

APPARATUS FOR TRANSMISSION OF TORQUE FROM A DRILL DEVICE TO A CORE BIT

5

TECHNICAL FIELD

The present invention relates to a device for transmitting a torque from a drill to a drill bit according to the preamble of claim 1.

10

PRIOR ART

EP 1 211 005 B1 discloses a known device for transmitting torque from a drill to a drill bit. The device for transmitting torque is arranged between the drill and the drill bit and transmits the torque, which is produced by a drill motor of the drill, to the drill bit. The device for transmitting torque comprises a tool fitting which is permanently connected to the drill or is connected to the drill via a releasable connection, and a shank which is permanently connected to the drill bit or is connected to the drill bit via a releasable connection.

20

The shank is constructed in a sleeve-shaped manner from a first outer conical region, a groove region, a second outer conical region and a cylinder region and comprises a plurality of first longitudinal grooves extending over the first outer conical region, the groove region, the second outer conical region and the cylinder region, and a plurality of second longitudinal grooves extending over the second outer conical region and the cylinder region. The number of the plurality of first longitudinal grooves is identical to the number of the plurality of second longitudinal grooves. The second longitudinal grooves are different from the first longitudinal grooves and differ in that the second longitudinal grooves are restricted to the second outer conical region and to the cylinder region and do not extend over the first outer conical region and the groove region.

30

The tool fitting is constructed in three parts from a basic body, an intermediate element and a locking device. The locking device is adjustable parallel to a longitudinal axis of the tool fitting between a receiving position and a locking position, wherein the shank is

insertable into the tool fitting in the receiving position and is connected to the tool fitting in the locking position.

5 The intermediate element is annular designed with an inner driver region, which has a plurality of first inner rotary drivers with a first width and first depth and a plurality of second inner rotary drivers with a second width and second depth, and with an outer driver region, which has a plurality of first outer rotary drivers with a third width and third depth. The number of the plurality of first inner rotary drivers, the number of the plurality of second inner rotary drivers and the number of the plurality of first outer rotary drivers
10 correspond. The basic body is sleeve-shaped with an inner conical region and a rotary driving region, which has a plurality of first outer rotary driving grooves.

In the connected state of the tool fitting and the shank, the first inner rotary drivers of the intermediate element engage in the first longitudinal grooves of the shank, the second
15 inner rotary drivers of the intermediate element engage in the second longitudinal grooves of the shank, and the first outer rotary drivers of the intermediate element engage in the first outer rotary driving grooves. The torque, which is produced by a drill motor of the drill is transmitted to the shank by means of the first inner rotary drivers and second inner rotary drivers.

20

The device for transmitting torque that is known from EP 1 211 005 B1 has the disadvantage that the tool fitting and the shank are approved only for drills having outputs of up to approx. 2.5 kW. At higher outputs, the surface pressure is very high, which can damage the inner and outer rotary drivers of the tool fitting. In addition, the service life of
25 the tool fitting and the service life of the shank are reduced.

SUMMARY OF THE INVENTION

30 The object of the present invention is to further develop the tool fitting and the shank of the device for transmitting torque known from EP 1 211 005 B1 in such a way that the new device can transmit higher torques than the old device. In addition, the new shank should be able to be connected to the old tool fitting and the new tool fitting should not be able to be connected to the old shank.

This object is achieved according to the invention in the case of the device for transmitting a torque mentioned at the beginning by the features of independent claim 1. Advantageous developments are specified in the dependent claims.

- 5 According to the invention, it is provided that the intermediate element has a plurality of second outer rotary drivers with a fourth width and fourth depth and the rotary driving region has a plurality of second outer rotary driving grooves, wherein, in the connected state of the device, the second outer rotary drivers engage in the second outer rotary driving grooves. The second outer rotary drivers increase the contact area between the
- 10 basic body and the intermediate element and thereby enable the transmission of greater forces and torques. The larger the contact area, the lower the surface pressure between the basic body and the intermediate element, or if the surface pressure remains the same, greater forces and torques can be transmitted over the larger contact area.
- 15 Preferably, the second outer rotary drivers are aligned with the second inner rotary drivers of the intermediate element in a plane perpendicular to the longitudinal axis of the tool fitting. The second outer rotary drivers increase the contact area between the basic body and the intermediate element and, if the surface pressure remains the same, thereby enable the transmission of greater forces and torques. Owing to the fact that the
- 20 second outer rotary drivers are aligned with the second inner rotary drivers, the force is transmitted from the tool fitting to the shank over the shortest path. The force is transmitted from the second outer rotary driving grooves in the rotary driving region of the basic body to the second outer rotary drivers of the intermediate element and is transmitted from the second inner rotary drivers of the intermediate element to the
- 25 second longitudinal grooves of the shank.

The third depth of the first outer rotary drivers and the fourth depth of the second outer rotary drivers are preferably identical. The same depth of the first and second outer rotary drivers has the advantage that the force or the torque can be transmitted uniformly via

30 the first and second outer rotary drivers from the basic body to the intermediate element.

The third width of the first outer rotary drivers and the fourth width of the second outer rotary drivers are particularly preferably identical. The same depth and the same width of the first and second outer rotary drivers has the advantage that the force or the torque

35 can be transmitted uniformly via the first and second outer rotary drivers from the basic

body to the intermediate element. In addition, there is no need to assign the first outer rotary drivers to the first outer rotary driving grooves or the second outer rotary drivers to the second outer rotary driving grooves. Each outer rotary driver can be inserted into any outer rotary driving groove.

5

In a further development of the device, the first depth of the first inner rotary drivers and the second depth of the second inner rotary drivers are identical, and the second longitudinal grooves of the shank also extend over the first outer conical region and the groove region. Owing to the fact that, in the case of the new tool fitting, the second depth of the second inner rotary drivers is identical to the first depth of the first inner rotary drivers, the second inner rotary drivers in the case of the new tool fitting have a greater second depth than in the case of the old tool fitting. The greater second depth of the second inner rotary drivers increases the contact area between the new tool fitting and the new shank and enables higher torques to be transmitted from the drill to the drill bit.

15

The greater second depth of the second inner rotary drivers prevents the new tool fitting, which is designed for powerful drills, from being able to be connected to the old shank, which is approved only for drills with outputs of up to approx. 2.5 kW, and thus increases the operational safety of the drill. Since the second longitudinal grooves of the old shank extend only over the second outer conical region and have a smaller depth than in the case of the new shank, the second inner rotary drivers of the new tool fitting are too deep and cannot be inserted into the second longitudinal grooves of the old shank.

20

Since the second longitudinal grooves in the case of the new shank have a greater depth than in the case of the old shank, the new shank can be connected to the old tool fitting. The second inner rotary drivers of the old intermediate element engage in the second longitudinal grooves of the new shank. The new shank is designed for powerful drills and approved for greater forces and torques than the old tool fitting, which is not critical in operation. Operating a shank with outputs or torques that are lower than the permitted maximum value can have a positive effect on the service life of the shank.

25

30

The first width of the first inner rotary drivers and the second width of the second inner rotary drivers are preferably identical. The same depth and the same width of the first and second inner rotary drivers has the advantage that there is no need to assign the first inner rotary drivers to the first longitudinal grooves or the second inner rotary drivers

35

to the second longitudinal grooves. Each inner rotary driver can be inserted into any longitudinal groove.

5 In a preferred variant, the intermediate element is annular designed with an inner lateral surface, an outer lateral surface and a base surface, wherein a plurality of lower rotary drivers are arranged on the base surface of the intermediate element and a plurality of lower rotary driving grooves are arranged in the annular shoulder of the basic body, wherein, in the connected state of the tool fitting, the lower rotary drivers interact with the lower rotary driving grooves. The lower rotary drivers, which interact with the rotary
10 driving grooves of the annular shoulder, increase the contact area between the basic body and the intermediate element without increasing the height of the rotary driving region and, if the contact pressure remains the same, thus enable the transmission of greater forces and torques.

15 The arrangement of the lower rotary drivers in the base surface of the intermediate element has the advantage that the loads on the intermediate element are better distributed, which can lead to a longer service life of the intermediate element. The forces that are transmitted from the first and second lower rotary drivers to the first and second inner rotary drivers run predominantly parallel to the longitudinal axis of the tool fitting, whereas the forces that arises from the first and second outer rotary drivers to the first
20 and second inner rotary drivers runs predominantly in a plane perpendicular to the longitudinal axis of the tool fitting.

Preferably, the lower rotary drivers comprise a plurality of first lower rotary drivers with a
25 fifth width and fifth depth and the lower rotary driving grooves comprise a plurality of first lower rotary driving grooves, wherein, in the connected state of the device, the first lower rotary drivers interact with the first lower rotary driving grooves. The formation of the first lower rotary drivers and the arrangement thereof on the base surface of the intermediate element has the advantage that the contact area between the basic body and the intermediate element is increased without increasing the height of the rotary driving
30 region, and, in addition, the load on the intermediate element is shifted into other regions.

Particularly preferably, the first lower rotary drivers are aligned with the first inner rotary drivers of the intermediate element in a plane perpendicular to the longitudinal axis of
35 the tool fitting. Owing to the fact that the first lower rotary drivers are aligned with the first

inner rotary drivers, the force is transmitted over the shortest path from the tool fitting to the shank.

5 Preferably, the lower rotary drivers comprise a plurality of second lower rotary drivers with a sixth width and sixth depth and the lower rotary driving grooves comprise a plurality of second lower rotary driving grooves, wherein the second lower rotary drivers interact with the second lower rotary driving grooves. The formation of the second lower rotary drivers and the arrangement thereof on the base surface of the intermediate element has the advantage that the contact area between the basic body and the intermediate
10 element is increased without increasing the height of the rotary driving region, and, in addition, the load on the intermediate element is shifted into other regions.

Particularly preferably, the second lower rotary drivers are aligned with the second inner rotary drivers of the intermediate element in a plane perpendicular to the longitudinal axis
15 of the tool fitting. Owing to the fact that the second lower rotary drivers are aligned with the second inner rotary drivers, the force is transmitted over the shortest path from the tool fitting to the shank.

Particularly preferably, the fifth depth of the first lower rotary drivers and the sixth depth
20 of the second lower rotary drivers are identical. The same depth of the first and second lower rotary drivers has the advantage that the force or the torque is transmitted uniformly via the first and second lower rotary drivers from the basic body to the intermediate element.

25 Particularly preferably, the fifth width of the first lower rotary drivers and the sixth width of the second lower rotary drivers are identical. The same depth and the same width of the first and second lower rotary drivers has the advantage that the force or the torque can be transmitted uniformly via the first and second lower rotary drivers from the basic body to the intermediate element. In addition, there is no need to assign the first lower
30 rotary drivers to the first lower rotary driving grooves or the second lower rotary drivers to the second lower rotary driving grooves.

EXEMPLARY EMBODIMENTS

Exemplary embodiments of the invention are described hereinafter with reference to the drawing. It is not necessarily intended for this to illustrate the exemplary embodiments to scale; rather, the drawing is produced in a schematic and/or slightly distorted form where this is useful for explanation purposes. It should be taken into account here that various
5 modifications and alterations relating to the form and detail of an embodiment may be undertaken without departing from the general concept of the invention. The general concept of the invention is not limited to the exact form or the detail of the preferred embodiment shown and described hereinafter or limited to subject matter that would be limited compared to the subject matter claimed in the claims. For given dimensioning
10 ranges, values within the stated limits should also be disclosed as limit values and can be used and claimed as desired. For the sake of simplicity, identical reference signs are used hereinafter for identical or similar parts or parts having identical or similar functions.

In the figures:

- 15 FIG. 1 shows a device according to the invention for transmitting torque from a drill to a drill bit, consisting of a tool fitting, which is connected to the drill, and a shank, which is connected to the drill bit;
- FIGS. 2A, B show the tool fitting (FIG. 2A) and the shank (FIG. 2B) of the device according to the invention for transmitting torque that is illustrated in
20 FIG.1;
- FIGS. 3A, B show the shank of the device according to the invention for transmitting torque in a side view (FIG. 3A) and in a longitudinal section along the section plane A-A in FIG. 3A (FIG. 3B);
- FIGS. 4A, B show the device according to the invention for transmitting torque of FIG.
25 1 in the connected state in which the shank of FIG. 2B is connected to the tool fitting of FIG. 2A, in a side view (FIG. 4A) and in a longitudinal section along the section plane A-A in FIG. 4A (FIG. 4B);
- FIGS. 5A-C show a basic body of the tool fitting in a side view (FIG. 5A), in a longitudinal section along the section plane A-A in FIG. 5A (FIG. 5B) and
30 in a plan view of the interface with an intermediate element of the tool fitting (FIG. 5C); and
- FIGS. 6A-C show an intermediate element of the tool fitting in a side view (FIG. 6A), in a longitudinal section along the section plane A-A in FIG. 6A (FIG. 6B) and in a plan view of the interface with the basic body (FIG. 6C).

FIG. 1 shows a device **10** according to the invention for transmitting a torque from a drill **11** to a drill bit **12**. The device **10** is arranged between the drill **11** and the drill bit **12** and transmits the torque from the drill **11** to the drill bit **12**.

5 The device **10** is constructed from a tool fitting **13**, which is connected to the drill **11**, and a shank **14**, which is connected to the drill bit **12**. The device **10** is connected to the drill **11** via a first connection **15** and to the drill bit **12** via a second connection **16**. In the connected state of the device **10**, torque is transmitted via the following components: drive shaft **17** of the drill **11**, tool fitting **13**, shank **14** and drill bit **12**. The connected state
10 of the device **10** is defined as the state in which the tool fitting **13** and the shank **14** are connected.

FIGS. 2A, B show the drill **11** with the tool fitting **13** (FIG. 2A) and the drill bit **12** with the shank **14** (FIG. 2B) of the device **10** according to the invention. The tool fitting **13** and
15 the shank **14**, in the connected state, form the device **10** according to the invention of FIG. 1.

The tool fitting **13** is connected to the drill **11** via the first connection **15**, which in the exemplary embodiment is designed as a releasable connection; alternatively, the tool fitting **13** can be connected to the drill **11** via a non-releasable first connection **15**. Since
20 the tool fitting **13** is a wearing part, it makes sense to design the tool fitting **13** as a separate component and to connect it to the drive shaft **17** of the drill **11** via a releasable first connection. In order to ensure that the drill **11** is operated only with an approved tool fitting **13**, it makes sense to design the first connection **15** in such a way that it can be
25 operated only with a special tool.

The shank **14** is connected to the drill bit **12** via the second connection **16**, which is designed as a releasable connection in the exemplary embodiment. For this purpose, the drill bit **12** has an internal thread which is connected to an external thread of the
30 shank **14**. The releasable second connection **16** is designed, for example, as a metric ISO threaded connection or other releasable connection. Instead of the releasable second connection **16**, the shank **14** can be connected non-releasably to the drill bit **12**; for this purpose, the shank **14** can be connected non-releasably to the drill bit **12**, for example by welding or other methods.

The drive shaft 17 is designed to be rotatable about a first axis of rotation **21** which, in the connected state of the tool fitting 13 and the drill 11, coincides with a longitudinal axis **22** of the tool fitting 13. The drill bit 12 is designed to be rotatable during operation about a second axis of rotation **23** which, in the connected state of the shank 14 and the drill bit 12, coincides with a longitudinal axis **24** of the shank 14. For differentiation purposes, the longitudinal axis 22 of the tool fitting 13 is referred to as the first longitudinal axis 22 and the longitudinal axis 24 of the shank 14 is referred to as the second longitudinal axis 24. In the connected state of the drill 11 and the drill bit 12, the first longitudinal axis 22 and second longitudinal axis 24 are arranged coaxially to one another.

FIGS. 3A, B show the shank 14 of the device 10 according to the invention for transmitting torque in the non-connected state of the device 10 in a side view (FIG. 3A) and in a longitudinal section along the section plane A-A in FIG. 3A (FIG. 3B). The shank 14 is constructed from a first portion **26** and a second portion **27**, which in the exemplary embodiment are formed in one piece and have a central through-hole **28**.

The second portion 27 of the shank 14 has an external thread **29**, forming the second threaded connection 16 with a matching internal thread of the drill bit 12. The first portion 26 of the shank 14 is composed of five portions and includes a front region **32**, a first outer conical region **33**, a groove region **34**, a second outer conical region **35** and a cylinder region **36**. The first and second outer conical region 33, 35 have a first or second conical outer surface which widens in the direction of the drill bit 12. The conical outer surfaces are produced for example by turning; by manufacturing the first and second conical outer surface in one setting, high manufacturing accuracy can be achieved.

The shank 14 has a plurality of first longitudinal grooves **37** and a plurality of second longitudinal grooves **38**, which extend parallel to the second longitudinal axis 24 of the shank 14 and are arranged on the outside of the first portion 26. The first longitudinal grooves 37 and second longitudinal grooves 38 are identically formed in the exemplary embodiment and extend over the first outer conical region 33, the groove region 34 and the second outer conical region 35 and also over the cylinder region 36. The first longitudinal grooves 37 and second longitudinal grooves 38 are uniformly distributed in the circumferential direction **39** of the shank 14 and are arranged alternately, each first longitudinal groove 37 being arranged between two second longitudinal grooves 38. In the exemplary embodiment, the shank 14 has three first longitudinal grooves 37 and

three second longitudinal grooves 38; it generally applies that the number of the plurality of first longitudinal grooves 37 is identical to the number of the plurality of second longitudinal grooves 38.

5 **FIGS. 4A, B** show the device 10 according to the invention for transmitting torque in the connected state, in which the shank 14 is connected to the tool fitting 13, in a side view (FIG. 4A) and in a longitudinal section along the section plane A-A in FIG. 4A (FIG. 4B).

10 The tool fitting 13 is constructed from a basic body **41**, an intermediate element **42** and a locking device **43**. The intermediate element 42 forms the interface between the tool fitting 13 and the shank 14 and the torque is transmitted from the intermediate element 42 to the shank 14. The connected state of the tool fitting 13 is defined as the state in which the basic body 41, the intermediate element 42 and the locking device 43 are connected.

15

The locking device 43 is designed to be adjustable relative to the basic body 41, wherein the locking device 43 is displaceable in a longitudinal direction **44** that runs parallel to the first longitudinal axis 22 of the tool fitting 13, and is rotatable about the first longitudinal axis 22. The locking device 43 is adjustable between a plurality of positions, which are referred to as the basic position, receiving position and locking position. In order to be able to connect the shank 14 to the tool fitting 13 in a form-fitting manner, the locking device 43 is shifted from the basic position in the longitudinal direction 44 into the receiving position. In the receiving position, the shank 14 is inserted into the tool fitting 13. To lock the device 10, the locking device 43 is rotated about the first longitudinal axis 22 into the locking position. In the process, locking elements **45** engage in the groove region 34 of the shank 14 and lock the shank 14 to the tool fitting 13. The basic position of the locking device 43 is optional and can be omitted; the receiving position and locking position of the locking device 43 are necessary.

20
25
30 **FIGS. 5A-C** show the basic body 41 of the tool fitting 13 in a side view (FIG. 5A), in a longitudinal section along the section plane A-A in FIG. 5A (FIG. 5B) and in a plan view of the interface with the intermediate element 42 (FIG. 5C).

35 The basic body 41 is sleeve-shaped with a central through-hole **47** and is composed of a plurality of portions, which in the exemplary embodiment are made in one piece. In

addition to the internal thread, the basic body 41 comprises an internal conical region **48** which interacts with the shank 14, and a rotary driving region **49** which interacts with the intermediate element 42. The inner conical region 48 has a conical inner surface which widens in the direction of the drill. In the connected state of the device 10, the inner
5 conical region 48 of the basic body 41 and the first and second outer conical region 33, 35 of the shank 14 form a form-fitting connection.

The rotary driving region 49 is formed in a step-shaped manner from an annular collar **51** and an annular shoulder **52**. A plurality of first outer rotary driving grooves **53** and a
10 plurality of second outer rotary driving grooves **54** are provided in the annular collar 51, said grooves interacting with first outer rotary drivers and second outer rotary drivers of the intermediate element 42 in the connected state of the tool fitting 13, and a plurality of first lower rotary driving grooves **55** and a plurality of second lower rotary driving grooves **56** are provided in the annular shoulder 51, said grooves interacting with first
15 lower rotary drivers and second lower rotary drivers of the intermediate element 42 in the connected state of the device 10. The first and second outer rotary driving grooves 53, 54 are combined under the term "outer rotary driving grooves" and the first and second lower rotary driving grooves 55, 56 are combined under the term "lower rotary driving grooves".

20

The first outer rotary driving grooves 54 and second outer rotary driving grooves 55 are uniformly distributed in a circumferential direction **57** of the basic body 41 in the annular collar 51 of the rotary driving region 49 and are arranged alternately, each first outer rotary driving groove 54 being arranged between two second outer rotary driving grooves
25 56. The first lower rotary driving grooves 55 and second lower rotary driving grooves 56 are uniformly distributed in the circumferential direction 57 of the basic body 41 in the annular shoulder 52 and are arranged alternately, each first lower rotary driving groove 55 being arranged between two second lower rotary driving grooves 56.

30 In the exemplary embodiment, the annular collar 51 has three first outer rotary driving grooves 53 and three second outer rotary driving grooves 54 and the annular shoulder 52 has three first lower rotary driving grooves 55 and three second lower rotary driving grooves 56; it applies in general that the number of the plurality of first outer rotary driving grooves 53 is identical to the number of the plurality of second outer rotary driving

grooves 54, and the number of the plurality of first lower rotary driving grooves 55 is identical to the number of the plurality of second lower rotary driving grooves 56.

FIGS. 6A-C show the intermediate element 42 of the tool fitting 13 in a side view (FIG. 6A), in a longitudinal section along the section plane A-A in FIG. 6A (FIG. 6B) and in a plan view of the interface with the basic body 41 (FIG. 6C). In the connected state of the device 10, the intermediate element 42 is arranged between the basic body 41 and the shank 14 and the torque is transmitted from the basic body 41 via the intermediate element 42 to the shank 14.

The intermediate element 42 is annular designed with a base surface **61**, an inner lateral surface **62** and an outer lateral surface **63**. The inner lateral surface 62 forms an inner driver region and the outer lateral surface 63 forms an outer driver region. On the inner lateral surface 62, the intermediate element 42 has a plurality of first inner rotary drivers **64** and a plurality of second inner rotary drivers **65** which, in the connected state of the device 10, engage in the first longitudinal grooves 37 and second longitudinal grooves 38 of the shank 14. On the outer lateral surface 63, the intermediate element 42 has a plurality of first outer rotary drivers **66** and a plurality of second outer rotary drivers **67** which, in the connected state of the tool fitting 13, engage in the first outer rotary driving grooves 53 and second outer rotary driving grooves 54 on the annular collar 51 of the basic body 41.

The first inner rotary drivers 64 and second inner rotary drivers 65 are combined under the term "inner rotary drivers". Perpendicular to the first longitudinal axis 22 of the tool fitting 13, the first inner rotary drivers 64 have a first width **B₁** and a first depth **T₁** and the second inner rotary drivers 65 have a second width **B₂** and a second depth **T₂**. Parallel to the first longitudinal axis 22 of the tool fitting 13, the first inner rotary drivers 64 extend over a first height **H₁** and the second inner rotary drivers 65 extend over a second height **H₂**. In order to set the surface pressure between the intermediate element 42 and the shank 14 to be as small as possible, the first height **H₁** and the second height **H₂** are as large as possible.

The first outer rotary drivers 66 and second outer rotary drivers 67 are combined under the term "outer rotary drivers". Perpendicular to the first longitudinal axis 22 of the tool fitting 13, the first outer rotary drivers 66 have a third width **B₃** and a third depth **T₃** and

the second outer rotary drivers 67 have a fourth width **B₄** and a fourth depth **T₄**. Parallel to the first longitudinal axis 22 of the tool fitting 13, the first outer rotary drivers 66 have a third height **H₃** and the second outer rotary drivers 67 have a fourth height **H₄**. In order to set the surface pressure between the basic body 41 and the intermediate element 42 to be as small as possible, the third height **H₃** and the fourth height **H₄** are as large as possible.

The first outer rotary drivers 66 and second outer rotary drivers 67 are aligned in a plane **68** perpendicular to the first longitudinal axis 22 of the tool fitting 13 with the first inner rotary drivers 64 and second inner rotary drivers 65, respectively. This arrangement has the advantage that the forces are transmitted directly from the basic body 41 to the shank 14. In the connected state of the device 10, the force flows onto the first outer rotary drivers 66 and second outer rotary drivers 67 on the outer lateral surface 63 of the intermediate element 42; the forces are transmitted via the intermediate element 42 to the first inner rotary drivers 64 and second inner rotary drivers 65 on the inner lateral surface 62 of the intermediate element 42, the first inner rotary drivers 64 transmitting the forces to the first longitudinal grooves 37 and the second inner rotary drivers 65 transmitting the forces to the second longitudinal grooves 38.

In addition to the inner rotary drivers 64, 65 and outer rotary drivers 66, 67, the intermediate element 42 has a plurality of first lower rotary drivers **71** and a plurality of second lower rotary drivers **72**, which are arranged on the base surface 61 of the intermediate element 42 and which merge into the first inner rotary drivers 64 and the second inner rotary drivers 65, respectively. The first lower rotary drivers 71 merge into the first inner rotary drivers 64 and the second lower rotary drivers 72 merge into the second inner rotary drivers 65.

The first and second lower rotary drivers 71, 72 are combined under the term "lower rotary drivers". Perpendicular to the first longitudinal axis 22 of the tool fitting 13, the first lower rotary drivers 71 have a fifth width **B₅** and a fifth depth **T₅** and the second lower rotary drivers 72 have a sixth width **B₆** and a sixth depth **T₆**. Parallel to the first longitudinal axis 22 of the tool fitting 13, the first lower rotary drivers 71 have a fifth height **H₅** and the second lower rotary drivers 72 have a sixth height **H₆**. In order to set the surface pressure between the basic body 41 and the intermediate element 42 to be as small as possible, the fifth height **H₅** and sixth height **H₆** are as large as possible.

The intermediate element 42 illustrated in the exemplary embodiment has all the rotary drivers which are designed as first and second inner rotary drivers 64, 65, as first and second outer rotary drivers 66, 67 and as first and second lower rotary drivers 71, 72.

- 5 The first lower rotary drivers 71 and the second lower rotary drivers 72 are optional. The contact area between the basic body 41 and the intermediate element 42 is increased by the first lower rotary drivers 71 and second lower rotary drivers 72.

- 10 The new tool fitting 13 differs from the old tool fitting by the second outer rotary drivers 67 and the second outer rotary driving grooves 54. In the connected state of the device 10, the second outer rotary drivers 67 engage in the second outer rotary driving grooves 54 of the basic body 41. The second outer rotary drivers 67 and rotary driving grooves 54 increase the contact area between the basic body 41 and the intermediate element 42 and thereby enable the transmission of greater forces and torques. The larger the
15 contact area, the lower the surface pressure between the basic body 41 and the intermediate element 42, or if the surface pressure remains the same, greater forces and torques can be transmitted over the larger contact area.

- 20 In the exemplary embodiment of the device 10, the third depth T_3 of the first outer rotary drivers 66 is identical to the fourth depth T_4 of the second outer rotary drivers 67. The same depth ($T_3 = T_4$) of the first outer rotary drivers 66 and second outer rotary drivers 67 has the advantage that the force or torque is transmitted uniformly via the first outer rotary drivers 66 and second outer rotary drivers 67 from the basic body 41 to the intermediate element 42. In addition, in the exemplary embodiment of the device 10, the
25 third width of the first outer rotary drivers 66 and the fourth width of the second outer rotary drivers 67 are identical. The same depth ($T_3 = T_4$) and the same width ($B_3 = B_4$) of the first outer rotary drivers 66 and second outer rotary drivers 67 has the advantage that there is no need to assign the first outer rotary drivers 66 to the first outer rotary driving grooves 53 or the second outer rotary drivers 67 to the second outer rotary driving
30 grooves 54. Each outer rotary driver can be inserted into any outer rotary driving groove.

- With the new tool fitting 13 illustrated in the exemplary embodiment, the first depth T_1 of the first inner rotary drivers 64 is identical to the second depth T_2 of the second inner rotary drivers 65. With the old tool fitting, the second depth of the second inner rotary
35 drivers is smaller than the first depth of the first inner rotary drivers. The greater second

depth of the second inner rotary drivers increases the contact area between the new tool fitting and the new shank and enables greater forces and torques to be transmitted from the drill to the drill bit. The same depth ($T_1 = T_2$) of the first inner rotary drivers 64 and second inner rotary drivers 65 also has the advantage that the new tool fitting cannot be
5 combined with the old shank, since the dimensions of the second longitudinal grooves 38 in the plane perpendicular to the second longitudinal axis 24 of the shank 14 are too small to be combined with the second inner rotary drivers 65.

In the exemplary embodiment of the device 10, the first width B_1 of the first inner rotary
10 drivers 64 is identical to the second width B_2 of the second inner rotary drivers 65. With the old tool fitting, the second width of the second inner rotary drivers is smaller than with the new tool fitting. The same depth ($T_1 = T_2$) and the same width ($B_1 = B_2$) of the first inner rotary drivers 64 and second inner rotary drivers 65 has the advantage that there is no need to assign the first inner rotary drivers 64 to the first longitudinal grooves 37 or
15 the second inner rotary drivers 65 to the second longitudinal grooves 38.

The new tool fitting 13 illustrated in the exemplary embodiment differs from the old tool fitting in that it has the lower rotary drivers 71, 72 and lower rotary driving grooves 55, 56. The design of the first lower rotary drivers 71 and second lower rotary drivers 72 and
20 the arrangement thereof on the base surface 61 of the intermediate element 42 has the advantage that the contact area between the basic body 41 and the intermediate element 42 is increased without increasing the height of the rotary driving region 49. In addition, the load on the intermediate element 42 is shifted into other regions. The force flow that arises during the transmission of force from the first outer rotary drivers 66 and second
25 outer rotary drivers 67 to the first inner rotary drivers 64 or second inner rotary drivers 65 runs predominantly in the plane 68 perpendicular to the first longitudinal axis 22 of the tool fitting 13, and the force flow which arises during the transmission of force from the first lower rotary drivers 71 and second lower rotary drivers 72 to the first inner rotary drivers 64 and second inner rotary drivers 65, respectively, runs predominantly parallel
30 to the first longitudinal axis 22 of the tool fitting 13. The loads on the intermediate element 42 are better distributed, which leads to a longer service life of the intermediate element 42.

In the exemplary embodiment of the device 10, the fifth depth T_5 of the first lower rotary
35 drivers 71 is identical to the sixth depth T_6 of the second lower rotary drivers 72. The

same depth ($T_5 = T_6$) of the first lower rotary drivers 71 and second lower rotary drivers 72 has the advantage that the force or the torque is transmitted uniformly via the first lower rotary drivers 71 and second lower rotary drivers 72 from the basic body 41 to the intermediate element 42. In addition, in the exemplary embodiment of the device 10, the
5 fifth width B_5 of the first lower rotary drivers 71 is identical to the sixth width B_6 of the second lower rotary drivers 72. The same depth ($T_5 = T_6$) and the same width ($B_5 = B_6$) of the first lower rotary drivers 71 and second lower rotary drivers 72 has the advantage that the force or torque can be transmitted uniformly via the first rotary drivers 71 and second lower rotary drivers 72 from the basic body 41 to the intermediate element 42
10 and, in addition, there is no need to assign the first lower rotary drivers 71 to the first lower rotary driving grooves 55 or the second lower rotary drivers 72 to the second lower rotary driving grooves 56.

CLAIMS

1. A device (10) for transmitting a torque, which is produced by a drill (11), to a drill bit (12), comprising:

- 5 ▪ a shank (14) having a first outer conical region (33), a groove portion (34) and a second outer conical region (35) and a plurality of first longitudinal grooves (37) extending over the first outer conical region (33), the groove portion (34) and the second outer conical region (35), and a plurality of second longitudinal grooves (38) extending over the second outer conical region (35), wherein the number of the plurality of first longitudinal grooves (37) is identical to the number of the plurality of second longitudinal grooves (38), and
- 10 ▪ a tool fitting (13) which has a basic body (41), an intermediate element (42) and a locking device (43), wherein
- 15 – the intermediate element (42) has a plurality of first inner rotary drivers (64) with a first width (B_1) and first depth (T_1), a plurality of second inner rotary drivers (65) with a second width (B_2) and second depth (T_2) and a plurality of first outer rotary drivers (66) with a third width (B_3) and third depth (T_3),
- 20 – the basic body (41) has an inner conical region (48) and a rotary driving region (49) with first outer rotary driving grooves (53), wherein, in the connected state of the tool fitting (13), the first outer rotary drivers (66) of the intermediate element (42) engage in the first outer rotary driving grooves (53), and
- 25 – the locking device (43) is adjustable parallel to a longitudinal axis (22) of the tool fitting (13) between a receiving position and a locking position, wherein the shank (14) is insertable into the tool fitting (13) in the receiving position and is connected to the tool fitting (13) in the locking position,
- wherein, in the connected state of the device (10), the first inner rotary drivers (64) of the intermediate element (42) engage in the first longitudinal grooves (37) of the shank (14) and the second inner rotary drivers (65) of the intermediate element (42) engage in the second longitudinal grooves (38) of the shank (14),
- 30 characterized in that the intermediate element (42) has a plurality of second outer rotary drivers (67) with a fourth width (B_4) and fourth depth (T_4) and the rotary driving region (49) has a plurality of second outer rotary driving grooves (54), wherein, in the connected state of the device (10), the second outer rotary drivers (67) engage in the second outer rotary driving grooves (54).

2. The device as claimed in claim 1, characterized in that the second outer rotary drivers (67) are aligned with the second inner rotary drivers (65) in a plane (68) perpendicular to the longitudinal axis (22) of the tool fitting (13).

5 **3.** The device as claimed in either of claims 1 and 2, characterized in that the third depth (T_3) of the first outer rotary drivers (66) and the fourth depth (T_4) of the second outer rotary drivers (67) are identical.

10 **4.** The device as claimed in claim 3, characterized in that the third width (B_3) of the first outer rotary drivers (66) and the fourth width (B_4) of the second outer rotary drivers (67) are identical.

15 **5.** The device as claimed in one of claims 1 to 4, characterized in that the first depth (T_1) of the first inner rotary drivers (64) and the second depth (T_2) of the second inner rotary drivers (65) are identical, and the second longitudinal grooves (38) of the shank (14) also extend over the first outer conical region (33) and the groove region (34).

20 **6.** The device as claimed in claim 5, characterized in that the first width (B_1) of the first inner rotary drivers (64) and the second width (B_2) of the second inner rotary drivers (65) are identical.

25 **7.** The device as claimed in one of claims 1 to 6, characterized in that the intermediate element (42) is annular designed with an inner lateral surface (62), an outer lateral surface (63) and a base surface (61), wherein a plurality of lower rotary drivers (71, 72) are arranged on the base surface (61) of the intermediate element (42) and a plurality of lower rotary driving grooves (55, 56) are arranged in an annular shoulder (52) of the rotary driving region (49), wherein, in the connected state of the device (10), the lower rotary drivers (71, 72) interact with the lower rotary driving grooves (55, 56).

30 **8.** The device as claimed in claim 7, characterized in that the lower rotary drivers (71, 72) comprise a plurality of first lower rotary drivers (71) with a fifth width (B_5) and fifth depth (T_5) and the lower rotary driving grooves (55, 56) comprise a plurality of first lower rotary driving grooves (55), wherein, in the connected state of the device (10), the first lower rotary drivers (71) interact with the first lower rotary driving grooves (55).

9. The device as claimed in claim 8, characterized in that the first lower rotary drivers (71) are aligned with the first inner rotary drivers (64) of the intermediate element (42) in a plane (68) perpendicular to the longitudinal axis (22) of the tool fitting (13).

5 **10.** The device as claimed in one of claims 7 to 9, characterized in that the lower rotary drivers (71, 72) comprise a plurality of second lower rotary drivers (72) with a sixth width (B_6) and sixth depth (T_6) and the lower rotary driving grooves (55, 56) comprise a plurality of second lower rotary driving grooves (56), wherein, in the connected state of the device (10), the second lower rotary drivers (72) interact with the second lower rotary driving
10 grooves (56).

11. The device as claimed in claim 10, characterized in that the second lower rotary drivers (72) are aligned with the second inner rotary drivers (65) of the intermediate element (42) in a plane (68) perpendicular to the longitudinal axis (22) of the tool fitting
15 (13).

12. The device as claimed in either of claims 10 and 11, characterized in that the fifth depth (T_5) of the first lower rotary drivers (71) and the sixth depth (T_6) of the second lower rotary drivers (72) are identical.
20

13. The device as claimed in claim 12, characterized in that the fifth width (B_5) of the first lower rotary drivers (71) and the sixth width (B_6) of the second lower rotary drivers (72) are identical.