

The invention relates to a tool according to the concept of claim 1 (CH-A-481 703).

Also known is a tool (DE-PS 2533495) comprising two tool holders, which are offset by 180° to each other and which are radially adjustable and which are fixed to the main body by means of a common clamping plate and the worm drives of which are arranged in the form of worm-gear spindles, which are guided in a threaded bore of the clamping plate in the displacement direction of the tool holder and which abut with their tips against a protrusion of the tool holder. Thus, a screwing motion is converted by the known worm drive into a thrust. In normal operation, the worm-gear spindles exclusively serve an adjustment function during the radial adjustment of the tool holder. Clamping of the tool holders to the main body is carried out exclusively by the common clamping plate which is fixed to the main body by two independently releasable bolts which pass through elongated holes in the tool holders. When the tool holders are properly clamped by the clamping plate, a surface toothing ensures a sufficient contact in shape and strength for accommodating the cutting forces. However, should a "crash" occur during processing, then forces developing at the tool holders in the direction of the teeth of the surface toothing can become so great that the clamping forces of the clamping plate are exceeded. In this event, a portion of the forces is transferred to the worm drive, causing bending of the worm-gear spindles of this known arrangement and consequently often irreparable damage to the tool. Furthermore, the worm drives are openly arranged at the head of the tool

and are thus exposed to the danger of rapid soiling and damage.

Based thereupon, it is an object of the invention to improve the known tool so that damage to the worm drive is extensively avoided even in the event of a crash.

According to the invention, this object is achieved by the suggested features of claim 1. Further advantageous embodiments and further developments of the invention are contained in the subclaims.

The inventive solution introduces measures which counteract rapid soiling and irreparable plastic deformation of the worm-gear spindle of the worm drive.

The most important step in this direction is, according to the invention, that the worm drive comprises a worm-gear spindle which is with both its ends rotatably and indisplaceably mounted in the main body, and a gate block, which is arranged with a nut thread on the worm-gear spindle and guided in a gate-type guide of the main body and which is detachably coupled to the tool holder.

It is possible in principle to provide the gate block with a drive pin which engages a corresponding open-edged cut-out on the tool holder. However, this arrangement has proved to be problematic inasmuch as, in the event of a crash, a portion of the forces can be transferred by leverage via the drive pin, which is rigidly arranged on the gate block, directly to the worm drive, resulting in irreparable deformation of the worm-gear spindle.

According to a preferred embodiment of the invention, it is therefore suggested that the drive pins are rigidly connected to the tool holder rather than to the gate block, so that it can plastically deform and release itself from the gate block in the event of a

crash without undue flexural loads for the worm-gear spindle. Advantageously, the drive pin which engages the edge-open cut-out of the gate block is then, whilst under load, easier to plastically deform than the flanks of the open edged cut-out and the worm-gear spindle. For practical reasons, the drive pin is then provided with a flexural or breaking zone, which can be arranged either as a transverse groove in the pinhead or as a cross-sectional narrowing in the shaft of the drive pin. In a further advantageous arrangement in this direction, the drive pin comprises a ball head which can roll off on the flanks of the open-edged cut-out. In the event of greater breaking forces, a deformation of the gate block can still be tolerated if this prevents the plastic deformation of the worm-gear spindle.

According to a further advantageous embodiment of the invention, the wear-gear spindle is mounted with preferably ballshaped spherical ends in open ball sockets and/or ballrace sockets of the main body. The worm-gear spindle is then not clamped with its ends into the mount, but can escape lateral forces which may occur in the event of a crash without undue flexural load in the mounting and without plastic deformation. In this event and in order to axially hold the worm-gear spindle free of play, at least one of the ball-race sockets is arranged as a loose circular disc, which is pressed in the axial direction and without play against the worm-gear spindle by means of a threaded sleeve which is guided in a threaded bore of the main body. This arrangement offers the additional advantage that the worm-gear spindle can comprise an operating pin, which passes with radial play through a central bore of the threaded sleeve and which is rotatable from the outside, preferably by means of a

screwdriver or a spanner. In this case, the threaded sleeve and the operating pin can have at their outwardly oriented surface an annular dial which indicates the rotational position of the threaded spindle, and thus the displacement position of the gate block.

Below, the invention will be explained in more detail, based on exemplary embodiments which are schematically illustrated in the drawing. Shown are, in

Fig. 1: a side view of a double-cutter roughing tool with radially adjustable tool holders, partially in cross-sectional illustration;

Fig. 2: a top view (top) of, and a horizontal section (bottom) through the tool of Fig. 1;

Fig. 3: a cross-section of Fig. 1, with modified drive pin;

Fig. 4: a cross-section of Fig. 1, with a further modification of the drive pin.

The double-cutter roughing tool shown in the drawing comprises substantially a main body 10 which carries a connecting stub 12 for connection to a machine spindle, two tool holders 14, which are radially adjustable relative to the main body 10 along a surface toothing 16 and mountable on the main body 10 by means of a clamping plate 18 and fixing bolts 20, as well as one each change-over cassette 24, which is arranged on the tool holders so as to be axially adjustable and which carries a cutting plate arranged as an indexible plate 22.

For radial adjustment of the tool holders 14, the main body 10 comprises for each tool holder one worm-drive 26 with a worm-gear spindle 28, which is oriented in the direction of displacement of the respective tool

holder 14, and with a gate block 32, which has a female thread on the worm-gear spindle 28 and is guided in a gate guide 30 of the main body 10. The gate block 32 comprises a cut-out 34, which is arranged as a transverse groove which is open towards the adjacent tool holder 14 and into which engages a drive pin 36 which protrudes over the guide surface of the tool holder 14 which is provided with a surface toothing 16. The worm-drive spindle 28 is rotatably and axially indisplaceably mounted with its ballshaped spherical ends 38, 38' in open ballrace sockets 40, 40'. The ball socket 40 is then directly formed into the material of the main body, whilst the ballrace socket 40' is formed into a circular body 44, which is loosely inserted into a bore adjacent the gate guide 30 and which is axially and without play pressed towards the end 38' of the worm-gear spindle 28 by means of the threaded sleeve 46 which is guided in an internal thread of main main body 10. The threaded sleeve 28 is in its screwed-in end position secured by means of a threaded pin 48 which is screwed in transversely to the threaded bore. The worm-gear spindle 28 has at its end 38' an axially protruding operating pin 50, which passes with radial play through the central bore of the threaded sleeve 46. The operating pin 50 has at its free end a multi-edged hole 52 for a hexagonal key, by means of which the worm-gear spindle 28 can be rotated whilst displacing the gate block 32.

In order to prevent permanent bending of the worm-gear spindle 28 in the event of a crash, a "crumble zone" is established in the region of the drive pin 36, which breaks down possible energy peaks by way of deformation and keeps them away from the worm-gear spindle 28. This deformation preferably takes place in the area of the drive pin 36 and, if appropriate, in the area of the

flanks 54 of the cut-out 34. For this purpose, a cross-sectional narrowing 56 in the shaft region or a transverse groove 58 in the head region can be provided on the drive pin 36 to serve as a flexural or breaking zone, as can be seen in Figs. 3 and 4. Therefore, the drive pin 36 should also be made of plastically deformable, for example soft or pre-hardened steel. Furthermore, the spherical arrangement of the drive-pin head 60, as is illustrated in Fig. 3, contributes to the rolling off of the pinhead on the flanks 54 of the cut-out 34 in the event of a crash, if appropriate without damage to the flanks 54.

Furthermore, the spherical ends 38, 38' of the worm-gear spindle 28, which are mounted in the ballrace sockets 40, 40', contribute to the worm-gear spindle 28 not being radially clamped at its mounting locations, so that it can elastically evade possible transverse forces without permanent deformation.



Patent Claims

- 1: Tool for the use in machine tools, comprising a main body (10) and at least one tool holder (14), which is radially adjustable to the main body (10) by means of a worm drive (26) and releasably fixed thereto and which carries at least one cutting plate (22), in which respect the worm drive (26) comprises a worm-gear spindle (28), which is with both its ends (38, 38') rotatably and indisplaceably mounted in the main body (10), and a gate block (32), which is arranged with a nut thread on the worm-gear spindle (28) and guided in a gate guide (30) of the main body (10) and detachably coupled to the tool holder (14), characterised in that the gate block (32) is provided with a cut-out (34), which is open-edged towards the tool holder (14) and into which engages a drive pin (36) which is arranged on the tool holder, and that the drive pin (36) comprises a flexural or breaking zone which plastically bends or breaks under load.
- 2: Tool according to claim 1, characterised in that the tool holder (14) is adjustable radially to the main body (10) along a surface toothing (16).
- 3: Tool according to claim 1 or 2, characterised in that the open-edged cut-out (34) is arranged as a groove which extends transversely to the gate guide (30).



- 4: Tool according to one of claims 1 to 3, characterised in that the drive pin (36) whilst under load is easier plastically deformed than the flanks (54) of the open-edged cut-out (34) and the worm-gear spindle.
- 5: Tool according to one of claims 1 to 4, characterised in that the flexural location or breaking location is formed by a cross-sectional narrowing (56, 58) in the drive pin.
- 6: Tool according to claim 5, characterised in that the flexural location or breaking location is formed by a transverse groove (58) in the drive pin (36), which is open towards the gate block (32) and which extends transversely to the gate guide (30).
- 7: Tool according to claim 5, characterised in that the flexural location or breaking location is formed by a cross-sectional narrowing (56) in the shaft of the drive pin (36).
- 8: Tool according to one of claims 2 to 7, characterised in that the flanks (54) of the open-edged cut-out (34) of the gate block (32) whilst under load are easier plastically deformable than the worm-gear spindle (28).
- 9: Tool according to one of claims 1 to 8, characterised in that the drive pin (36) comprises a spherical head (60) which rolls off on the flanks (54) of the open-edged cut-out (34).
- 10: Tool according to one of claims 1 to 9, characterised in that the drive pin (36) is made of soft or hardened steel.



- 11: Tool according to one of claims 1 to 10, characterised in that the gate block (32), which is made of steel, is at least in the region of the cut-out flanks (54) soft or hardened.
- 12: Tool according to one of claims 1 to 11, characterised in that the worm-gear spindle (28) is mounted with ballshaped spherical ends (38, 38') in open ball sockets and/or ballrace sockets (40, 40') of the main body (10).
- 13: Tool according to claim 12, characterised in that at least one of the ballrace sockets (40') is arranged as an annular body (44), which is loosely seated in a bore (42) of the main body (10) and which is pressed free of play in the axial direction against the worm-gear spindle (28) by means of a threaded sleeve (46) which is guided in a threaded bore of the main body.
- 14: Tool according to claim 13, characterised in that the worm-gear spindle (28) comprises an operating pin (50), which passes with radial play through a central bore of the threaded sleeve (46) and which is rotatable from the outside, preferably by means of a screwdriver or a spanner.
- 15: Tool according to claim 14, characterised in that the threaded sleeve (46) and the operating pin (50) have at the outward facing ends an annular dial which indicates the rotational position of the worm-gear spindle (28), and thus the displacement position of the gate block (32) and of the tool holder (14).