



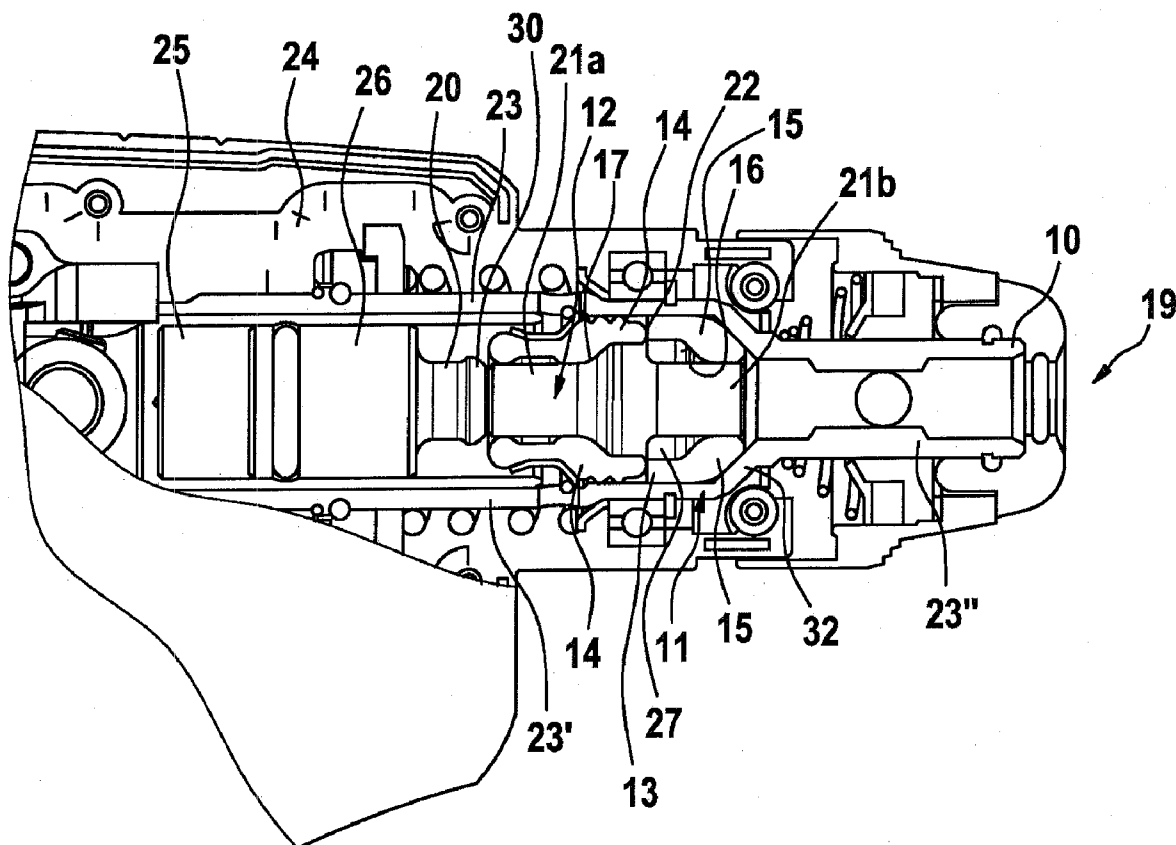
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Duesselberg et al.(10) **Pub. No.: US 2008/0245220 A1**(43) **Pub. Date: Oct. 9, 2008**(54) **PERCUSSION MECHANISM AND AT LEAST
PERCUSSIVELY-OPERATED HAND
MACHINE TOOL WITH A PERCUSSION
MECHANISM**(30) **Foreign Application Priority Data**

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HUNTINGTON, NY 11743(52) **U.S. Cl. 91/234; 175/415**(73) Assignee: **ROBERT BOSCH GMBH**,
Stuttgart (DE)(21) Appl. No.: **11/575,994**(22) PCT Filed: **Jun. 22, 2006**(86) PCT No.: **PCT/EP06/63468**§ 371 (c)(1),
(2), (4) Date: **Mar. 26, 2007**(57) **ABSTRACT**

The invention relates to a percussion mechanism for an at least percussively-operated hand machine tool, in particular a hammer drill or chisel, comprising a drive motor and a tool holder (10) for housing a tool, with a percussive pin (12) acting on the tool which is axially displaceable within a percussive pin guide (11). The percussive pin guide (11) has a body (13) enclosing the percussive pin (12). According to the invention, the body (13) is made from two materials of differing hardness. The invention further relates to an at least percussively-operated hand machine tool, in particular a hammer drill or chisel with a percussion mechanism.



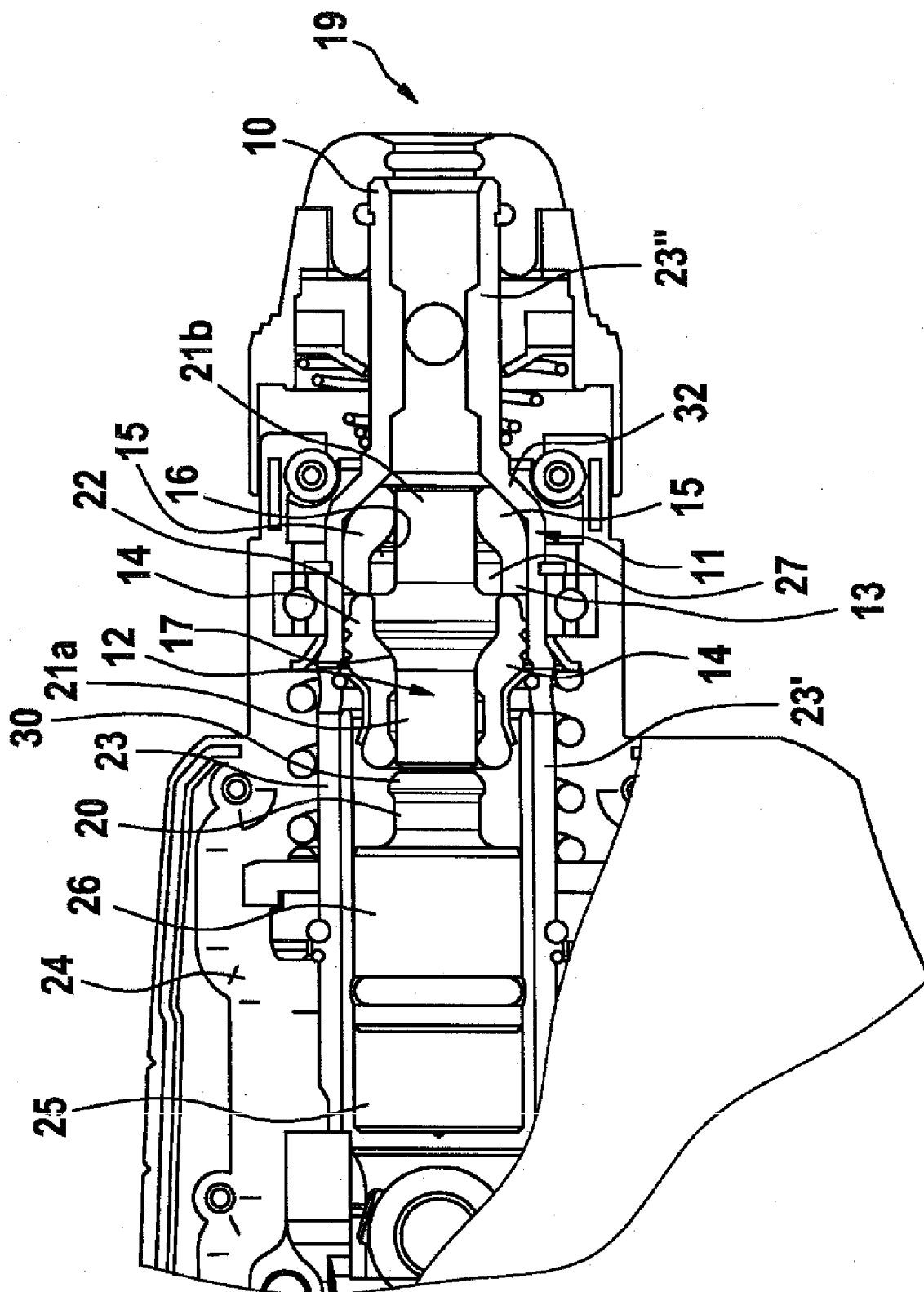


Fig. 2a

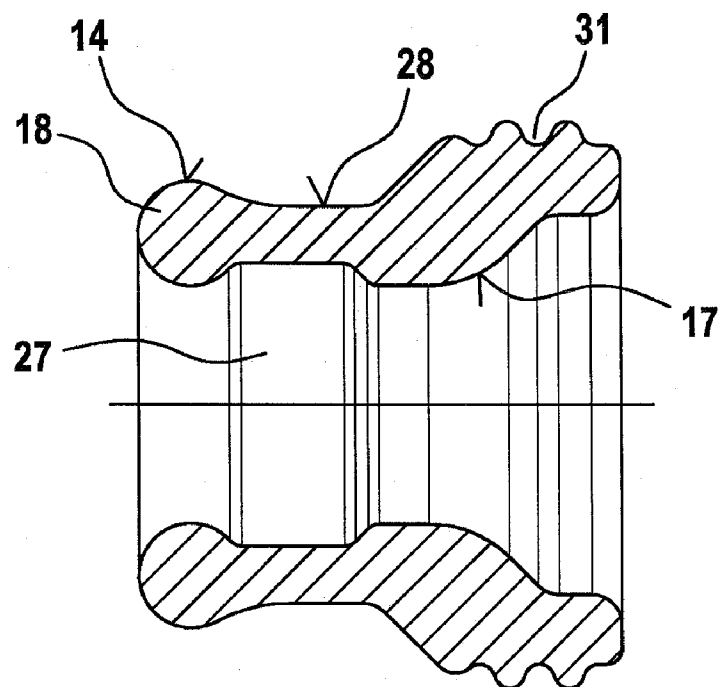
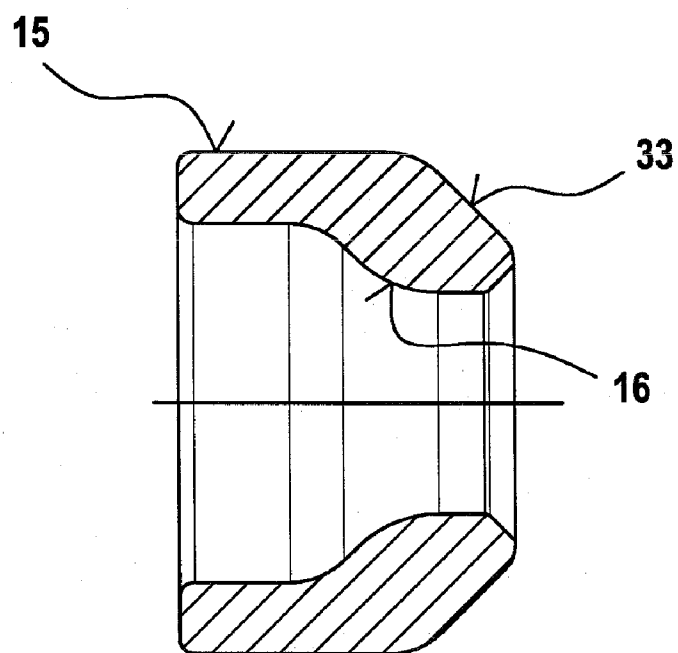


Fig. 2b



PERCUSSION MECHANISM AND AT LEAST PERCUSSIVELY-OPERATED HAND MACHINE TOOL WITH A PERCUSSION MECHANISM

PRIOR ART

[0001] The invention is based on a percussion mechanism and an at least percussively drivable hand power tool having a percussion mechanism, as defined by the preambles to the independent claims.

[0002] In the prior art, a percussion mechanism of percussively drivable hand power tools, such as drill hammers and/or percussion hammers, in order to transmit a percussion pulse, often includes a so-called header or percussion bolt, which is axially displaceably supported in a percussion bolt guide and is acted upon on the drive end with blows by a beater of the percussion mechanism in the drilling or percussion direction. The percussion energy of the blows is transmitted by the percussion bolt to a face end on the drive end of the tool that is received in the tool holder. A lubricant-filled interior of the percussively drivable hand power tool is thus sealed off from the outside. The percussion bolt, typically made from steel, is guided in hard fashion in the tool holder, or in a steel hammer barrel that adjoins the tool holder on the drive end. This version comprises a great number of individual parts, whose manufacture requires precise machining. In particular, in machining contact faces of the percussion bolt and of the tool holder or of the hammer barrel, certain minimum tolerances cannot be allowed to be exceeded, so as to keep the components in the percussion line and thus assure only slight transverse forces. The proposed steel version is thus quite cost-intensive.

[0003] In Published German Patent Disclosure DE 103 23 606 A1, a percussion bolt guide of elastomer material is proposed, in which the percussion bolt is guided elastically. The percussion bolt guide is embodied in one piece or in multiple parts. It is true that because of the use of elastomer material, an inexpensive version is furnished. A disadvantage, however, is that the reflection performance of the elastomer material differs from that of steel, which has unfavorable effects on the idling function which was unproblematic in the earlier steel version. Furthermore, when used in higher-quality devices, the expected service life is shorter, which in turn adversely affects the cost factor.

ADVANTAGES OF THE INVENTION

[0004] In the percussion mechanism of the invention for an at least percussively drivable hand power tool, a percussion bolt guide includes a body of annular cross section that surrounds the percussion bolt and is formed of at least two materials of different hardness. An at least percussively drivable hand power tool, such as a drill hammer and/or percussion hammer, according to the invention includes a correspondingly embodied percussion mechanism. Preferably, a drive part of the body is formed of an elastomer, and a tool part of the body is formed of steel. It is advantageous that using steel, instead of the elastomer material, in the tool part of the body, makes a substantially better transition of the percussion mechanism from a percussion mechanism function to an idling function attainable. The proposed component furthermore has a longer service life compared to the purely elastomer version. There is also a pronounced cost advantage of the proposed version, with at the same time improved func-

tionality, compared to the version constructed entirely of elastomer. Instead of elastomer, some other material may also be used, such as plastic or the like.

[0005] In the version according to the invention, the body is embodied in two parts, with a drive part of the body comprising the elastomer material and a tool part of the body comprising steel. Preferably, the two parts have a continuous axial recess for the percussion bolt, and the percussion bolt is limitedly axially displaceable in the recess between an idling position and a percussion position. Expediently, the thus-shaped parts of the body have a guide function for the percussion bolt. In particular, the tool part of the body may have an inner idling impact stop shoulder, against which the percussion bolt rests in the idling mode. The drive part of the body preferably has a B-impact stop shoulder, which damps the recoil of the percussion bolt after the transfer of the percussion pulse to the tool. Because of the embodiment according to the invention of the drive part of the body of elastomer, the deceleration of the percussion bolt in its reverse motion in the percussion mode is damped.

[0006] In an embodiment of the invention, a sealing element can be located on an on an inner and/or outer jacket face of the drive part of the body. As a result, even better sealing action can favorably be attained, especially against the entry of dirt from outside. The sealing element preferably annularly surrounds the percussion bolt.

[0007] The drive part of the body may be shaped such that besides guiding the percussion bolt, it performs one or more other functions, such as a sealing function and/or an idling function in idling impact or B-impact, in order to damp the recoil that then occurs and to brace the drill in the device. For performing another additional function, a beater catch ring may be integrated with the drive part of the body, in order to catch the beater in the idling mode. By means of the thus-shaped drive part of the body, which performs multiple functions simultaneously, it is favorably possible to dispense with furnishing separate components.

[0008] In an alternative embodiment, instead of the beater catch ring integrated with the drive part of the body, a separate beater catch ring may be provided. For this, a standard sealing ring may for instance be used, thus simplifying the tool construction.

[0009] It can be provided that the tool part of the body is longer than the drive part. Alternatively, a length ratio between the tool part and the drive part of the body can be transposed, with the drive part of the body being longer than the tool part. As a result, depending on the design of the device, various geometric variations can be attained.

DRAWING

[0010] Further embodiments, aspects and advantages of the invention will become apparent, including regardless of how they are summarized in claims, without limitation to their generality, from exemplary embodiments of the invention described below in conjunction with drawings.

[0011] In the following:

[0012] FIG. 1 is a fragmentary longitudinal section through an at least percussively drivable hand power tool with a percussion bolt group; and

[0013] FIGS. 2a, b show an enlarged view of a drive part (FIG. 2a) and a tool part (FIG. 2b) of the percussion bolt guide.

DESCRIPTION OF THE EXEMPLARY EMBODIMENT

[0014] In FIG. 1, part of an electric hand power drill or percussion hammer with a percussion mechanism is shown in longitudinal section. The percussion mechanism essentially includes a percussion bolt guide 11 and a percussion bolt 12, which is axially displaceable in the percussion bolt guide 11 and which transmits the percussion pulse of a beater 20 of the percussion mechanism, which is driven by a drive motor, not shown, of the handheld drill hammer or percussion hammer, to a drilling or percussion tool 19 inserted into a tool holder 10 of the percussion mechanism.

[0015] The percussion bolt 12 is made from solid steel and comprises two elongated cylindrical end parts 21a, 21b, as well as a radially thickened middle part 22 that connects the two end parts 21a, 21b and is located between them.

[0016] The percussion bolt guide 11 extends over the entire length of the percussion bolt 12 and includes a hammer barrel 23, which is braced in the axial direction in a housing 24 of the drill hammer or percussion hammer. A body 13 is fixed in the hammer barrel 23. The hammer barrel 23 comprises two tubular portions 23', 23'', joined by a conical annular shoulder 32, and of these the front tubular portion 23'', toward the tool, has a smaller diameter and forms the tool holder 10. The rear tubular portion 23' has a larger diameter and is open at its rear face end, so that the body 13, the percussion bolt 12, the beater 20, and a piston 25 of the percussion mechanism acting on the beater 20 can be introduced into the hammer barrel 23 from this end. Between the piston 25 and the beater 20, an air cushion chamber 26 is embodied in the hammer barrel 23; it can be ventilated via radial air bores (not shown) in the wall of the hammer barrel 23.

[0017] The body 13 held by the hammer barrel 23 is embodied with an annular cross section and is formed of two materials of different hardness. The body 13 is embodied in two parts, with a drive part 14 and a tool part 15. The drive part 14 of the body 13 is formed of an elastomer, and the tool part 14 of the body 13 is of steel. The drive part 14 of the body 13 has a greater axial length than the tool part 15.

[0018] The two parts 14, 15 have a continuous axial recess 27 for the percussion bolt. The drive part 14 has a B-impact stop shoulder 17 on the drive end, and this shoulder damps the recoil of the percussion bolt 12 after the transfer of the percussion pulse to the tool 19. The tool part 15 of the body 13 has an inner idling stop shoulder 16 toward the tool, against which shoulder the percussion bolt 12 rests in the idling mode. Thus in the recess 27 formed by the parts 14, 15, the percussion bolt 12 is limitedly axially displaceable between an idling position and a percussion position. The parts 14, 15 thus serve as a guide for the percussion bolt 12.

[0019] In FIG. 2a, a detail of the drive part 14 of the body 13, with the B-impact stop shoulder 17, is shown, and in FIG. 2b, a detail of the tool part 15 of the body 13, with the idling stop shoulder 16, is shown. The parts 14, 15 each form a recess 27, in which the percussion bolt 12, not shown here, is axially displaceable.

[0020] In addition to guiding the percussion bolt 12, the parts 14, 15 are shaped such that still other functions can be integrated. A beater catch ring 18 is integrated with the drive part 14 of the body 13, in order to catch the beater 20 in the idling mode. The beater catch ring 18 is located on the drive end, and on its free end, which is on the drive end in the installed state, it is thickened in beadlike fashion. The beater catch ring 18 is embodied as protruding axially. An inside

diameter of the beater catch ring 18 is smaller than an outside diameter of a thickened face end 30 of the beater 20 toward the tool and shown in FIG. 1. The beater catch ring is joined to the part 14 via a hollow-cylindrical neck part 28. The neck part 28 has an inside diameter that is widened compared to the inside diameter of the beater catch ring 18.

[0021] The drive part 14 of the body 13 is shaped such that besides guiding the percussion bolt 12 and having the beater catching function, it performs still other functions, such as a sealing function and/or a damping function in idling impact or B-impact, in order to damp the resultant recoil and brace the drill in the device. This can be attained for instance by means of a plurality of encompassing grooves 31, which are located on the end toward the tool of the drive part 14 in the installed state.

[0022] The tool part 15 of the body 13 is shaped like a steel sleeve, and toward the tool it includes the inner idling stop shoulder 16. An outer face 33 of the part 15 tapers toward the tool in a shape embodied as complementary to the annular shoulder 32 of the hammer barrel 23. The outer face 33 of the part 15 can thus be braced on the annular shoulder 32.

1. A percussion mechanism for an at least percussively drivable hand power tool, in particular a drill hammer and/or percussion hammer, having a drive motor and a tool holder (10) for receiving the tool, including percussion bolt (12) which is axially displaceable in a percussion bolt guide (11) and acts on the tool, the percussion bolt guide (11) including a body (13) that surrounds the percussion bolt (12), characterized in that the body (13) is formed of at least two materials of different hardness.

2. The percussion mechanism as defined by claim 1, characterized in that a drive part (14) of the body (13) is formed of an elastomer.

3. The percussion mechanism as defined by claim 1, characterized in that a tool part (15) of the body (13) is formed of steel.

4. The percussion mechanism as defined by claim 3, characterized in that a sealing element is located on an inner and/or outer jacket face of the drive part (14) of the body (13).

5. The percussion mechanism as defined by claim 4, characterized in that the sealing element annularly surrounds the percussion bolt (12).

6. The percussion mechanism as defined by claim 2, characterized in that a beater catch ring (18) is integrated with the drive part (14) of the body (13).

7. The percussion mechanism as defined by claim 1, characterized in that a separate beater catch ring is provided.

8. The percussion mechanism as defined by claim 2, characterized in that the tool part (15) of the body (13) is embodied as longer than the drive part (14).

9. The percussion mechanism as defined by claim 2, characterized in that the drive part (14) of the body (13) is embodied as longer than the tool part (15).

10. An at least percussively drivable hand power tool, in particular a drill hammer and/or percussion hammer, having a percussion mechanism, a drive motor, and a tool holder (10) for receiving a tool, in which the percussion mechanism includes a percussion bolt that is axially displaceable in a percussion bolt guide (11) and acts on the tool, and the percussion bolt guide (11) includes a body (13) surrounding the percussion bolt (12), characterized in that the body (13) is formed of at least two materials of different hardness.