressed during use with the resulting imaginable hazards.

The problem of reconciling these opposing requirements does not appear easy to solve considering that improvement of the ease of intentional unscrewing can lead to inappropriate ease of accidental loosening and, contrarily, an improvement in safety against accidental loosening can lead to an increase in the difficulty of intentional loosening.

It is an object of the present invention to obviate the above mentioned shortcomings and provide a machine tool, e.g. portable, of the rotating tool type, comprising a safety device against accidental disassembly of the tool which would, however, facilitate intentional disassembly.

In EP-A-231500 is disclosed a machine tool of the type comprising a threaded end projecting from a powered shaft to fasten coaxially to the shaft a rotating tool by tightening of a ring nut on said threaded end and a collar is mounted on the shaft resting axially on a radial projection of the shaft. A roller bearing is interposed between the collar and radial projection and the ring nut is on the threaded end to clamp the tool against the front surface of the collar.

In accordance with the present invention, a machine tool comprises a threaded end projecting from a powered shaft to fasten coaxially to the shaft a rotating tool by tightening of a ring nut on said threaded end and a collar is mounted on the shaft resting axially on a radial projection of the shaft, and a roller bearing interposed between said collar and radial projection, the ring nut being screwed to the threaded end to clamp the tool against the front surface of the collar, characterised in that coupling means are placed between the ring nut and the collar and between the collar and the

shaft there are means of unidirectional constraint upon rotation for free rotation of the collar in the direction of loosening the ring nut, and there also being provided manual control means for deactivation of the unidirectional constraint means.

To further clarify the explanation of the innovative principles of the present invention and its advantages as compared with known prior art a preferred embodiment is described below with reference to the attached drawings in which:

Figure 1 shows a partial cutaway front elevation view of a machine with rotating tool provided in accordance with the invention;

Figure 2 shows a partial cross section along plane of cut II-II of Figure 1, and

Figure 3 shows a partial plan view of the device shown in Figure 1.

With reference to the figures there may be seen in Figure 1 a portable machine tool (shown only partially since the rest belongs to the known art) in accordance with the invention which comprises a casing 21 from which projects a threaded end 10 of a powered shaft 22 supported in a rotating manner by a bearing 23 and comprising a device indicated generally by reference number 24 for intentional facilitated loosening and locking against accidental loosening of a ring nut 18 which fastens a tool 20.

The device 10 comprises a collar 16 positioned coaxially with the shaft 22 and in contact therewith through a roller bearing 17 opposite a projection radial to the shaft.

The end 10 of the shaft 22 is axially drilled and receives in a sliding manner a control rod 11 having at the top a control end in the form of a pushbutton and the opposite end 25 rounded to constitute a thrust surface for two pins 12 sliding in a direction radial to the shaft to act against two levers 13 directed virtually in a direction tangent to the collar and moving on pivots under the effect of springs 14 to engage with a toothed surface 15 internally circumferential to the collar 16 as may be seen in Figure 2.

A thrust spring 29 holds the rod 11 normally in the raised position so that the pins 12 do not thrust the levers 13, which, being thrust by the respective springs 14, maintain their opposite ends engaged with the teeth 15.

As shown in Figure 1 the ring nut 18 has at the bottom teeth 19 engaging in corresponding seats 26 (well shown in Figure 3 in which is seen a plan view of the part 24 of the device) in a plate element 30 sliding axially in the collar 16. The plate 30 has radial tongues 31 sliding in grooves 32 under the thrust of springs 33. A stop ring 34 prevents the plate 30 from coming out of the collar 16.

In operation it suffices to tighten (counter-clockwise in Figure 2) the ring nut 18 on the threaded

end 10 so as to clamp the tool 20, e.g. an angle grinding wheel, between the surface 28 of the ring nut and the surface 27 of the collar. Upon tightening, the teeth 19 engage in the seats 26 of the plate 30 which, by means of the tongues 31, causes the collar 16 to rotate with the ring nut. The axial sliding of the plate 30 facilitates engagement of the teeth 19 which rest on the surface of the plate 30 until they meet the seats 26.

The collar can rotate freely in the direction of tightening of the ring nut, the levers 13 being arranged so as to slide with their free end on the teeth 15 in said direction. Contrarily, an attempt to rotate in the opposite direction, loosening the ring nut, is prevented by the engagement under the thrust of the springs 14 of the end of each lever 13 in a tooth of the toothed surface 15, as may be readily imagined by those skilled in the art.

It is thus clear how accidental loosening of the ring nut is prevented.

To loosen the ring nut intentionally it suffices to press the pushbutton formed by the upper end of the rod 11 so that its other end 25 pushes outward the pins 12 which in turn push against the effect of the springs 14 and cause the respective levers to disengage from the teeth 15.

In this manner the collar 16 becomes free to rotate even in the direction of loosening of the ring nut. The ring nut can thus be easily loosened thanks to the presence of the roller bearing 17 which supports the axial thrust resulting from even extreme tightening of the ring nut caused by the forces in play during use of the machine.

The objectives of ease of intentional loosening and impossibility of accidental loosening, e.g. in case of sudden stopping of the motor due to accidental causes of braking, are achieved.

For example, the control rod 11 is shown in the drawings with the operating pushbutton emerging from the threaded end 10 of the shaft 22. But it is easy to imagine the possibility of placing said control rod 11 directed in the opposite direction along the shaft 22 so that the control button appears on the side of the machine opposite the threaded end 10.

The invention can be employed to fasten to a machine tool any type of rotating element, e.g. an abrasive or polishing disc, a grind stone, a circular saw, etc.

Finally, it is easy for those skilled in the art to imagine the possibility of employing said operating pushbutton of the above described device to activate simultaneously a device of the known art for stopping rotation of the shaft 22 so as to facilitate manual loosening.

Claims

1. A machine tool of the type comprising a threaded end (10) projecting from a powered shaft (22) to fasten coaxially to the shaft a rotating tool (20) by tightening a ring nut (18) on said threaded end (10), a collar (16) mounted on the shaft (22) resting axially on a radial projection of the shaft and a roller bearing (17) interposed between said collar and radial projection, the ring nut (18) being screwed to the threaded end (10) to clamp the tool (20) against the front surface of the collar (16), characterised in that coupling means (19, 30) are placed between the ring nut (18) and the collar (16), and there being placed between the collar (16) and the shaft (22) means (13, 15) of unidirectional constraint upon rotation of the collar (16) in the direction of loosening the ring nut (18), and there also being provided manual control means (11, 12) for deactivation of the unidirectional constraint means.
2. Machine tool in accordance with claim 1 characterised in that said unidirectional constraint means comprise levers (13) pivoted on the shaft (22) and thrust elastically with one of their ends against a ring gear (15) inside said collar (16).
3. Machine tool in accordance with claim 2 characterised in that the control means comprise a control rod (11) sliding axially in the shaft (22) against the effect of a spring (29) and having an end (25) constituting thrust surfaces in a direction radial to the shaft (22) for two sliding pins (12) which act against said levers (13) in the direction of withdrawing them from coupling with said ring gear (15).
4. Machine tool in accordance with claim 1 characterised in that said coupling means between the ring nut (18) and the collar (16) comprise teeth (19) projecting axially from the ring nut (18) and engaging in complementary seats (26) in an element (30) constrained to rotate with the collar (16).
5. Machine tool in accordance with claim 4 characterised in that the element (30) is constrained to rotate with the collar (16) by engagement of radial tongues (31) in complementary grooves (32) in the collar (16), said element (30) sliding axially in said grooves against the effect of springs (33) upon tightening of the ring nut (18).

6. Machine tool in accordance with claim 3 characterised in that said rod (11) emerges from the threaded end (10).

Patentansprüche

1. Werkzeugmaschine mit einem Gewindeende (10), das sich von einer angetriebenen Welle (22) erstreckt, um ein sich drehendes Werkzeug (20) durch Anziehen einer Ringmutter (18) auf dem Gewindeende (10) koaxial zu befestigen, einem Bund (16), der auf der Welle (22) angebracht ist und axial auf einem radialen Vorsprung der Welle gelagert ist, und einem Rollenlager (17), das zwischen dem Bund und dem radialen Vorsprung angeordnet ist, wobei die Ringmutter (18) auf das Gewindeende (10) geschraubt ist, um das Werkzeug (20) gegen die Vorderfläche des Bundes (16) zu verspannen, **dadurch gekennzeichnet**, daß Kupplungsmittel (19, 30) zwischen der Ringmutter (18) und dem Bund (16) angeordnet sind und zwischen dem Bund (16) und der Welle (22) Mittel (13, 15) vorgesehen sind, um die freie Drehung des Bundes (16) in Richtung des LöSENS der Ringmutter (18) zu verhindern, und weiterhin manuelle Steuerungsmittel (11, 12) für die Außerbetriebsetzung der Mittel für die Dreharretierung in einer Richtung vorgesehen sind.
2. Werkzeugmaschine nach Anspruch 1, **dadurch gekennzeichnet**, daß die Mittel zur Begrenzung der Drehung in eine Richtung Hebel (13) aufweisen, die gelenkig auf der Welle (22) gelagert sind und mit einem ihrer Enden elastisch gegen einen Zahnkranz (15) an der Innenseite des Bundes (16) drücken.
3. Werkzeugmaschine nach Anspruch 2, **dadurch gekennzeichnet**, daß die Steuerungsmittel eine Steuerstange (11) aufweisen, die in der Welle (22) axial entgegen der Wirkung einer Feder (29) gleitet und die ein Ende (25) aufweist, das Druckflächen in einer Richtung radial zur Welle (22) für zwei Gleitstifte (12) besitzt, die auf die Hebel (13) in Richtung ihres Zurückziehens aus der Kopplung mit dem Zahnkranz (15) wirken.
4. Werkzeugmaschine nach Anspruch 1, **dadurch gekennzeichnet**, daß die Kupplungsmittel zwischen der Ringmutter (18) und dem Bund (16) Zähne (19) aufweisen, die sich axial von der Ringmutter (18) erstrecken und die mit komplementären Sitzen (26) in einem Element (30) im Eingriff sind, das gezwungen ist, sich mit dem Bund (16) zu drehen.

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5. Werkzeugmaschine nach Anspruch 4, **dadurch gekennzeichnet**, daß das Element (30) gezwungen ist, sich durch Eingriff von radialen Zungen (31) in komplementäre Nuten (32) im Bund (16) mit dem Bund (16) zu drehen, wobei das Element (30) entgegen der Wirkung von Federn (33) beim Anziehen der Ringmutter (18) axial in den Nuten gleitet.

6. Werkzeugmaschine nach Anspruch 3, **dadurch gekennzeichnet**, daß die Stange (11) aus dem Gewindeende (10) hervorragt.

Revendications

1. Outil pour machine du type comportant une extrémité filetée (10) faisant saillie à partir d'un arbre de puissance (22) pour fixer coaxialement à l'arbre un outil rotatif (20) par vissage d'un écrou annulaire (18) sur ladite extrémité filetée (10), un collier (16) monté sur l'arbre (22) en appui axialement sur une saillie radiale de l'arbre et un palier à rouleau (17) interposé entre ledit collier et ladite saillie radiale, l'écrou annulaire (18) étant vissé sur l'extrémité filetée (10) pour serrer l'outil (20) contre la surface avant du collier (16), caractérisé en ce que des moyens d'accouplement (19, 30) sont situés entre l'écrou de serrage (18) et le collier (16) et qu'entre le collier (16) et l'arbre (22) sont situés des moyens (13, 15) de mise en contrainte unidirectionnelle lors de la rotation du collier (16) dans la direction de relâchement de l'écrou annulaire (18), et il est aussi agencé des moyens de commande manuels (11, 12) pour désactiver les moyens de mise en contrainte unidirectionnelle.
2. Outil pour machine selon la revendication 1, caractérisé en ce que lesdits moyens de mise en contrainte unidirectionnelle comportent des leviers (13) montée pivotants sur l'arbre (22) et repoussés élastiquement, une première de leurs extrémités étant contre un engrenage en couronne (15) situé à l'intérieur dudit collier (16).
3. Outil pour machine selon la revendication 2, caractérisé en ce que les moyens de commande comportent une tige de commande (11) coulissant axialement dans l'arbre (22) à l'encontre de l'action d'un ressort (29) et ayant une extrémité (25) constituant des surfaces de poussée dans une direction radiale de l'arbre (22) pour deux doigts coulissants (12) qui agissent contre lesdits leviers (13) dans la direction de retrait de ces derniers de l'accouplement avec ledit engrenage en couronne (15).

4. Outil pour machine selon la revendication 1, caractérisé en ce que lesdits moyens d'accouplement situés entre l'écrou annulaire (18) et le collier (16) comportent des dents (19) faisant saillie axialement à partir de l'écrou annulaire (18) et en prise dans des sièges complémentaires (26) situés dans un élément (30) contraint à tourner avec le collier (16). 5
5. Outil pour machine selon la revendication 4 ou 5, caractérisé en ce que l'élément (30) est contraint à tourner avec le collier (16) par mise en prise de languettes radiales (31) dans des gorges complémentaires (32) situées dans le collier (16), ledit élément (30) coulissant axialement dans lesdites gorges à l'encontre de l'action de ressorts (33) lors du serrage de l'écrou annulaire (18). 10 15
6. Outil pour machine selon la revendication 3, caractérisé en ce que ladite tige (11) fait saillie à partir de l'extrémité filetée (10). 20

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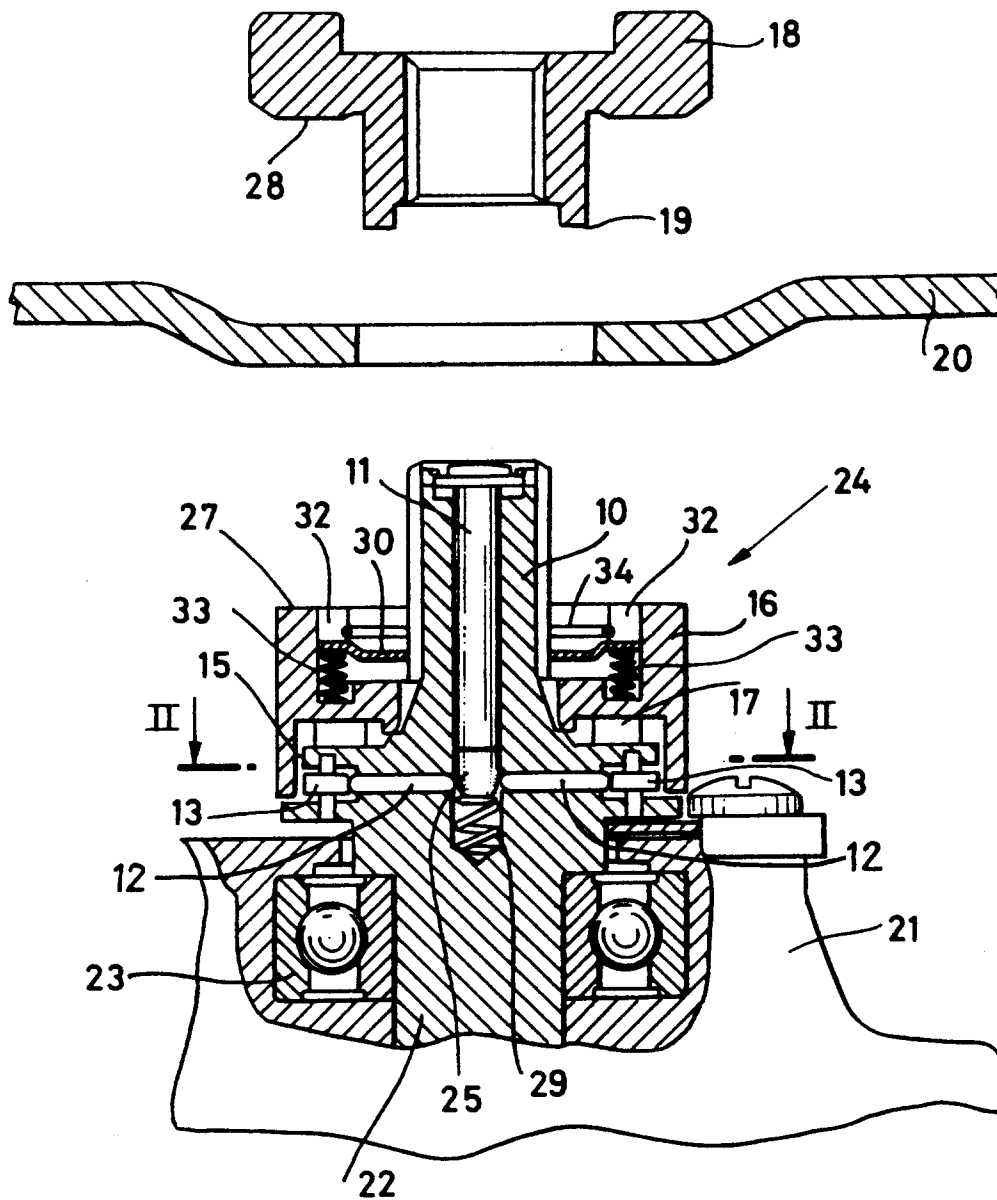


Fig.1

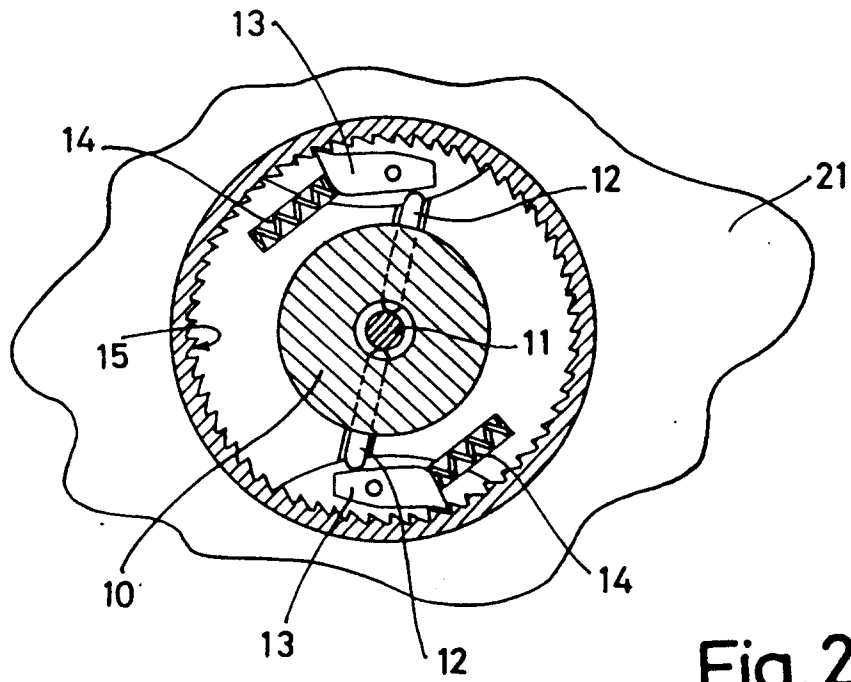


Fig. 2

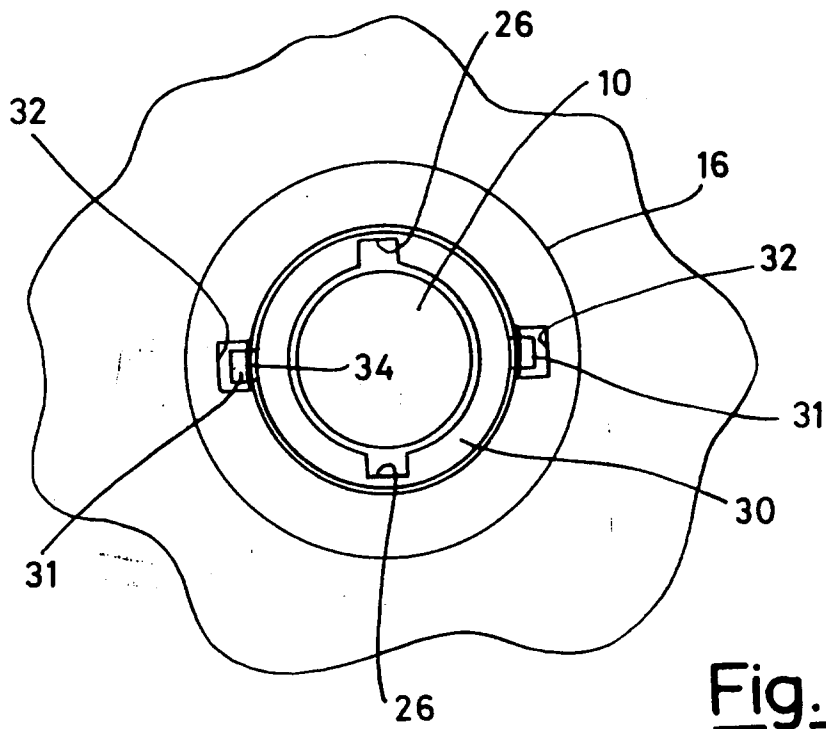


Fig. 3