A hand-held power tool has a housing and a drive motor arranged in the housing. A blower wheel is provided, wherein the housing has at least one area provided with openings allowing passage of air conveyed by the blower wheel. A protective device is arranged on an exterior wall of the housing, wherein the protective device has a damping area and the damping area protects the housing in the area provided with the openings from mechanical impact loads.
HAND HELD POWER TOOL AND
PROTECTIVE DEVICE FOR A HAND HELD
POWER TOOL

BACKGROUND OF THE INVENTION

[0001] The invention relates to a hand-held power tool comprising a drive motor that is arranged in a housing of the power tool and further comprising at least one blower wheel wherein the housing of the power tool has at least one area provided with openings allowing passage of air conveyed by the blower wheel. The invention furthermore relates to a protective device for a hand-held power tool.

[0002] U.S. Patent 2001/0005482 discloses a hand-held power tool in the form of a blower whose housing has intake ports. In the area of the intake ports, the structure of the housing is weakened. When making such a housing from plastic material, reinforcements and the like must be provided in order to ensure a sufficient stability of the housing. A point impact load on the housing in the area of the intake ports can cause damage to the housing.

SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide a hand-held power tool of the aforementioned kind that is well protected from mechanical loads. A further object of the invention resides in that a protective device for protecting the housing of the hand-held power tool from mechanical loads is to be provided.

[0004] In accordance with the present invention, this is achieved in that on the exterior wall of the housing a protective device is arranged that has a damping area wherein the damping area protects the housing in the area provided with openings from mechanical impact loads.

[0005] With regard to the protective device this object is solved in that the protective device has a damping area for protecting a housing of the power tool from mechanical loads and at least one attachment means for attaching the protective device on the housing of the power tool.

[0006] In order to be able to absorb mechanical loads on the housing such as point impact loads or the like, it is proposed to arrange on the exterior wall of the housing a protective device. The protective device has a damping area that protects mechanically the housing in the area of the openings. The damping area enables distribution of impact loads across a large area so that great point loads are prevented. At the same time, impacts can be dampened and absorbed. The protective device can also be retrofitted on already existing power tools.

[0007] It is provided that the blower wheel is a fan wheel that conveys cooling air to the drive motor. Alternatively or additionally, a blower wheel can be provided that conveys working air of the power tool, in particular, when the power tool is a blower, a vacuum device and/or a sprayer. Through the openings air can be sucked in or blown out.

[0008] A protective device that has a damping area is particularly advantageous for a power tool whose housing is provided in the area of the openings with webs that separate the individual openings from one another. Such webs that are in particular arranged in a grid configuration cause a weakening of the structure of the housing. By means of the protective device, a satisfactory stability of the housing in the weakened area can be achieved without the webs having to be too large or having to be made from a stronger material. In particular the arrangement of the protective device on an outwardly projecting area of the housing is advantageous. An outwardly projecting area of the housing is susceptible to mechanical loads that can occur when the housing hits other objects or when the housing is dropped. These mechanical loads can be absorbed well by the protective devices. In this way, the housing as a whole can be produced with comparatively small wall thickness and thus minimal weight. This is advantageous in particular in the case of hand-held power tools because the operator must carry the entire weight of the power tool.

[0009] Expediently, the drive motor is an internal combustion engine. It is provided that the power tool has a starter device for the internal combustion engine wherein the protective device is arranged in the area of the starter device on the housing. In the area where the starter device is located there are usually also cooling air openings. Starter devices that are manually actuated have usually a handle by means of which a cable drum can be rotated. In order to ensure direct transmission of the force onto the cable drum, the starter device is usually arranged in an area of the housing that is located on the exterior and projects past the main body of the housing. This area is therefore not well protected from mechanical loads.

[0010] Advantageously, the damping area of the protective device is comprised at least partially of an elastic material. Advantageously, the elastic material is rubber or a thermoplastic elastomer. Elastic materials can absorb impacts easily and distribute the impact well. In this way, overloading of the housing in individual areas is prevented. Such elastic or flexible materials have a comparatively minimal weight so that the housing including the protective device can be produced with a minimal weight in comparison to a housing that is so strong, i.e., has thick walls and is provided with reinforcements so that high impact forces can be absorbed. In particular, the protective device is comprised of a first material and a second material wherein the first and second materials have different mechanical properties. In this way, the protective device can be matched well to the forces to be absorbed. It can be provided that the damping area of the protective device is of a solid (no voids) configuration. It can also be advantageous that the damping area of the protective device has at least one cavity. By designing the cavities of the protective device in a suitable way, a targeted adjustment of the damping properties of the protective device can be achieved. By means of a suitable configuration of the cavities, it is also possible to provide through the cavities an elasticity or flexibility so that the material of the protective device itself must have only minimal elasticity.

[0011] Advantageously, the protective device is detachably secured on the housing. In this way, the protective device can be removed in case of working tasks in which the housing of the power tool is not subjected to high mechanical loads. In this way, the weight of the power tool is reduced for such tasks. Advantageously, the protective device is secured on the housing by a locking (snap-on) connection. Expediently, the protective device has at least one locking finger that is locked in an opening of the housing. For fixation of the protective device, the already existing openings can thus be used for this purpose. Additional devices for attachment must not be provided on the housing. However, it can be provided that the protective device is secured on the housing by an adhesive connection. Advantageously, the protective device is injection-molded onto the housing.

[0012] For a protective device for a hand-held power tool it is provided that the protective device has a damping area for protection of a housing of the power tool from mechanical loads as well as attachment means for attaching the protective device on the housing of the power tool. The protective device can be secured with the attachment means on the housing of the power tool, in particular in such way that the protective
device protects an area of the housing of the power tool that is exposed to high mechanical loads or whose structure is weakened. Accordingly, in a simple way a protection of the housing of the power tool from mechanical loads and thus protection of the housing from damage can be achieved.

Advantageously, the attachment means provides for a releasable connection. In this way, the protective device can be removed or detached from the housing of the power tool when the power tool is to be used in such a way that it is exposed to only minimal mechanical loads. Depending on the type of use of the power tool, the protective device can be secured on the housing of the power tool or can be removed from it. Advantageously, the attachment means comprises a locking hook. The locking hook is in particular arranged on a locking finger wherein the locking finger is attached to the damping area. Advantageously, the damping area is of an annular configuration. The annular configuration of the damping area enables the protection of a comparatively large area of the power tool with little material being expended on the protective device. In this way, the protective device can be of a simple and lightweight design. The damping area can be, for example, of a circular ring shape or can be shaped as an oval ring.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective illustration of a blower.

FIG. 2 is a schematic section illustration of a blower.

FIG. 3 is a detail view of the blower of FIG. 1 in the area of the starter device.

FIG. 4 shows the housing of the blower of FIG. 1 in the area of the starter device.

FIG. 5 is a section view of the housing of the blower in the area of the starter device in a simplified illustration.

FIG. 6 is a first perspective illustration of a protective device according to the invention.

FIG. 7 is a second perspective illustration of the protective device according to the invention.

FIG. 8 is a schematic section illustration of one embodiment of a protective device according to the invention.

FIG. 9 is a schematic section illustration of another embodiment of a protective device according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The hand-held portable power tool illustrated in FIG. 1 is a blower 1. However, the invention can also be used for other hand-held power tools such as vacuum devices, combined vacuum/blower devices, motor chainsaws, trimmers or the like. The blower 1 has a housing 2 on which a blower tube 3 is secured. The blower 1 conveys working air through the blower tube 3. For conveying the working air, the drive motor 7, schematically illustrated in FIG. 1, is arranged in the housing 2. The drive motor is an internal combustion engine. The drive motor 7 is in particular a two-stroke engine, but the drive motor 7 can also be a four-stroke engine, in particular a mixture-lubricated four-stroke engine.

On the housing 2 a top handle 4 for guiding the blower 1 is arranged. On the housing 2 there are two legs 6. The blower 1 can be put down to rest on the two legs 6. For starting the drive motor 7, the blower 1 has a starter device 8. The starter device 8 has a starter handle 9 to which is secured a cable, not illustrated, that when pulling the starter handle 9 will cause the cable drum arranged in the housing 2 to rotate and thereby start the internal combustion engine provided as the drive motor 7. The starter device 8 can however also be operated electrically.

A series of cooling air openings 15 is provided on the housing 2 in the area adjacent to the blower tube 3 that points forwardly in operation as well as in the area of the starter device 8.

In FIG. 2, the configuration of the blower 1 is schematically shown. The drive motor 7 has a crankshaft 10 that is driven in rotation by the reciprocating movement of the piston 11. The starter device 8 acts on the crankshaft 10. Between the starter device 8 and the drive motor 7, a blower wheel 18 can be fixedly secured on the crankshaft 10. The blower wheel 18 serves in this connection in particular for conveying cooling air to the drive motor 7. The cooling air is sucked in through the cooling air openings 15 (FIG. 1) arranged in the area of the starter device 8.

The blower 1 has a blower spiral 13 having secured to its exit the blower tube 3. The crankshaft 10 drives a second blower wheel 12 in rotation which is used for conveying working air through the blower spiral 13 into the blower tube 3. The second blower wheel 12 takes in working air in the axial direction through intake openings 14 (schematically shown in FIG. 2).

FIGS. 3 and 4 show the area of the housing 2 where the starter device 8 is located. In the area of the starter device 8 the housing 2 is curved outwardly in the shape of a truncated cone. The cone wall is provided with cooling air openings 15. The cooling air openings 15 are separated from one another in the circumferential direction by circumferentially extending webs 20 as well as radial webs 21. The characterization as circumferential and radial refers in this connection to the axis of rotation of the crankshaft 10. In the area of the starter device 8 on the housing 2 a flat circular plate 23 is arranged. On the circumference of the circular plate 23 a protective device 16 is secured on the housing 2. The protective device 16 has a damping area 28 that is of a circular annular shape in the embodiment. The damping area 28 forms an outwardly projecting bead on the housing 2 so that the housing 2 in the area of the starter device 8 is protected mechanically from external impacts. When the housing 2 hits a plane object, for example, when the blower 1 drops to the ground, in the area of the starter device 8 only the damping area 28 can contact the ground. The housing 2 itself is protected in this area.

FIG. 5 shows the housing 2 in the area of the starter device 8 in section. The arrangement of the starter device 8 in the housing interior 27 is schematically shown. The damping area 28 is arranged on the exterior 26 of the housing 2. The damping area 28 is supported with inwardly projecting lip 22 on the plate 23 of the housing 2. The damping area 28 is provided with a total of 10 locking fingers 19 (see also FIGS. 6 and 7). Each locking finger 19 has an outwardly projecting locking hook 25 that engages a circumferential web 20. Each finger 19 projects through a cooling air opening 15. The locking hooks 25 are accessible from the exterior housing wall 26 of the housing 2 so that the locking hooks 25 can be pressed inwardly in order to release them. In this way, the protective device 16 can be removed or detached from the housing 2 if this is desired by the operator. On the damping area 28, the protective device 16 has a circumferential shoulder 17 supported on the housing 2. In this way, the protective device 16 is secured safely on the housing 2.

As shown in FIGS. 6 and 7, the protective device 16 has an area 24 where no locking fingers 19 are arranged. The area 24 will be positioned in the area of the handle 9. The other locking fingers 19 are distributed uniformly about the circumference of the damping area 28.

The protective device 16 is comprised advantageously of an elastic or flexible material. In particular, the
protective device 16 is comprised of rubber or a thermoplastic elastomer. However, other materials may also be advantageous.

In FIG. 8, one embodiment of the protective device 36 is illustrated. The damping area 28 of the protective device 36 comprises a first material 37 that forms a base member. The first material 37 is secured on the housing 2 of the blower 1, in particular, by an adhesive. On the base member formed by the first material 37 a second material 38 is provided as a coating or cover. The second material 38 encloses the first material 37 in those areas where the protective device 16 will come into contact with other flat objects. When the housing 2 of the blower 1 impacts on an object, first the second material 38 contacts the object. The first material 37 and the second material 38 have different mechanical properties, for example, the second material can be more elastic and softer than the first material 37. By a suitable selection of the materials and of the geometry of the materials, the desired damping and springing properties can be adjusted.

In the embodiment illustrated in FIG. 9, the desired elasticity and damping properties of the protective device 46 are achieved by selecting a suitable geometry. In order to increase the elasticity of the protective device 46, the protective device 46 has at least one cavity 47. It is also possible that several cavities 47 are distributed about the circumference of the protective device 46. The cavities 47 can be open toward the housing 2 or can be completely closed off. For fixation on the housing 2 it is provided that the protective device 46 is injection-molded onto the housing 2. The protective device 46 is comprised also of a material with elastic properties such as rubber or a thermoplastic elastomer.

The aforementioned configurations for fixation of the protective device and for adjusting the elasticity of the protective device can be combined with one another in any way in order to achieve suitable properties of the protective device. The openings for the passage of air can also be openings through which the conveyed air is blown out, in particular when the power tool is a vacuum device or a combined vacuum/blower device.

The specification incorporates by reference the entire disclosure of German priority document 10 2007 007 182.7 having a filing date of Feb. 14, 2007.

While specific embodiments of the invention have been shown and described in detail to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A hand-held power tool comprising:
   a housing,
   a drive motor arranged in the housing;
   a first blower wheel, wherein the housing has at least one area provided with openings allowing passage of air conveyed by the first blower wheel;
   a protective device arranged on an exterior side of the housing, wherein the protective device has a damping area and the damping area protects the housing in the area provided with the openings from mechanical impact loads.
   2. The power tool according to claim 1, wherein the first blower wheel is a fan wheel that conveys cooling air to the drive motor.
   3. The power tool according to claim 2, comprising a second blower wheel conveying working air of the power tool.
   4. The power tool according to claim 1, wherein the first blower wheel conveys working air of the power tool.
   5. The power tool according to claim 1, wherein the housing has webs in the area provided with the openings, wherein the webs separate the individual openings from one another.
   6. The power tools according to claim 1, wherein the protective device is arranged on an area of the housing that projects outwardly.
   7. The power tool according to claim 1, wherein the drive motor is an internal combustion engine and the power tool has a starter device for the internal combustion engine wherein the protective device is arranged on the housing in the area where the starter device is located.
   8. The power tool according to claim 1, wherein the damping area of the protective device is at least partially comprised of an elastic material.
   9. The power tool according to claim 8, wherein the elastic material is rubber or a thermoplastic elastomer.
  10. The power tool according to claim 1, wherein the protective device comprises a first material and a second material wherein the first material and the second material have different mechanical properties.
  11. The power tool according to claim 1, wherein the damping area of the protective device is solid.
  12. The power tool according to claim 1, wherein the damping area of the protective device has at least one cavity.
  13. The power tool according to claim 1, wherein the protective device is detachably secured on the housing.
  14. The power tool according to claim 1, wherein the protective device is secured on the housing by a locking connection wherein the protective device has at least one locking finger that is locked in one of the openings of the housing.
  15. The power tool according to claim 1, wherein the protective device is secured on the housing by an adhesive connection.
  16. The power tool according to claim 1, wherein the protective device is injection-molded to the housing.
  17. A protective device for a hand-held power tool, wherein the protective device has a damping area for protecting a housing of the power tool from mechanical loads and at least one attachment means attaching the protective device on the housing of the power tool.
  18. The protective device according to claim 17, wherein the at least one attachment means is releasable.
  19. The protective device according to claim 17, wherein the at least one attachment means has at least one locking hook arranged on a locking finger and wherein the locking finger is attached to the damping area.
  20. The protective device according to claim 17, wherein the damping area is annular.

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