Abstract Title: Vibration-damping handle

A handle comprises a handle cover 10, a handle core 20 and an intermediate space 30 between the handle cover and handle core, wherein the handle core comprises a fastening element 40 at one end and extends to the end of the handle cover remote from the fastening element, and wherein at least one damping element 52 is provided in the intermediate space, the handle core forming a contactless relief cut 60 in the handle cover. The contactless relief cut prevents separation of the core from the handle cover if at least one damping element fails, and may be formed in the region of the core remote from the fastening element. The handle core may be provided with at least one relief cut element 68, which may be a foot. The fastening element may be constructed integrally with the core, which may be a screw, the screw head forming the relief cut element (Figure 4). The handle cover may be provided with at least one relief cut element (69, Figure 5).
GB 2445256 A continuation

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Description

5 Title
Handle

Background art

10 The invention relates to a handle, in particular for a hand tool machine, according to the preamble of claim 1.

Many electric tools, such as for example right angle grinders, drilling machines and hammer drills, are equipped with an additional handle. In order to prevent the vibrations that arise during operation of the electric tool from being transmitted via the additional handle to the operator, additional handles are mostly provided with vibration-damping means.

20 From DE 103 48 973 A1, a vibration-damped handle is known, which comprises a sleeve-shaped outer handle element and a sleeve-shaped or cylindrical inner handle core. The inner handle core is disposed concentrically and with spacing relative to the outer handle element so that the handle core with the handle element delimits a hollow-cylindrical intermediate space. The handle core, at its appliance-side end that projects from the handle element, has a fastening portion. In the intermediate space between handle element and handle core vibration-damping means in the form of spacers made of rubber-elastic, preferably elastomeric material are provided. The spacers made of rubber-elastic material are for example rings, webs or knobs.
The handle known from DE 103 48 973 A1 has the drawback of not being pull-off proof. Should the rubber-elastic material of the spacers tear, for example as a result of material fatigue, there is a risk of separation of the handle element and the handle core. In such a situation, only the handle core would remain attached to the hand tool machine, whilst the handle element would be detached from the hand tool machine.

Disclosure of the invention

The invention proceeds from a handle comprising a handle cover and a handle core. The handle core is equipped at one end with a fastening element for fastening the handle to a hand tool machine and extends right up to the end of the handle cover remote from the fastening element. An intermediate space is disposed between handle cover and handle core, with the result that handle cover and handle core are not in mutual contact. The handle cover is designed for example substantially as a hollow cylinder. The handle core is for example substantially cylindrical in shape and disposed coaxially with the handle cover. In the intermediate space between handle cover and handle core at least one damping element is provided. The damping element reduces the transmission of vibrations from the handle core to the handle cover, and hence to the operator of the hand tool machine.

In order to incorporate an anti-pull-off device on the handle, the handle core and the handle cover are designed in such a way that the handle core forms a contactless relief cut in the handle cover. The relief cut is of a contactless design because handle core and handle cover are
not in mutual contact but are connected to one another merely by damping elements. It is only in the event of failure of the damping element that the handle core comes into abutment with the handle cover and by virtue of the relief cut prevents a separation of handle core and handle cover. The contactless relief cut therefore, in the event of failure of the damping element, guarantees an axial locking.

In particular, the handle core forms the contactless relief cut in the region of the end of the handle cover remote from the fastening element. Thus, the handle core is provided preferably in the region of the end remote from the fastening element with at least one relief cut element.

Preferably a foot is formed as a relief cut element at the end of the handle core remote from the fastening element. A widening of the handle core at the opposite end to the fastening element is regarded as a foot.

In one embodiment, the foot is formed by a screw head. For this purpose, at the end of the handle core remote from the fastening element a screw is screwed into the handle core with its screw head projecting in radial direction beyond the handle core. The diameter of the screw head is larger than the inside diameter of the handle cover so that, in the event of failure of the damping element, the screw head comes to lie adjacent to the inner wall of the handle cover.

Alternatively, the foot may be formed by a disk, which is moulded or fastened, e.g. screwed, on the free end of the handle core.
In another embodiment, the fastening element is formed integrally with the handle core. The handle core plus fastening element in this case is a screw, of which the screw neck is disposed, in particular coaxially, in the handle cover and the screw head forms a contactless relief cut at the free end of the handle cover. At least part of the thread of the screw projects as a fastening element from the handle cover.

In addition or as an alternative to one or more relief cut elements on the handle core, at least one relief cut element may be formed on the handle cover. The relief cut elements project into the handle cover interior and/or into the intermediate space between handle cover and handle core. As relief cut elements, locking pawls for example are moulded on the inner wall of the handle cover.

The handle according to the invention preferably has the shape of a stylus, rod or the like. The handle cover of the handle in this case is substantially hollow-cylindrical in shape. In a simple embodiment, this may be a hollow cylinder. In a more developed embodiment, the hollow-cylinder-shaped handle cover may however also be adapted to the ergonomics of the human hand in that, in a departure from a purely hollow-cylindrical shape, it has for example different diameters along its longitudinal axis. The handle cover may in this case be of a rotationally symmetrical design, so that the handle may be grasped in any orientation by the operator, or it may be adapted in such a way to the ergonomics of the hand that an area of support for the palm and areas of support for the fingers are specially formed.
The handle cover may be made of plastics material, e.g. polyamide. It may in addition be coated with a soft component, for example with an elastic material, for example an elastomer.

The handle core preferably has the shape of a cylindrical rod, stylus or the like, which is disposed in particular coaxially in the handle cover. The handle core may alternatively be designed as a hollow cylinder, in which for example further vibration-damping means, such as for example an absorption mass, may be received.

In a simple embodiment, handle core and fastening element are of an integral construction. For this purpose, the handle core is formed by a screw, the screw neck of which is disposed coaxially and with spacing in the handle cover. The screw head at the free end of the handle forms a contactless relief cut in the handle cover. At least part of the thread projects at the opposite end from the handle cover. In this case, the thread of the screw forms the fastening element.

The fastening element may however also be designed in a different manner as a separate part. In a simple embodiment, it may be for example a threaded bolt or a screw, which is fitted on the handle core. In this case, the screw head is received in the handle core and the free, threaded screw end projects from the handle core and the handle cover.

Instead of a threaded bolt, screw or the like, a clamping device for connecting the handle to the housing of a hand
tool machine may for example be alternatively provided as a fastening element.

In a further alternative embodiment, the fastening element may take the form of a location sleeve with a screw nut. The location sleeve is used to receive a screw, which is connectable to the screw nut. In this case, a screw may be fitted on the housing of the hand tool machine. For fitting the handle on the hand tool machine, the screw is introduced into the location sleeve and screw-fastened by means of the screw nut. The screw may be fitted on the housing for example by means of a clamping device.

The damping element may be made for example of an elastic material, in particular an elastomer. The intermediate space between handle core and handle cover may be completely filled with the damping element, for example by injecting a thermoplastic elastomer into the intermediate space between handle core and handle cover. It is however also possible to introduce a plurality of individual damping elements in the form of knobs, rings, webs made of an elastomeric material between handle core and handle cover. It is equally possible to use other vibration-damping materials, such as foams or gels, and other fluid cushions as damping elements. Spring elements, such as leaf springs, helical springs etc., may also be used as damping elements.

The handle is particularly suitable as an additional handle for a hand tool machine, for example for a right angle grinder, a hammer drill or a drilling machine.
The invention further relates to a hand tool machine that has at least one handle according to the invention.

There now follows a detailed description of the invention with reference to the accompanying drawings. The drawings show

Figure 1 a first embodiment of a handle according to the invention

Figure 2 a second embodiment of a handle according to the invention

Figure 3 a third embodiment of a handle according to the invention

Figure 4 a fourth embodiment of a handle according to the invention

Figure 5 a fifth embodiment of a handle according to the invention.

Fig. 1 shows a first embodiment of a handle 100 according to the invention, which may be used as an additional handle for a mains-operated or battery-operated hand tool machine (not illustrated). The handle 100 comprises a handle cover 10 substantially in the shape of a hollow cylinder. In the handle cover 10 a handle core 20 is disposed coaxially and with spacing. The handle core 20 is substantially cylindrical in shape. The handle core 20 at its, in Fig. 1, upper end receives a fastening element 40. In the illustrated embodiment, the fastening element 40 is a screw, of which the screw head 42 is accommodated in the
handle core 20 and the screw neck 44 with screw thread 46 projects at least partially from the handle core 20 and the handle cover 10. The fastening element 40 is used to fastening the handle 100 detachably to a hand tool machine, which is not represented in detail. The handle core 20 extends substantially from one end 11 of the handle cover 10 to the other end 12. In this case, the handle core 20 at its end 21 facing the fastening element 40 may also project from the handle cover 10, as illustrated in Figs. 1, 2, 5. The end 22 of the handle core 20 remote from the fastening element 40 extends substantially right up to the end 12 of the handle cover 10.

An intermediate space 30 is disposed between handle core 20 and handle cover 10, with the result that handle core 20 and handle cover 10 are not in mutual contact. The intermediate space 30 contains a damping element 52, by means of which vibrations are reduced at the handle 100 during operation of the hand tool machine. The damping element 52 in the embodiments illustrated in Figs. 1 and 4 substantially completely fills the intermediate space 30. For this purpose, an elastic material, for example an elastomer or a foam, may be introduced, e.g. injected into the intermediate space 30. Alternatively, in the embodiment according to Fig. 3 the damping element 54 only partially fills the intermediate space 30. In a further embodiment according to Figs. 2 and 5, a plurality of individual damping elements 56 in the form of rings of elastic material, e.g. of elastomeric material, are introduced into the intermediate space 30. Further types of damping element, such as liquid- or gas cushions, spring elements, etc., are equally possible.
According to the invention, the handle core 20 and the handle cover 10 are designed and disposed in relation to one another in such a way that the handle core 20 forms a contactless relief cut 60 in the handle cover 10. The relief cut 60 is described as contactless because the handle core 20 and the handle cover 10 are separated from one another by the intermediate space 30 and are not in mutual contact. The vibration-damping property of the damping element 52 is therefore not impaired by the contactless relief cut 60. The relief cut 60 however in the event of failure of the damping element 52, for example as a result of damage or material fatigue, makes it impossible for the handle cover 10 to be separated from the handle core 20. In the event of failure of the damping element 52, the handle core 20 because of the relief cut 60 comes to lie adjacent to the handle cover 10.

In order to form such a contactless relief cut 60, in the embodiments according to Figs. 1-4 a relief cut element 68 in the form of a foot is formed on the end 22 of the handle core 20 remote from the fastening element 40. The foot widens the cross section of the handle core 20 in such a way that the cross section at least in one region of the handle cover 10 is larger than the inner cross section of the handle cover 10. In a first embodiment according to Fig. 1, the foot is formed by a screw head 62. For this purpose, at the end face of the handle core 20 remote from the fastening element 40 a screw 61 is introduced in such a way that the screw head 62 projects radially beyond the handle core 20. In a second embodiment according to Fig. 2, the foot is formed by a disk 63, which is fitted as a separate part on the end face of the handle core 20 by means of a screw 61. Like the screw head 62 according to
Fig. 1, the disk 63 projects in radial direction beyond the handle core 20. In a further embodiment according to Fig. 3, the foot is moulded in the form of a collar 64 directly onto the handle core 20.

In the embodiment according to Fig. 4, the handle core 20 is constructed integrally with the fastening element 40. In this case, a screw 25 is introduced in the handle cover 10 in such a way that it performs the function of the handle core 20 and the fastening element 40. The screw neck 26 is disposed coaxially with the handle cover 10 and serves as the handle core 20. The screw thread 27 projects at least partially from the handle cover 20 and serves as the fastening element 40. The screw head 28, on the other hand, is disposed at the opposite end 12 of the handle cover 10 and performs the function of the relief cut element 68.

In the embodiment according to Fig. 3, in a departure from the other embodiments the handle core 20 is designed at least partially as a hollow cylinder. This makes it possible to provide further damping means in the interior of the handle core 20. Thus, for example, in Fig. 3 an absorption mass 29 is additionally accommodated in the handle core 20. The absorption mass 29 may in this case be mounted in a fixed or resilient manner. It may moreover be of an exchangeable design so that, depending on the application, an absorption mass of greater or lower mass may be introduced. The axial position of the absorption mass 29 inside the handle core 20 may be designed so as to be variable, e.g. by means of a thread (not shown). A further difference of the handle core 20 according to Fig. 3 is that the handle core 20 is of a two-part construction.
A first part 23 of the handle core 20 is used on the one hand to receive the fastening element 40 and on the other hand to receive a second part 24. In this case, the second part 24 may be designed so as to be axially displaceable, for example by means of a thread (not shown). This allows the operator of the hand tool machine to adjust the vibration-damping properties and hence adapt them to the respective application.

In another embodiment of the handle 100 according to the invention according to Fig. 5, relief cut elements 69 in the form of locking pawls are formed on the handle cover 10. These relief cut elements 69 are also fashioned in such a way that a contactless relief cut 60 is formed, which in the event of failure of the damping element 56 prevents the handle cover 10 from being separated from the handle core 20. The locking pawls are moulded on the handle cover 10 in such a way that they project into the interior of the handle 100. In the handle core 20 corresponding recesses 29 are introduced, into which the locking pawls engage without contact.

The various forms of the relief cut elements 68, 69 may also be used in combination.
Claims

1. Handle comprising a handle cover (10) and a handle core (20), wherein the handle core (20) has a fastening element (40) at one end (21) and extends right up to the end (12) of the handle cover (10) remote from the fastening element (40), as well as an intermediate space (30) disposed between handle cover (10) and handle core (20), wherein in the intermediate space (30) at least one damping element (52, 54, 56) is provided, characterized in that the handle core (20) forms a contactless relief cut (60) in the handle cover (10).

2. Handle according to claim 1, characterized in that the handle core (20) forms the contactless relief cut (60) in the region of the end (12) of the handle cover (10) remote from the fastening element (40).

3. Handle according to one of claims 1 or 2, characterized in that the handle core (20) is provided with at least one relief cut element (68) in the region of the end (22) remote from the fastening element (40).

4. Handle according to claim 3, characterized in that a foot is formed as a relief cut element (68) at the end (22) of the handle core (20) remote from the fastening element (40).

5. Handle according to claim 4, characterized in that the foot is formed by a screw head (62).
6. Handle according to claim 4, characterized in that the foot is formed by a disk (63).

7. Handle according to claim 4, characterized in that the foot is formed by a collar (64) moulded on the handle core (20).

8. Handle according to one of the preceding claims, characterized in that the fastening element (40) is constructed integrally with the handle core (20).

9. Handle according to claim 8, characterized in that the handle core (20) with integrally constructed fastening element (40) is a screw (25), wherein the screw head (28) of the screw (25) forms the relief cut element (68).

10. Handle according to one of the preceding claims, characterized in that at least one relief cut element (69) is formed on the handle cover (10).

11. Handle according to claim 10, characterized in that locking pawls are moulded as relief cut element (69) on the handle cover (10).

12. A handle substantially as herein described with reference to the accompanying drawings.

13. Hand tool machine containing a handle according to one of the preceding claims 1-12.
## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

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<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<tr>
<td>X,P</td>
<td>1-4, 6, 13</td>
<td>EP1800807 A1 (HILTT) See especially Figure 2.</td>
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### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

Worldwide search of patent documents classified in the following areas of the IPC:
- B23B; B24B; B25D; B25F; B27B

The following online and other databases have been used in the preparation of this search report:
- WPI, EPODOC

### International Classification:

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